Georgia Adopt-A-Stream Chemical Monitoring

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GEORGIA
DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION DIVISION

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Georgia Adopt-A-Stream

- What is it?

  Georgia's volunteer water quality monitoring program

- Program Goals

  A: Increase public **awareness**

  D: Collect quality baseline water quality **data**

  O: Gather **observations**

  P: Encourage **partnerships** between citizens & local government

  T: Provide **tools & training**

Physical/Chemical Monitoring

- Purpose: Gather info about specific water quality characteristics
- In addition to the basic visual observations and weather information, AAS recommends monitoring these core 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.

EPA Quality Assurance Project Plan

- Quality Assurance
  Quality Control (QA/QC)
- Only individuals are certified
- Certification is valid for one year

- Volunteers must attend an annual recertification workshop
- Only certified volunteers can submit data!

To Become a Certified QA/QC Volunteer…

- In the field, volunteers' methods must achieve results within the duplicate precision rules of those obtained by the trainer

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

What is a Watershed?

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

Where, When and How Often?

Where - Same site location and in a **well mixed area** of flowing water

When - **Same time of day** and during normal flow conditions

How often - At least **once a month**

Safety Considerations

If conditions are too dangerous to sample…

DON'T SAMPLE!

- Wait until storm has stopped and strong flow has subsided
- Never sample alone
- Remember to wear gloves and boots
- Use waste bucket to dispose of chemicals!
- Receive permission from land owner before going onto private property

Temperature (°C)

Measurement:

- **In the shade**, away from direct sunlight.
- **Take air temperature before water temperature.**
- Single measurement for each parameter
- Measured in degrees Celsius (°C)

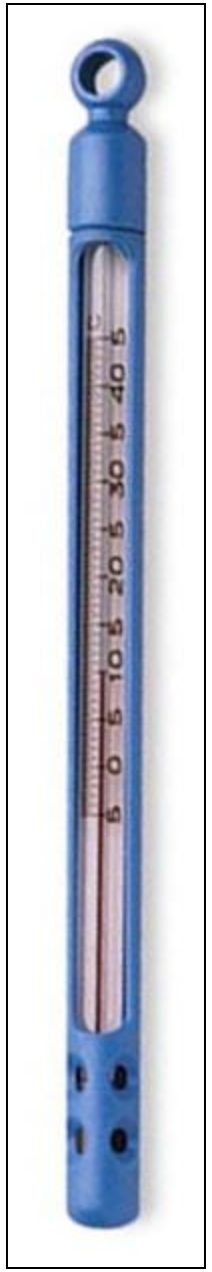
State Standards for Water Temperature:

- Less than 32.2°C (90°F)

Importance:

- Temperature affects **feeding, respiration, and aquatic metabolism.**
- Life adapts to a narrow range of temperatures. Changes of only a few degrees can affect the life in a stream.
- Temperature/dissolved oxygen relationship:

  The higher the temperature, the less oxygen water can hold.



Dissolved Oxygen

(mg/L or ppm)

Measurement:

- Rinse sampling bottles twice before collecting sample
- Submerge bottle completely in stream and cap under water
- Take two samples for duplicate precision.
  - **Two samples must be within +/- 0.6 of each other**
  - If not, **take another sample until two are within that range.**
- Measured in mg/L or ppm (1 mg/L = 1 ppm)

State Standards for DO levels:

- **Average of 5 mg/L**
- A minimum of 4 mg/L
- Trout streams: Average of 6 mg/L and a minimum of 5 mg/L

Importance:

- Needed for respiration for all aquatic life
- Can be altered by other physical/chemical parameters

Dissolved Oxygen

Inversely related to temperature:

- **As temperature increases, DO decreases**
- **As temperature decreases, DO increases**

DO is introduced into water via:

- **diffusion from the atmosphere**
- **plant metabolism** as a waste product of **photosynthesis**
- **turbulent mixing (riffles)**

DO levels may **decrease** due to

- rising temperatures
- **an overload of decaying organic matter** (due to excess nutrients)
- slow moving, deep water

pH

A measure of hydrogen ions (H+)

Measured on a 0-14 scale with 7 being neutral

Pure water has equal amount of H+ and OH- ions (pH of 7)

Measurement:

- Rinse sampling bottles twice before collecting sample
- Take two samples for duplicate precision.
  - **Two samples must be within +/-0.25 of each other**
  - If not, **take another sample until two are within that range**.

