

Georgia Adopt-A-Stream

CHEMICAL MONITORING WORKSHOP



Georgia Adopt-A-Stream

A citizen science water quality monitoring program encouraging all Georgians to get familiar with their watersheds, monitor impacts, improve streams, rivers, wetlands, lakes, and estuaries, and inform others about their effect on water quality.



A

Awareness



Increase public **awareness** of nonpoint source pollution & water quality issues

D

Data



Collect baseline water quality **data** according to Adopt-A-Stream protocols

O

Observations



Take **observations** of sites to note water quality conditions

P

Partnerships



Seek **partnerships** with local gov'ts, nonprofits, & other organizations to share results & resources

T

Tools & Training



Utilize **tools & training** provided by staff & local coordinators

TYPES OF POLLUTION



POINT SOURCE POLLUTION

- Easily identifiable pollutant source
- Regulated by GA EPD through NPDES permitting process



NONPOINT SOURCE POLLUTION

- Sources not easily distinguished/identified
- Everyone contributes
- Main cause of water quality problems in GA

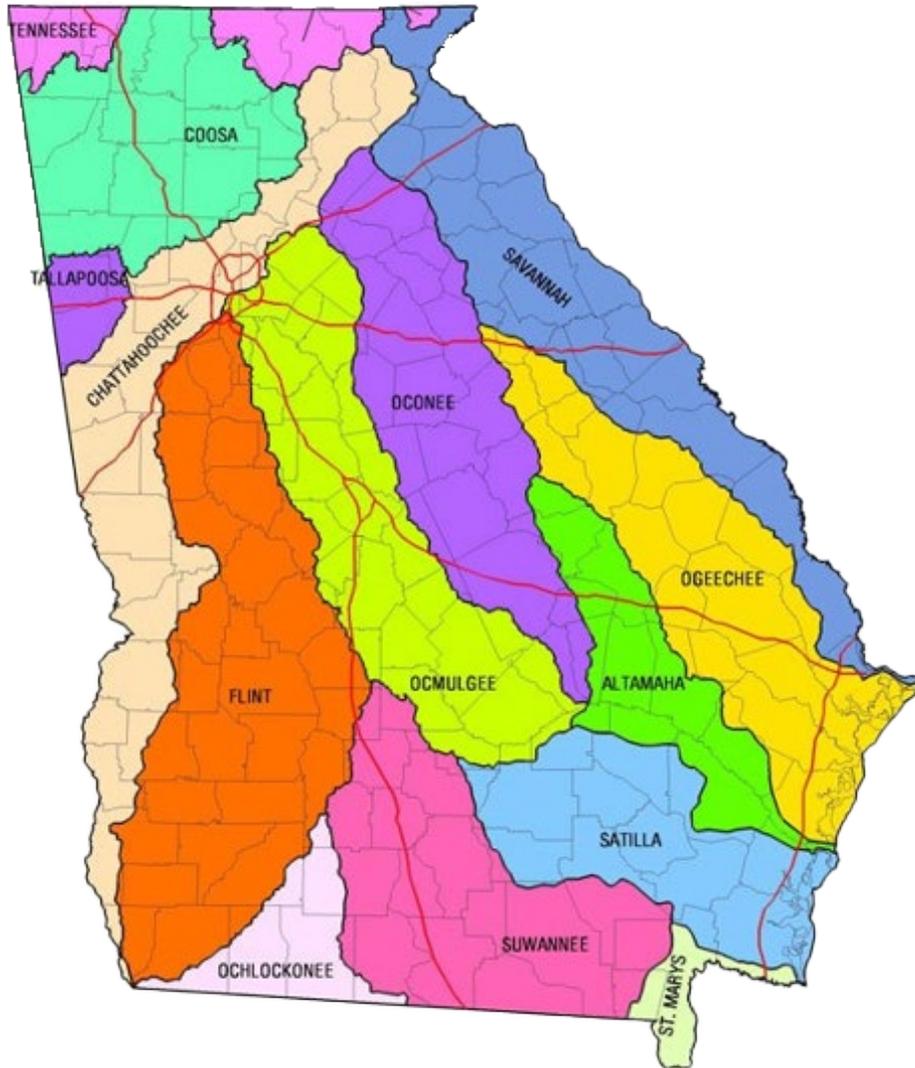
WHAT IS A WATERSHED?

- **A land area from which water, sediment, and dissolved materials drain to a common point along a stream, wetland, lake, or river.**
- Its boundaries are defined by the highest points of land around the waterbody.

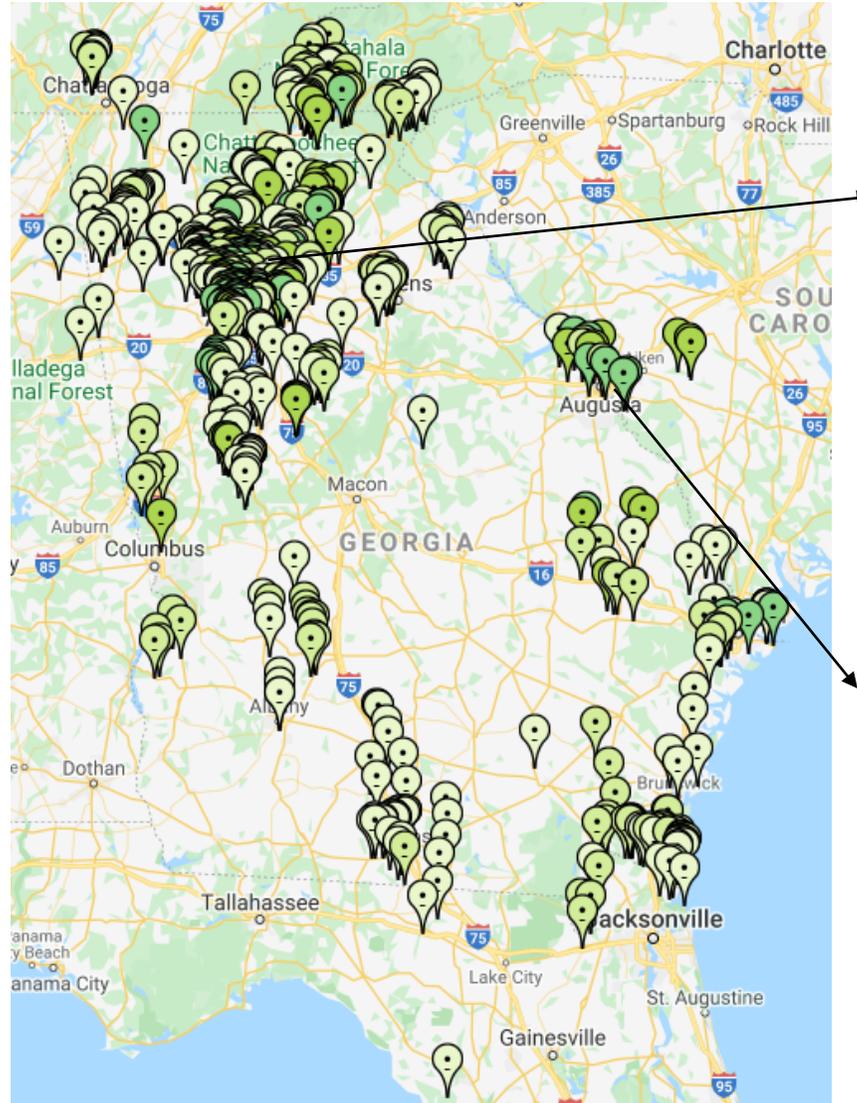
There is an unbreakable link between human health and wellbeing and ecosystems. -Walter Reid



