Georgia Adopt-A-Stream

CHEMICAL MONITORING WORKSHOP

Georgia Adopt-A-Stream
Volunteer Water Quality Monitoring

GEORGIA
DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION DIVISION

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.

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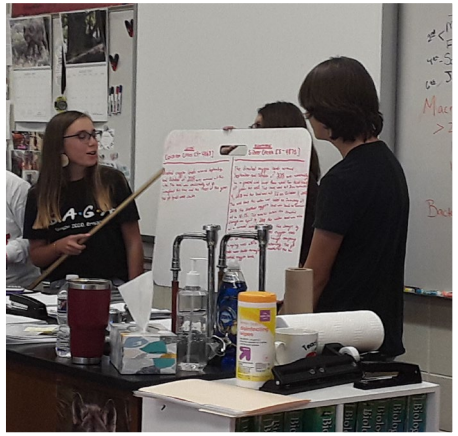
A
Awareness



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

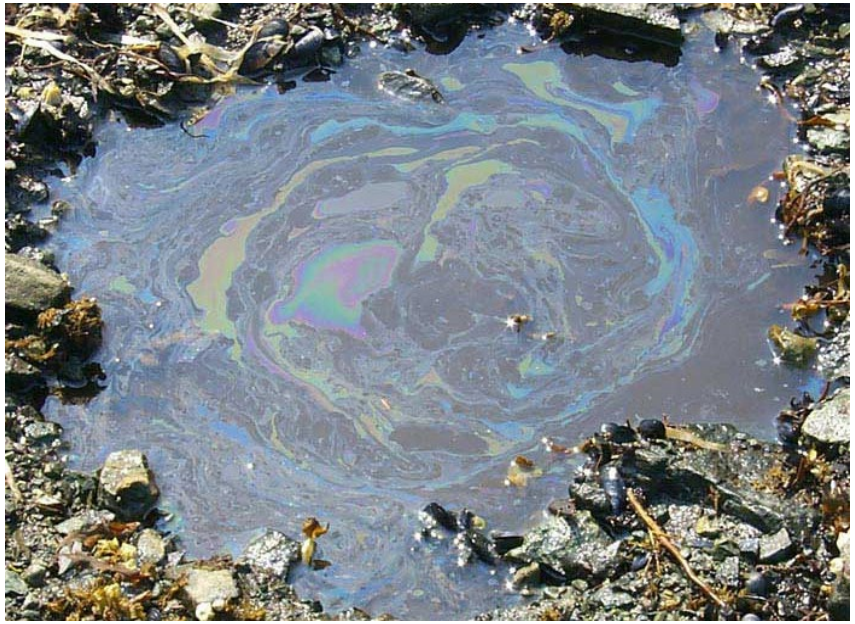
T
Tools & Training

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

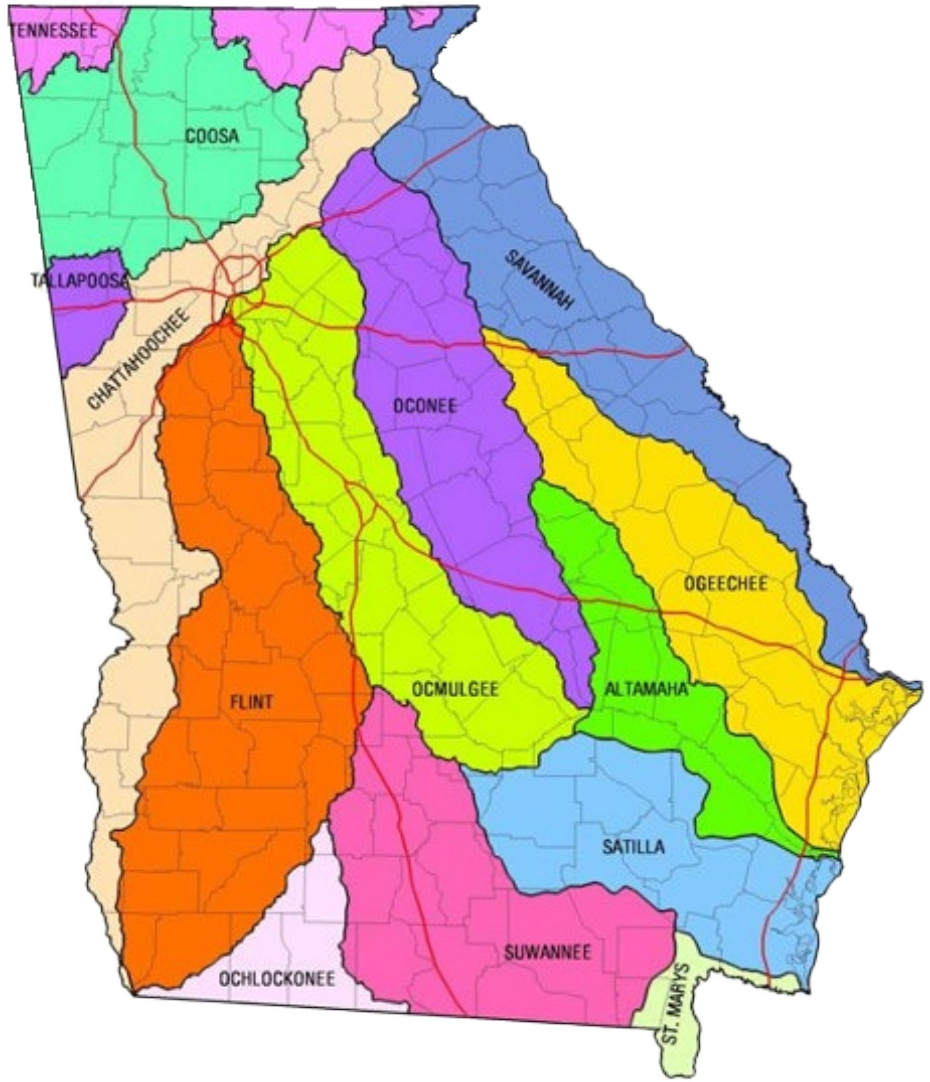
- Sources not easily distinguished/identified
- Everyone contributes
- Main cause of water quality problems in GA

