dhec

South Carolina Department of Health and Environmental Control

Healthy People. Healthy Communities.

Who Am I ?

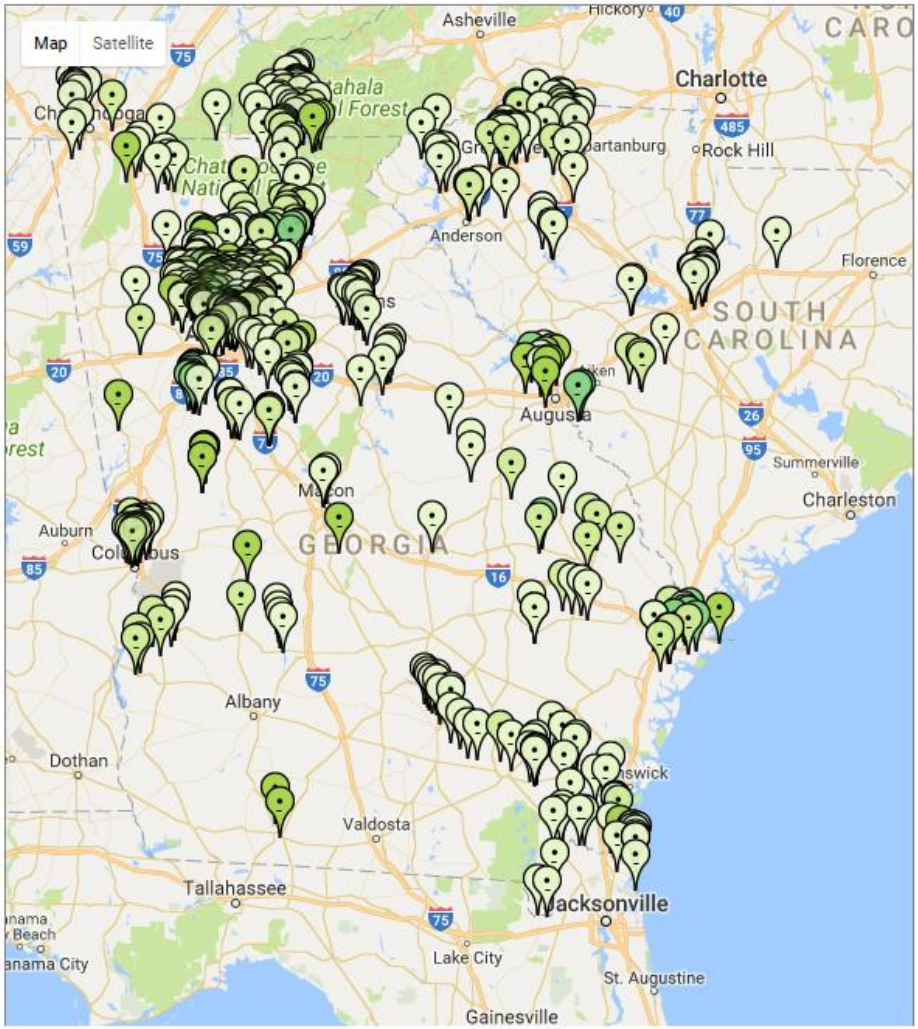
- B.S. Geology
- M.A. Education
- Secondary Science 18 years
- DHEC since 2008
- Public Engagement, Drinking Water, Community Liaison, Watershed Manager

Georgia Adopt-A-Stream, 1992

Volunteers With Georgia Adopt-A-Stream

Georgia Adopt-A-Stream

300 groups sampling 759 sites



Georgia AAS Volunteers in SC

Year	Groups	Counties
2008	1	Aiken
2009	1	N. Augusta
2012	1	Greenville
2013	3	Greenville
2014	6	Pickens, Spartanburg, Laurens
2015	12	Spartanburg, Greenville, Anderson, Pickens
2016	24	Oconee, Richland, Kershaw, Greenville, Spartanburg, Anderson, Pickens,
2017	13	Richland, Spartanburg, Pickens, Greenville

ANDERSON & PICKENS COUNTIES
stormwater
PARTNERS
A CLEMSON EXTENSION SERVICE

Upstate Forever

RICHLAND COUNTY
STORMWATER SERVICES

Watershed Ecology Center
UNIVERSITY OF SOUTH CAROLINA UPSTATE

Greenville
Technical College

ANDERSON
UNIVERSITY

dhec

S.C. Department of Health and Environmental Control

CENTER for WATERSHED EXCELLENCE

Clemson Public Service and Agriculture

South Carolina Department of Health and Environmental Control
Healthy People. Healthy Communities.