State Standards for pH:

- Between **6 and 8.5**
- **Some south Georgia waters may have pH as low as 3.5**
- In coastal waters, **pH increases (becomes more basic) with increasing salinity and is still within state standards.**

Importance:

- Aquatic organisms are sensitive to pH fluctuations

Conductivity

(mS/cm)

A measure of water's ability to pass an electrical current

Indicates the presence of ions in the water

Measurement:

- Single measurement for conductivity
- Measured in microSiemens per centimeter (µS/cm)
- **Conductivity meter should be calibrated within 24 hours prior to each monitoring event.**
- Record calibration information on data sheet

State Standards:

- No regulated level in Georgia
- Georgia waters generally range from 50 to 1500µS/cm
- AAS advises volunteers to find normal background levels
  - Closely monitor any deviations

Conductivity

Is primarily affected by the geology of the area through which water flows

- Water that flows through granite tends to have lower conductivity
- Water that runs through limestone and clay has higher conductivity

What else affects baseline conductivity levels?

- **Mining operations** – release of iron, copper and cadmium
- **Agriculture** – adds nutrient ions
- **Sewage effluent** – chloride, nitrates and phosphate
- **Urban runoff** – auto fluids, salts and other chemicals

Salinity (ppt)

Measures amount of dissolved salts in water

Measurement:

- Measured in parts per thousand (ppt)
- **Refractometer should be calibrated within 24 hours prior to each monitoring event**.
- Record calibration information on data sheet
- Take two samples for duplicate precision.
  - Two samples must be within **+/-1.0 ppt** of each other
  - If not, **take another sample until two are within that range**.

State Standards:

- No regulated level in Georgia
- Salinity of seawater is about 35ppt
- **Salinity varies depending on tidal stage and freshwater inputs**

Importance:

- Aquatic plants and organisms are sensitive to changes in salinity

Water Clarity

Measures the transparency or clearness of the water
Is affected by algae growth and the amount of suspended particles

Measurement:

- Instrument: Secchi Disk
- Measures Secchi Disk Depth in cm
- Take two samples for duplicate precision:
  - **Two samples must be within +/-10cm of each other**
  - If not, **take another sample until two are within that range**.

State Standards:

- No regulated value in Georgia

Water Clarity

Importance:

- Suspended particles can lower water clarity which can:
  - **Limit the amount of sunlight available for photosynthesis**
  - Damage gills of fish and macroinvertebrates
  - Suffocate fish and oysters
  - Disturb filter feeding of organisms

- What can affect water clarity?
  - Natural influences: rainfall, tidal stage, wind and algae growth
  - Human influences: nutrient additions, development, boating and dredging activities

Nutrients

Nitrates

- A nutrient found in the water from fertilizers or animal waste. Sewage is the main contributor.
- Normal background levels are below 1ppm

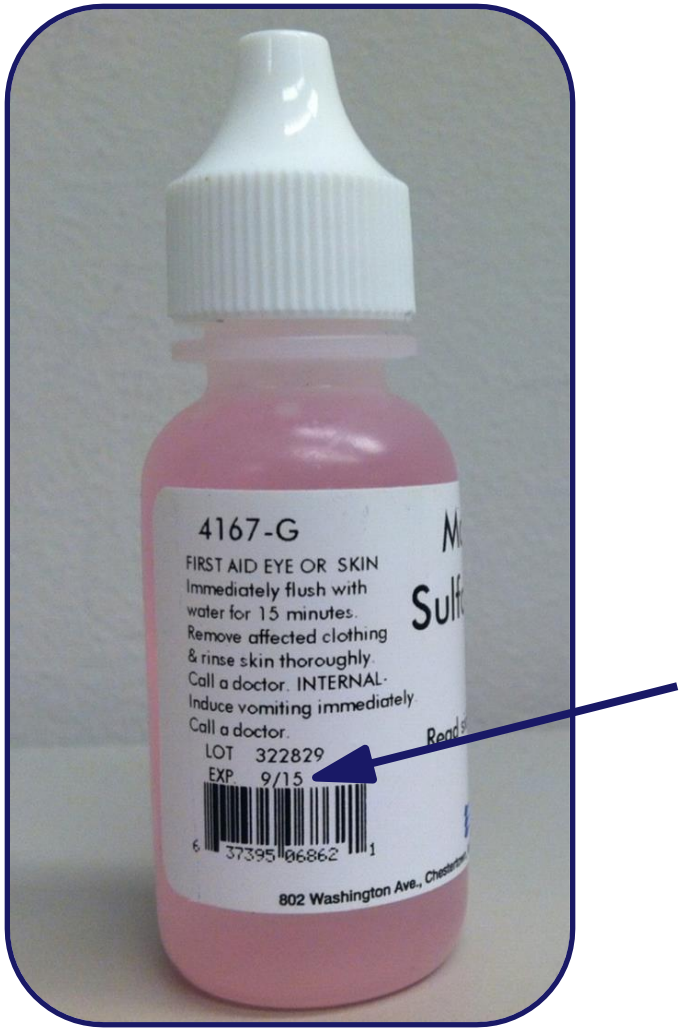
Phosphates

- A nutrient found in water from soaps, fertilizer, animal waste, industrial effluent and sewage
- Normal background levels are below 0.1ppm