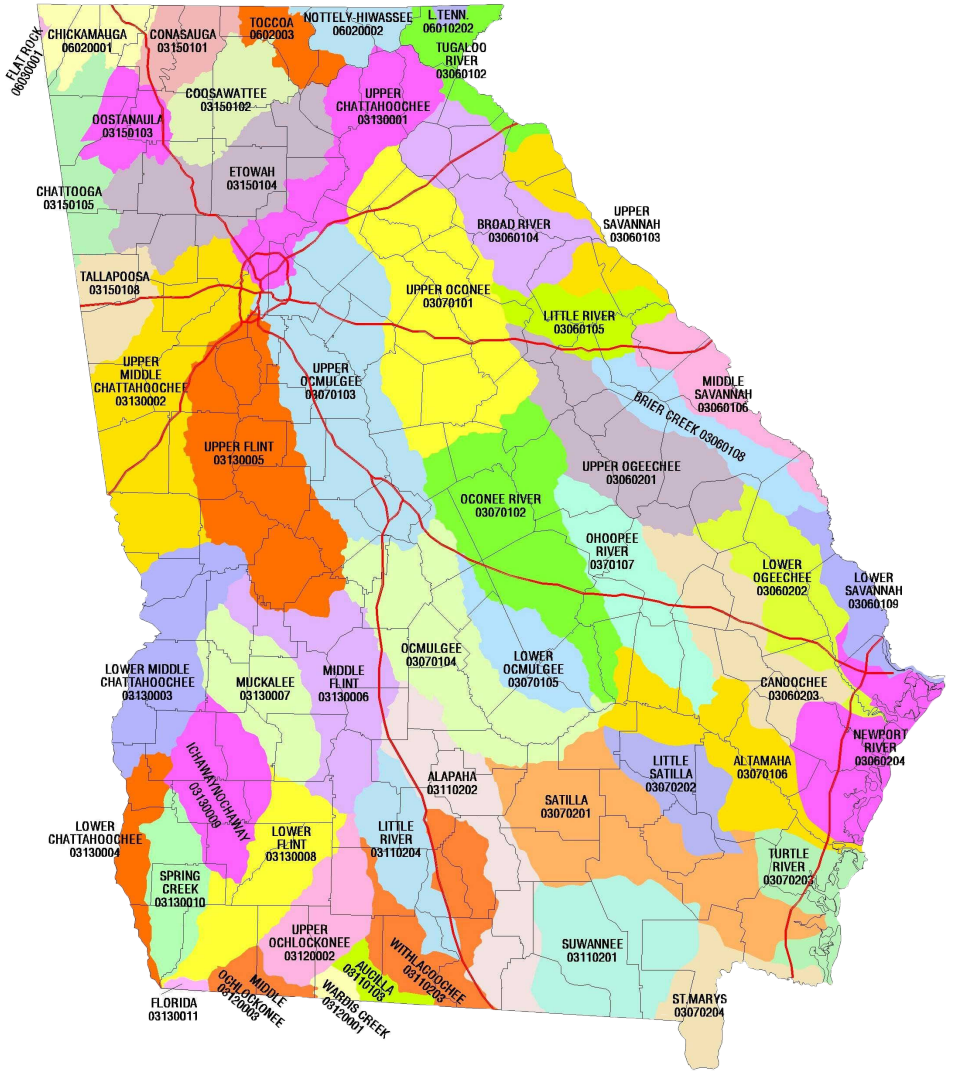
WHAT IS A WATERSHED?

- **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.

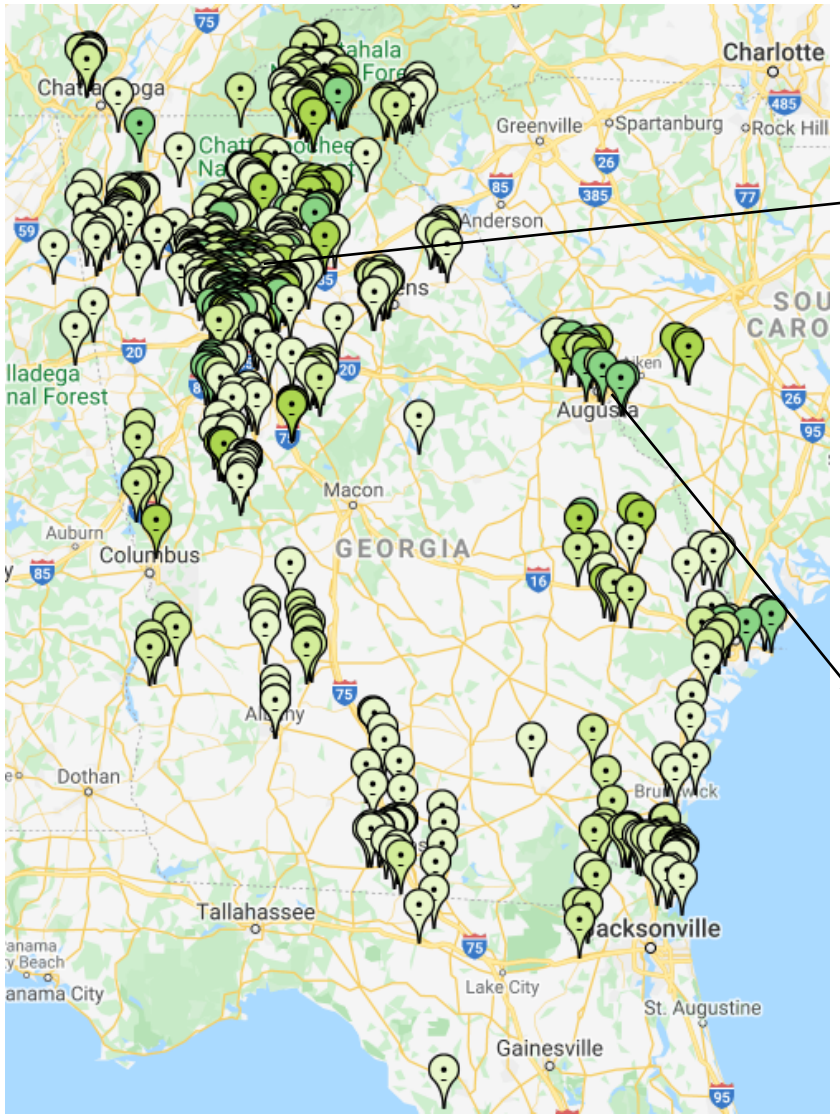
There is an unbreakable link between human health and wellbeing and ecosystems. -Walter Reid