WHERE IS YOUR WATERSHED?



VOLUNTEER NETWORK AND SUPPORT



VOLUNTEER NETWORK AND SUPPORT



AAS VOLUNTEERS USE STANDARDIZED PROTOCOLS

- EPA Approved Quality Assurance Project Plan (QAPP)
- Quality Assurance/Quality Control (QA/QC)
 - Required to attend workshop(s) and pass certification test(s) to become certified
 - Only individuals are certified
 - Set monitoring protocol ensures all volunteers are collecting baseline data using standard methods
 - Only certified volunteers can enter data, but anyone can access the 20+ years of data in the online AAS database



EARNING YOUR QA/QC CHEMICAL CERTIFICATION



FIELD:

Volunteers must demonstrate how to properly collect data and obtain results within duplicate precision of the trainer



WRITTEN TEST:

Volunteers must pass a written evaluation with a score of at least 80%

WHY MONITOR WATER CHEMISTRY?

- Water chemistry parameters provide information about stream health
- Establishing a baseline helps detect changes in water quality
- Aquatic life is adapted to certain range of water quality conditions
- Data can help determine which pollutants may be affecting water quality



WHAT DOES CHEMICAL MONITORING INVOLVE?

- AAS recommends monitoring these core chemical parameters:
 - Temperature
 - Dissolved Oxygen
 - pH
 - Conductivity (Stream and Lake)
 - Clarity (Coastal and Lake)
 - Salinity (Coastal)



Nutrient testing, alkalinity, and settleable solids monitoring may be added to your list as interest and equipment allows.

WHERE, WHEN, AND HOW OFTEN?

- Where to monitor:
 - **Well mixed, flowing area of water**
 - Same site location
- When to monitor:
 - Normal flow conditions
 - Same time of day
- How often to monitor:
 - **Once a month**



CORE CHEMICAL PARAMETERS

TEMPERATURE

A MEASURE OF THE THERMAL ENERGY PRESENT IN
A SUBSTANCE OR OBJECT

TEMPERATURE

- Units: degrees Celsius (°C)
- Measurement:
 - Thermometer
 - **In the shade**, away from direct sunlight.
 - **Take air temperature before water temperature.**
 - Single measurement for each parameter
- State Standard for Water Temperature:
 - Less than 32.2°C (90°F)



WHAT IMPACTS WATER TEMPERATURE?

- Water temperature naturally varies with time of day and seasons
- Increased by:
 - Industrial or utility plant discharge of water
 - Runoff from heated, impervious surfaces
 - Removal of tree canopy
- Decreased by:
 - Cool, underground water sources
 - Snowmelt
 - Over-hanging vegetation
- Importance:
 - Temperature affects **feeding, respiration, and metabolism**
 - May affect other chemical parameters