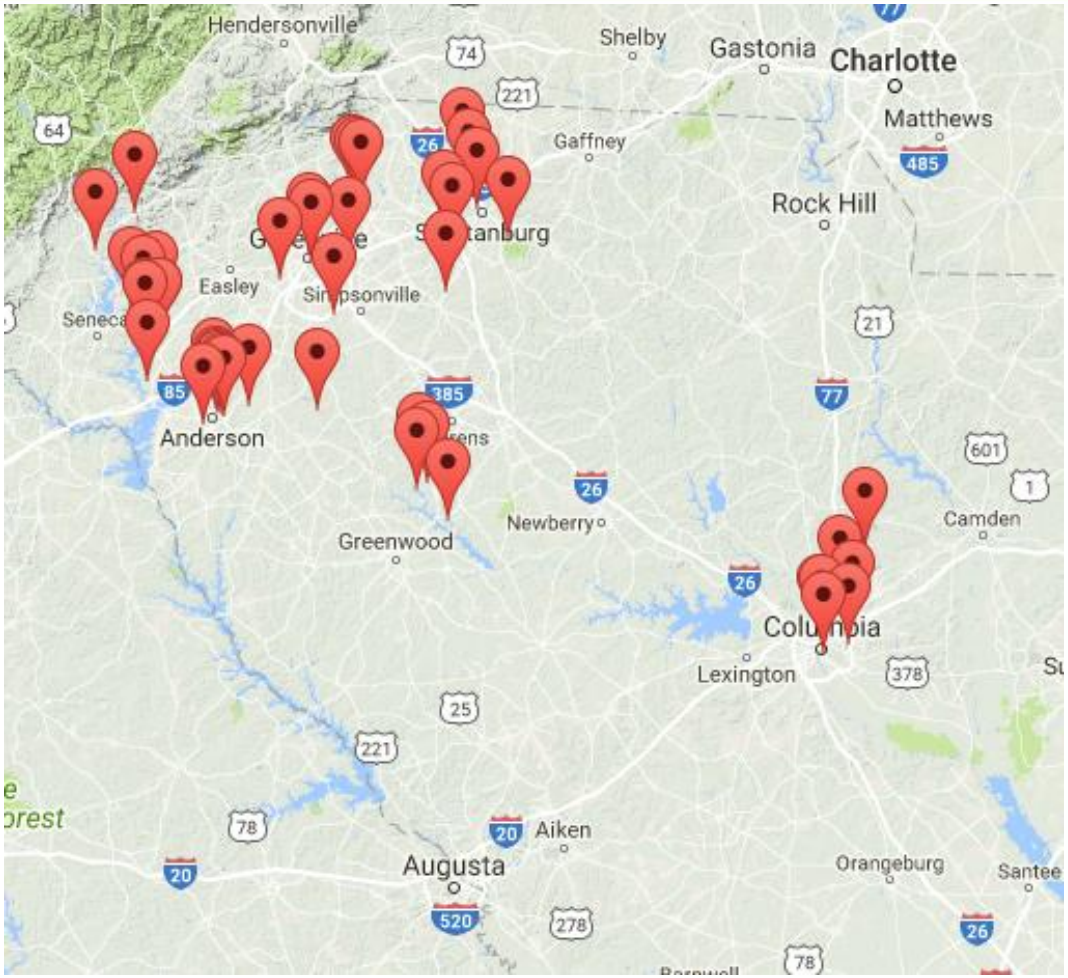
University of Idaho Extension
IDAH2O
MASTER WATER STEWARDS

UNIVERSITY OF
Rhode Island
Watershed Watch

Georgia Adopt-A-Stream

Water Action Volunteers

Wisconsin Volunteer Steam Monitoring



SC AAS: 43 groups sampling 51 sites

SC AAS Trainers

- 10 Trainers
- 8 in the Upstate
- 2 in the Midlands
- 7 University
- 1 Clemson Extension
- 1 Municipal Stormwater
- 1 Upstate Forever

BACTERIA

STREAM HABITAT

PHYSICAL/CHEMICAL

MACROINVERTEBRATES

Training Workshops

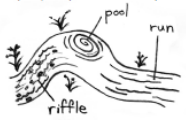
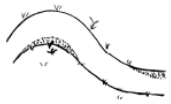
- Conducted by certified trainers
- Classroom component
- Field sampling techniques
- Test

EPA Quality Assurance Project Plan (QAPP)

- Duplicate precision rules
- Individuals are recertified annually
- Only certified volunteers can submit data

Stream Habitat Assessment

- Assessed yearly
- Used to track changes in the stream
- Includes stream and bank stability
- Adequate quality habitat
- Riparian conditions
- Channel alterations and bank stability