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

<u>FIELD:</u>

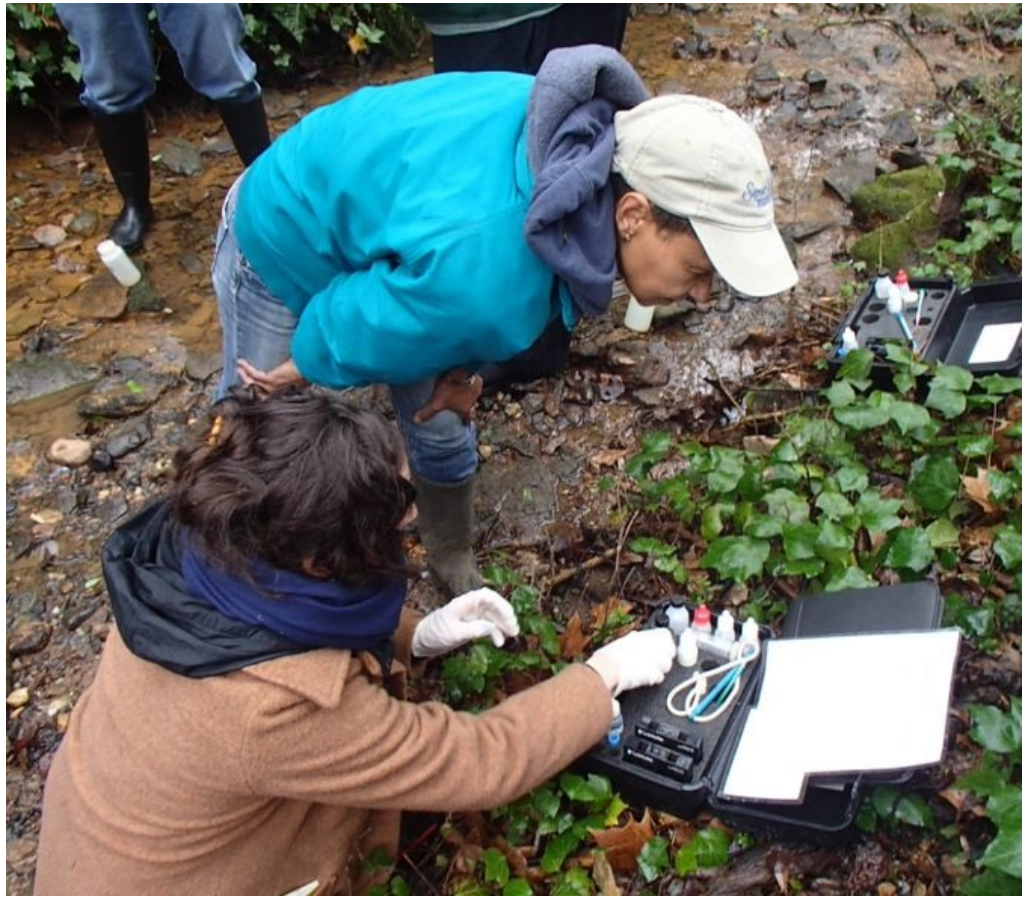
Volunteers must demonstrate how to properly collect data and obtain results within duplicate precision of the trainer

<u>WRITTEN TEST:</u>

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
- <u>Increased by:</u>
  - Industrial or utility plant discharge of water
  - Runoff from heated, impervious surfaces
  - Removal of tree canopy
- <u>Decreased by:</u>
  - Cool, underground water sources
  - Snowmelt
  - Over-hanging vegetation
- <u>Importance:</u>
  - Temperature affects **feeding, respiration, and metabolism**
  - May affect other chemical parameters

DISSOLVED OXYGEN

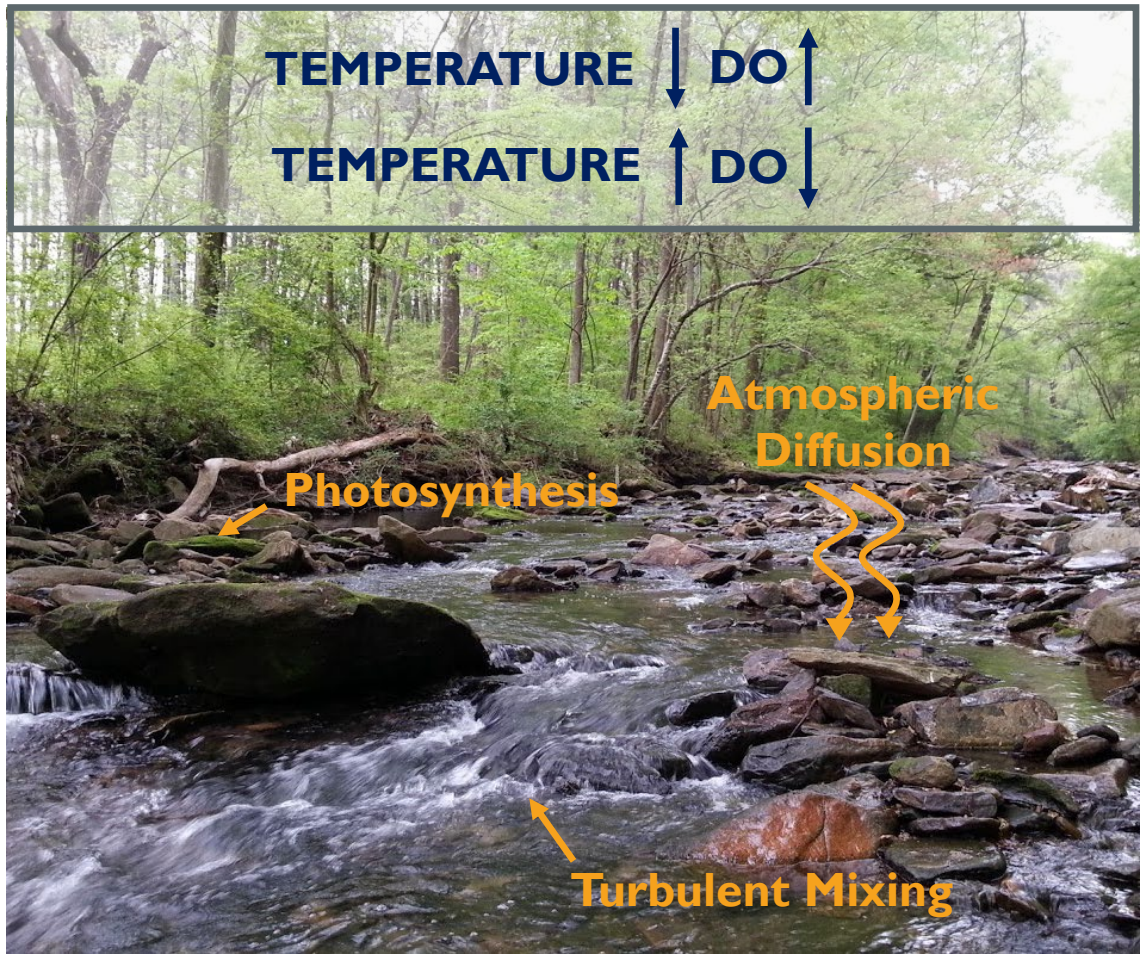
OXYGEN DISSOLVED IN WATER AND AVAILABLE FOR LIVING ORGANISMS TO USE FOR RESPIRATION

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?