DISSOLVED OXYGEN

OXYGEN DISSOLVED IN WATER AND AVAILABLE FOR LIVING ORGANISMS TO USE FOR RESPIRATION

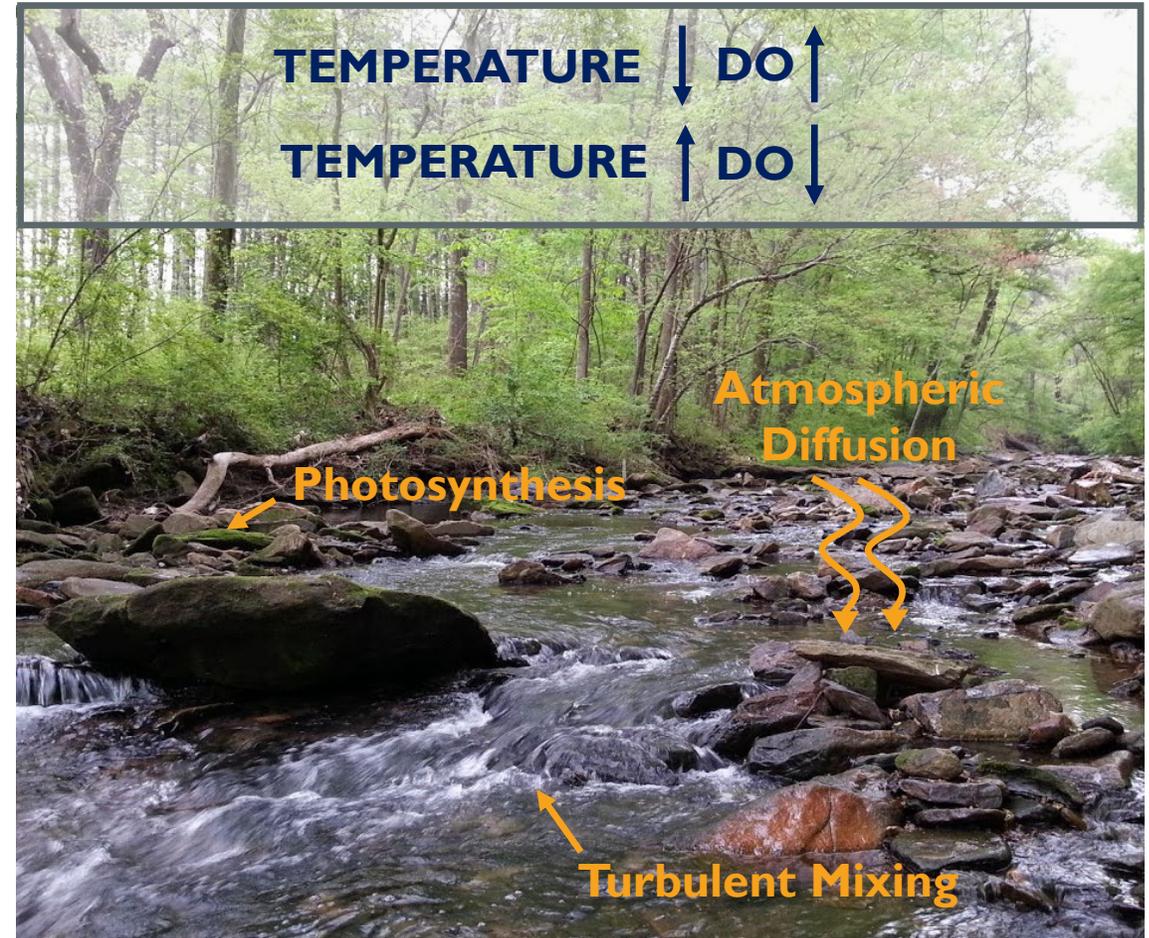
DISSOLVED OXYGEN

- Units: mg/L or ppm (1 mg/L = 1 ppm)
- Measurement:
 - Winkler titration
 - Take two samples for duplicate precision
 - Must be within **+/- 0.6 mg/L of each other**
 - If not, **take another sample until two are within that range**
- State Standards for DO:
 - **No less than 4 mg/L**
 - Trout streams: no less than 5 mg/L
 - Some south GA streams will naturally have a lower DO



WHAT IMPACTS DISSOLVED OXYGEN?

- Temperature and DO are **inversely related**
- Introduced/Increased by:
 - **Diffusion from the atmosphere**
 - As a waste product of **photosynthesis**
 - **Turbulent mixing (riffles)**
- Decreased by:
 - **Rising temperatures**
 - Slow moving, deep water
 - **An overload of decaying organic matter** (due to excess nutrients)
- Importance
 - Aquatic organisms need dissolved oxygen for respiration

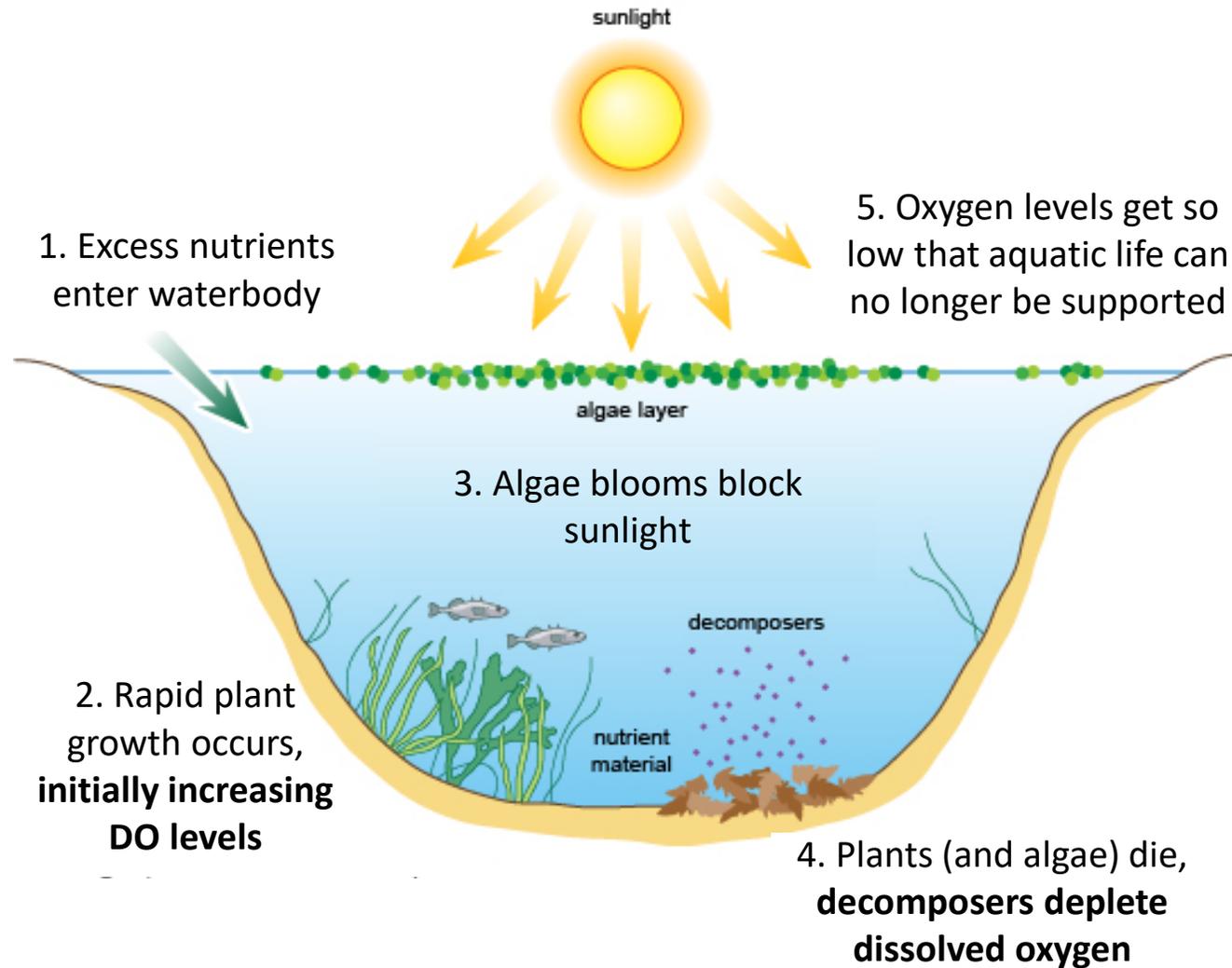


EUTROPHICATION

- Eutrophication: when a body of water becomes excessively enriched with nutrients
- Two main types of nutrients:
 - Nitrates (fertilizers, animal waste, sewage)
 - Phosphates (soaps, fertilizers, animal waste, sewage)
- Eutrophication can result in algal blooms, affecting sensitive aquatic organisms and **decreasing dissolved oxygen levels**