Excess nutrients can cause algal blooms, affect sensitive macroinvertebrates, and decrease dissolved oxygen levels

Chemical Kit Maintenance & Disposal

- **Store chemical kits in a cool, dark place.**
- **Replace chemicals when expired or contaminated**
- Disposal of chemicals:
  - **Used**: flush down drain with water (goes to a water treatment facility)
  - **Contaminated/expired**: Hazardous waste day or return to AAS/AAW office for disposal
- Contact your local coordinator or the Georgia Adopt-A-Stream office for replacement equipment or reagents



All monitoring programs

Chemical specific

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. Images can be submitted online with your other data.

Trash: ☐ None ☐ Yes, I did a cleanup ☐ This site needs an organized cleanup

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			°C				
Water Temp			°C				
pH (+/-0.25)			Standard unit				
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 www.AdoptAStream.Georgia.Gov

Observations

- **Flow/Water Level**
- **Water Clarity**
- **Water Color**
- **Water Surface**
- **Water Odor**
- **Photos**
- **Trash**

OBSERVATIONS

Flow/Water Level: *(check all that apply)*	☐ Dry ☐ Stagnant/Still ☐ Low ☐ Normal ☐ High ☐ Flood (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. Images can be submitted online with your other data.
Trash:	☐ None ☐ Yes, I did a cleanup ☐ This site needs an organized cleanup

Chemical Data Form

- Use Chemical data form (Chemical/Bacterial combo data form may also be used)

- Remember:
  - Check expiration dates of reagents
  - Duplicate precision for pH and Dissolved Oxygen

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				
Water Temp			^{0}C				
pH (+/-0.25)			Standard unit				
Dissolved Oxygen (+/-0.6)			mg/L or ppm				
Conductivity			uS/cm				

Submit the Data

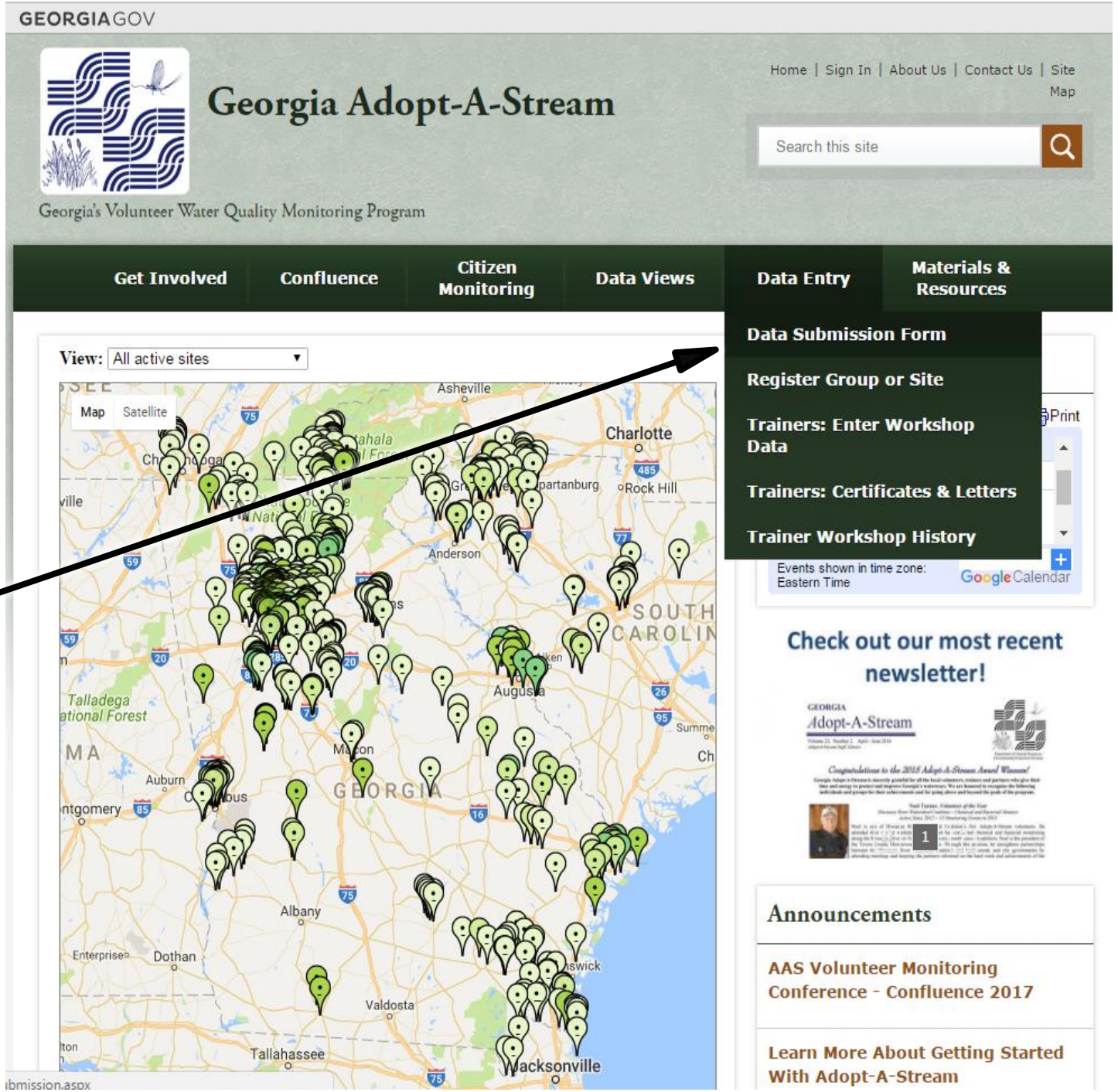
As soon as possible after monitoring is complete