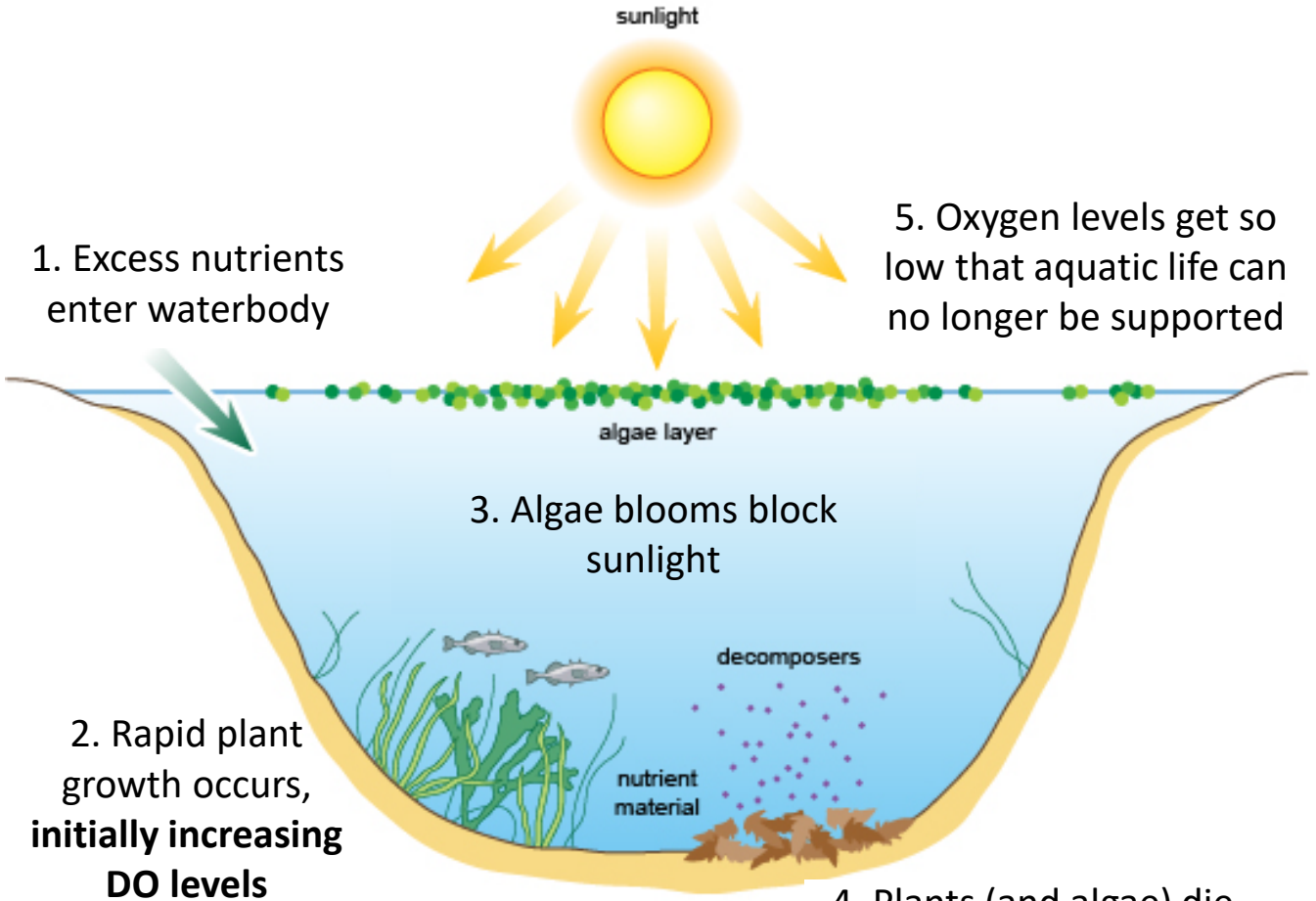
- Temperature and DO are **inversely related**
- <u>Introduced/Increased by:</u>
  - **Diffusion from the atmosphere**
  - As a waste product of **photosynthesis**
  - **Turbulent mixing (riffles)**
- <u>Decreased by:</u>
  - **Rising temperatures**
  - Slow moving, deep water
  - **An overload of decaying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

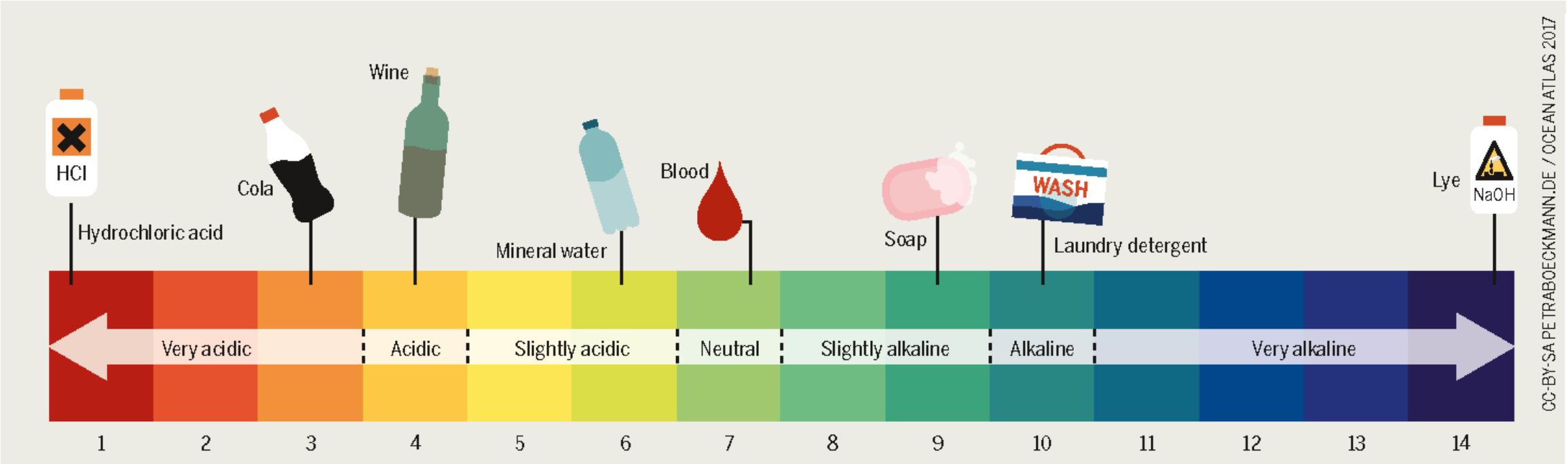
pH

- 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
- <u>Increased by:</u>
  - Photosynthesis
  - Calcium carbonate from limestone
- <u>Decreased by:</u>
  - Respiration
  - Tannins
  - Mine drainage
- <u>Importance:</u>
  - 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

