Name _____

Date _____ Period _____

Bottom Dwellers

"Big Backbone-less Bottom Dwellers Basics"

Research

Benthic Macro invertebrates are also called "**benthos.**" They are animals without backbones, which are very small but can still be seen **without** a microscope. They live in streams, on rocks, logs, leaves, aquatic plants, or in soft mud. Some examples of different benthos are crayfish, clams, snails, aquatic worms, and aquatic insects.

There are three reasons why benthos are used as indicators of a stream's health. First, unlike fish, benthos don't move around a lot so they are easier to catch. This also makes it hard for them to escape pollution and excess sediment (dirt in the water). Second they are a very diverse group of animals; they all respond to pollution differently, some can take it, and some can't. Third, benthos live for a number of years so scientists can look at them to see any change in the stream's health over several years.

Some benthos are extremely sensitive to pollution and are used to indicate stream health. Mayflies, stoneflies and caddisflies are three benthos that are VERY sensitive to pollution. They are referred to as **EPTs** from their scientific names: Ephemeroptera, Plecoptera, and Trichoptera. EPTs are often the first to die out because of pollution or damage to their habitat (the place where they live).

Observable Question:

Not all labs require a testable question. Often scientists need to make observations and collect data in order to compare information and answer an "observable question"

How does the _____ of a stream effect the

_____ population?

Procedures

1. Look at the "Critter Identification Sheet". Next, identify the benthic macro invertebrates in your stream (envelope).
    - Snail "tip"- hold the opening of the snail toward you and the pointed end away from you. If the shell opening is on the right it is a gilled snail. If the shell opening is on the left, it is a lunged snail.

2. Record the letter of your stream on the chart titled "Stream Survey of Benthic Macroinvertebrates."
3. Write down the names of the identified organisms on the chart below.
4. Record the total number of organisms in the second column.
5. Record the taxa group number for each organism.
6. If you have any EPTs (mayflies, stoneflies, or caddisflies), put a star next to their name.
7. When your chart is complete, record your data on the class data chart by filling in the empty boxes for your stream on the Promethean Board.
8. Figure out the total index value of your stream by completing the table on the next page.
9. Complete the "analyzing data" section.

Stream Survey for Benthic Macroinvertebrates

Stream Letter= _____

Organism Name	Number Counted	Stream Quality Group (Taxa #)

Finding the Total Index Value of a Stream

Directions: Check the box next to the benthos that were present in your stream.

Taxa 1 (sensitive to pollution)	**Taxa 2** (somewhat sensitive to pollution)	**Taxa 3** (tolerant to pollution)
☐ caddisfly larvae	☐ riffle beetle larvae	☐ midge larvae
☐ dobsonfly larvae	☐ damselfly larvae	☐ aquatic worm
☐ mayfly larvae	☐ fishfly larvae	☐ black fly larvae
☐ gilled snail	☐ crayfish	☐ leech
☐ stonefly larvae	☐ scud	☐ lunged snail
☐ water penny larvae	☐ cranefly larvae	
	☐ whirligig beetle larvae	
# of boxes checked x 3 Index Value _____	# of boxes checked x 2 Index Value _____	# of boxes checked x 1 Index Value _____

Add up the index values. What is the total index value of your stream? _____

Total Index Value of a stream =

Excellent (>22)	Fair (11 – 16)
Good (17 – 22)	Poor (<11)

Analyzing the data:

Stream rating based on stream quality taxa groups (circle one):

Excellent Good Fair Poor

Explain your choice by indicating the number of taxa groups and EPTs you found.

_____

_____

_____

_____

_____

_____

_____

Class Data

Stream Letter	Number of EPTs	Number of Group 1 Taxa	Number of Group 2 Taxa	Number of Group 3 Taxa
Least healthy Stream _____				
One Fair Stream _____				
Most Healthy Stream _____				

Analysis and Conclusion

1. List three different benthic macroinvertebrates mentioned in the introduction.

   - _____
   - _____
   - _____

2. Name the three EPT macroinvertebrates that are mentioned in the introduction (give their non-scientific name).

   - _____
   - _____
   - _____

3. What do EPTs indicate about a stream? (Read the research for the answer!)

_____
_____
_____
_____

Analyze the class data.

4. Which stream was the least healthy? _____ Explain your reasoning (Use the data!)

_____
_____
_____
_____
_____
_____

N

Stream Letter	Number of EPTs	Number in Group 1 Taxa X3	Number in Group 2 Taxa X2	Number in Group 3 Taxa X1	Total Index Value
A					
B					
C					
D					
E					
F					
G					
H					

Total Index Value =

Excellent (>22)	Fair (11 – 16)
Good (17 – 22)	Poor (<11)

Which Stream is Healthiest?