What types of submerged materials are on the channel bottom?	**Abundant stable** habitat cover for colonization by macroinvertebrates and fish: submerged roots, woody and vegetative debris, cobbles, leaf packs and undercut banks. 	**Adequate stable** habitat cover for colonization by macroinvertebrates and fish: submerged roots, woody and vegetative debris, cobbles, leaf packs and undercut banks. 	**Little or no stable** habitat cover available for colonization by macroinvertebrates and fish: submerged roots, woody and vegetative debris, cobbles, leaf packs and undercut banks; habitat may move during high flows. 
	10 9 8 7	6 5 4 3	2 1 0
2. Embeddedness * For ROCKY BOTTOM streams only **Are fine sediments being deposited in riffle/run area?**	Gravel and cobble are **slightly** embedded in riffle area. 	Gravel and cobble are **partially** embedded in riffle area. 	Gravel and cobble are **completely** embedded in riffle area. 
	10 9 8 7	6 5 4 3	2 1 0
3. Riffle/Run/Pool **Is a diversity of instream habitats available: riffle, runs and pools?**	Yes, all **three (3)** habitat types (riffle, run, pool) are present and frequent. 	**Two (2)** habitat types are present. 	Only **one (1)** habitat type present and dominant. 
	10 9 8 7	6 5 4 3	2 1 0
4. Sediment Deposition **Are sand bars and islands present?**	**Little or no** enlargement of vegetated islands or point bars. 	**Some** new bar formation of the channel bottom with new deposition in pools. Some increase in point bar formation. 	**Heavy** deposits of usually fine sediment; channel affected by extensive deposition. Point bars are bare. 
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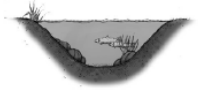
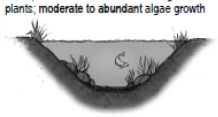
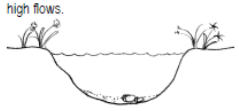
5. Aquatic Vegetation **How much algae and aquatic plant growth exists in the stream?**	Clear water in whole reach; diverse aquatic plant community - low quantity of plants; **little algae growth** 	Fairly clear to slightly greenish water in whole reach; some to abundance of lush green plants; **moderate to abundant algae growth** 	Pea green, gray, or brown water in whole reach; dense stands of plants clog stream; severe algal blooms create **thick algal mats** in stream 
	10 9 8 7	6 5 4 3	2 1 0

