

# Water Quality

## Division B/C

Georgia Tech Event Workshop Series  
2025-26

Science Olympiad  
at  
Georgia Tech®



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# The Rules Sheet

**Team Size:** Up to 2 students

**Event Time:** ~50 minutes

**Materials Allowed:**

- Writing utensils
- Up to 2 Class II calculators

**Reference Sheet:**

- One 8.5" × 11" sheet
- Both sides allowed
- Any format, any source

**Event Sections:**

- Freshwater Ecology — **30%**
- Macroinvertebrates — **30%**
- Water Monitoring & Analysis — **30%**
- Salinometer Testing — **10%**

**Safety:** Eye protection required for salinometer testing



**WATER QUALITY C**

The General Rules, Eye Protection & other Policies on [www.wqac.org](http://www.wqac.org) as they apply to every event.



1. **DESCRIPTION:** Participants will be assessed on their understanding and evaluation of freshwater aquatic environments.

**A TEAM OF UP TO: 2** **APPROXIMATE TIME:** 50 minutes

**EYE PROTECTION: C** **CALCULATOR:** Class II

2. **EVENT PARAMETERS:**

- Each team may bring writing utensils.
- Each team may bring two Class II calculators.
- Each team may bring one (1) 8.5" x 11" sheet of paper that may contain information on both sides in any form and from any source. The sheet of paper may be laminated or placed in a sheet protector to increase durability. Affixed labels, as well as multiple sheets of paper (whether in a single sheet protector or not) are prohibited.
- Each team may bring one student built salinometer/hydrometer for testing.
- Participants must wear eye protection during Salinometer Testing (3 Part IV). Teams without proper eye protection must be immediately informed and given a chance to obtain eye protection before time allows.

3. **DISSEMINATION:** Participants must include a description of their results, and supporting data, in their final report. Always follow proper safety protocols. Do not use any equipment, materials, or interpret water measuring, analyzing data, and making inferences.

**Part I: Freshwater Ecology – 30% of the total score**

- This section will use multiple choice, matching, fill-in-the-blank and/or short answer questions in areas such as: aquatic ecology, water quality, nutrient cycling, aquatic chemistry and its implications for life, potable water treatment, water quality assessment, water quality monitoring, community interactions, population dynamics, water resources, sedimentation pollution, and harmful species.
- Understand and apply the concept of indigenous knowledge or traditional ecological knowledge (TEK) to given scenarios.
- State and National only: life history strategies (e.g.; age structure, survival curves, life tables, succession, R and K strategies).

**Part II: Freshwater Macroinvertebrates – 30% of the total score**

- This section will require participants to identify (common name only) immature and adult macroinvertebrates and aquatic nuisance organisms listed below and to understand their importance as indicators of water and wetland quality.
- In addition, teams are expected to know the general ecology, life cycles, and feeding habits of all listed organisms.

Class 1 – Pollution Sensitive	Class 2 – Moderately Sensitive	Class 3 – Moderately Tolerant	Class 4 – Pollution Tolerant	Class 5 – Air Breathing
Mayfly	Aquatic Sowbug	Water Mite	Air Breathing Snail	Whirligig Beetle
Caddisfly	Damselfly	Midge	Deer/Horse Fly	Water Strider
Stonefly	Dragonfly	Blackfly	Tubifex	Mosquito
Dobsonfly	Scuds	Flatworm	Blood Midge	Giant Water Bug
Gilled Snails	Crane Fly	Leeches		Back Swimmer
Water Penny				Water Boatman
Rifle Beetle				Predacious Diving Beetle

**Water Scorpion**  
Aquatic Nuisance Plants: Purple Loosestrife, Eurasian Water Milfoil, and Water Hyacinth  
Aquatic Nuisance Animals: Zebra Mussel, Spiny Water Flea, Asian Tiger Mosquito, Asian Carp and Crayfish/Crawdads