You have been hired by an environmental agency to evaluate the health of three different streams. All three of these streams are located near housing developments. Each of the housing developments is using a different method to protect the health of their nearby stream. The environmental agency wants to determine which of the three methods being used is the most effective. You will be able to answer this question by determining which of the three streams is the healthiest.

You decide to collect benthic macroinvertebrates to answer the question. You know that these organisms are often used to indicate the health of a stream and you know that this is a quick way to solve your problem.

To make this a controlled experiment you only allow yourself five minutes at each stream to collect organisms. The table below shows you the different macroinvertebrates you were able to collect at each stream.

Macroinvertebrates Collected from each Stream		
Stream A	**Stream B**	**Stream C**
Taxa 1: 6	Taxa 1: 0	Taxa 1: 0
Taxa 2: 9	Taxa 2: 0	Taxa 2: 5
Taxa 3: 8	Taxa 3: 5	Taxa 3: 2
EPT: 3	EPT: 0	EPT: 0

- Rate the three streams as healthy, fair, and poor.
- Explain why you chose to rate each of the streams as you did.
- Describe some possible environmental factors that affected the health of the streams.
- What are two things that the residents of the housing developments could do to improve the health of their nearby stream?

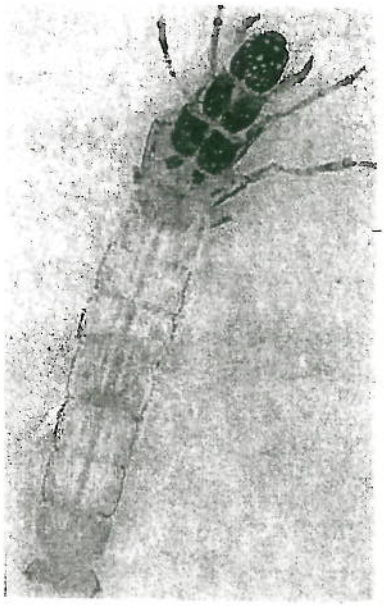
Your response will be evaluated for completeness, making sense of information, supporting details, accurate use of vocabulary, and applying your knowledge.

Critter Identification Sheet

Taxa 1 Critters – these guys are VERY sensitive to pollution.

Stonefly Larvae
EPT

Mayfly Larvae
EPT



Caddisfly Larvae
EPT

Water Penny Larvae

Dobsonfly Larvae

Gilled Snail

Taxa 2 Critters – somewhat sensitive to pollution

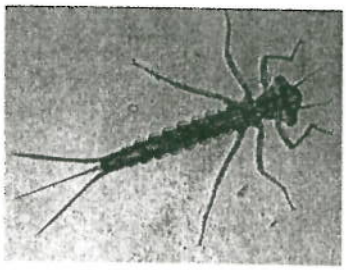
Riffle Beetle Larvae

Fishfly Larvae

Crayfish

Scud

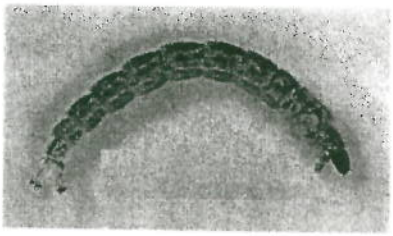
Cranefly Larvae



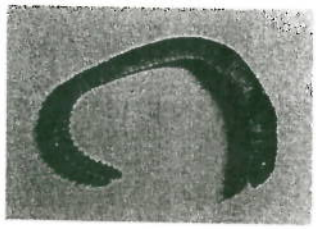
Damselfly Larvae

Whirligig Beetle Larvae

Taxa 3 Critters – tolerant of pollution



Midge Larvae



Aquatic Worm

Black Fly Larvae

Leech

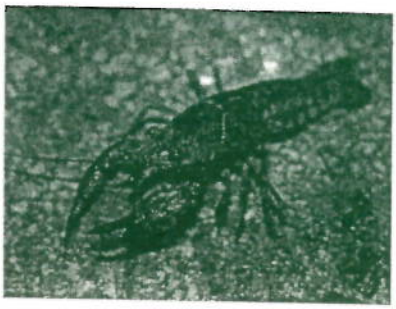
Lunged Snail

Stream A



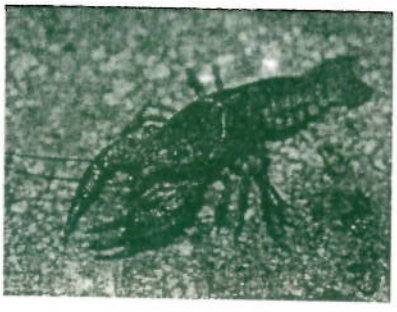




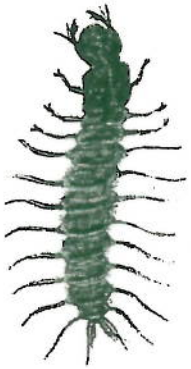









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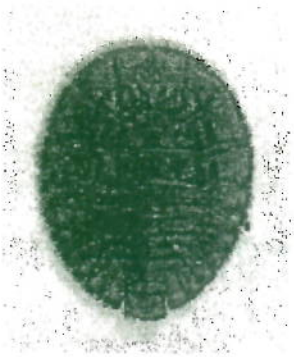