What types of submerged materials are on the channel bottom?	**Abundant stable** habitat cover for colonization by macroinvertebrates and fish: submerged roots, woody and vegetative debris, cobbles, leaf packs and undercut banks. 	**Adequate stable** habitat cover for colonization by macroinvertebrates and fish: submerged roots, woody and vegetative debris, cobbles, leaf packs and undercut banks. 	**Little or no stable** habitat cover available for colonization by macroinvertebrates and fish: submerged roots, woody and vegetative debris, cobbles, leaf packs and undercut banks; habitat may move during high flows. 
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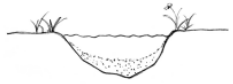
2. Embeddedness * For ROCKY BOTTOM streams only **Are fine sediments being deposited in riffle/run area?**	Gravel and cobble are **slightly** embedded in riffle area. 	Gravel and cobble are **partially** embedded in riffle area. 	Gravel and cobble are **completely** embedded in riffle area. 
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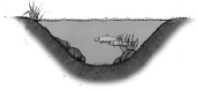
5. Aquatic Vegetation **How much algae and aquatic plant growth exists in the stream?**	Clear water in whole reach; diverse aquatic plant community - low quantity of plants; **little algae growth** 	Fairly clear to slightly greenish water in whole reach; some to abundance of lush green plants; **moderate to abundant algae growth** 	Pea green, gray, or brown water in whole reach; dense stands of plants clog stream; severe algal blooms create **thick algal mats** in stream 
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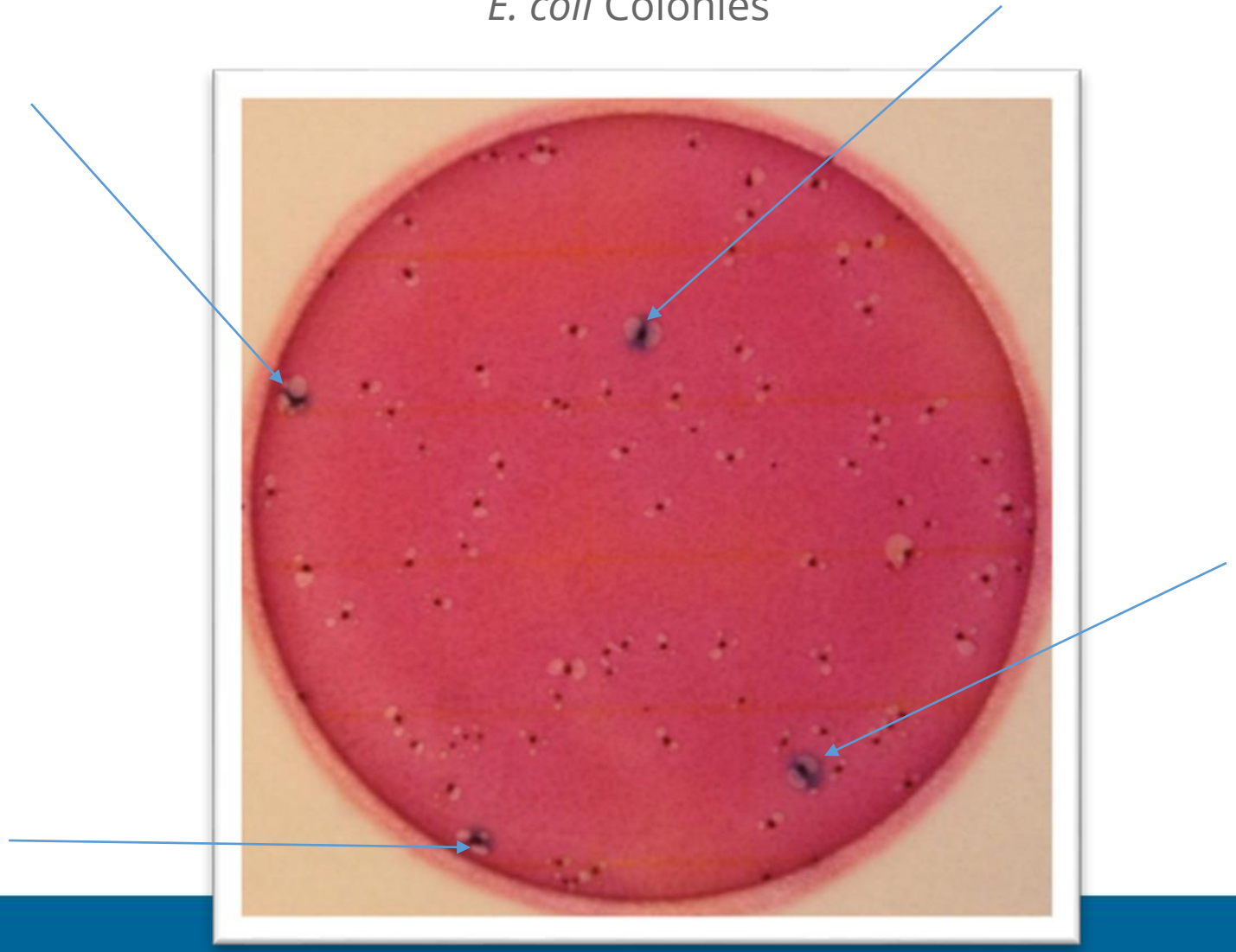
Bacteria – measured monthly

E. coli Colonies



How Do We Calculate Results?