EUTROPHICATION

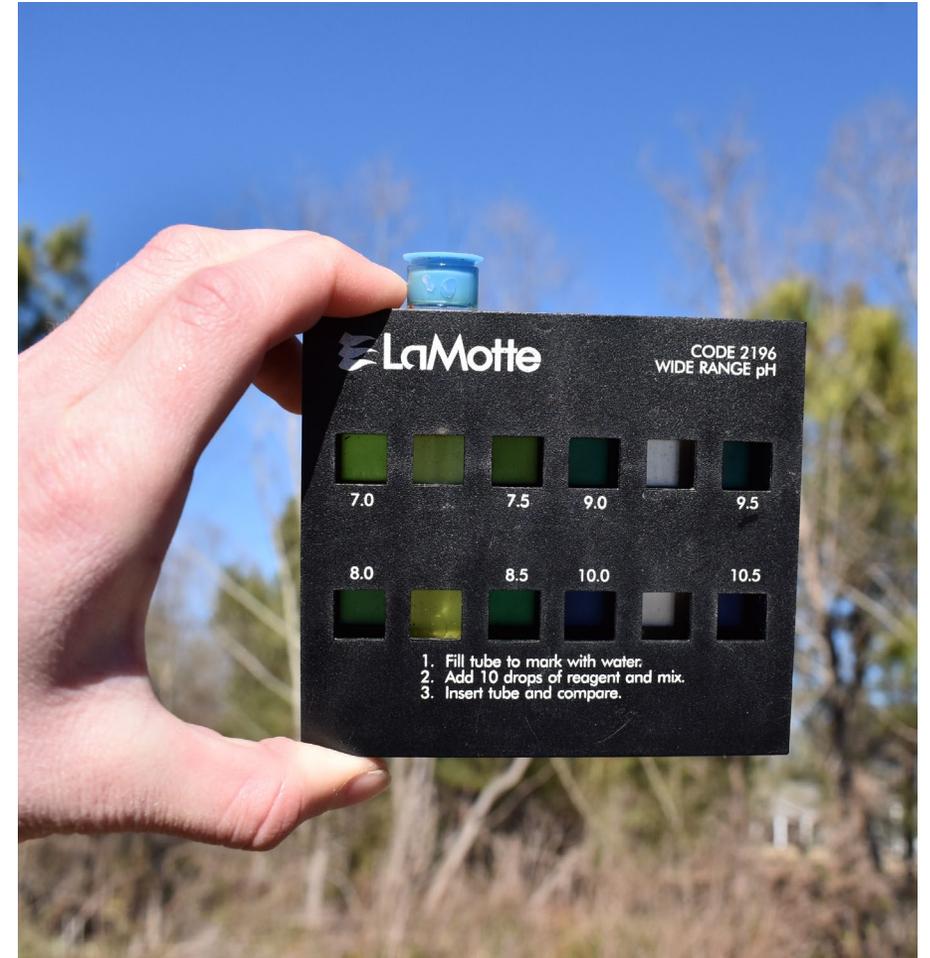


pH

A MEASURE OF THE HYDROGEN IONS (H⁺) PRESENT IN A
SUBSTANCE; HOW ACIDIC OR BASIC A SUBSTANCE IS

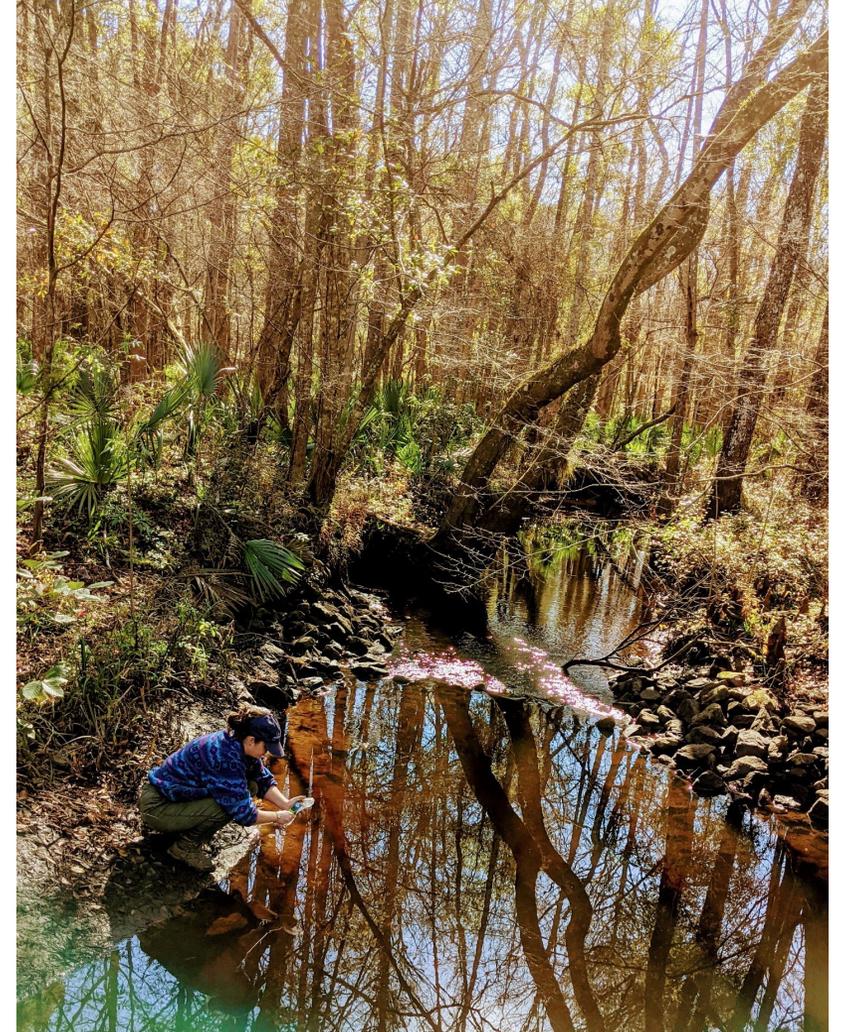
pH

- Units: none (0-14 scale with 7 being neutral)
- Measurement:
 - Color comparator
 - Take 2 samples for duplicate precision
 - Must be within **+/-0.25 of each other**
 - If not, **take another sample until two are within that range.**
- State standard:
 - **Between 6 and 8.5**
 - South Georgia streams can get as **low as 3.5**
 - Coastal: **pH increases (becomes more basic) with higher salinity**