Data should be submitted to the state program's **online database**:

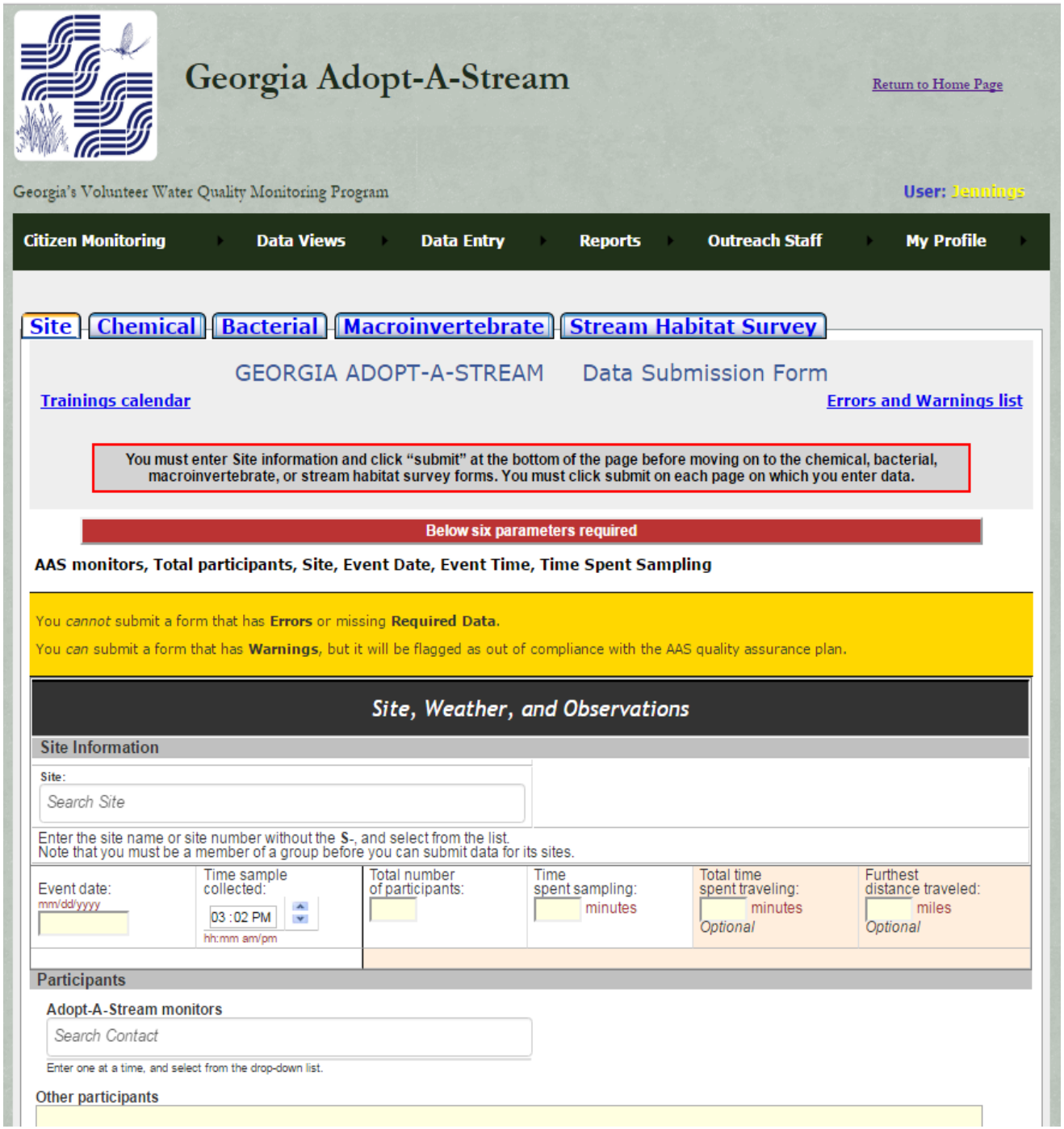
AdoptAStream.Georgia.gov

Share your data with partners, local