	Plate 1	Plate 2	Plate 3
E. coli Colonies	3	2	3

Step 1: $\frac{3 + 2 + 3}{3}$ = 2.67 CFU/1 ml

Step 2: 2.67 CFU/1 ml x 100 ml = **267 CFU/100 ml**

SC Bacteria Standards

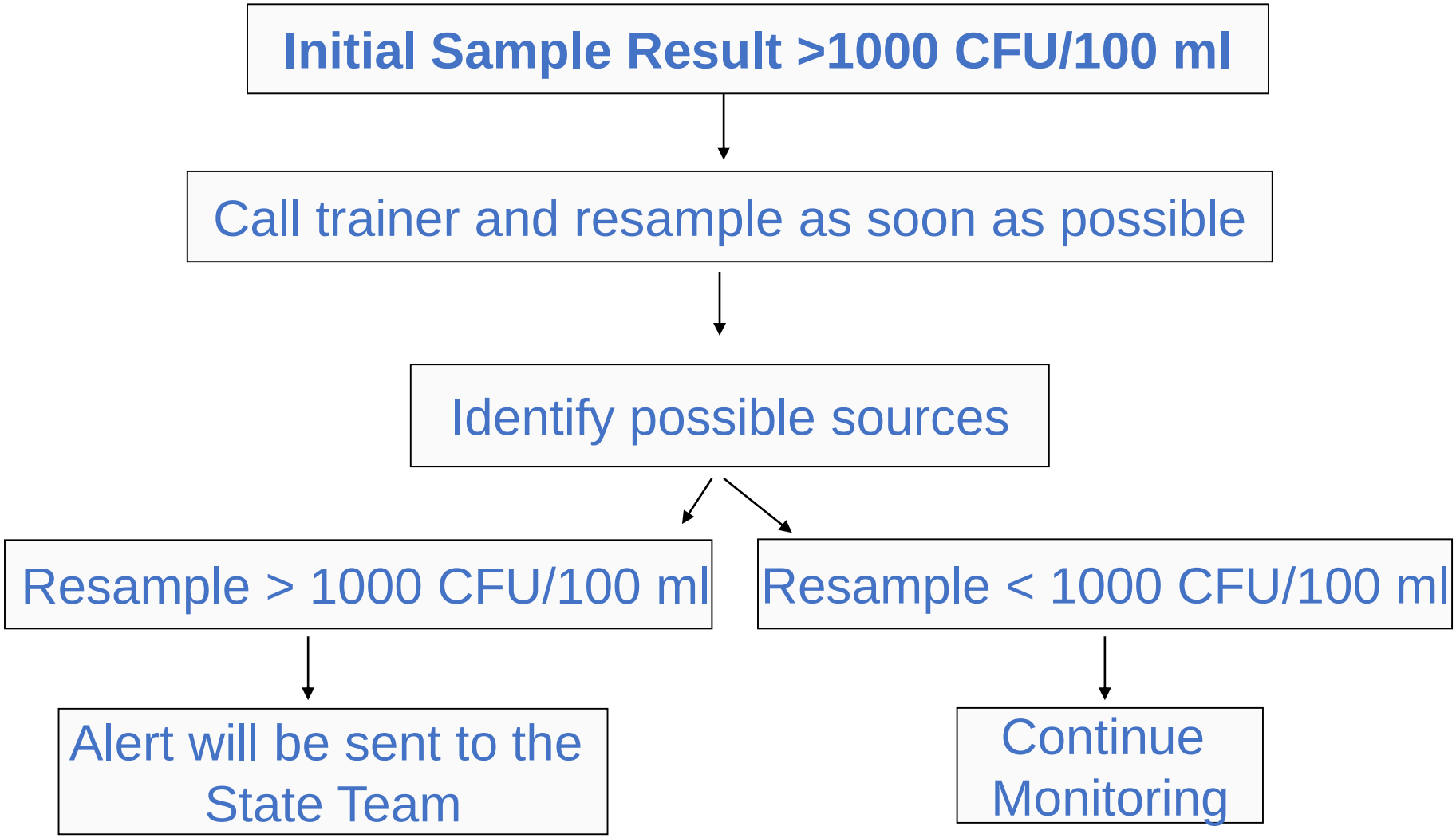
Freshwater	Monthly Geometric Mean	Single Sample
E. coli	<126 MPN*/100 ml	<349 MPN/100 ml

These levels correspond to an acceptable risk level of 32-36 human illnesses out of 1,000 swimmers.

***MPN and CFU refer to different methods to estimate the number of *E. coli per* 100 ml of stream water. The results are considered comparable.**

WHAT SC AAS BACTERIA LEVEL TRIGGERS ACTION?

- 1000 CFU/100 ml
- Petrifilm is not a regulatory method
- Petrifilm is used for screening purposes only


Initial Sample Result >1000 CFU/100 ml
Call trainer and resample as soon as possible
Identify possible sources
Resample > 1000 CFU/100 ml
Resample < 1000 CFU/100 ml
Alert will be sent to the State Team
Continue Monitoring

Physical/Chemical
Measured Monthly

- ✓ Air Temperature
- ✓ Water Temperature
- ✓ Dissolved Oxygen
- ✓ pH
- ✓ Conductivity

Dissolved Oxygen

- Winkler titration
- Two samples must be within +/- 0.6 mg/l
- Required for aquatic life respiration

pH

- LaMotte colorimetric pH test kit
- Two samples must be within +/-0.25
- Aquatic organisms are sensitive to pH fluctuations

Conductivity

- Conductivity meter
- Conductivity indicates the presence of ions in the water
- No regulated level in South Carolina

Macroinvertebrates
Measured Quarterly

Rocky Bottom Sampling Method

Sample **TWO** different habitats using a **kick net**

Stream Bottom (riffle areas)

- 3 kick net samples (2'x2' or 4 square feet)

Organic Matter (Leaf packs)

- 4 handfuls (1 square foot) of decayed, submerged leaves

Muddy/Sandy Sampling Method

Sample **THREE** different habitats using a **D-frame net**

Vegetative Margins

- 7 scoops (1 square foot)

