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Station

## 2010 Missouri Envirothon Aquatics Ecostation

Team #

1. What are 2 negative impacts that ponds can have when built in watersheds of small streams. (2 points)

*add predator fish into headwater streams that aren't usually found there, decrease base flows, reduce sediment inputs disturbing natural equilibrium*

2. What are 2 positive impacts that ponds can have when built in watersheds of small streams. (2 points)

*retention of soils from erosion, retention of nutrients from overland flow*

3. What is the greatest source of oxygen found within lake or pond water? (1 points)

*Plants*

4. What is the most common cause of a fish kill in a pond or lake? (1 points)

*Depletion of oxygen*

5. How many acres of drainage does a pond need to adequately supply enough water for a one acre pond? (1 points)

*10-15 acres*

6. What is an ideal percent of a ponds water surface that should be covered by plants? Name two benefits aquatic plants provide. (3 points)

*20%; they provide oxygen, shade, hiding places from predators, food production areas, etc.*



7. What effect do impervious surfaces have on streams? (2 points)

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*increase velocities which can increase erosion, increase temperatures, lower absorption rates into the ground which can decrease base flows, can cause flash flooding*

8. Look at this stream and explain how it benefits the downstream system that it flows to. *Hint: Be sure to include information about excess nutrients, sediment, erosion, flows and habitat.* (5 points).

*It can absorb excess nutrients and sediment because of the close interface with the streambed, this protects the downstream network from becoming overloaded with nutrients and keeps the streambeds from becoming embedded with sediment. It slows velocities and reduces stream power so there is less erosion to larger downstream channels. Leaf litter and woody input in headwater streams form debris dams causing excellent habitat areas for invertebrates and fish.*

9. What kind of response would you see in this stream if the woods were cleared? (3 points)

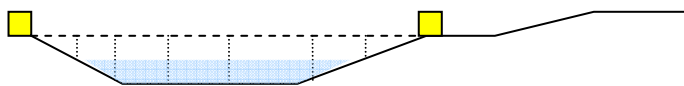
*Channel widening and deepening, less habitat, more runoff, more turbid water, higher stream temperatures, erosion*

10. Headwater streams are dry most of the year; therefore, they are often overlooked as important. What are two (2) threats to headwater streams and explain what the consequences of those threats would be. (4 points)

*urbanization or paving the channels - increases runoff, blows out channels, reduces habitat and water quality*

11. The flags labeled A4 indicate the bankfull stage of this creek. Use the stretched tape measure showing a width of 25 ft., a yardstick, and a calculator to determine the bankfull cross sectional area of this stream in  $\text{ft}^2$ . (Show your work for partial credit.) (5 points)

*$A=WxD$  (depth will have to be measured across the width and averaged) sqft.  
 $25 \times 34 = 850 \text{ft}^2$  will accept an answer ranging from 800-900 $\text{ft}^2$  as long as the math is correct.*



*1 pt for correct width, 2 pts if they measure more than one depth and averaged them, 1 pt for correct equation, 2 more pts for near the correct answer if the math adds up.)*

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12. If you own land along a stream and you use all of the best management practices for streams on your land including riparian corridors, could you still have streambank erosion? Why or why not? (3 points)

*Yes, a stream is a reflection of its entire watershed, so it could be due to things going on outside of your property boundaries, upstream or downstream. Also, lag time from when those practices were installed.*

*1 pt for yes, 2 pts for understanding the watershed concept*

13. Using the turbidity tube provided, give a secchi reading for the stream today. (2 points)

14. Using the key provided, identify the macroinvertebrate in the vial with its common or scientific name. (2 points)

*Mayfly nymph*

15. Define point source pollution and non-point source pollution. Look around and name two possible sources or non-point source pollution from the surrounding developed area near the stream. (4 points)

*2 points for defining and 2 point for sources*

*Point - Pollution from a pipe or direct input of pollutants.*

*Non-point - is caused by rainfall or snowmelt moving over and through the ground (you cannot point to the source). As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even our underground sources of drinking water.*

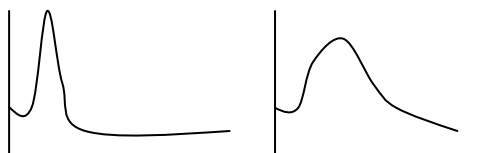
- Excess fertilizers, herbicides, and insecticides from residential areas*
- Oil, grease, and toxic chemicals from urban runoff and energy production*
- Bacteria and nutrients from livestock, pet wastes, and faulty septic systems*

