Visual Stream Monitoring: Exploring Georgia's Newly Developed Visual Monitoring Methods

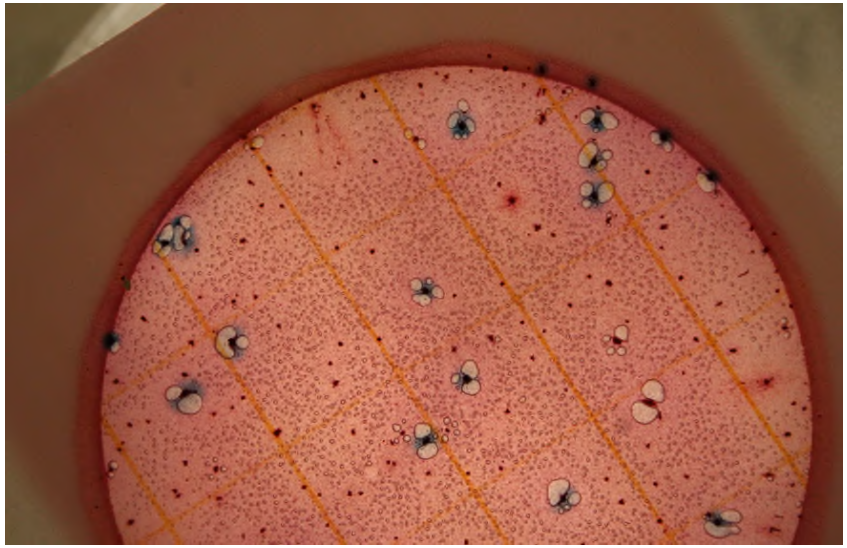
Harold Harbert

Outreach Unit Manager

Georgia Environmental Protection Division

Program components

- Streams, lakes, coastal waters
- Intro programs
  - Watershed Assessment
  - Visual Stream Survey
- QA/QC Monitoring
  - Chemical
  - Macroinvertebrate
  - Bacterial



Georgia Adopt-A-Stream

GEORGIA'S VOLUNTEER WATER QUALITY MONITORING PROGRAM

WATERSHED PROTECTION BRANCH

Adopt-A-Stream | Get Involved | Groups | Sites | People | Data Views | Data Entry | Materials & Resources | Teacher's Corner | Contact us | Sign in

NEW Online Data Entry, Data Forms & QC Measures 2014

Meet Anne Stahley

Did you know? You can view monthly summaries of your group's activities, such as the number of events conducted, data reported, hours contributed and more.

Apr 17, 2014	Groups	Sites	Events	Data	Volunteers	Newsletters
Currently active	203	521	4186	18405	2510	Jan-Mar 2014
Database totals	663	1450	23390	121286	20092	Archived

