NAME_____ GROUP_____ INSTRUCTOR _____

DATA ANALYSIS OF THE STREAM ECOSYSTEM

NOTE: Keep in mind as you analyze the gathered stream data that the biota are not just responding to the conditions that exist on the day and hour that you are there; they must survive there 24 hours a day and 365 days a year.

When asked to use data, you need to include actual data values in your discussion.

1. Using gathered data on the ranges for air and water temperatures, which environment is most stable, air or water? Explain.

2. Sketch three labeled graphs that show: (1) how the activity of enzymes is related to increasing temperature; (2) how the metabolism of cold blooded animals is related to increasing temperature and (3) how the solubility of gases in water is related to increasing water temperature.

3. Using the high and low readings for Dissolved Oxygen and Carbon Dioxide for your Drey Land session and information from the Stream Abiotic Factors Book, did either gas exceed its tolerance levels for fish? Explain.

4. List two major ways that oxygen gas enters the water of Sinking Creek.
   Way one:

   Way two:

5. List two major ways that carbon dioxide enters the water of Sinking Creek.
   Way one:

   Way two:

6. Name the life processes in which carbon dioxide and oxygen are utilized by the organisms of the creek ecosystem.

Oxygen used by plants and animals: _____

Balanced equation for this process.

_____

Carbon dioxide used by plants: _____

Balanced equation for this process.

_____

7. Using data gathered on the high and low readings for Nitrate and Phosphate in the stream, and information on the solubilties of Nitrate and Phosphate, determine whether Nitrate or Phosphate is most likely a **limiting nutrient** in Sinkin' Creek. (Make sure you know what a limiting nutrient is.)

8. What would happen if the amount of this limiting nutrient (your answer to the question above) were increased in the creek while the amount of all other nutrients remained constant?

9. What is measured by the pH test? Using the data gathered for Sinkin'Creek, and information from the Abiotic Factors Book, are the pH levels of Sinkin' Creek suitable for the fish? Explain.

10. What information about the stream water is furnished from the alkalinity test?

11. Use the data gathered to determine if the Alkalinity of Sinkin' Creek is high enough to protect it from "acid rain." Explain.

12. How would you expect the stream velocity and flow rate to compare before and after a rain? Explain. Support your expectation with **data**. (Posters from previous years may have useful numbers.)

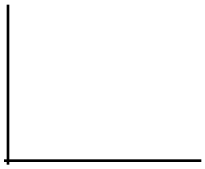
13. How would you expect the stream turbidity and color to compare before and after a rain? Explain. Compare **data** collected for turbidity and color before and after a rain. (Use posters again.)

14. Estimates on how much water the average American uses per day range from 2 liters to 750 liters, dependent on lifestyle. We will use the figure of *750 liters / day*.

We will also use the figure of *one cubic meter of water being equal to 1,000 liters*. Complete the following calculations to find out how many people could obtain their daily water needs from Sinkin' Creek.

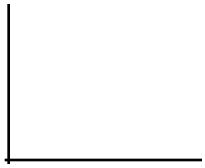
_____	X	_____	=	_____	/	_____	=	_____
Liters of water per minute (Use camp average)		No. Minutes in a day		Total liters of water per day		Amount of water one person uses per day		Total # of people who live from water in this stream

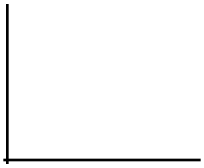
15. Draw a graph that illustrates the relationship you would expect to find between increasing turbidity and total solids.



16. Draw two graphs that illustrates the relationship you would expect between (a) increasing turbidity (X axis) and the rate of photosynthesis and (b) total solids (X axis) and the rate of photosynthesis in the creek ecosystem? **Explain why** you would expect these results.

EXPLANATION





17. Use the dissolved oxygen readings of the water sample before and after the 5 day BOD test to calculate BOD for Sinkin' Creek.

Before _____ After _____. BOD _____

What caused the disappearance of the oxygen in the BOD bottle?