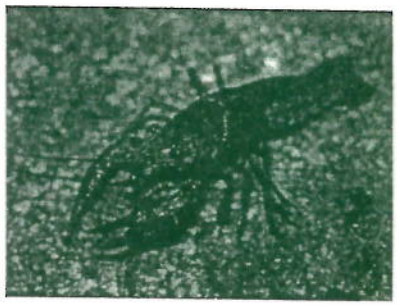

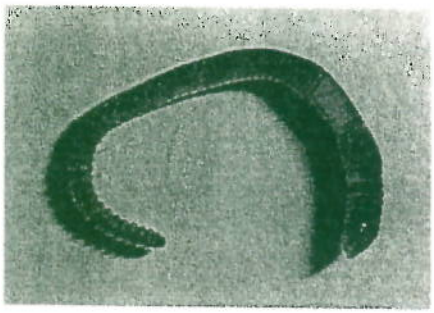
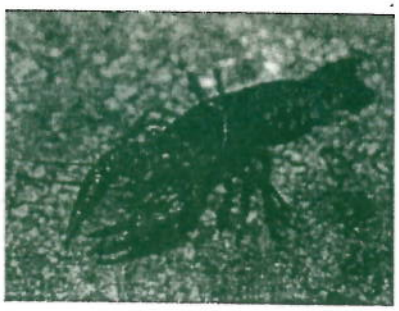
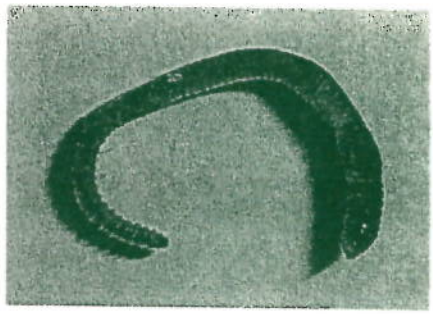


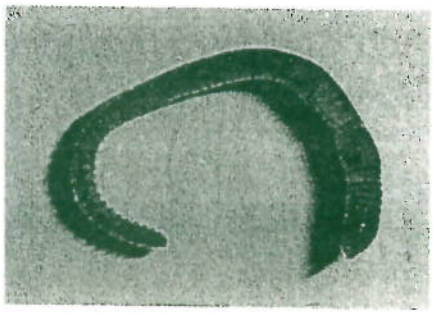







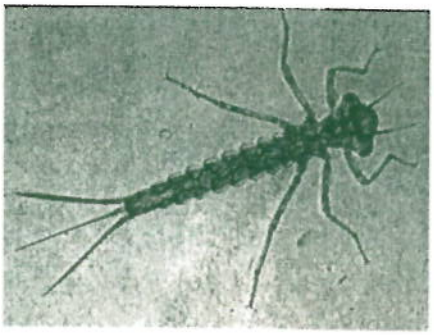
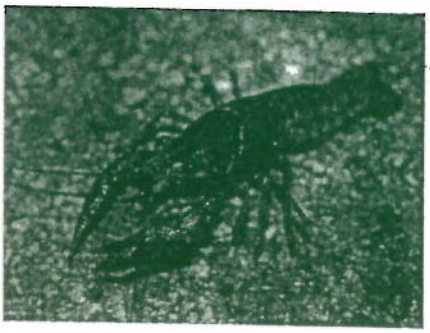

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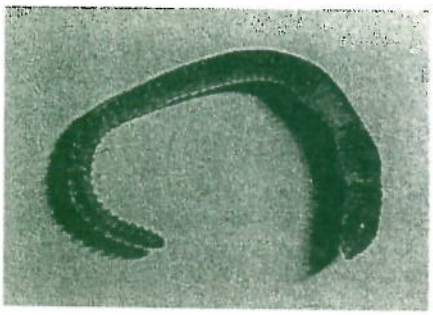