Thursday, April 17 View monthly calendar Print

Thursday, April 17

6:00pm Cobb. Chemical Monitoring Workshop

Saturday, April 19

9:00am Biological, Visual Workshop, Augusta, GA

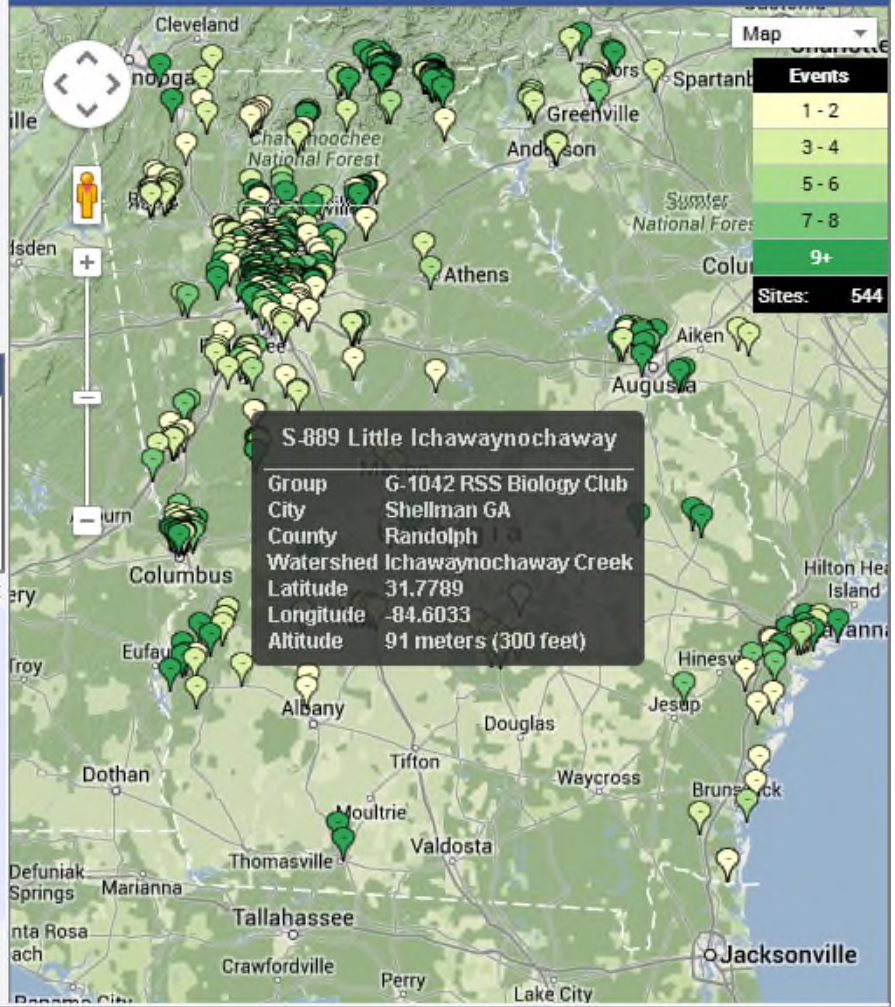
Saturday, April 26

Forsyth County - Amphibian Workshop

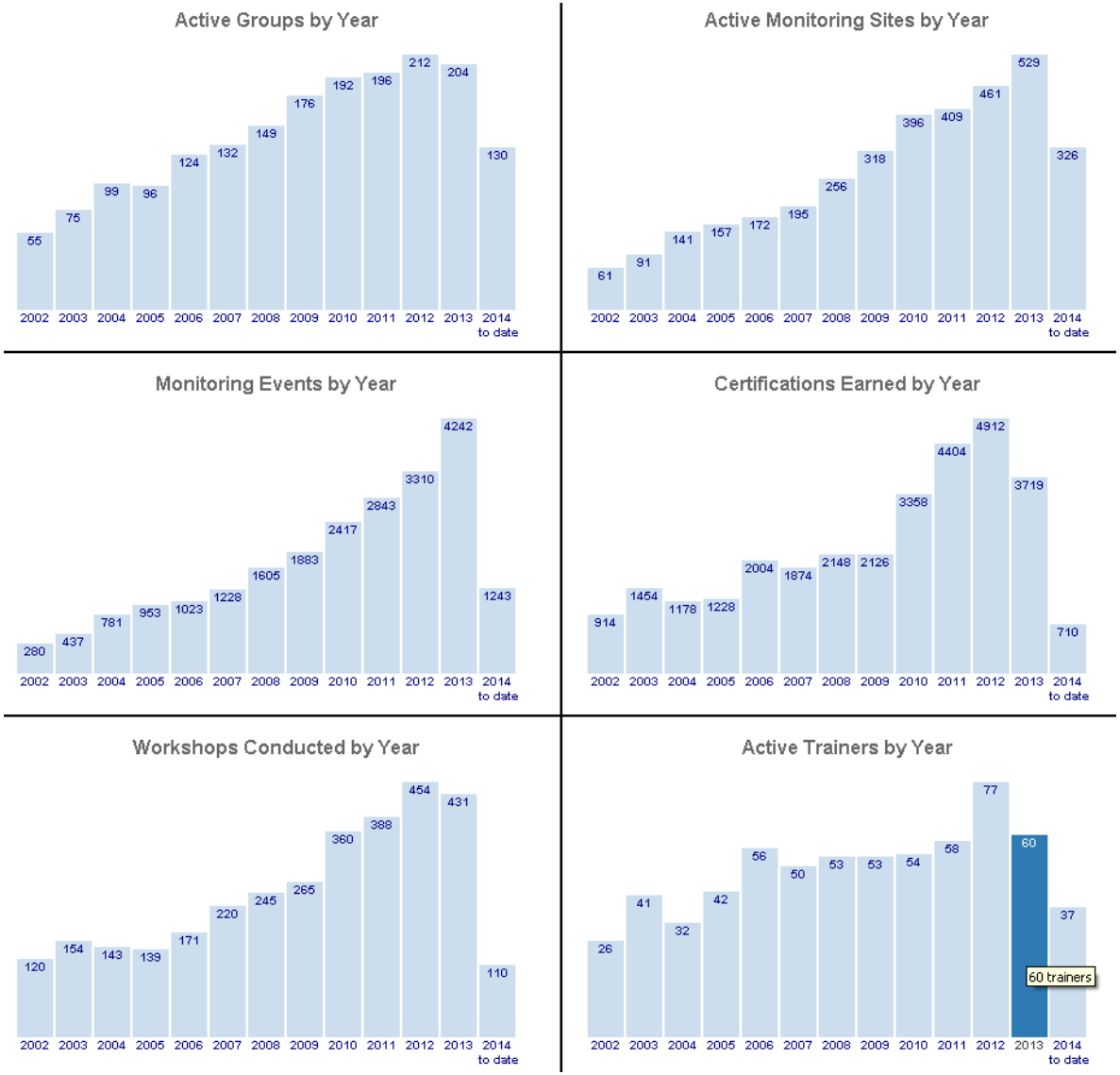
Google Calendar

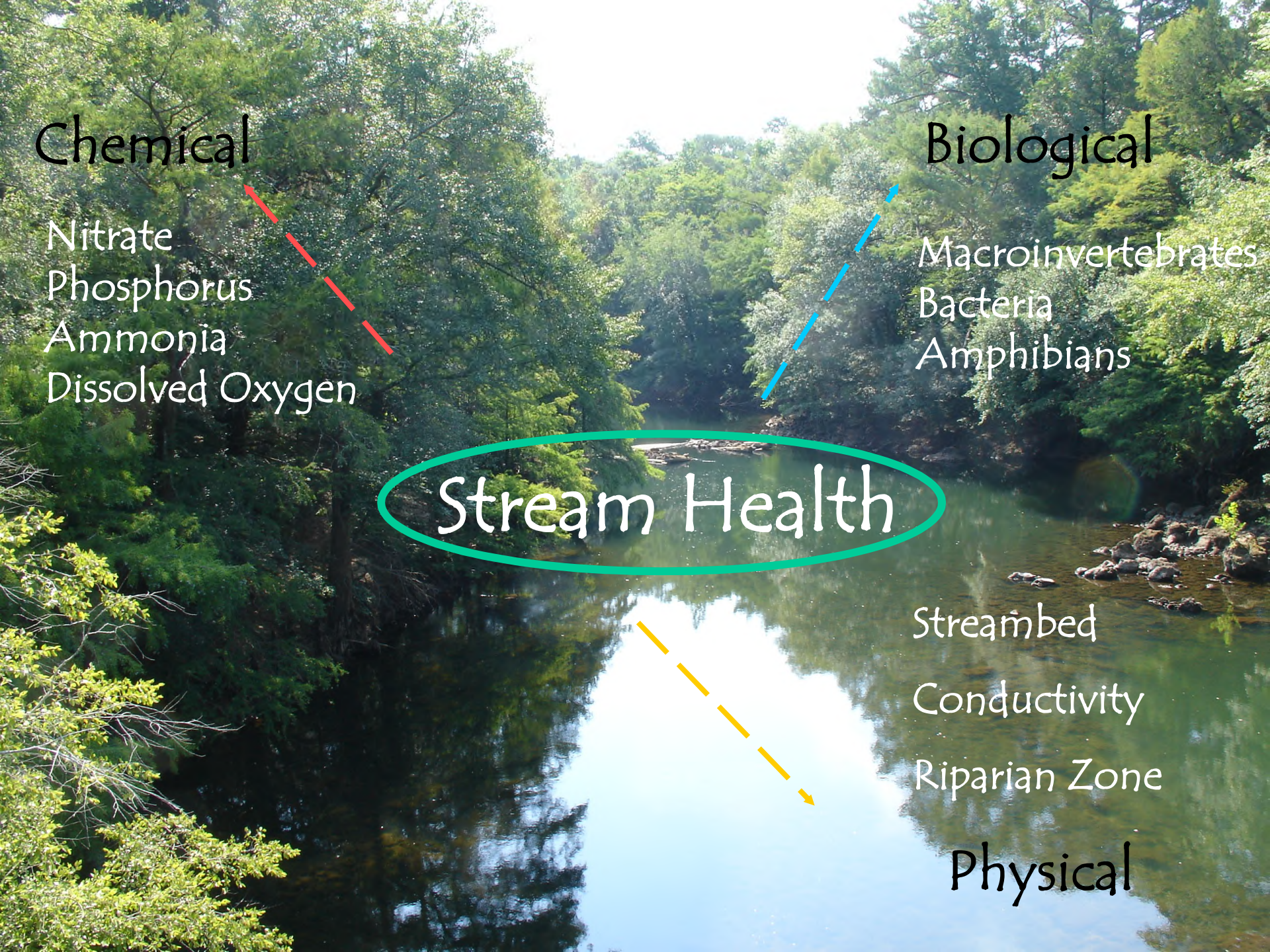
AAS Coordinators and Trainers can post on the calendar. Contact the State Office for more information: aas@gaepd.org.