governments and your local Adopt-A-Stream coordinators

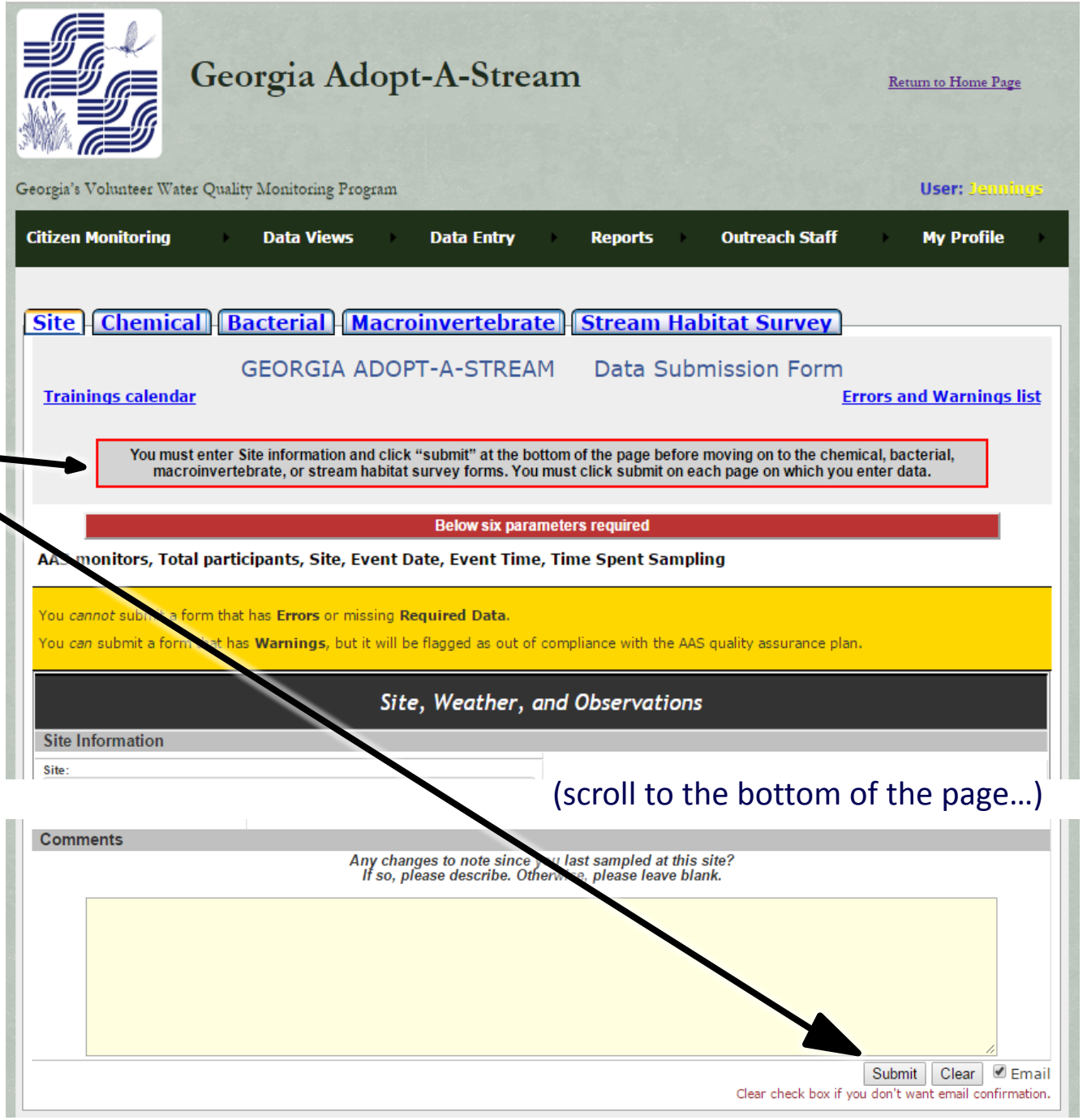
From the website's Home Page, select "Data Submission Form" under the Data Entry tab.