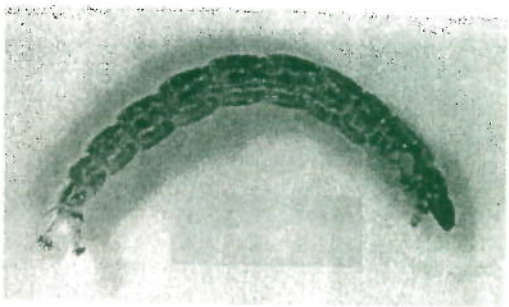
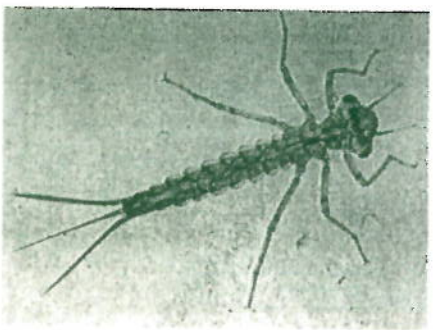
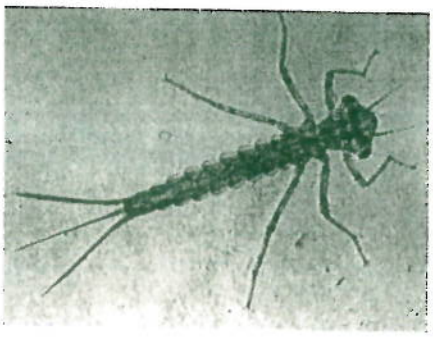


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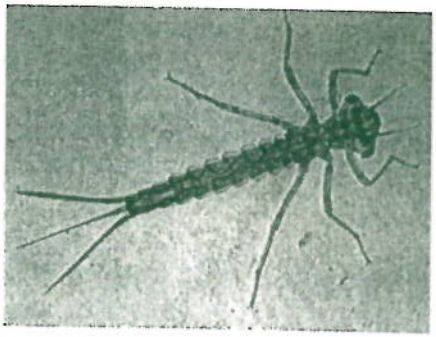

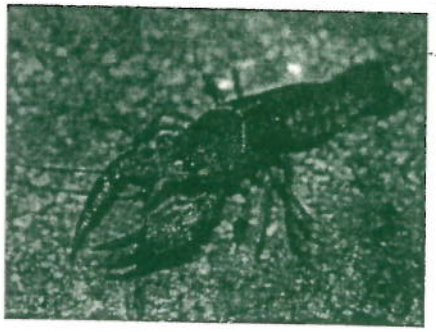

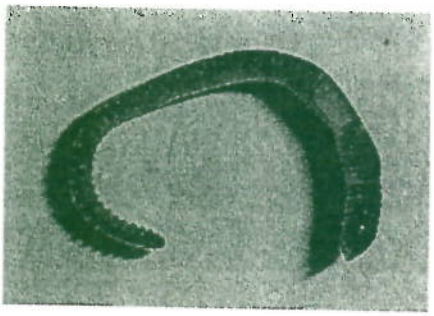

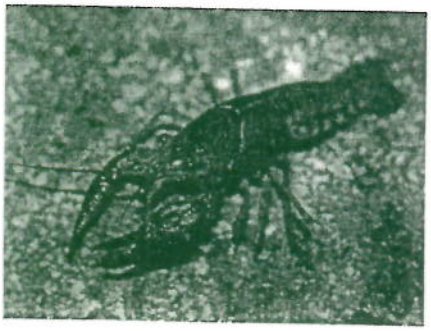

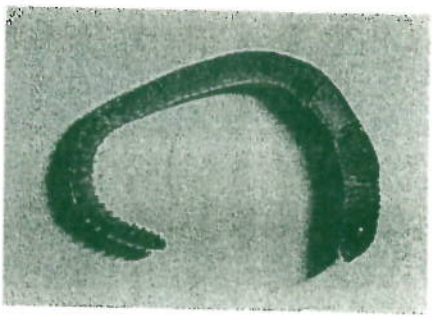

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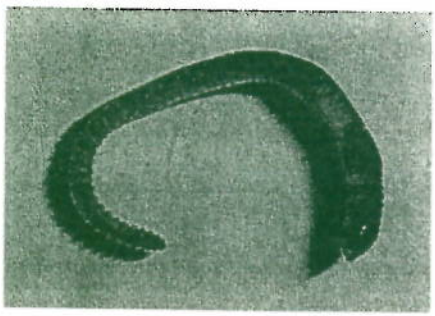