Show: All active sites



Started in 1992




Chemical
Nitrate
Phosphorus
Ammonia
Dissolved Oxygen
Biological
Macroinvertebrates
Bacteria
Amphibians
Stream Health
Streambed
Conductivity
Riparian Zone
Physical

Visual Stream Monitoring

Visual & physical evaluation of stream conditions

Monitoring: 4 x/yr

Workshop: 3-4 hrs

Supplies: $100

No QA/QC

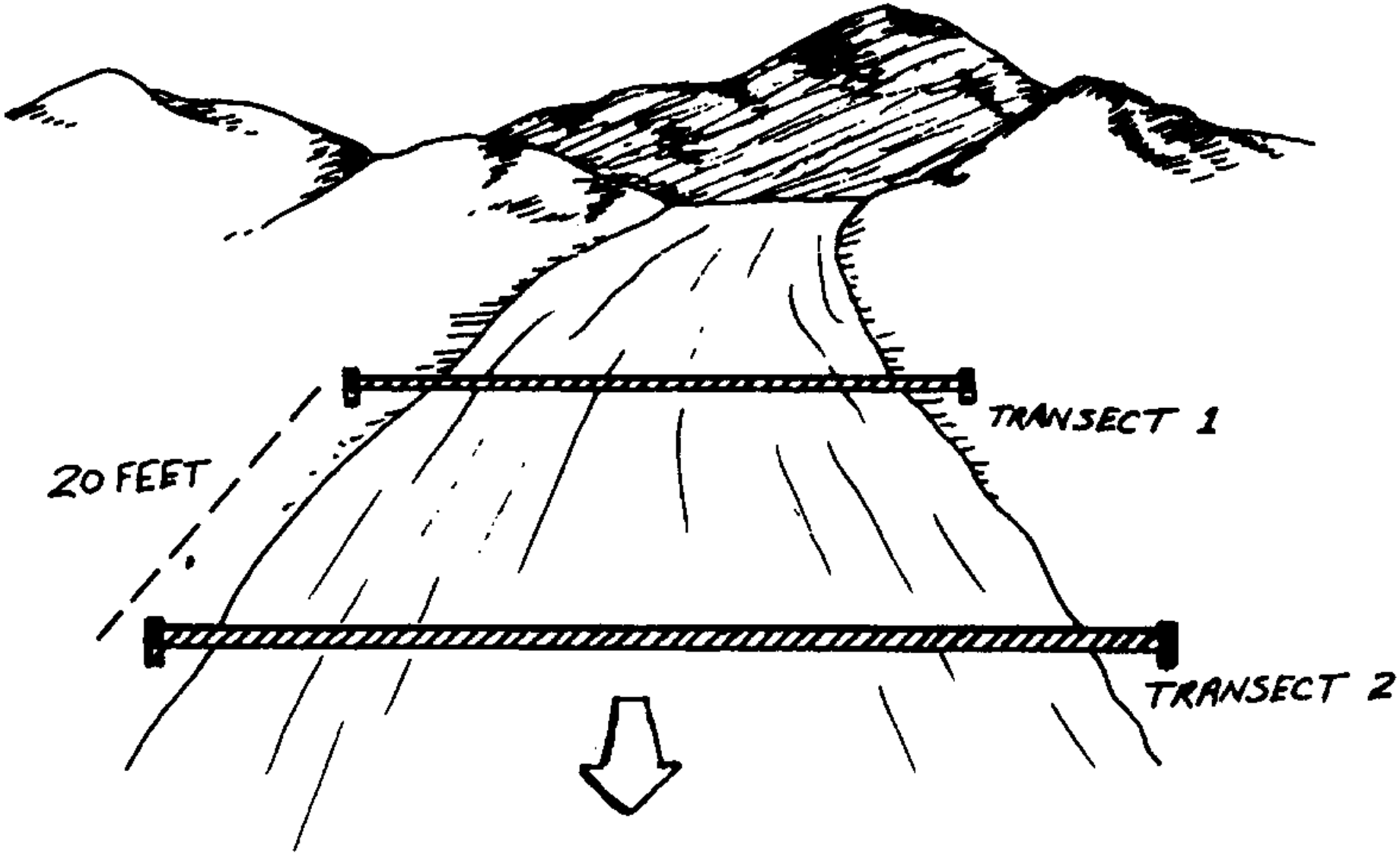
Visual Stream Monitoring

- Why is it important?
  - Quickly assess stream conditions
  - Quickly identify problems
- Can indicate erosion, sewage spills, sedimentation, algae, etc.
- Who should do it? Everyone