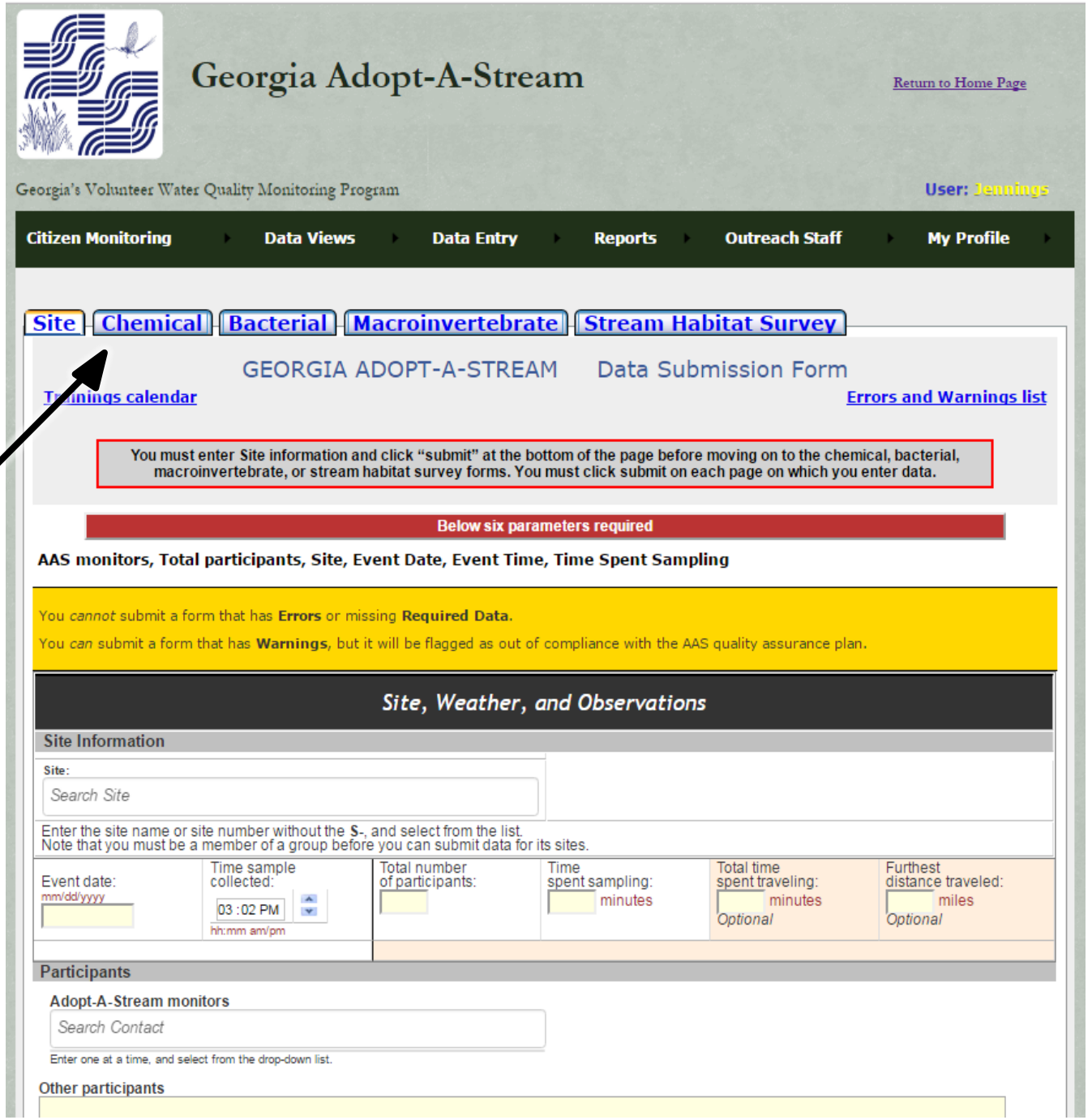
Enter your site information as well as any weather and observation information on this page.