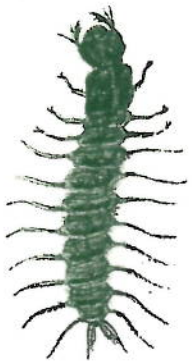


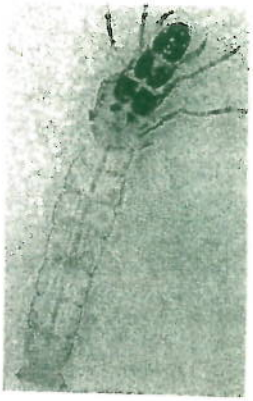

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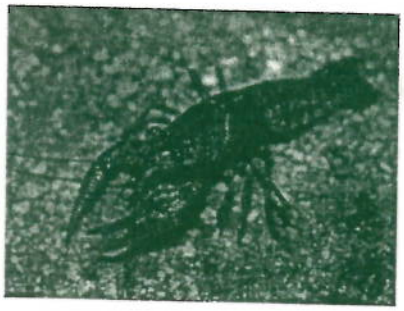

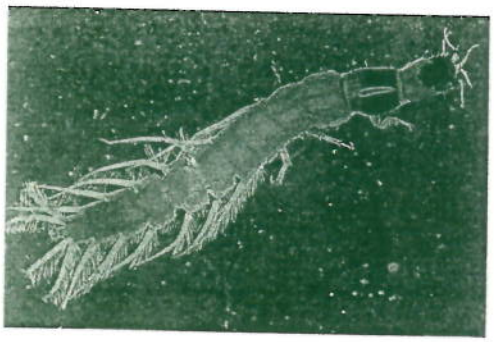


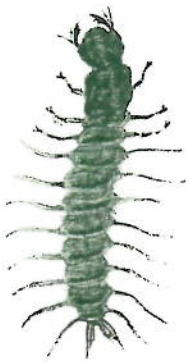


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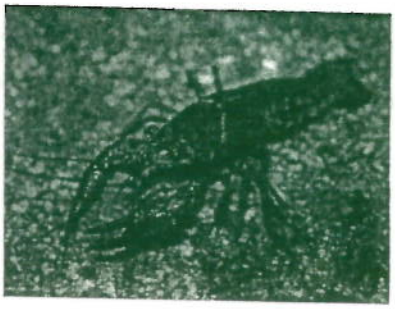

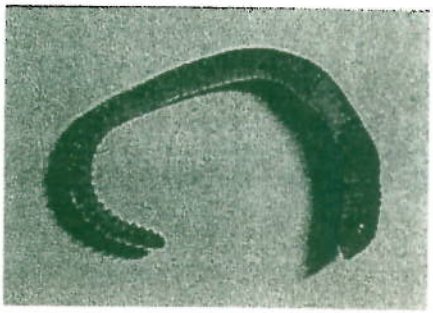








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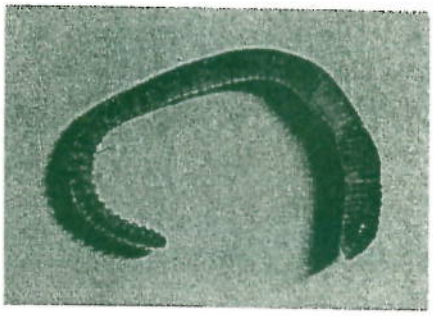
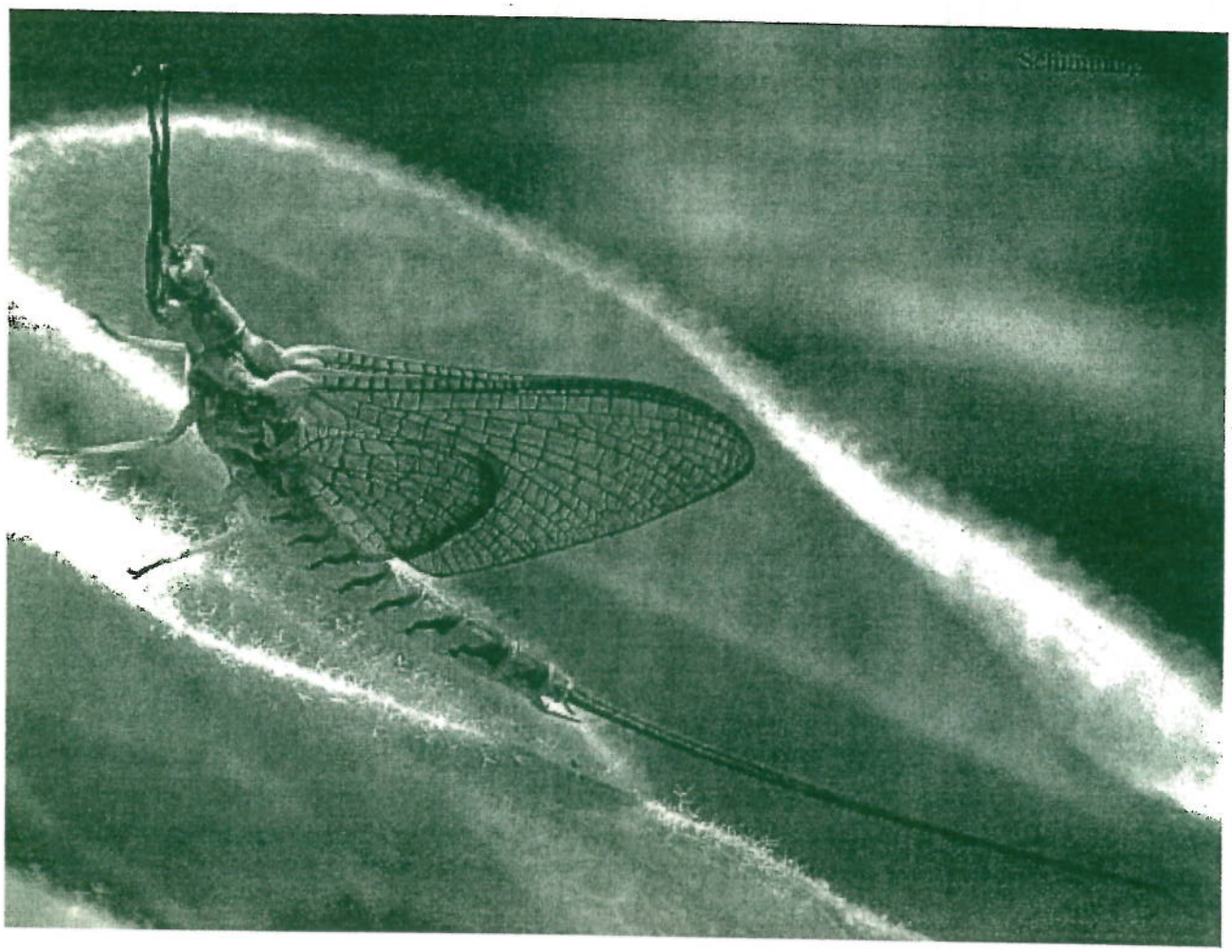