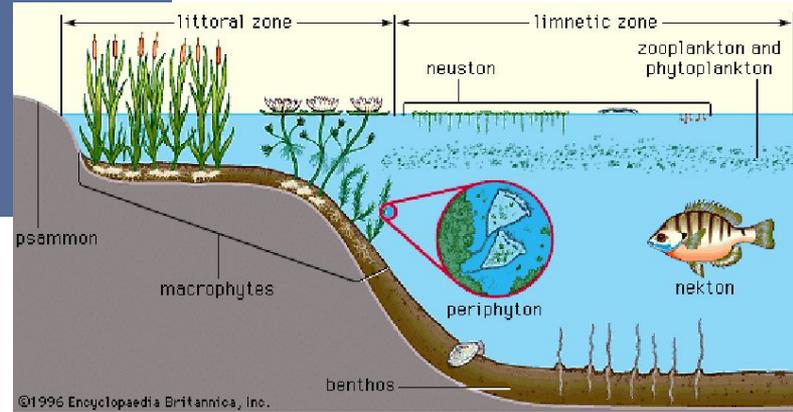
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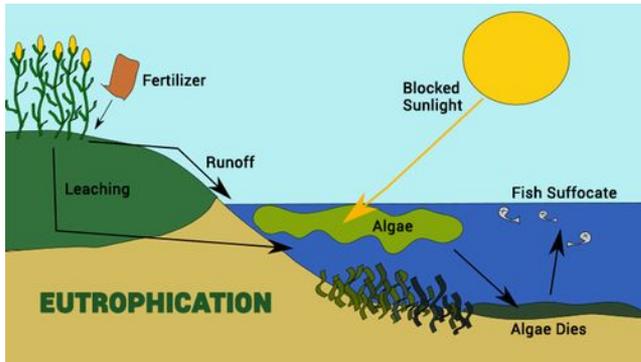
# DIFFICULT TOPICS

# Freshwater Ecology

- Aquatic ecosystems & watersheds
- Nutrient cycles (Nitrogen & Phosphorus)
- Biotic & abiotic factors
- Human impacts & pollution
- Indicator species & ecosystem health

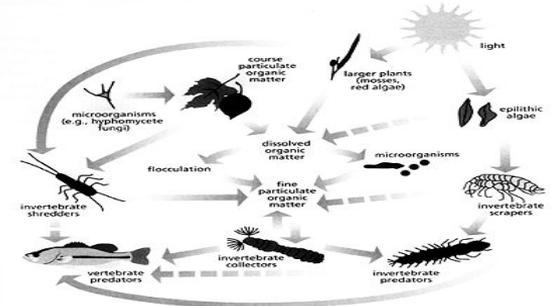
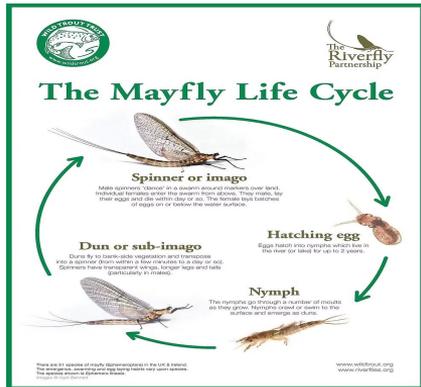


A Watershed Example



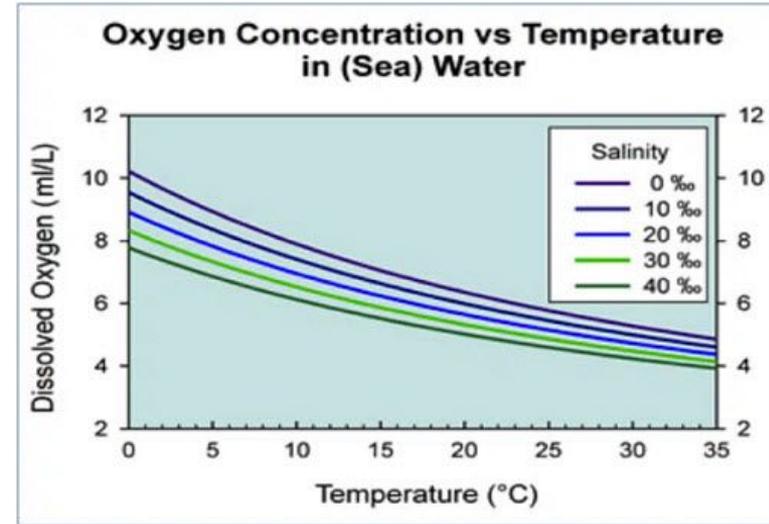
# Freshwater macroinvertebrates

- What are macroinvertebrates?
- Pollution tolerance levels
- Indicator species & water quality
- Life cycles & feeding groups
- Commonly tested taxa