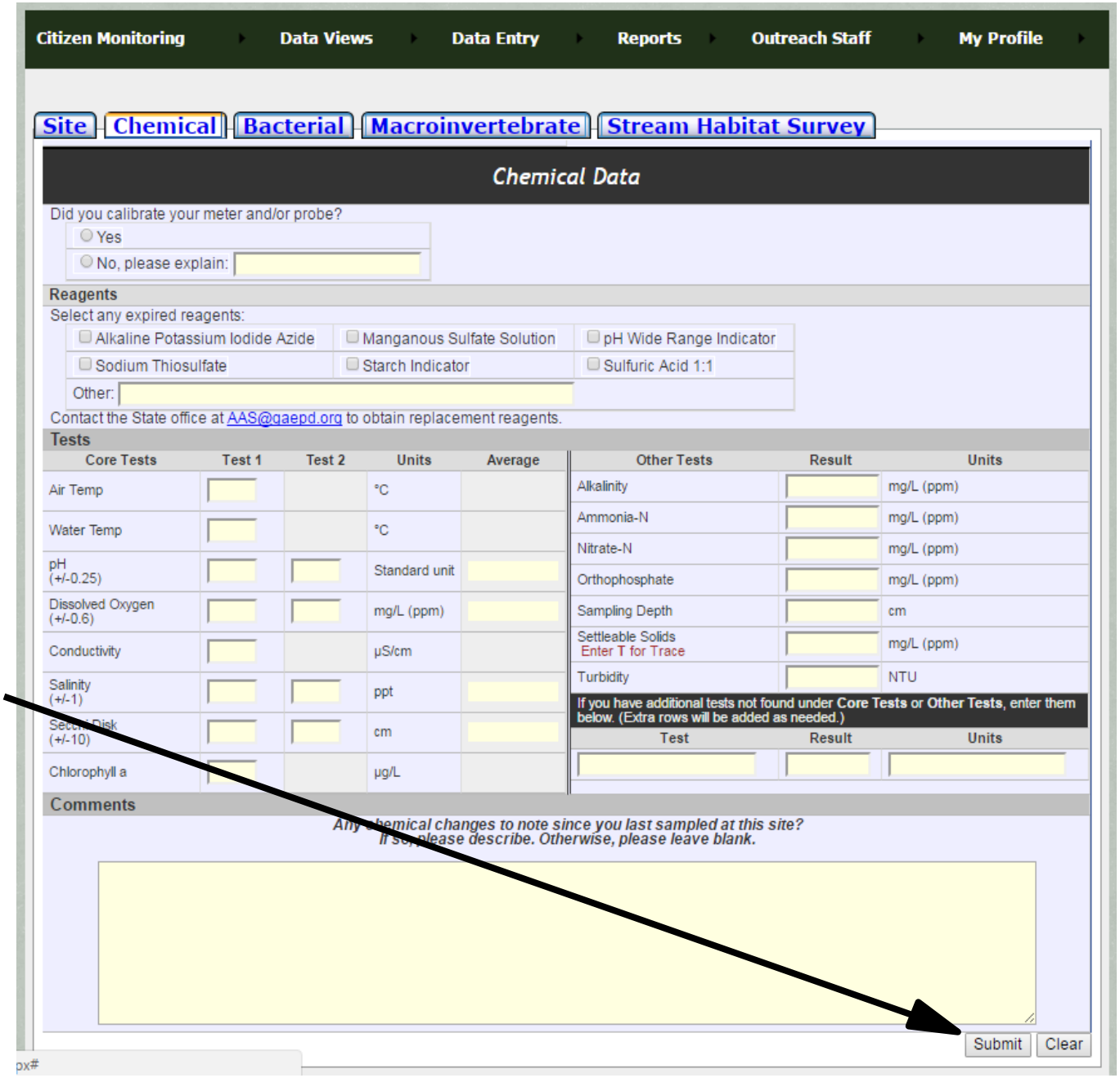
Click “Submit” at the bottom of the page to record your data. You must submit your site data before you can enter chemical data