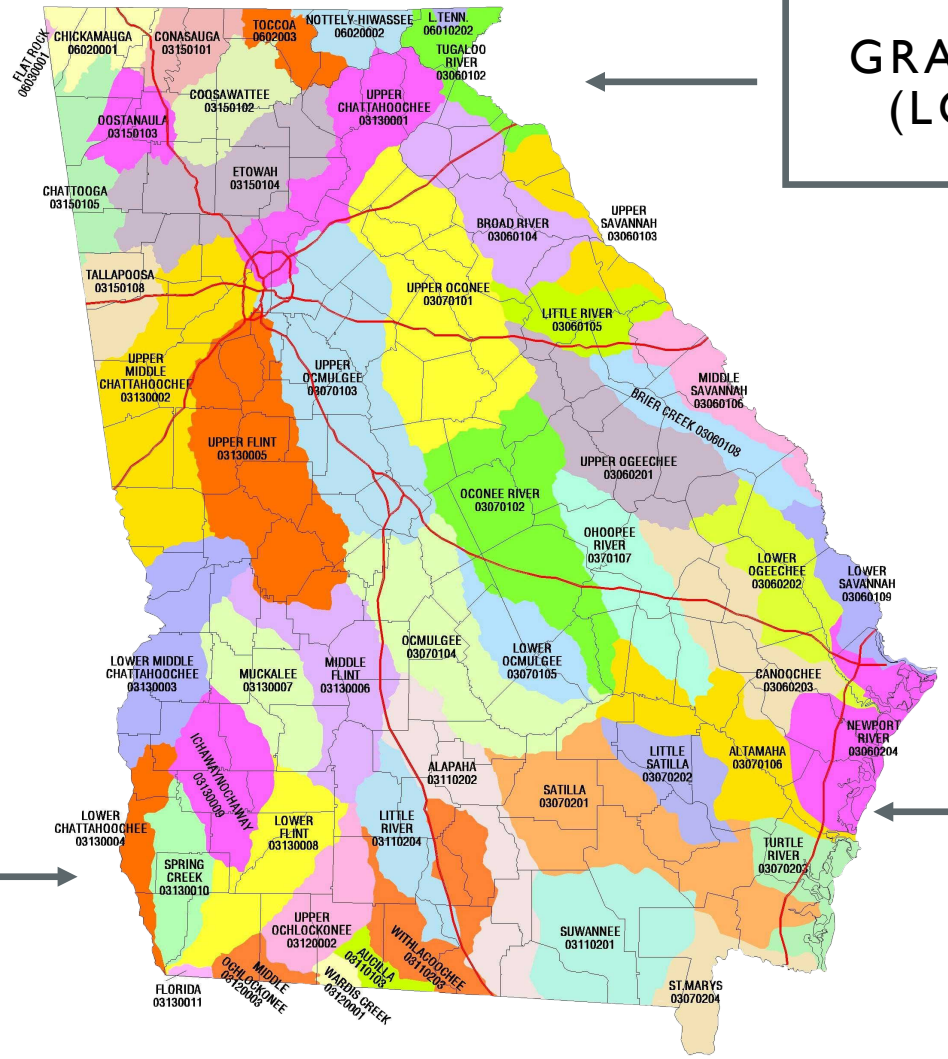
A MEASURE OF A SUBSTANCE'S ABILITY TO PASS AN ELECTRICAL CURRENT; INDICATES THE PRESENCE OF IONS

CONDUCTIVITY

- Units: **microSiemens per centimeter (µS/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 µS/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?

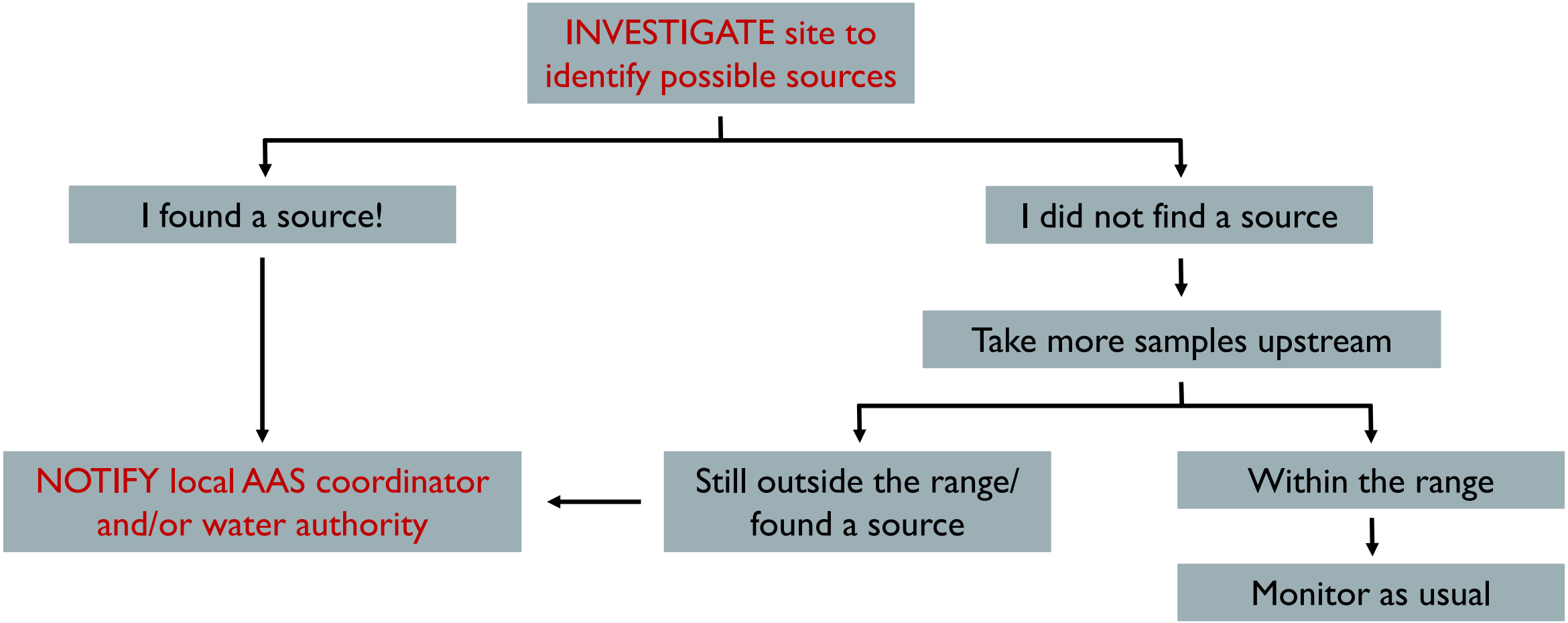
- Natural Factors:
  - Rainfall
  - Tidal stage
  - Algae growth
- Human Factors:
  - Eutrophication
  - Development/erosion
  - Dredging operations
- Importance:
  - Low water clarity limits the amount of sunlight available for photosynthesis
  - Suspended particles can damage gills or suffocate aquatic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

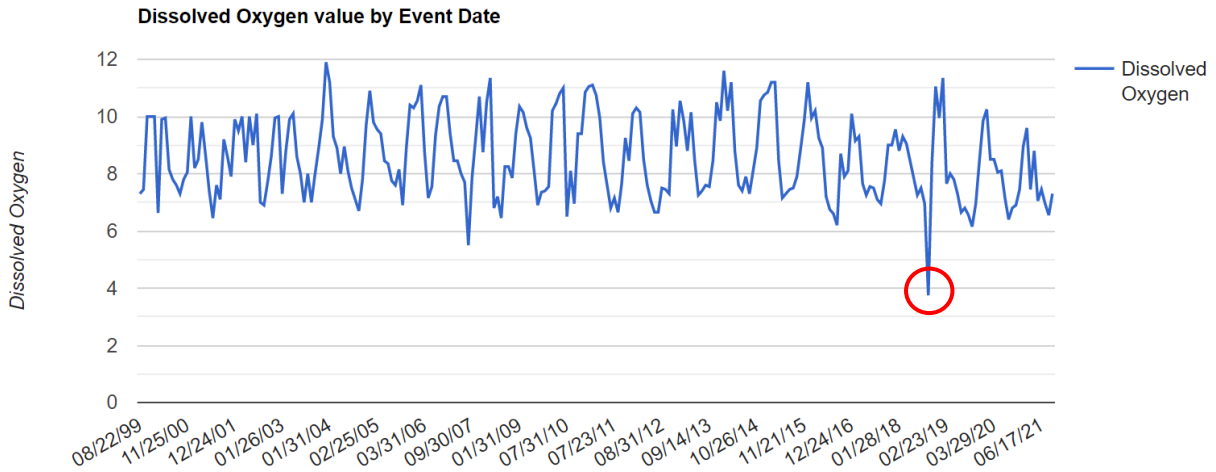
- Try not to sample alone- take a monitoring buddy!
- Do not sample during high flows or after a heavy rain event
- Obtain permission if sampling on private property
- Wear PPE when sampling