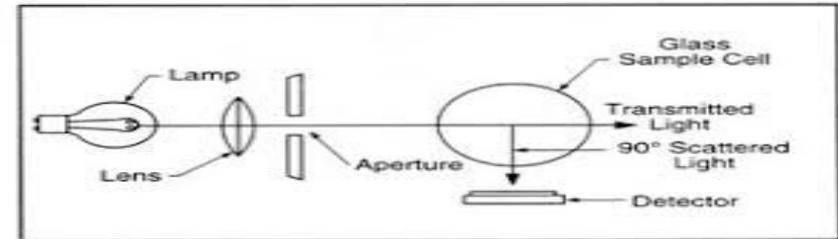
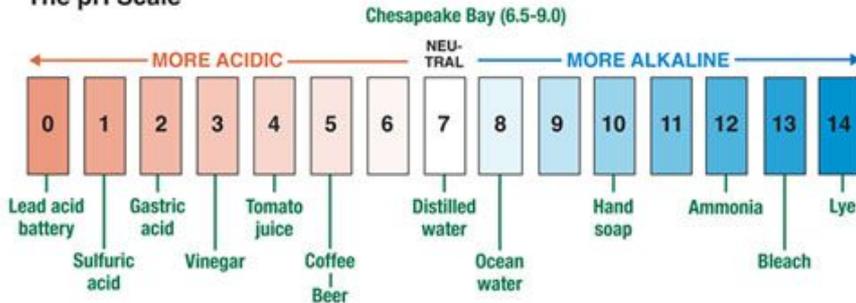


# Water monitoring and Analysis

- Physical, chemical & biological parameters
- pH & dissolved oxygen (DO)
- Turbidity & temperature
- Nutrients: nitrates & phosphates
- Interpreting data & trends



## The pH Scale





# COMMON QUESTIONS

All of the following questions have been pulled from past Y11 exams (which can be found on our website) or the Text Exchange on SciOly Wiki

# Question 1

Which organism below is the best indicator of high water quality in a freshwater stream?

- A. Tubifex worm
- B. Midge larva
- C. Mayfly nymph
- D. Leech



**Ephemeroptera**  
(mayflies)



**Plecoptera**  
(stoneflies)



**Trichoptera**  
(caddisflies)

## Group 1: Pollution Intolerant Species



Mayfly



Riffle  
Beetle



Caddisfly  
Larva



Stonefly



Right-Handed  
Snail

## Group 2: Moderately Pollution Intolerant Species



Sowbug



Scud



Clam



Crayfish



Damselfly  
Larva

## Group 3: Pollution Tolerant Species



Aquatic  
Worm



Midge  
Larva



Leech



Black Fly  
Larva



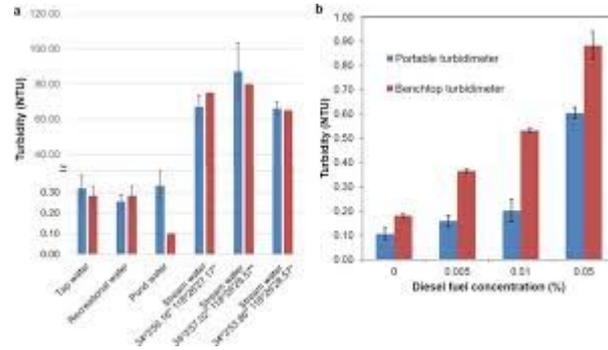
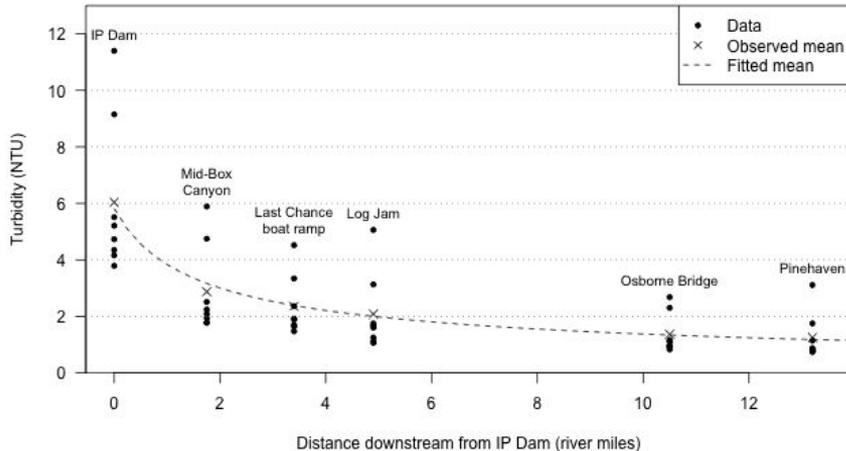
Left-Handed  
Snail



# Question 3

The graph shows turbidity levels at four sampling sites along a river. Which site is most likely located downstream of a construction zone?

Turbidity data and fitted model  
2016



# Tips from a Veteran

- Know the rules better than anyone
- Organize your cheat sheet strategically
- Practice interpretation, not just memorization
- Divide responsibilities with your partner
- Don't ignore the salinometer



# **Additional Resources**

**Science Olympiad Wiki**

**USGS Water  
Science School**

**EPA Water Quality  
Resources**

**Past Invitational &  
State Exams**

**THANKS!**