Why is the BOD bottle covered with tin foil?

18. How does the BOD of water in the Missouri River to compare with the BOD of water in Sinkin' Creek? Explain, using data values. Give two reasons for the difference.

19. Energy for stream first order consumers can come directly from producers living in the stream as well as from organic matter that does not originate in the stream. List the

- major 2 producers of Sinkin' Creek _____ _____
- an organic source of energy not from the stream _____

20. In order of abundance list the **phyla** of the animals collected or reported as having been seen at the creek. Examine **ALL tables** carefully before listing. After each phylum list the common name of two different animals found in the group. (In case you've forgotten, the animal phyla are: Porifera, Cnidaria, Platyhelminthes, Nematoda, Mollusca, Annelida, Arthropoda, Echinodermata, and Chordata.)

PHYLUM	COMMON NAMES OF TWO DIFFERENT ANIMALS	
1.		
2.		
3.		
4.		
5.		

21. List the following **classes** of animals in order of abundance in which they were found in Sinkin' Creek. After each, name one example animal actually found during your session that belongs to each class. **osteicthyes, insecta, gastropoda, arachnida, mammalia, amphibia**

Class Name	**Example Animal**

22. Using data from all the Biotic Tables fill in the following table in **order of abundance**. Do not use more blanks than given.

Third Order Consumers

Common Name	Total

Grand Total _____

Second Order Consumers

Common Name	Total

Grand Total _____

First Order Consumers
(Include detritus feeders here)

Common Name	Total

Grand Total _____

Total of all 1st, 2nd, 3rd order consumers _____

23. Using your data from the Biotic Tables (not from the question above), count the total **number of different** "**species**" (kinds) at each trophic level and calculate the percent out of the total number of species of animals found at Sinkin' Creek:

	Number of "Species"	Percent of Total
Third Order Consumers		
Second Order Consumers		
First Order Consumers		
Total		100

24. Using your data from the Biotic Tables (not from the question above), count the **total number of organisms** (individuals) at each trophic level and calculate the percent of out of the total number of organisms found at Sinkin' Creek :

	Number of Organisms	Percent of Total
Third Order Consumers		
Second Order Consumers		
First Order Consumers		
Total		100

25. In which trophic level do you see the greatest species **diversity**? _____
(Note: Producers are defined as the first trophic level)

In which trophic level do you see the greatest **total number** of organisms?

_____

26. What do you observe concerning the general body size of the organisms as you move from the first trophic level to the third?

27. Using the data collected on total and fecal counts and information from the Stream Abiotic Factor Book, determine and explain:

- whether Sinkin' Creek is safe for swimming.

- whether Sinkin' Creek is safe for drinking without purification

.

28. A mark and recapture technique was used to estimate the density of crayfish in Sinkin' Creek. Ideally, a random sample is taken on both day 1 and day 2. Our estimate of population size may be inaccurate for a number of reasons. List 4 possible reasons. (HINT: Think about situations that would affect the marked individuals differently from the unmarked ones.)

a.

b.

c.

d.

29. In the Space below, draw a **pyramid of numbers** using the data collected (See question number 24 above and the data table on diatoms). Draw the pyramid using rectangles of **a size that represents the relative number of organisms within them**. Include that number in the drawing. When evaluating the number of diatoms, calculate the number of diatoms available in one minute of the stream's flow. Use this number in your pyramid. Neatness and accuracy count.

30. Read the article from the St. Louis Post Dispatch entitled, **"Where His Heart Is ... Leo Drey Uses His Resources to Buy and Save Nature's Gems"** that describes the activities of Leo Drey. At the end of the article, Mr. Drey is quoted as saying, "The Coalition [for the Environment] embraces the fundamental humanistic concept that we are stewards of the land -- that we hold it in trust for ourselves and future generations." Write a paragraph, using information in the article and the fact that Leo Drey essentially donoates the use of his land to our school, demonstraing how Leo Drey carries out this humanistic concept. Use the backside of this page if you need more space.