ONCE YOU'RE CERTIFIED

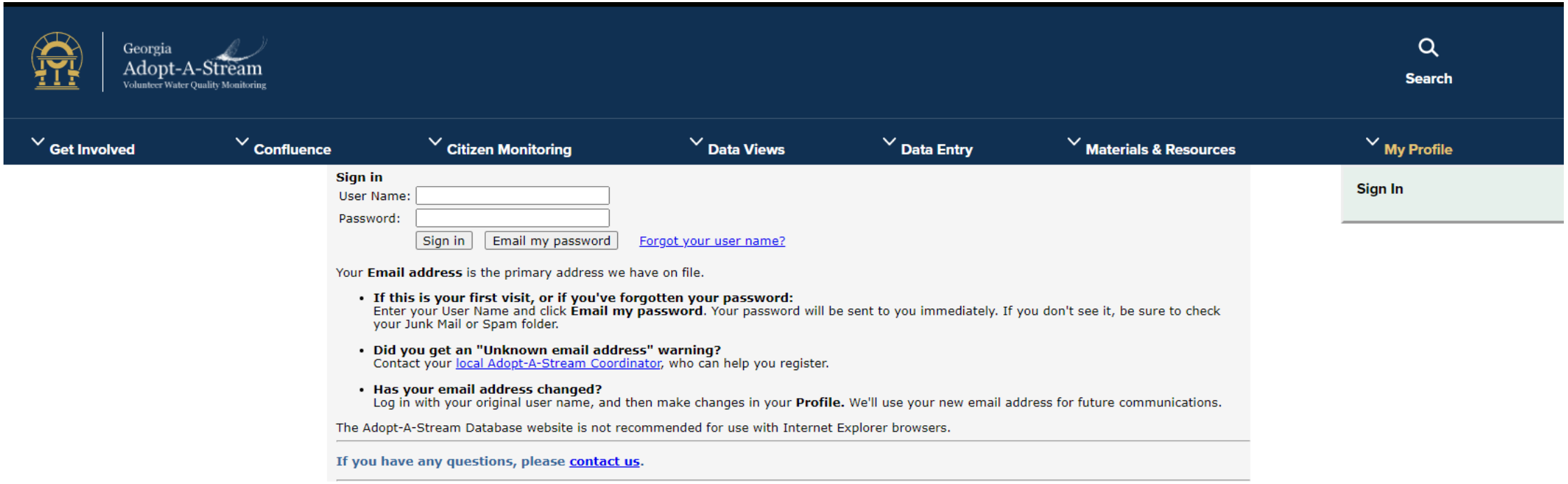
- You get an account to our online database!
- Only certified volunteers can submit data
- Certification is valid for one year
- Volunteers must attend an annual recertification workshop

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

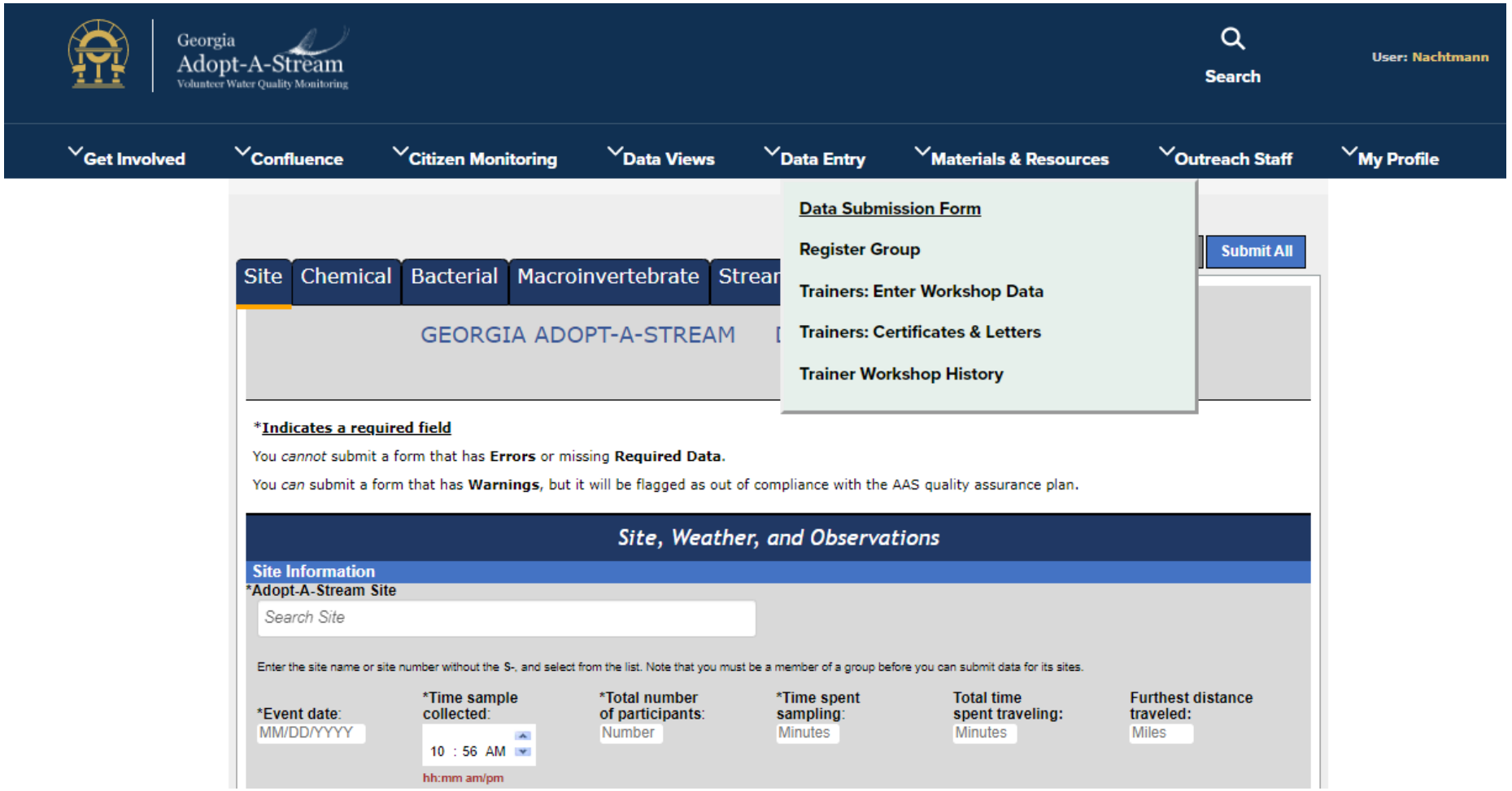


DATABASE LOGIN



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

DATA SUBMISSION FORM



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)

WEATHER

Present conditions (check all that apply)

☐ Heavy Rain ☐ Steady Rain ☐ Intermittent Rain

☐ Overcast ☐ Partly Cloudy ☐ Clear/Sunny

Amount of rain, if known?