Organic Matter (woody debris, leaf packs)

- 4 scoops (1 square foot)

Stream Bottom (sand/rock/gravel or coarsest area)

- 3 scoops (1 square foot)

South Carolina Department of Health and Environmental Control
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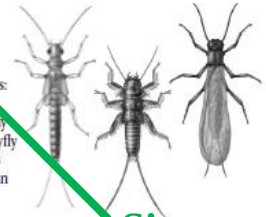
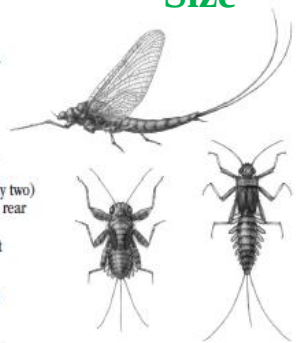
INSECTS

Stoneflies
Order: Plecoptera
Size: ½" to 1½"
Tolerance: Sensitive
Distinguishing Characteristics:
- Two hair-like tails
- No gills on rear half of body
- Structurally similar to mayfly nymphs, but have two tails instead of the usual three in mayflies
- 2 claws on each foot



Size

Mayflies
Order: Ephemeroptera
Size: ¼" to 1"
Tolerance: Sensitive
Distinguishing Characteristics:
- Usually three long, hair-like tails (but sometimes only two)
- Gills present on the rear half of body
- 1 hook on each foot

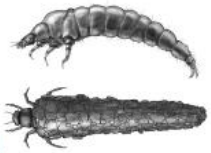


Water Pennies
Order: Coleoptera
Size: up to ½"
Tolerance: Very sensitive
Distinguishing Characteristics:
- Looks like a flat, oval disc
- Plates extend from all sides
- Cannot survive on rocks covered with excessive algae or inorganic sediment

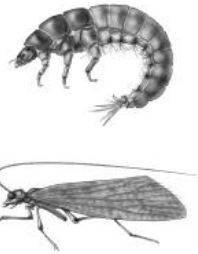
Riffle Beetles
Order: Coleoptera
Size: 1/16" to 1/8"
Tolerance: Sensitive
Distinguishing Characteristics:
- Very small
- Dark colored
- Adult riffle beetles will be found walking on the bottom of the stream

Aquatic Snipe Flies
Order: Diptera
Size: ¼" to 1"
Tolerance: Sensitive
Distinguishing Characteristics:
- Body is pale brown to green color
- Mostly cylindrical, with the front tapering to a cone-shaped point
- Larva have a number of mostly paired caterpillar-like prolegs
- Two stout, pointed tails with feathery hairs at back end

Caddisflies
Order: Trichoptera
Size: ½" to 1 ½"
Tolerance: Sensitive
Distinguishing Characteristics:
- Larva is caterpillar-like with three pairs of legs and tends to curl up slightly
- Two claws at posterior (rear) end
- May be found in a stick, rock, or leaf case with its head sticking out

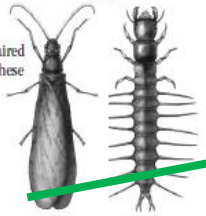


Common Net Spinning Caddisflies
Order: Trichoptera
Family: Hydropsychidae
Size: up to 1"
Tolerance: Somewhat sensitive
Distinguishing Characteristics:
- Body is caterpillar-like with three pairs of legs and is strongly curved
- Dorsal plates (sclerites) on all three thoracic segments
- Branched gills on the ventral surface of the last two thoracic segments and most of the abdominal segments
- Usually have a bristle-like, setal tuft at the end of each anal proleg
- Color varies from bright green to dark brown



Dobsonflies/Hellgrammites and Fishflies
Order: Megaloptera
Size: ¾" to 4"
Tolerance: Somewhat sensitive
Distinguishing Characteristics:
- Stout body with large pinching jaws
- Eight pairs of pointed lateral appendages
- On the rear end of the body a pair of stubby, unjointed legs (prolegs), each with a pair of claws
- Dobsonflies/Hellgrammites have paired cotton-like gill tufts, fishflies lack these
- Fishflies have two short tube-like structures on the tail end

Dobsonfly Larva



Fishfly Adult | Fishfly Larva

Distinguishing Characteristics

Damselflies and Dragonflies
Order: Odonata
Size: ½" to 2"
Tolerance: Somewhat sensitive
Distinguishing Characteristics:
- Both have large eyes, six legs, and a large lower lip that covers much of the bottom of the head
- Damselflies are slender and have three oar shaped tails (gills)
- Dragonflies have a stocky body without tails