31. Pick five different animals from the stream ecosystem and name a structural adaptation that is specific for each of the animals. In addition explain how the structure listed increases the survival potential of the members of that species. DO NOT use the same structure or animal more than once.

1.Animal:_____:Structure:_____

HOW:_____
_

2.Animal:_____:Structure:_____

HOW:_____
_

3.Animal:_____:Structure:_____

HOW:_____
_

4.Animal:_____:Structure:_____

HOW:_____
_

5.Animal:_____:Structure:_____

HOW:_____
_

32. **DIRECTIONS FOR THE CHART ON THE NEXT PAGE:**

Besides using abiotic factors to determine water quality, sampling the biological community can help determine how healthy or polluted a stream is. Different organisms have varying tolerances to degraded environments and degraded environments usually support fewer types of organisms. Macroinvertebrates are used more frequently than other animals for biomonitoring because they cannot easily move from a place when conditions change. An advantage of biological sampling (versus chemical testing) is that it looks at indicators of conditions which are present in the stream over a period of time, rather than just at the moment which a water sample is collected.

Use the table on the following page. Make a check by each type of organism that was found in sinking creek during biotic sampling. Add up the **number of different types of organisms** in each category and **multiply** by the indicated number to obtain the index value for that category. **Sum the index values** for the three categories to find the water quality rating.

MACROINVERTEBRATE COUNT

SENSITVE ORGANISMS

_____ Caddisfly larvae
_____ Hellgramites
_____ Mayfly nymphs
_____ Right-Handed Snails
_____ Riffle beetle adults
_____ Stonefly nymphs
==========
_____ **TOTAL # OF KINDS OF SENSTIVE ORGANISMS X 3 = _____**

SOMEWHAT-SENSTIVE ORGANISMS

_____ Other beetle larvae
_____ Clams
_____ Cranefly larvae
_____ Crayfish
_____ Dragonsly nymphs
_____ Damselfly nymphs
_____ Scuds
_____ Sowbugs
_____ Fishfly larvae
_____ Alderfly larvae
==========
_____ **TOTAL # OF KINDS OF SOMEWHAT ORGANISMS X 2** = _____

TOLERANT

_____ Aquatic worms
_____ Blackfly larvae
_____ Leeches
_____ Midgefly larvae
_____ Left-Handed Snails
==========
_____ **TOTAL # OF KINDS OF TOLERANT ORGANISMS X 1** =_____

Sinkin' Creek Water Quality Biotic Value _____

Sinkin' Creek Water Quality Rating _____

Water Quality Rating Scale:

>22	Excellent
17-22	Good
11-16	Fair
<11	Poor

Sinkin' Creek Stream Essay Topics

After organizing your thoughts and ideas, write a one (1) page discussion of one of the following topics. Quality is the key to success, so choose your words well and use appropriate terms. Your report should be written in INK. This is to be a report of the scientific study we have conducted here at Drey Land over the past 3 days. We have collected much useful data, and we also have data from previous studies to supplement your own work. A quality report not only draws conclusions from the study but **supports those statements with the available evidence and data**. You should do this in your report.

Topics:

1. **Abiotic conditions** of the stream and the effect of these conditions on **stream organisms** as shown by examples from the 3 day study. Focus your paper on several of the abiotic conditions; you can't do all in one page.

2. **Biotic interactions** within the stream community as shown by mutualistic, commensalistic, predatory, parasitic and competitive relationships.

3. **Energy flow**, into and through the stream ecosystem as shown by (a) food chains, food webs, and pyramids of numbers and (b) measurements of production and respiration.

4. Interrelationships observed between the **forest and stream** ecosystems.

5. Relative Importance of various factors contributing to the **Overall Water Quality** of Sinking Creek.

6. A **comparison** between the water quality of sinking creek and that of either the Missouri River or Mississippi River as measured in class prior to Drey Land. This should not simply be a listing of values from data tables. Explain **why** the differences exist.

7. A topic of **your own** that is Okayed by your stream instructor.