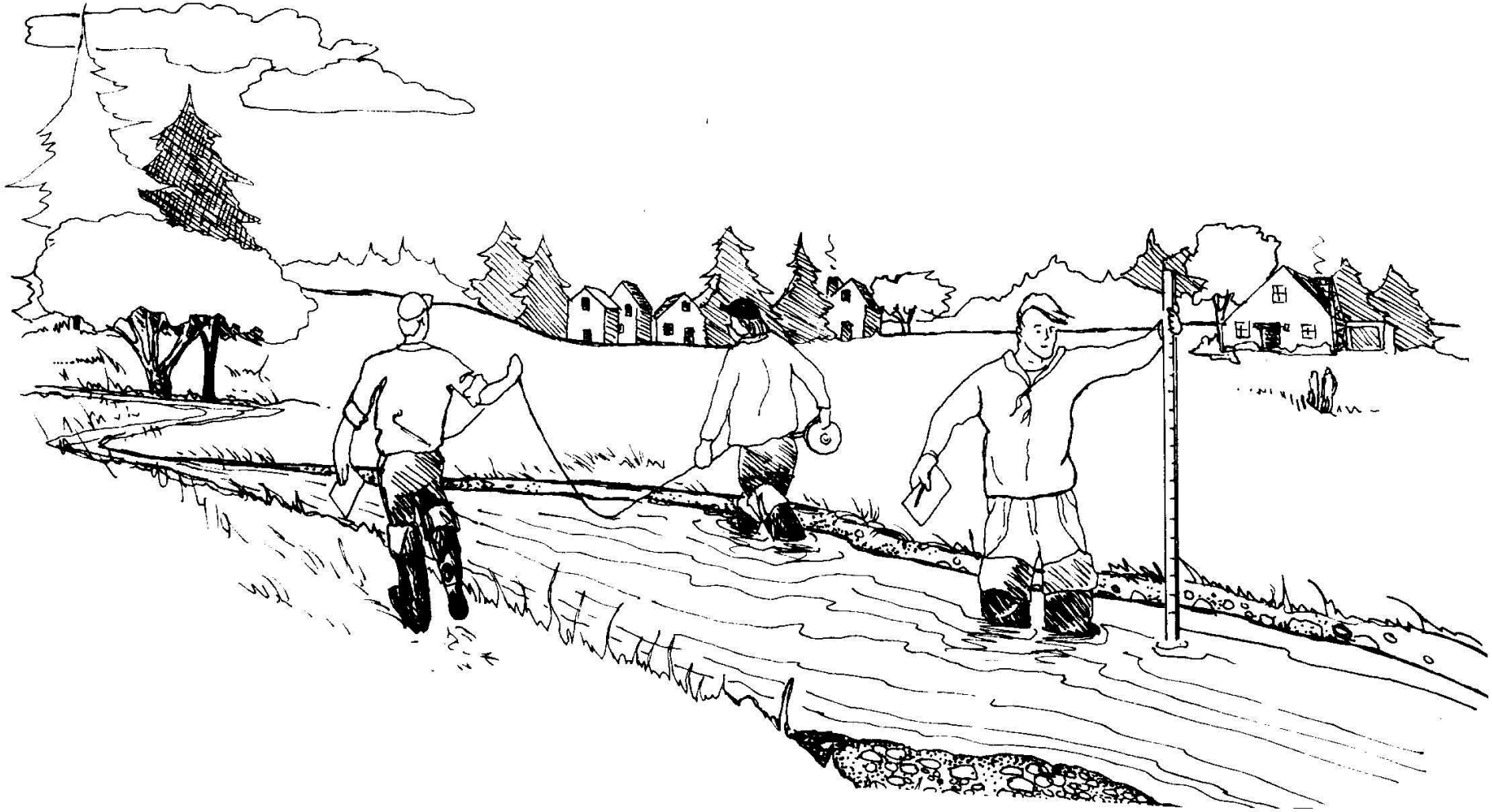
Visual Stream Survey

- Basic Visual Form
  - Photo points
- Stream Habitat Survey
- Stream Flow
- Channel Cross-section
- Wentworth Pebble Count
- Site Sketch