Dragonfly Adult | Dragonfly Larva | Damselfly

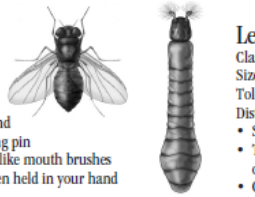
Crane Flies
Order: Diptera
Size: ⅓" to 2 ½"
Tolerance: Somewhat sensitive
Distinguishing Characteristics:
- Worm-like plump body
- Can be found in a variety of colors (clear, white, brown, and green)
- Segmented body with finger-like projections (gills) at the back end
- Head is usually pulled back into the front of the body

Length Reference

Midge Flies
Order: Diptera
Size: up to ¼"
Tolerance: Tolerant
- They can indicate poor stream health caused by pollution if found in large numbers

Distinguishing Characteristics:
- Often whitish to clear, but occasionally bright red
- Segmented body
- Has distinct head with two small prolegs in the front of the body
- Display a spastic squirming action in the water

Black Flies
Order: Diptera
Size: up to ¼"
Tolerance: Tolerant
Distinguishing Characteristics:
- The body is larger at the rear end similar to the shape of a bowling pin
- The distinct head contains fan-like mouth brushes
- Often curl into a "u" shape when held in your hand



CRUSTACEANS

Crayfish
Order: Decapoda
Size: up to 5"
Tolerance: Somewhat sensitive
- Can withstand large ranges of pH and temperatures and is sensitive to toxic substances

Distinguishing Characteristics:
- Resembles a lobster
- Has 10 legs and the two front legs have large claws or pinchers

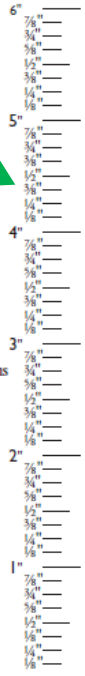
Aquatic Sow Bugs
Order: Isopoda
Size: ¼"- ¾"
Tolerance: Somewhat sensitive
Distinguishing Characteristics:
- Flat, segmented body
- Has an "armored" appearance
- Seven pairs of legs
- Can be confused with scuds, however they are flattened top to bottom

Scuds
Order: Amphipoda
Size: ⅛" to ¼"
Tolerance: Somewhat sensitive
Distinguishing Characteristics:
- Resemble a small shrimp
- Translucent body with silvery-gray or tan coloration
- Seven pairs of legs
- Unlike sow bugs, scuds are flattened side to side

WORMS

Aquatic Worms
Class: Oligochaeta
Size: Usually 1" but up to 4"
Tolerance: Tolerant
Distinguishing Characteristics:
- Can be very tiny and slender or look similar to earthworms
- No legs, distinct head or any mouthparts
- Segmented body
- Aquatic worms can indicate organic pollution when they dominate the majority of the sample collection

Leeches
Class: Hirudinea
Size: ¼" to 2"
Tolerance: Tolerant
Distinguishing Characteristics:
- Somewhat slimy, soft, segmented body
- Two suckers on the underside of the body, one in the front and one in the rear
- Can be confused with a flatworm, however flatworms have no suckers and leeches have fine lines (annuli) across the body



TAXA GROUPS

SENSITIVE TAXA	SOMEWHAT SENSITIVE TAXA	TOLERANT TAXA
☐ Stonefly Nymphs	☐ Common Net Spinning Caddisflies	☐ Midge Fly Larvae
☐ Mayfly Nymphs	☐ Dobsonfly/Helgrammite & Fishfly	☐ Black Fly Larvae
☐ Water Penny Larvae	☐ Dragonfly & Damselfly Nymphs	☐ Lunged Snails
☐ Riffle Beetle Larvae/Adults	☐ Crayfish	☐ Aquatic Worms
☐ Aquatic Snipe Flies	☐ Crane Flies	☐ Leeches
☐ Caddisflies	☐ Aquatic Sow Bugs	
☐ Gilled Snails	☐ Scud	
	☐ Clams & Mussels	

WATER QUALITY INDEX/RATING

☐ **# groups times 3 =____**	☐ **# groups times 2 =____**	☐ **# groups times 1 =____**

Now add together the three index values to get your **Water Quality Index Score** =_____

Use this score to find out your **Water Quality Rating** for your stream (below).

Good water quality is indicated by a variety of different kinds of taxa/organisms, with no one kind making up a majority of the sample.