Macro Invertebrates Stream Study Answer Key

This key is very confidential and will self destruct as soon as the lab is complete.

Sample Stream A Answer Page

Total points = 25

Water quality rating = excellent

EPTs = 3

Riffle beetle larvae
(2 points)

Stonefly larvae
(3 points)

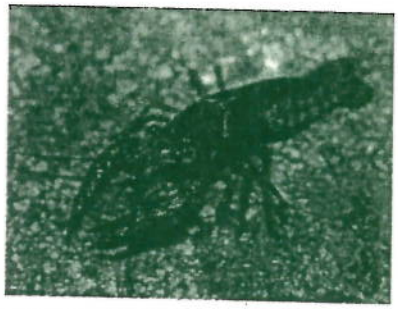
Mayfly larvae
(3 points)

Caddisfly larvae
(3 points)

Water Penny larvae
(3 points)

Dobson fly larvae
(3 points)

Crayfish
(2 points)



Gilled Snail
(3 points)

Scud
(2 points)

Midge larvae
(1 point)

.a

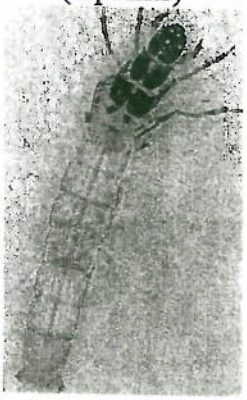
Sample Stream B Answer Page

Total points = 17 Water quality rating = good EPTs = 2

Cranefly larvae
(2 points)

Stonefly larvae
(3 points)

Caddisfly larvae
(3 points)

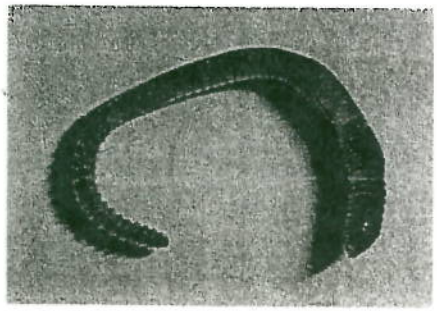


Water Penny larvae
(3 points)

Fishfly larvae
(2 points)

Crayfish
(2 points)

Aquatic Worm
(1 point)



Midge larvae
(1 point)