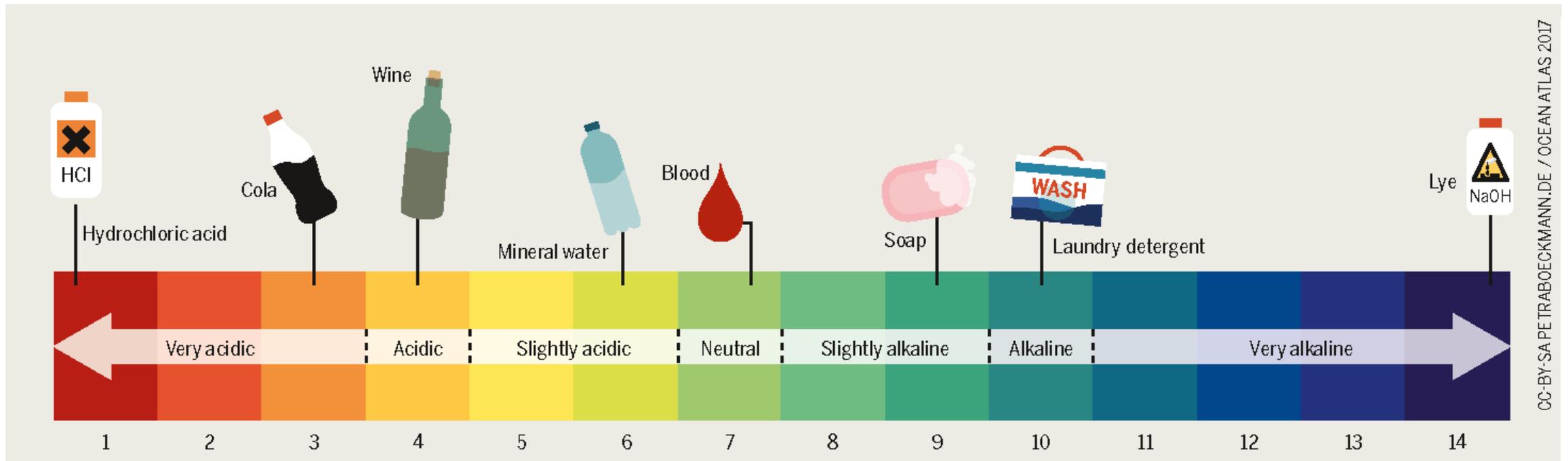


WHAT IMPACTS pH?

- pH should remain relatively consistent, so closely monitor for deviations
- Increased by:
 - Photosynthesis
 - Calcium carbonate from limestone
- Decreased by:
 - Respiration
 - Tannins
 - Mine drainage
- Importance:
 - Small change in pH represents large change in H^+ ions
 - Aquatic organisms sensitive to fluctuations
 - Impacts the solubility of nutrients and heavy metals



pH SCALE FOR REFERENCE



CONDUCTIVITY

A MEASURE OF A SUBSTANCE'S ABILITY TO PASS AN ELECTRICAL CURRENT; INDICATES THE PRESENCE OF IONS

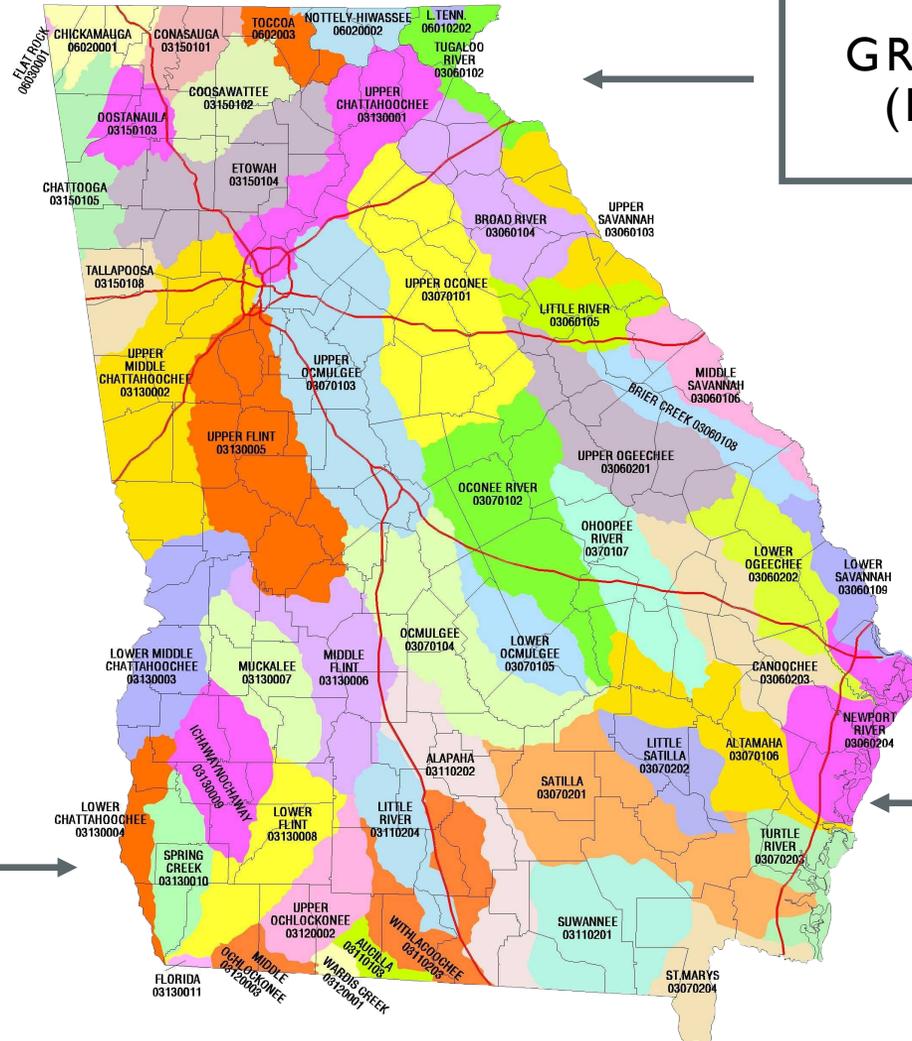
CONDUCTIVITY

- Units: **microSiemens per centimeter ($\mu\text{S}/\text{cm}$)**
- Measurement:
 - Conductivity meter (single reading)
 - **Conductivity meter should be calibrated within 24 hours prior to each monitoring event**
- State Standard:
 - No state standard for conductivity in Georgia
 - Georgia waters generally range from 50-1500 $\mu\text{S}/\text{cm}$
 - Volunteers should monitor consistently to establish baseline levels and note any deviations



WHAT IMPACTS CONDUCTIVITY?