Amount in Inches :_____

In Last Hours/Days:_____

*Refer to *wunderground.com* for rainfall data

OBSERVATIONS

Flow/Water Level: *(check all that apply)* ☐ Dry ☐ Stagnant/Still ☐ Low ☐ Normal ☐ High ☐ Flow (over banks)

Water Clarity: ☐ Clear/Transparent ☐ Cloudy/Somewhat Turbid ☐ Opaque/Turbid

Water Color: ☐ No Color ☐ Brown/Muddy ☐ Green ☐ Milky/White ☐ Tannic ☐ Other:_____

Water Surface: ☐ Clear ☐ Oily sheen: Does it break when disturbed? Yes/No (circle one) ☐ Algae

☐ Foam ◯ Greater than 3" high ◯ It is pure white Other:_____

Water Odor: ☐ Natural/None ☐ Gasoline ☐ Sewage ☐ Rotten Egg

☐ Fishy ☐ Chlorine ☐ 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: ☐ None ☐ Yes, I did a cleanup ☐ 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? ☐ Yes ☐ No List any expired: _____

Core Tests	Test 1	Test 2	Units	Other Tests	Test 1	Test 2	Units
Air Temp			^{0}C	Secchi Depth(+/- 10)			cm
Water Temp			^{0}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

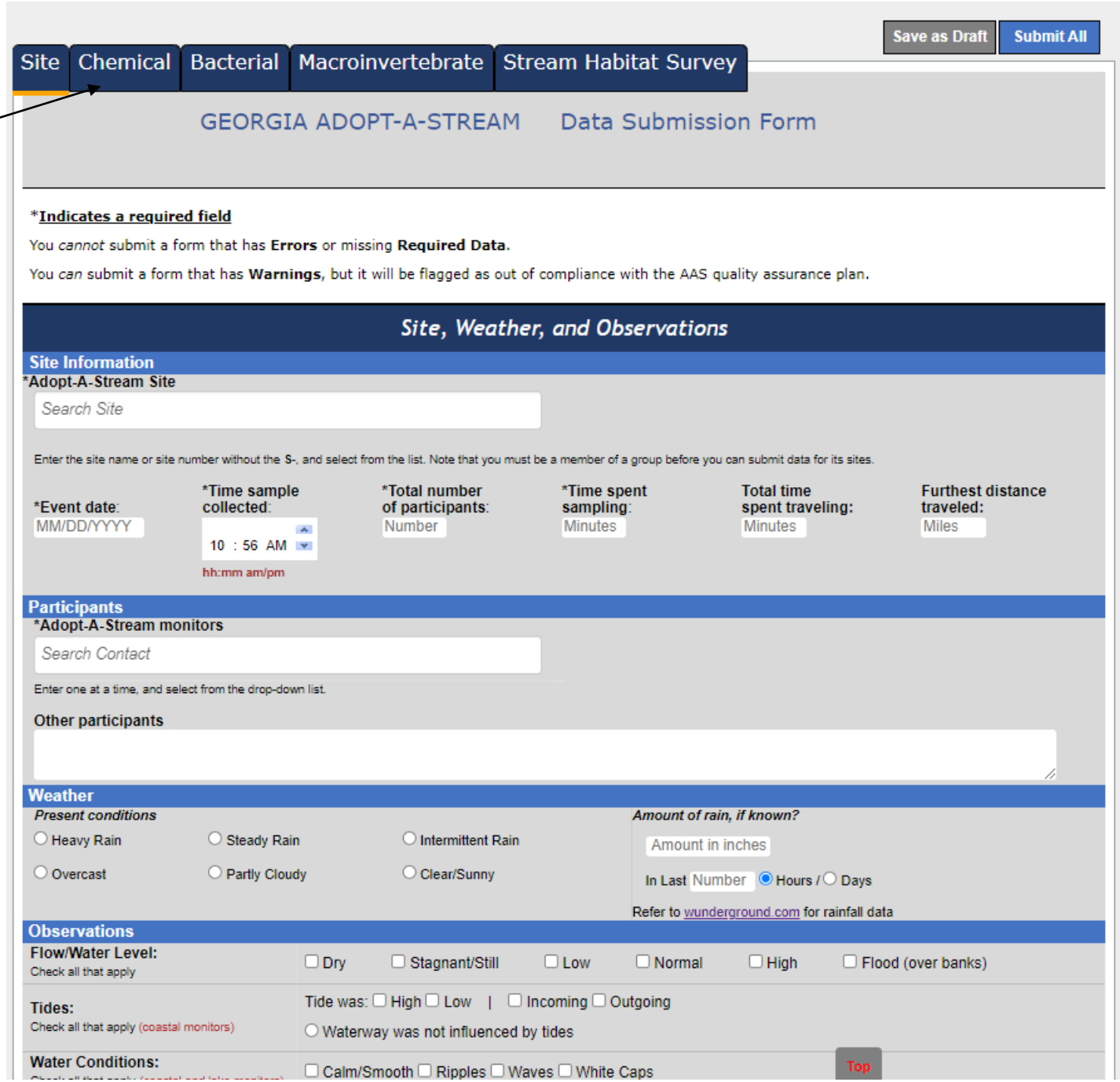
Any changes since you last sampled at this site? If yes, please describe.