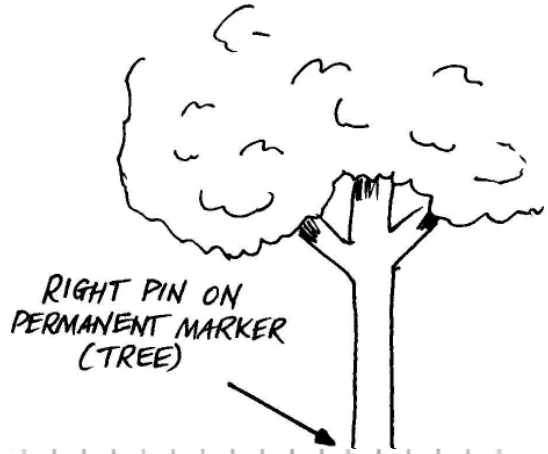
FLOW= Area x Velocity/Speed

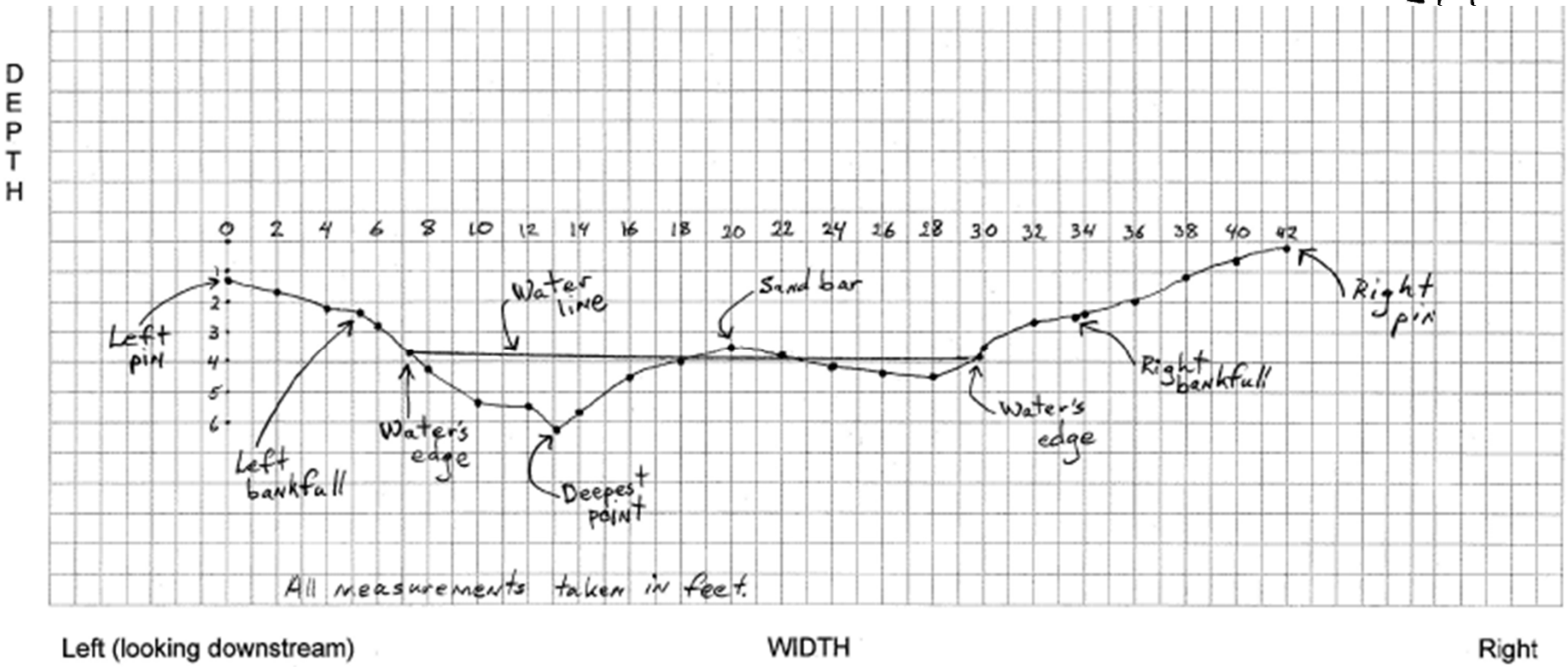


Channel Cross Section



Channel Cross Section Setup



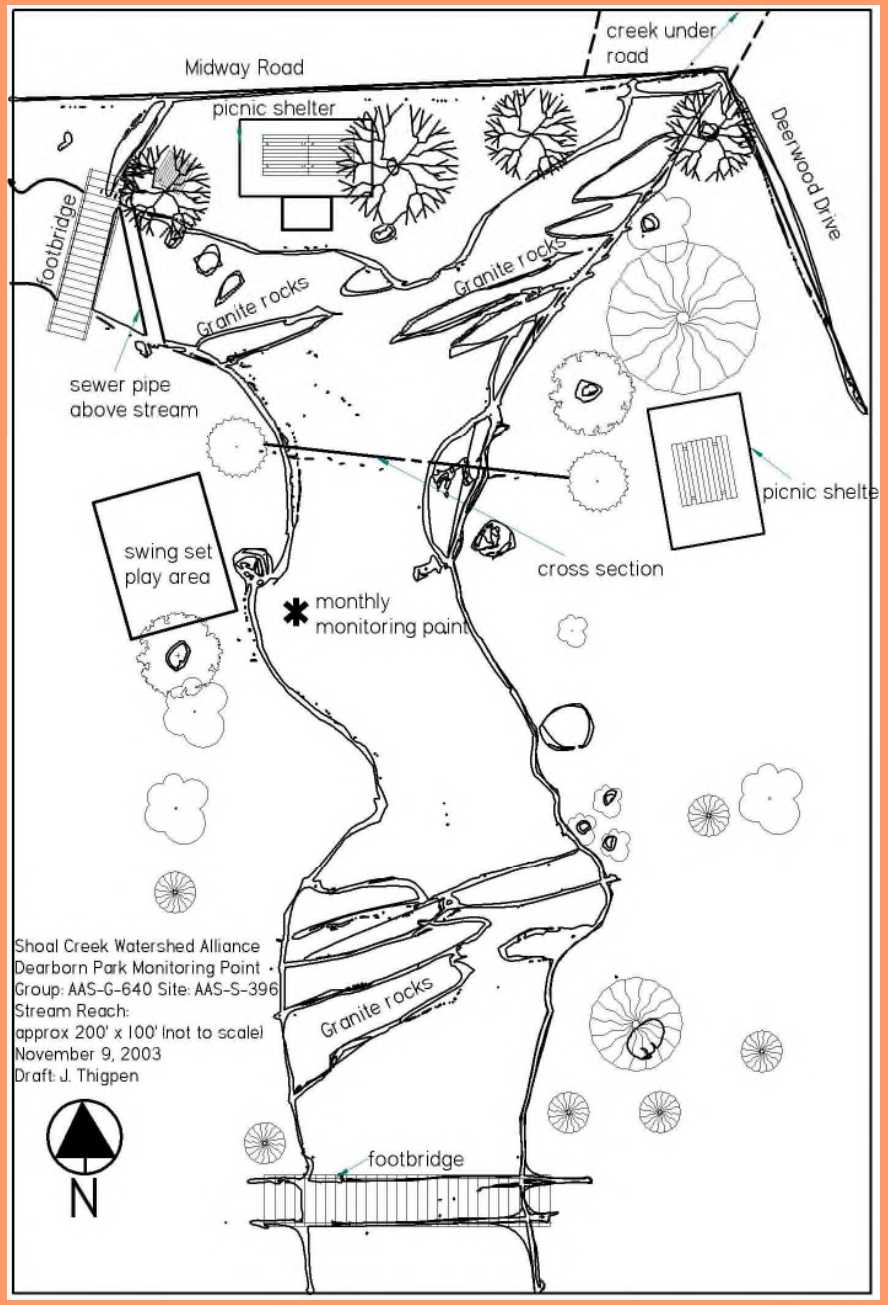


Wentworth Pebble Count

- Characterize particle size

Size Class	Size Range (mm)	Description
Silt/Clay	< 0.062	Smooth when rubbed between fingers
Sand	0.062 – 2.0	May have some clay in it but you will feel the gritty texture.
Gravel	2.0 – 64.0	This line is just over 2 mm
Cobble	64.0 – 256.0	This line is about 64 mm. This page is just over 256 mm long.
Boulder	256.0 – 4096.0	These are big!
Bedrock		Bare/exposed rock.

Sketch your site



GEORGIA ADOPT-A-STREAM: Basic Visual Form

To be used with: Photo Points, Wentworth Pebble Count, Cross Section, Bio Survey, Stream Habitat Survey, Stream Flow and Site Sketch

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 ☐ Flood (over banks)

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

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:_____

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

PHOTO POINTS

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.

Reference Location (RL): Latitude (+)_____ (DD.DDDD°) Longitude (-)_____ (DD.DDDD°)

Compass bearing to permanent Photo Point Location (PPL): Degrees (°)_____

Distance to permanent Photo Point Location (PPL) from Reference Location (RL): Distance _____(ft/in)

Camera height at permanent Photo Point location (PPL): Height _____(ft/in)

COMMENTS

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

Habitat Survey

- 1990s had a method for scoring habitat
  - overly simplistic
- 2000's had a qualitative assessment
  - Not popular, not fun to teach, not sure what to do with the assessments

- So, we embarked on a new scoring system…

Design Considerations

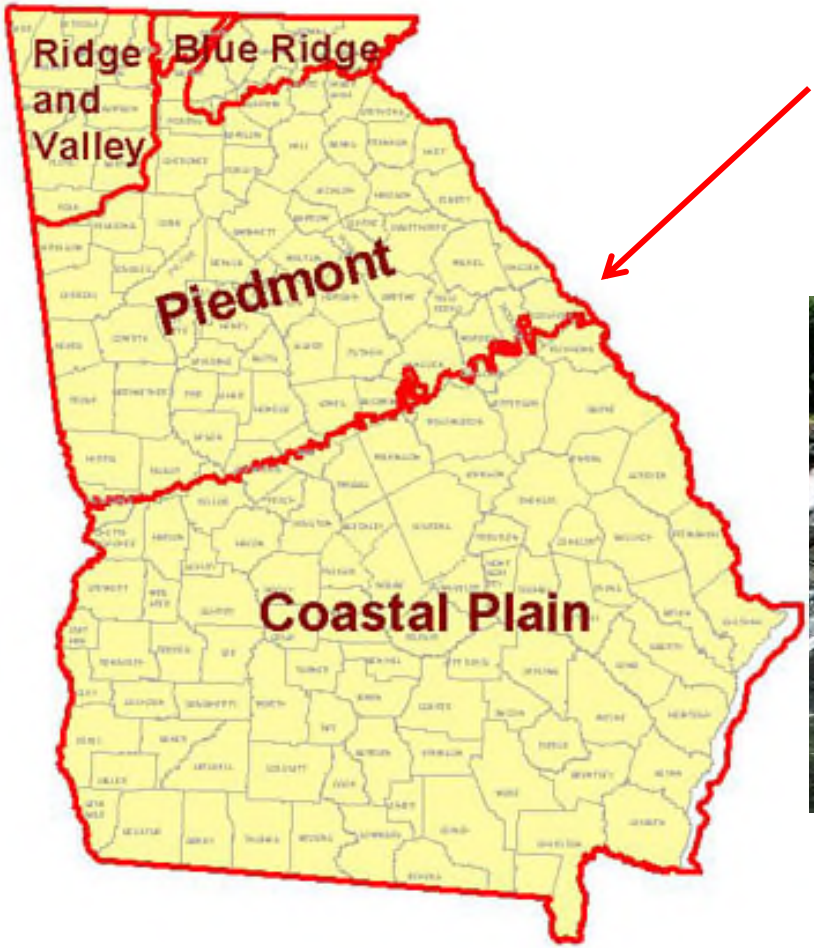
- Research of existing surveys
  - **Georgia EPD - Habitat Assessment Field Data Sheet – High & Low Gradient Streams**
  - **USDA Stream Visual Assessment Protocol**
  - **Michigan Survey**
- Standardized method
- What can a volunteer handle