- Natural Factors:
 - Geology
 - Salinity



GRANITE BEDROCK
(LOWER COND.)

LIMESTONE BEDROCK
(HIGHER COND.)

INCREASED SALINITY
(HIGHER COND.)

WHAT IMPACTS CONDUCTIVITY?

- Human Factors:
 - **Mining operations**
 - **Agriculture**
 - **Sewage effluent**
 - **Urban runoff**
- Importance:
 - Indicates the presence of potentially harmful chemicals
 - Further testing required to determine what chemicals are present



SALINITY

A MEASURE OF THE AMOUNT OF DISSOLVED SALTS IN WATER

SALINITY

- Units: parts per thousand (ppt)
- Measurement:
 - Refractometer
 - Two samples taken for duplicate precision
 - Must be within **+/- 1.0 ppt** of each other
 - If not, **take another sample until two are within that range.**
 - **Refractometer should be calibrated within 24 hours prior to each monitoring event**
- State Standard:
 - No state standard for salinity in Georgia
 - **Salinity varies depending on tidal stage and freshwater inputs**
 - Salinity of seawater is **~35 ppt**



WHAT IMPACTS SALINITY?

- Natural Factors:
 - Tides
 - Water temperature
- Human Factors:
 - Saltwater intrusion
 - Sea level rise
- Importance:
 - Aquatic plants and animals are adapted to certain salinity levels and are sensitive to change



WATER CLARITY

THE TRANSPARENCY OR CLEARNESS OF THE WATER

WATER CLARITY

- Units: **Centimeters (cm)** depth
- Measurement:
 - Secchi disk
 - Two samples taken for duplicate precision
 - Must be within **+/- 10 cm** of each other
 - If not, **take another sample until two are within that range.**
- State Standard:
 - No state standard for water clarity in Georgia



WHAT IMPACTS WATER CLARITY?

- Natural Factors:
 - Rainfall
 - Tidal stage
 - Algae growth
- Human Factors:
 - Eutrophication
 - Development/erosion
 - Dredging operations
- Importance:
 - Low water clarity limits the amount of sunlight available for photosynthesis
 - Suspended particles can damage gills or suffocate aquatic organisms and disturb filter feeding



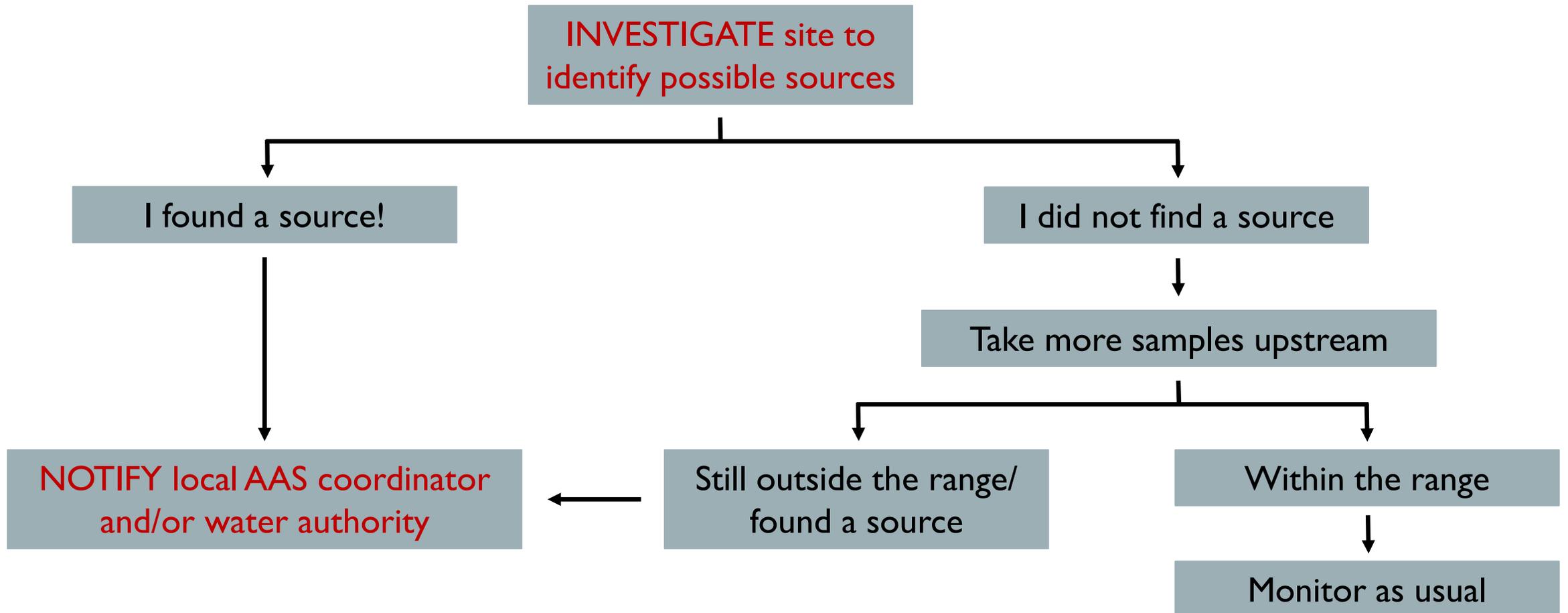
REAGENT MAINTENANCE AND DISPOSAL

- **Store chemical kits in a cool, dark place**
- **Replace reagents when expired or contaminated**
- Disposal of reagents:
 - On municipal system- expired/contaminated reagents can be poured down the drain and flushed with water
 - On septic- solidify expired/contaminated reagents using cat litter and throw away, or bring to AAS office or water treatment facility
- Contact your local coordinator or the State office for replacement equipment or reagents