Sample Stream C Answer Page

Total points = 15

Water quality rating = fair

EPTs = 1

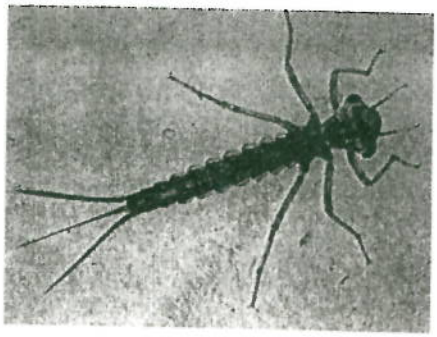
Cranefly larvae
(2 points)

Stonefly larvae
(3 points)

Dobsonfly larvae
(3 points)

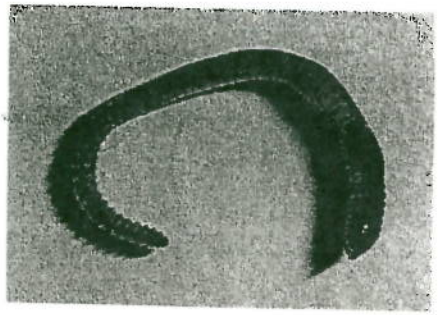
Black Fly larvae
(1 point)

Damselfly larvae
(2 points)



Crayfish
(2 points)

Aquatic Worm
(1 point)



Midge larvae
(1 point)

Sample Stream D Answer Page

Total points = 11

Water quality rating = fair

EPTs = 0

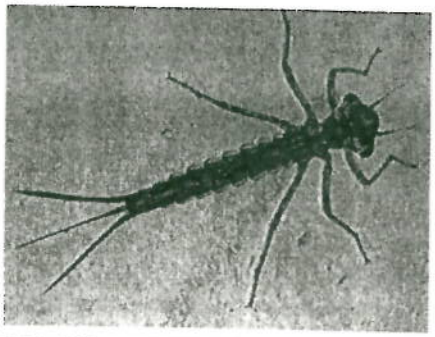
Cranefly larvae
(2 points)

Leech
(1 point)

Lunged Snail
(1 point)

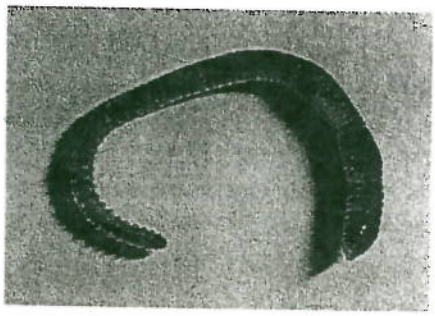
Black Fly larvae
(1 point)

Damselfly larvae
(2 points)

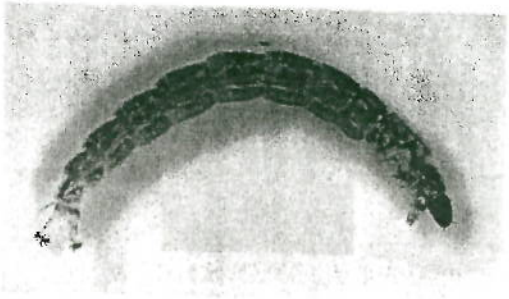


Crayfish
(2 points)

Aquatic Worm
(1 point)



Midge larvae
(1 point)



Sample Stream E Answer Page

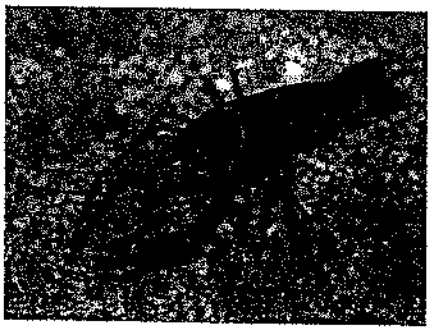
Total points = 8 Water quality rating = poor EPTs = 0

Cranefly larvae
(2 points)

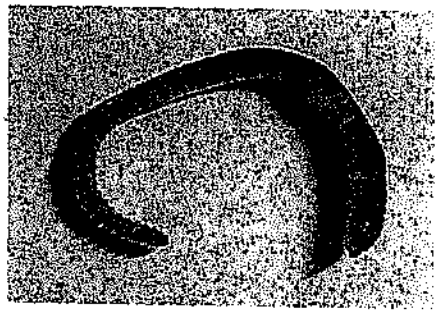
Lunged Snail
(1 point)

Black Fly larvae
(1 point)

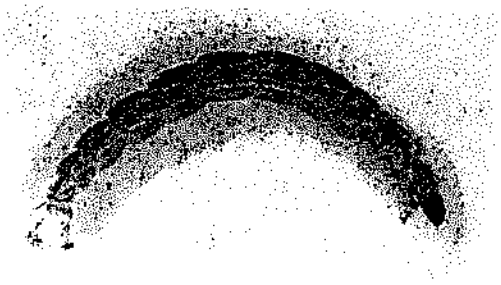
Crayfish
(2 points)