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME:		SITE (or ID) #:
LAT (DD):	LONG (DD):	
LAT (D,M,S):	LONG (D,M,S):	
INVESTIGATORS:	FORM COMPLETED BY:	
PROJECT:	DATE _____ TIME AM PM	REASON FOR SURVEY:
FIELD SEASON:	COMMENTS:	

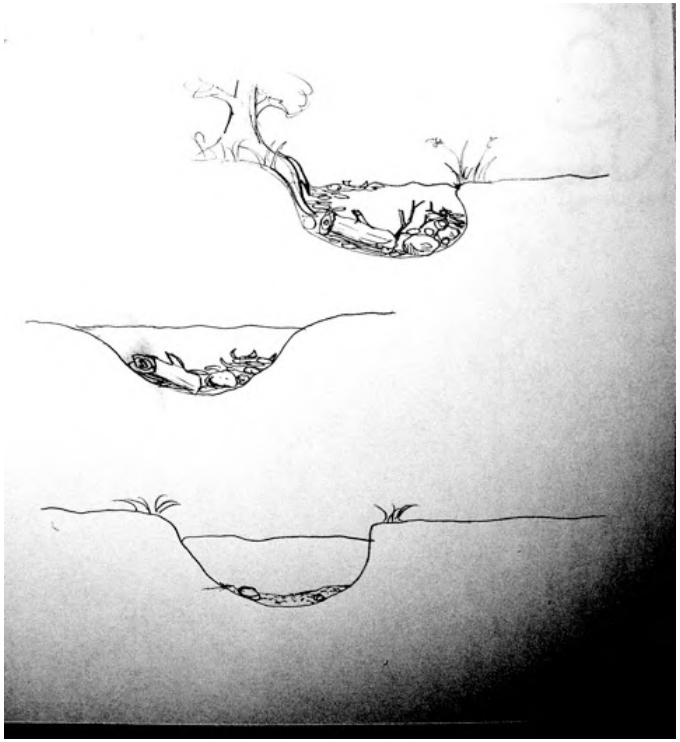
Parameters to be evaluated in sampling reach	Habitat Parameter	Condition Category			
		Optimal	Suboptimal	Marginal	Poor
	1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
	SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
	4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.

Design Considerations



Fall line

Design Considerations



- Finding a scientific artist

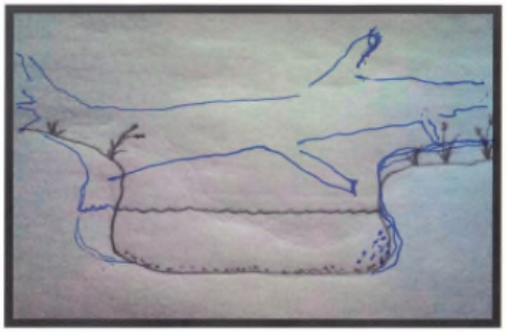


photo 3

- make stream wider
- on right side, make it look like part of bank has caved into stream, w/a pile of loose soil
- keep tree on left, which has now died, has fallen across stream & has broken dead limbs
- make water live a little lower

Good photo 1

photo 2 make gentle slope on right bank

Contributing Parties

Scientist

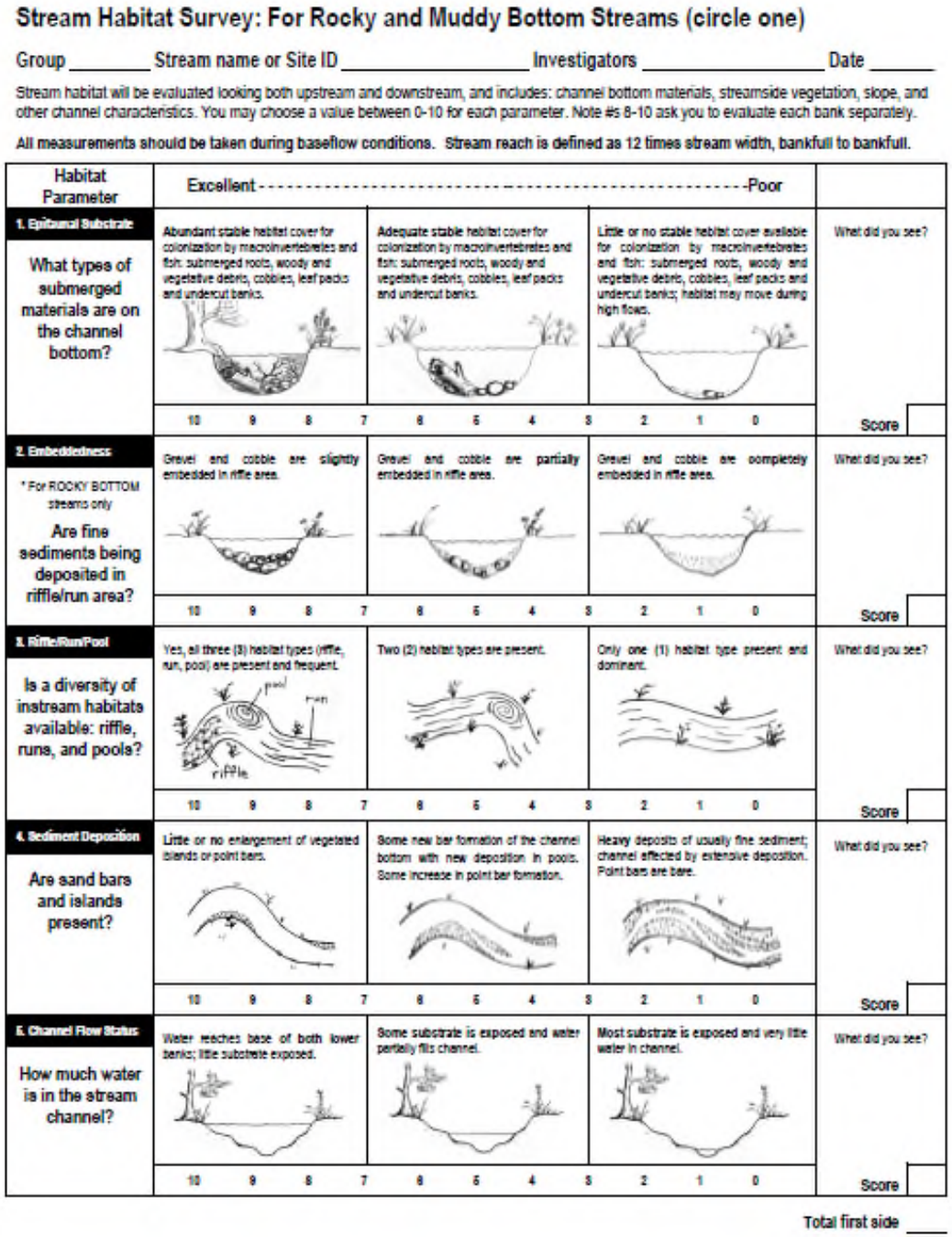
Federal, state, and local government, academic and professional scientist provided feedback and guidance