RESULTS OUTSIDE OF THE STATE STANDARD

If your results are outside the range of the state standard or deviate from your baseline



SAFETY

- Try not to sample alone- take a monitoring buddy!
- Do not sample during high flows or after a heavy rain event
- Obtain permission if sampling on private property
- Wear PPE when sampling



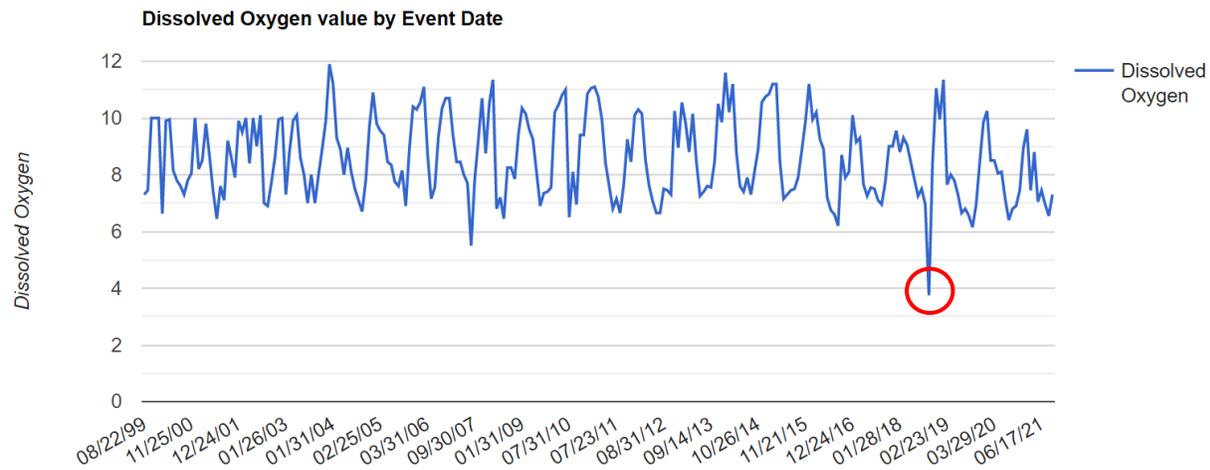
ONCE YOU'RE CERTIFIED

- You get an account to our online database!
- Only certified volunteers can submit data
- Certification is valid for one year
- Volunteers must attend an annual recertification workshop



HOW ARE YOUR DATA USED?

- Establish baseline conditions for waterbodies across the state
- Discover and report water quality issues
- Educate your community
- Help inform status of streams for 303d/305b list



DATABASE LOGIN

Georgia Adopt-A-Stream
Volunteer Water Quality Monitoring

Search

Get Involved Confluence Citizen Monitoring Data Views Data Entry Materials & Resources My Profile

Sign in

User Name:

Password:

[Forgot your user name?](#)

Your **Email address** is the primary address we have on file.

- **If this is your first visit, or if you've forgotten your password:**
Enter your User Name and click **Email my password**. Your password will be sent to you immediately. If you don't see it, be sure to check your Junk Mail or Spam folder.
- **Did you get an "Unknown email address" warning?**
Contact your [local Adopt-A-Stream Coordinator](#), who can help you register.
- **Has your email address changed?**
Log in with your original user name, and then make changes in your **Profile**. We'll use your new email address for future communications.

The Adopt-A-Stream Database website is not recommended for use with Internet Explorer browsers.

If you have any questions, please [contact us](#).

From the AAS website's homepage, hover over the My Profile tab and click Sign In

DATA SUBMISSION FORM

The screenshot shows the Georgia Adopt-A-Stream website interface. At the top, there is a dark blue header with the logo on the left, a search bar on the right, and the user name "User: Nachtmann". Below the header is a navigation bar with several tabs: "Get Involved", "Confluence", "Citizen Monitoring", "Data Views", "Data Entry", "Materials & Resources", "Outreach Staff", and "My Profile". The "Data Entry" tab is highlighted, and a dropdown menu is open, showing options: "Data Submission Form", "Register Group", "Trainers: Enter Workshop Data", "Trainers: Certificates & Letters", and "Trainer Workshop History".

Below the navigation bar, there is a section for "GEORGIA ADOPT-A-STREAM" with tabs for "Site", "Chemical", "Bacterial", "Macroinvertebrate", and "Stream". A "Submit All" button is visible on the right.

Below the tabs, there is a section titled "Site, Weather, and Observations" with a sub-section "Site Information". The "Adopt-A-Stream Site" field is a search box labeled "Search Site". Below this, there is a note: "Enter the site name or site number without the S-, and select from the list. Note that you must be a member of a group before you can submit data for its sites."

Below the note, there are several input fields:

- *Event date: MM/DD/YYYY
- *Time sample collected: 10 : 56 AM (with a dropdown arrow)
- *Total number of participants: Number
- *Time spent sampling: Minutes
- Total time spent traveling: Minutes
- Furthest distance traveled: Miles

At the bottom of the input fields, there is a small text "hh:mm am/pm" below the time sample field.

From the AAS website's homepage, hover over the Data Entry tab and click Data Submission Form