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1. There are 2 hydrographs below. One of them is an urban hydrograph and one of them is a forested hydrograph. Label each one of them with identification and explain why there is a difference. *Hint: time is on the x axis and water level is on the y axis.* (4 points)



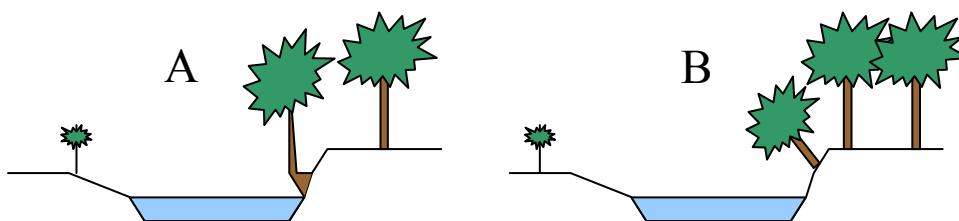
*1<sup>st</sup> one is urban, the impervious surfaces speed the water to the stream causing a fast peak and then the low base flows return quickly since there is less groundwater coming into the stream*

2. Which tree assemblage provides the best stream bank protection and why? (3 points)

- An even stand of old growth forest with tall canopy's and little undergrowth.
- A mixed stand of dense timber from very young trees to very old trees interspersed.*
- A mowed area with a few large oaks and some ornamental redbuds spaced far apart.

*because the high stem count will add roughness at bank full levels which will reduce velocities) (Also might say that there is new timber to replace old trees when they die and allows for dense root masses at all soil levels*

3. Based only on the trees at these stream cross sections, which stream has been stable longer? A or B? How can you tell? (3 points)



*Stream A, because the tree has been there long enough to phototroph, whereas stream B the tree has not had time to adjust to the recent slumping of the bank.  
1 pt for right answer, 2 pts for explanation.*





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4. List four (4) functions that trees in riparian corridors can provide to the stream. (4 points)

*shade, adding organic inputs, woody cover and habitat, bank stabilization with roots, evapotranspiring moisture from soil, friction to slow stream velocities*

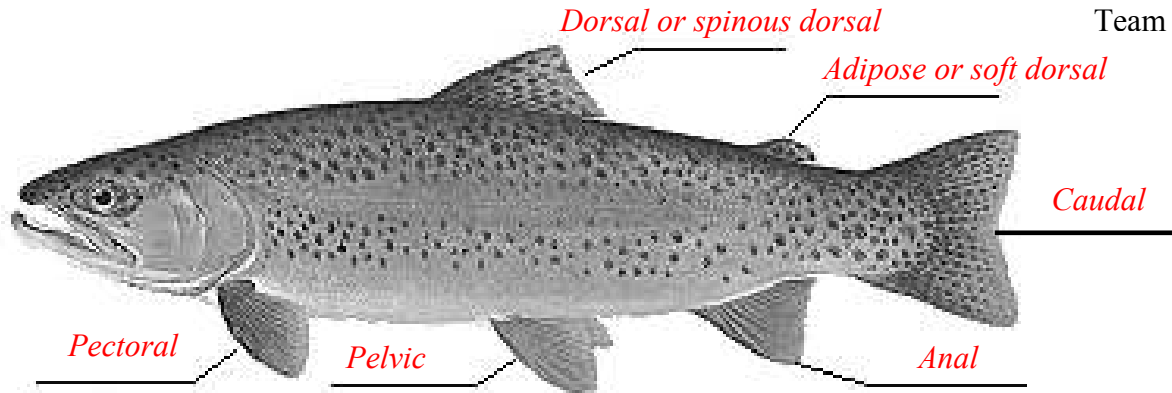
5. What chemical in leaves makes the water clear in the fall when they fall into the stream? (1 point)

*Tannin*



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1. Identify the labeled fish fins. (6 points)



2. Why are non-native, invasive species dangerous to native ecosystems? Name one invasive aquatic animal. (3 points)

*They compete with native species and may eliminate native species, reducing diversity, and changing the food web which could cause a chain reaction of organisms to decline or perish. The non-native species often has no competitors or predators to keep their populations in check and manageable, so they are able to do more damage to the ecosystem as a whole. 2 pts for diversity, linking it to ecosystem integrity, competing with or eliminating native species, no competitors and predators to manage their populations (there could be other answers and as long as they are valid and not repetitive they could replace one of these for a pt. 1 point for naming 1 invasive aquatic animal.*

3. Geese are common residents of lakes and ponds. Some stay year round because people feed them. How can waterfowl in excess numbers have a detrimental effect on ponds and fish? (2 points)