Aquatic Worm
(1 point)



Midge larvae
(1 point)



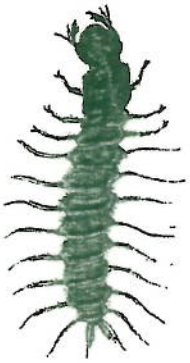
Sample Stream F Answer Page

Total points = 26

Water quality rating = excellent

EPTs = 3

Fishfly larvae
(2 points)



Stonefly larvae
(3 points)

Mayfly larvae
(3 points)

Caddisfly larvae
(3 points)

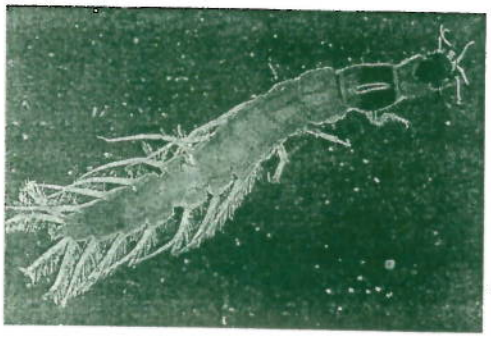
Water Penny larvae
(3 points)

Dobson fly larvae
(3 points)

Crayfish
(2 points)

Gilled Snail
(3 points)

Whirligig Beetle larvae
(2 points)



Cranefly larvae
(2 points)

Sample Stream G Answer Page

Total points = 24

Water quality rating = excellent

EPTs = 3

Riffle beetle larvae
(2 points)

Stonefly larvae
(3 points)

Mayfly larvae
(3 points)

Caddisfly larvae
(3 points)

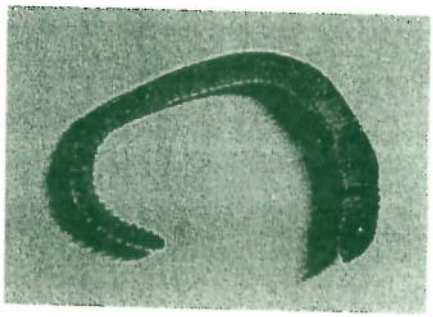
Water Penny larvae
(3 points)

Dobson fly larvae
(3 points)

Crayfish
(2 points)

Gilled Snail
(3 points)

Aquatic worm
(1 point)



Blackfly larvae
(1 point)

Sample Stream H Answer Page

Total points = 24

Water quality rating = excellent

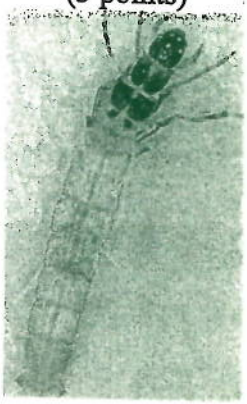
EPTs = 3

Dobson fly larvae
(2 points)

Stonefly larvae
(3 points)

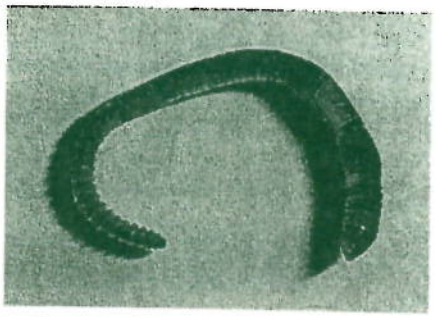
Mayfly larvae
(3 points)

Caddisfly larvae
(3 points)

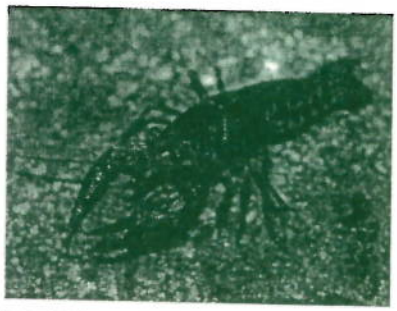


Water Penny larvae
(3 points)

Aquatic Worm
(1 point)



Crayfish
(2 points)



Gilled Snail
(3 points)

Midge larvae
(1 point)

Cranefly larvae
(2 points)

Class Data

Stream Letter	Number of EPTs	Group 1 Taxa Index Value	Group 2 Taxa Index Value	Group 3 Taxa Index Value
A	**3**	**18**	**6**	**1**
B	**2**	**9**	**6**	**2**
C	**1**	**6**	**6**	**3**
D	**0**	**0**	**6**	**5**
E	**0**	**0**	**4**	**4**
F	**3**	**18**	**8**	**0**
G	**3**	**18**	**4**	**2**
H	**3**	**18**	**4**	**2**