Local trainers & educators & citizens field tested suitability

Regular Folk

Stream Habitat Survey

- Decided on 3 images
- Scoring 10 to 0
- 10 parameters
  - 9 for low gradient
  - 9 for high gradient
- What did you see?



Stream Habitat Survey: For Rocky and Muddy Bottom Streams (circle one)

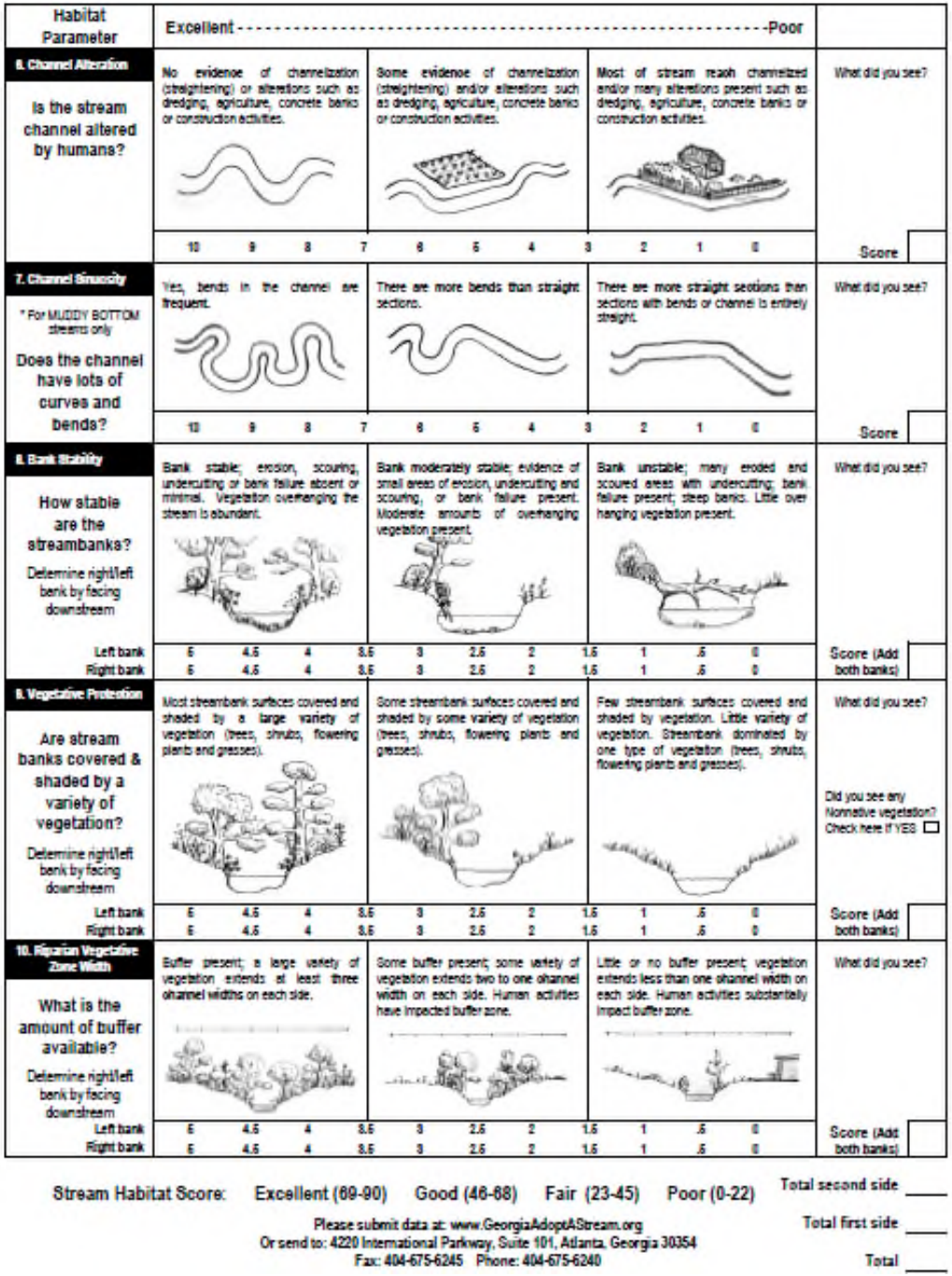
Group _____ Stream name or Site ID _____ Investigators _____ Date _____

Stream habitat will be evaluated looking both upstream and downstream, and includes: channel bottom materials, streamside vegetation, slope, and other channel characteristics. You may choose a value between 0-10 for each parameter. Note #s 8-10 ask you to evaluate each bank separately.

All measurements should be taken during baseflow conditions. Stream reach is defined as 12 times stream width, bankfull to bankfull.

| Habitat Parameter | Excellent - - -

- Language was important
  - Abundant, adequate, little
  - Slightly, partially, completely
  - Little, some, heavy
  - 3 times channel width, 2 times…
- Scoring matches macroinvertebrate index/rating