SITE, WEATHER, AND OBSERVATIONS

GEORGIA ADOPT-A-STREAM: Chemical Form

To be conducted every month

SITE INFORMATION	Group Name: _____ Event Date: _____ (MMDDYYYY) Group ID: G-_____ Site ID: S-_____ Time Sample Collected: _____ (HHMM am/pm) Stream Name: _____ Time Spent Sampling: _____ (Min) Monitor(s): _____ Total Time Spent Traveling (optional): _____ (Min) Number of Participants: _____ Furthest Distance Traveled (optional): _____ (Miles)	
	<table border="1"> <tr> <td> Present conditions (check all that apply) <input type="checkbox"/> Heavy Rain <input type="checkbox"/> Steady Rain <input type="checkbox"/> Intermittent Rain <input type="checkbox"/> Overcast <input type="checkbox"/> Partly Cloudy <input type="checkbox"/> Clear/Sunny </td> <td> Amount of rain, if known? Amount in Inches : _____ In Last Hours/Days: _____ *Refer to <i>wunderground.com</i> for rainfall data </td> </tr> </table>	Present conditions (check all that apply) <input type="checkbox"/> Heavy Rain <input type="checkbox"/> Steady Rain <input type="checkbox"/> Intermittent Rain <input type="checkbox"/> Overcast <input type="checkbox"/> Partly Cloudy <input type="checkbox"/> Clear/Sunny
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OBSERVATIONS	Flow/Water Level: <small>(check all that apply)</small> <input type="checkbox"/> Dry <input type="checkbox"/> Stagnant/Still <input type="checkbox"/> Low <input type="checkbox"/> Normal <input type="checkbox"/> High <input type="checkbox"/> Flow (over banks)	
	Water Clarity: <input type="checkbox"/> Clear/Transparent <input type="checkbox"/> Cloudy/Somewhat Turbid <input type="checkbox"/> Opaque/Turbid	
	Water Color: <input type="checkbox"/> No Color <input type="checkbox"/> Brown/Muddy <input type="checkbox"/> Green <input type="checkbox"/> Milky/White <input type="checkbox"/> Tannic <input type="checkbox"/> Other: _____	
	Water Surface: <input type="checkbox"/> Clear <input type="checkbox"/> Oily sheen: Does it break when disturbed? Yes/No (circle one) <input type="checkbox"/> Algae <input type="checkbox"/> Foam <input type="radio"/> Greater than 3" high <input type="radio"/> It is pure white Other: _____	
	Water Odor: <input type="checkbox"/> Natural/None <input type="checkbox"/> Gasoline <input type="checkbox"/> Sewage <input type="checkbox"/> Rotten Egg <input type="checkbox"/> Fishy <input type="checkbox"/> Chlorine <input type="checkbox"/> Other: _____	
	Photos: Please take images to document your observations and changes in water quality conditions. Photo point directions can be found in the manuals. Send photos to AAS@gaepd.org .	
	Trash: <input type="checkbox"/> None <input type="checkbox"/> Yes, I did a cleanup <input type="checkbox"/> This site needs an organized cleanup	

CHEMICAL DATA

CHEMICAL	Conductivity Meter Calibration (within 24hrs of sampling)							
	Date _____ Time _____ Standard Value _____ Initial Meter Reading _____ Meter Adjusted to _____							
	Reagents: Are any reagents expired? <input type="checkbox"/> Yes <input type="checkbox"/> No List any expired: _____							
	Core Tests	Test 1	Test 2	Units	Other Tests	Test 1	Test 2	Units
	Air Temp			°C	Secchi Depth(+/- 10)			cm
	Water Temp			°C	Chlorophyll a			ug/L
	pH (+/-0.25)			Standard unit	Salinity (+/- 1)			ppt
Dissolved Oxygen (+/-0.6)			mg/L or ppm					
Conductivity			uS/cm					
COMMENTS	<i>Any changes since you last sampled at this site? If yes, please describe.</i>							

Please submit data to our online database at AdoptAStream.Georgia.gov

Submit data ASAP to online database

Access database via AdoptAStream.Georgia.gov

Fill out site data first, then navigate to the chemical tab to continue entering data

[Save as Draft](#) [Submit All](#)

Site Chemical Bacterial Macroinvertebrate Stream Habitat Survey

GEORGIA ADOPT-A-STREAM Data Submission Form

***Indicates a required field**
You *cannot* submit a form that has **Errors** or missing **Required Data**.
You *can* submit a form that has **Warnings**, but it will be flagged as out of compliance with the AAS quality assurance plan.

Site, Weather, and Observations

Site Information

***Adopt-A-Stream Site**

Search Site

Enter the site name or site number without the S-, and select from the list. Note that you must be a member of a group before you can submit data for its sites.

*Event date: MM/DD/YYYY	*Time sample collected: 10 : 56 AM <small>hh:mm am/pm</small>	*Total number of participants: Number	*Time spent sampling: Minutes	Total time spent traveling: Minutes	Furthest distance traveled: Miles
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Participants

***Adopt-A-Stream monitors**

Search Contact

Enter one at a time, and select from the drop-down list.

Other participants

Weather

Present conditions

Heavy Rain Steady Rain Intermittent Rain
 Overcast Partly Cloudy Clear/Sunny

Amount of rain, if known?

Amount in inches

In Last Number Hours / Days

Refer to wunderground.com for rainfall data

Observations

Flow/Water Level:
Check all that apply

Dry Stagnant/Still Low Normal High Flood (over banks)

Tides:
Check all that apply (coastal monitors)

Tide was: High Low | Incoming Outgoing

Waterway was not influenced by tides

Water Conditions:
Check all that apply (coastal and lake monitors)

Calm/Smooth Ripples Waves White Caps

[Top](#)

After entering all of your data, click “Submit All” to submit your data to the database

[Save as Draft](#) [Submit All](#)

Site Chemical Bacterial Macroinvertebrate **Stream Habitat Survey**

GEORGIA ADOPT-A-STREAM Data Submission Form

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Amount in inches
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Refer to wunderground.com for rainfall data

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Check all that apply (coastal monitors)

Tide was: High Low | Incoming Outgoing
 Waterway was not influenced by tides

Water Conditions:
Check all that apply (coastal and lake monitors)

Calm/Smooth Ripples Waves White Caps

[Top](#)

Use “Save as Draft” to finish submitting data at a later time. Data must be submitted within 7 days of saving as a draft.

Site Chemical Bacterial Macroinvertebrate Stream Habitat Survey

GEORGIA ADOPT-A-STREAM Data Submission Form

Save as Draft **Submit All**

***Indicates a required field**
You cannot submit a form that has **Errors** or missing **Required Data**.
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Site, Weather, and Observations

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***Event date:** MM/DD/YYYY

***Time sample collected:** 10:56 AM
hh:mm am/pm

***Total number of participants:** Number

***Time spent sampling:** Minutes

Total time spent traveling: Minutes

Furthest distance traveled: Miles

Participants

***Adopt-A-Stream monitors**

Search Contact

Enter one at a time, and select from the drop-down list.

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Calm/Smooth Ripples Waves White Caps

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FOLLOW AAS AND STAY CONNECTED

 AAS@dnr.ga.gov

 AdoptAStream.Georgia.gov

 facebook.com/georgiaadoptastream

 @georgiaadoptastream

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TEST REVIEW