*Waterfowl droppings in and around ponds act as a fertilizer and cause algae and aquatic plants to grow excessively. When the algae and or the plants become too abundant they can cause fish kills by depleting the oxygen in ponds when they die. This can be caused by a period of overcast days, or rapid changes in water temperature.*

4. In natural stream systems how do fish benefit terrestrial ecosystems such as a surrounding floodplain? (2 points)

*When streams are allowed to capture floodplains in high flow events some fish will utilize the shallow backwater areas in the floodplains, when the water recedes some of the fish get stranded on the floodplain; as they decay they provide important nutrients to the floodplain soils. Also the fish are a major food source for many terrestrial mammals, birds and reptiles.*

5. Are any species of trout native to Missouri? If so, which ones(s). (2 points)

*No.*



1. Explain some causes of soil compaction and the effect it has on streams. (3 points)

*cattle, hogs, repeated tilling, construction, etc.....; it does not allow rain to penetrate the ground so there is less groundwater to go to streams, usually lowers base flows, higher runoff from the land which can cause more erosion*

2. What type of soil is most resistant to erosion on streambanks? (2 points)

*clay*

3. What are three benefits of warm season grasses over fescue in relation to erosion. (3 points)

*deeper root systems hold soil better, more rigid stems slow velocities of overland flow (roughness); doesn't lay flat like fescue when water is running over it*

4. Why do Ozark streams have mostly gravel bottoms? Why do North Missouri streams have mostly sand and silt bottoms? (3 points)

*gradient, velocities, geology*

5. Why do floodplains typically have very lush fertile soils? (2 points)

*Because the river deposits soils eroded from the uplands onto floodplains during high flow events.*

6. Soil erosion is the number one pollutant in Missouri streams. In general soil erosion is considered to be what type of pollution? (2 points)

*Non-point  
2 pts for correct answer*



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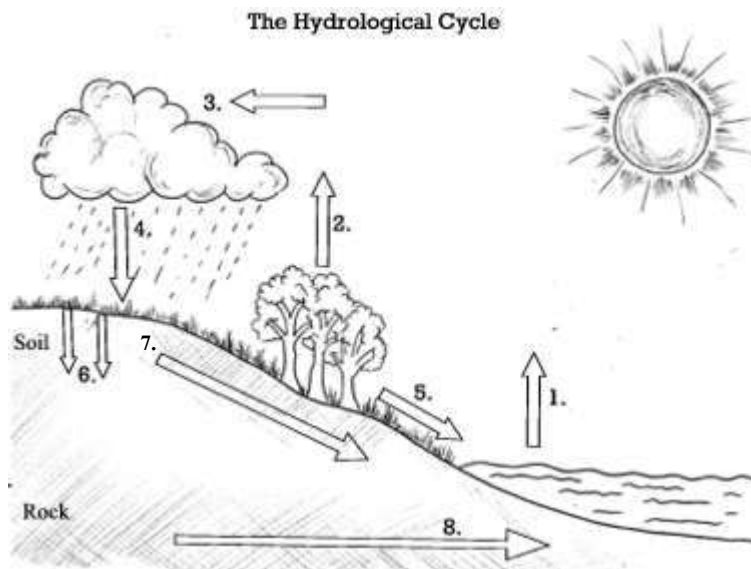
1. Headwater streams have more streambed surface area to water interface than larger order streams because they are shallow and the water has more contact with the channel bed. Explain how this effects groundwater and stream velocities. (2 points)

*It allows more water to infiltrate through to groundwater before running off, therefore stream velocities are slowed because there is less runoff*

2. Explain the difference between a losing stream and a gaining stream? Some streams are losing and gaining. How can they be both? (4 points)

*Gaining streams receive groundwater input, losing streams lose water to the groundwater. At different times of the year a stream can change depending on the water table level. ie. drought times would be losing, rainy season might be gaining.  
2 pts for definitions, 2 pts for explanation*

3. Label the drawing below with correct terms of the hydrologic cycle. (8 points)



- 1 – Evaporation
- 2 – Transpiration
- 3 – Transport/Condensation
- 4 – Precipitation
- 5 – Surface Runoff/Overland Flow
- 6 – Infiltration/Percolation
- 7 – Subsurface Flow
- 8 – Groundwater Flow

4. How do watershed boundaries affect the movement of groundwater? (1 points)

*Groundwater can move across watershed boundaries in many different ways including sink holes, losing streams, and getting into deep aquifers where it can travel hundreds of miles.*



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