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

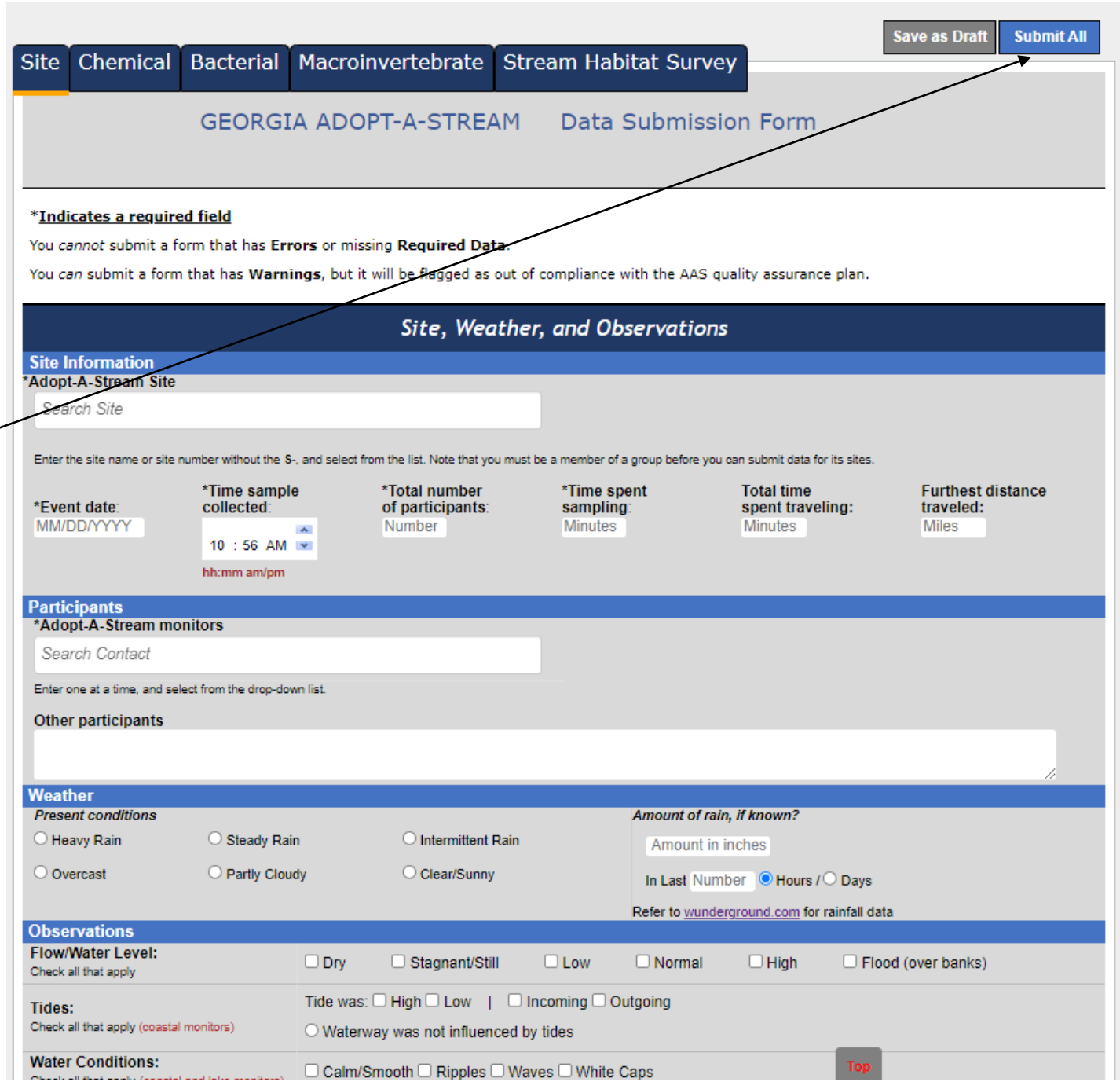
Submit data ASAP to online database

Access database via AdoptAStream.Georgia.gov

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

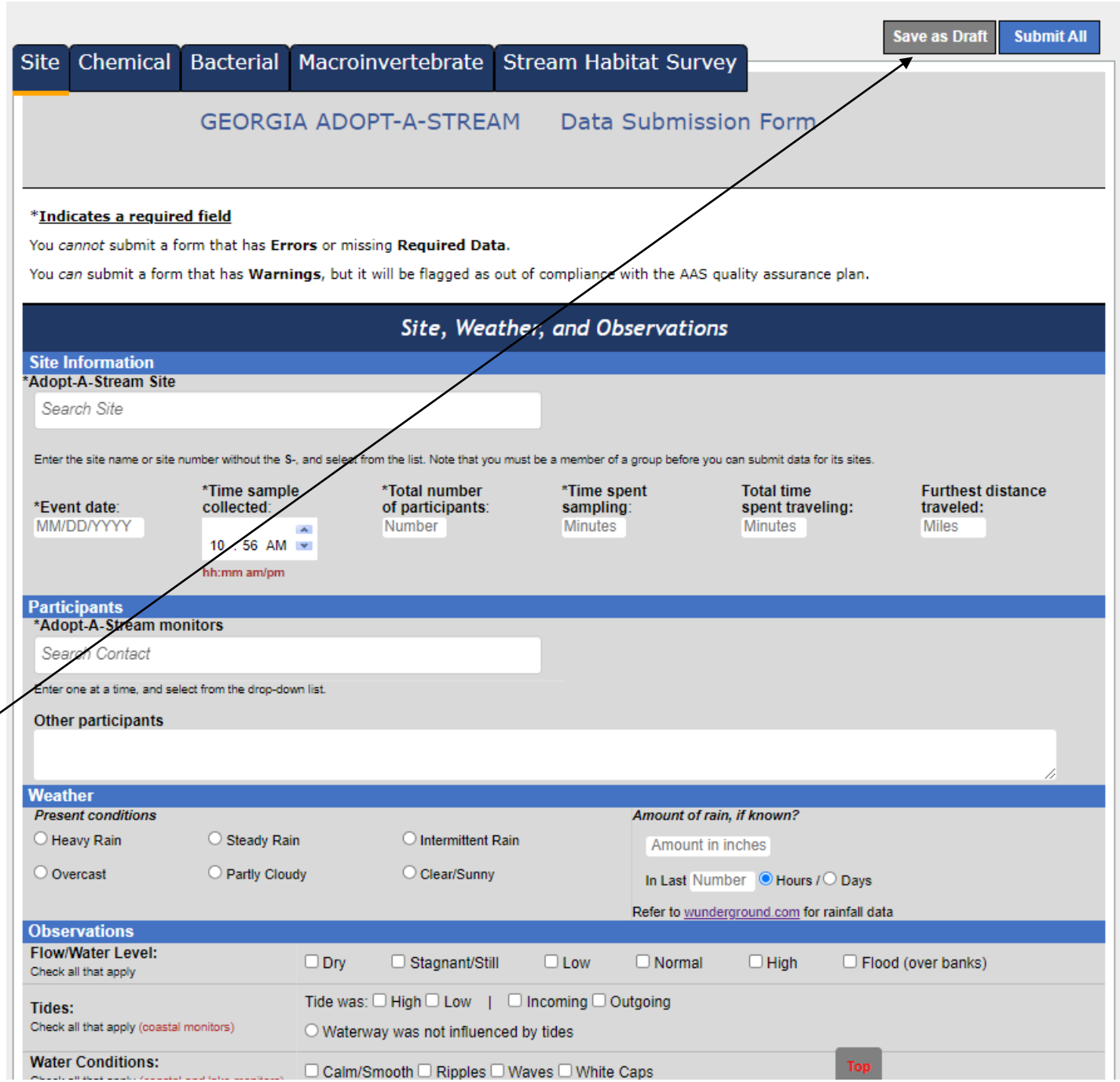


After entering all of your data, click "Submit All" to submit your data to the database



Use “Save as Draft” to finish submitting data at a later time.

Data must be submitted within 7 days of saving as a draft.



FOLLOW AAS AND STAY CONNECTED

AAS@dnr.ga.gov

AdoptAStream.Georgia.gov

facebook.com/georgiaadoptastream

@georgiaadoptastream

2 Martin Luther King Jr. Drive
Suite 1462, East Tower
Atlanta, Georgia 30334

470-938-3341 and 470-524-5791

TEST REVIEW