Habitat Parameter	Excellent ---------- Poor			
6. Channel Alteration Is the stream channel altered by humans?	No evidence of channelization (straightening) or alterations such as dredging, agriculture, concrete banks or construction activities.	Some evidence of channelization (straightening) and/or alterations such as dredging, agriculture, concrete banks or construction activities.	Most of stream reach channelized and/or many alterations present such as dredging, agriculture, concrete banks or construction activities.	What did you see?
	10 9 8 7	6 5 4 3	2 1 0	Score
7. Channel Sinuosity * For MUDDY BOTTOM streams only Does the channel have lots of curves and bends?	Yes, bends in the channel are frequent.	There are more bends than straight sections.	There are more straight sections than sections with bends or channel is entirely straight.	What did you see?
	10 9 8 7	6 5 4 3	2 1 0	Score
8. Bank Stability How stable are the streambanks? Determine right/left bank by facing downstream	Bank stable; erosion, scouring, undercutting or bank failure absent or minimal. Vegetation overhanging the stream is abundant.	Bank moderately stable; evidence of small areas of erosion, undercutting and scouring, or bank failure present. Moderate amounts of overhanging vegetation present.	Bank unstable; many eroded and scoured areas with undercutting; bank failure present; steep banks. Little over hanging vegetation present.	What did you see?
Left bank	5 4.5 4 3.5	3 2.5 2 1.5	1 .5 0	Score (Add both banks)
Right bank	5 4.5 4 3.5	3 2.5 2 1.5	1 .5 0	
9. Vegetative Protection Are stream banks covered & shaded by a variety of vegetation? Determine right/left bank by facing downstream	Most streambank surfaces covered and shaded by a large variety of vegetation (trees, shrubs, flowering plants and grasses).	Some streambank surfaces covered and shaded by some variety of vegetation (trees, shrubs, flowering plants and grasses).	Few streambank surfaces covered and shaded by vegetation. Little variety of vegetation. Streambank dominated by one type of vegetation (trees, shrubs, flowering plants and grasses).	What did you see? Did you see any Nonnative vegetation? Check here if YES ☐
Left bank	5 4.5 4 3.5	3 2.5 2 1.5	1 .5 0	Score (Add both banks)
Right bank	5 4.5 4 3.5	3 2.5 2 1.5	1 .5 0	
10. Riparian Vegetative Zone Width What is the amount of buffer available? Determine right/left bank by facing downstream	Buffer present; a large variety of vegetation extends at least three channel widths on each side.	Some buffer present; some variety of vegetation extends two to one channel width on each side. Human activities have impacted buffer zone.	Little or no buffer present; vegetation extends less than one channel width on each side. Human activities substantially impact buffer zone.	What did you see?
Left bank	5 4.5 4 3.5	3 2.5 2 1.5	1 .5 0	Score (Add both banks)
Right bank	5 4.5 4 3.5	3 2.5 2 1.5	1 .5 0	

Stream Habitat Score: Excellent (69-90) Good (46-68) Fair (23-45) Poor (0-22)

Total second side ____
Total first side ____
Total ____

Please submit data at: www.GeorgiaAdoptAStream.org
Or send to: 4220 International Parkway, Suite 101, Atlanta, Georgia 30354
Fax: 404-675-6245 Phone: 404-675-6240

Stream Habitat Survey

#6 CHANNEL ALTERATION: Is the stream channel altered by humans?

Habitat Parameter	Excellent ---------- Poor			
6. Channel Alteration Is the stream channel altered by humans?	No evidence of channelization (straightening) or alterations such as dredging, agriculture, concrete banks or construction activities.	Some evidence of channelization (straightening) and/or alterations such as dredging, agriculture, concrete banks or construction activities.	Most of stream reach channelized and/or many alterations present such as dredging, agriculture, concrete banks or construction activities.	What did you see?
	10 9 8 7	6 5 4 3	2 1 0	Score

What to Look for: Streams tend to follow a normal and natural meandering pattern. This parameter examines changes in sinuosity and if the shape of the channel and/or the instream habitat have been impacted by large-scale alterations. Examples of alterations include: riprap, artificial embankments or stabilization structures, straightening for significant distances, or the presence of dams and bridges.

Why is it Important? Streams that have been altered typically have fewer natural habitats for aquatic organisms and have an unnatural shape that leads to major differences in energy distribution, structures, and flow regimes.

How to Score this Parameter

Rated on a scale from 0-10, choose a value that reflects the occurrence of bends in the channel ranging from 'most of the stream is channelized to no evidence of channelization.' Look for evidence of alterations to also score this parameter including: dredging, agriculture, concrete banks or construction activities.

Definition of Terms

- *CHANNELIZATION:* Straightening of a stream channel to make water move faster.

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Total ____

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Results

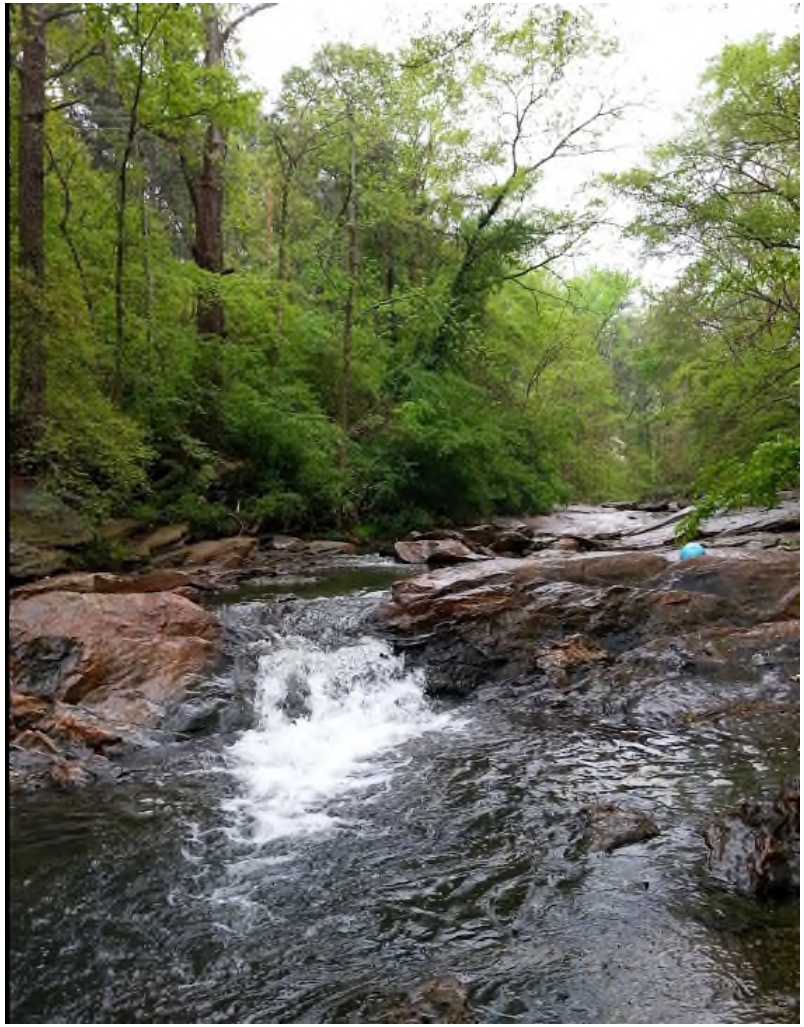
- Habitat assessment should indicate suitability of stream to support aquatic life.

- Early data indicates that on a scale of 1 to 4, habitat scores average .5 to 1 point higher than macroinvertebrate assessments.

Stone Mt
- **Macros average 13.67**
- **Habitat average 49.5**

Druid Hills
- **Macros average 9.75**
- **Habitat average 45**

Clayton State
- **Macros average 16.5**
- **Habitat average 63.5**

Conclusion

- Many uses
  - Excellent education tool on how streams work
- Overtime, data interpretation will prove valuable