Water Quality Rating

☐ *Excellent (>22)* ☐ *Good (17-22)* ☐ *Fair (11-16)* ☐ *Poor (<11)*

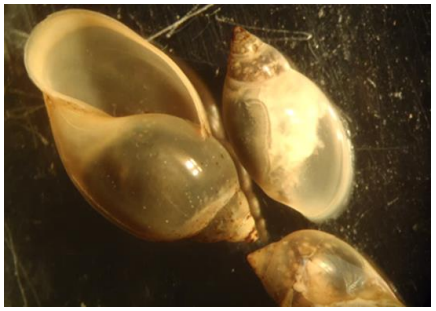
Tolerant

Midge Fly Larva

Black Fly Larvae

Leech

Aquatic Worm



Lunged Snail

Somewhat Sensitive

Dragonfly Larva

Sow Bug

Dobson Fly
(Hellgrammite)

Net Spinning Caddisfly

Crane Fly Larva

Scud

Damselfly Larvae

Sensitive

Stonefly Nymphs

Mayfly Nymphs

Caddisfly Nymph

Gilled Snail

Riffle Beetle

Snipe

Water Penny

https://www.youtube.com/watch?v=p9TjyolacZo&index=1&list=PLqGWmyz3QMptdDY4MbmAF0mOZttUrtUIJ

South Carolina Department of Health and Environmental Control

Healthy People. Healthy Communities.

SC Adopt-A-Stream | Sampling Events | Groups | Sites | Certifications | Thresholds | Volunteer Sign Up | Contacts | Admin | skippekb@dhec.sc.gov

SC ADOPT-A-STREAM / EVENT VIEW

Site Information | Weather | Observations | Chemical | Bacterial | Macroinvertebrates | Stream Habitat

General Data

Did you use a method other than 3M Petrifilm Plates? No

3M Petrifilm Method *Escherichia coli*

Run three (3) plates/tests for each site, plus one (1) blank plate. Process within 0-24 hrs, incubate at 35°C ± 1°, and read at 24 ± 1 hr.

Blank Plate	Plate 1	Plate 2	Plate 3	Avg	cfu /100mL
0	1	0	1	0.67	66.67

Incubation Start Time	Incubation End Time	Total Incubation Time	Minimum Temperature	Maximum Temperature
10/07/2017 8:24	10/08/2017 8:24	24.00 Hrs	34 °C	35 °C

Comments

Any bacterial changes to note since you last sampled at this site?

www.scadoptastream.org

Welcome to South Carolina Adopt-a-Stream, a new program with growing enthusiasm and membership for the protection of South Carolina's waterways!

South Carolina Adopt-a-Stream (SC AAS) creates a network of watershed stewardship, engagement, and education through involvement. SC AAS volunteers can play an important role in monitoring and tracking water quality while sharing information about local water resources with their communities. In providing baseline information about stream conditions, volunteers, local communities, educators, and local government agencies can partner to protect and restore our waters.

You do not need to be an environmentalist, fisherman, or scholar to join this effort. All are welcome to find more information, seek training, and add to the knowledgebase of river health in South Carolina!

LEARN MORE about the program and how to get involved!

SUBSCRIBE TO OUR NEWSLETTER to stay in touch with program growth and news.

ENTER AND VIEW DATA - The SC AAS Database launched on June 20, 2017!

EVENT INFORMATION - Check here often, as trainings are not always announced with the e-news!

Workshops & Events

Join us for the following training opportunities and events!

SC Adopt-A-Stream — Nov 11 9:30am

Chemical and Bacterial Workshops These workshops are "Rain or Shine". Please come prepared to get into a stream for the field portion of the workshops. Lunch will be provided.

Location: USC Upstate Campus

SC Adopt-A-Stream — Nov 18 9:30am

Macroinvertebrate Workshop. These workshops are "Rain or Shine". Please come prepared to get into a stream for the field portion of the workshops. Lunch will be provided.

Location: USC Upstate Campus

SC Adopt-A-Stream — Nov 29 9am

Free Chemical and Bacterial AAS workshop. Become a certified stream monitoring volunteer. Be prepared to get in the stream and bring a lunch.

Location: Pickens Extension Office

SC Adopt-A-Stream — May 5, 2018 9:30am

Chemical and Bacterial Workshops These workshops are "Rain or Shine". Please come prepared to get into a stream for the field portion of the workshops. Lunch will be provided.

Location: USC Upstate Campus

SC Adopt-A-Stream — May 19, 2018 9:30am

Macroinvertebrate Workshop These workshops are "Rain or Shine". Please come prepared to get into a stream for the field portion of the workshops. Lunch will be provided.

Location: USC Upstate Campus

South Carolina Department of Health and Environmental Control
Healthy People. Healthy Communities.

CONTACT US

Karin Skipper
SCDHEC Bureau of Water
803-898-4187

South Carolina Adopt-a-Stream
www.scadoptastream.org

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