After clicking "Submit," click on the Chemical tab to continue entering data

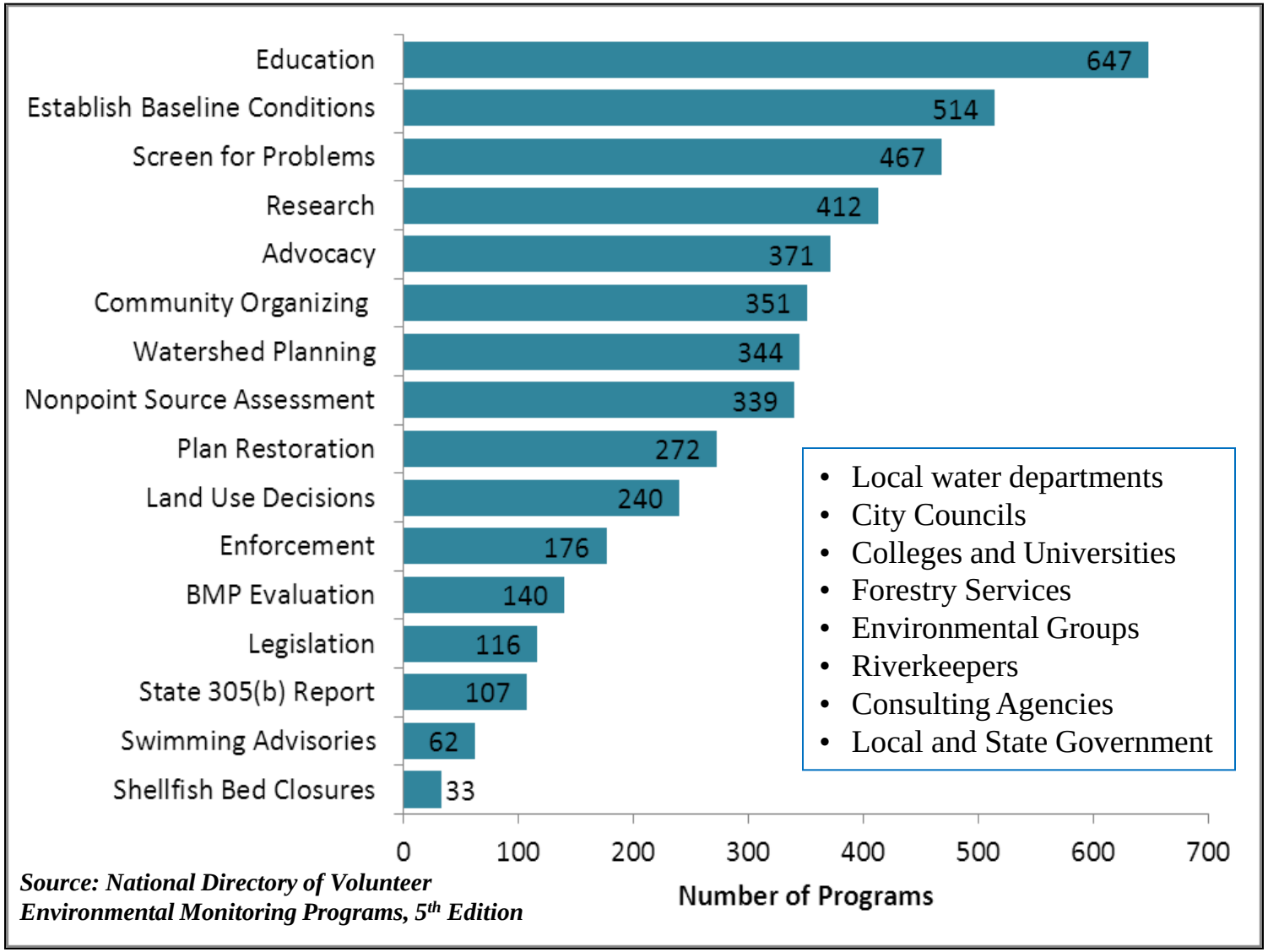


Fill out the form and click “Submit” to record your chemical data!



Note: You must click “Submit” on each tab if you are entering data for multiple parameters

Volunteer Monitoring Data Uses



Source: National Directory of Volunteer Environmental Monitoring Programs, 5th Edition

Just the Facts

- *Raise **A**wareness*
- *Water quality **D**ata*
- *Gather **O**bservations*
- *Encourage **P**artnerships*
- *Provide **T**ools and **T**raining*

Once a month

Well mixed area and at the same time of day

What is a watershed?

Temperature and DO

pH in South GA

Care for your kit

Water clarity and plant growth

<u>Data:</u> on-line database as soon as possible, local program, city & county government & municipality, partners, county commissioners, universities, others?

<u>Excess Organic Matter:</u> Causes a decrease in dissolved oxygen levels

<u>Conductivity:</u> The ability of water to carry a current. Is affected by mining, agriculture, sewage effluent, urban runoff.

How is oxygen introduced into water?

<u>Temperature:</u> importance of, where to measure…

Parameter	State Standards	Duplicate Precision	Units
Dissolved Oxygen	Avg of 5, not <4	+/- 0.6	Mg/L or ppm
pH	6-8.5	+/- 0.25	
Salinity		+/- 1.0	ppt
Clarity (Secchi Disk)		+/- 10	cm

When to calibrate?

← Coastal Volunteers

←Coastal and Lake Volunteers