

Indicating Insects



Healthy streams contain entire communities of plants, animals, and other organisms which interact with one another and their environment. Producers such as cyanobacteria, diatoms, and water mosses grow on stones at the edge or on the bottom of the brook. These producers provide food and shelter to aquatic insects. The insects, in turn, provide food for the small fish inhabiting the brook.

Any physical, biological, or chemical change in water quality that adversely affects living organisms is considered to be pollution. Water pollution affects all the living things of a stream. Some organisms are resistant to certain types of pollutants. Others, however, are less resistant and are vulnerable to the adverse effects of water pollution.

Water quality researchers often sample insect populations to monitor changes in stream conditions. The insects are monitored over time to assess the cumulative effects of environmental stressors such as pollutants. Environmental degradation resulting from pollution will likely decrease the diversity of insects found by eliminating those that are less tolerant to unfavorable conditions. Insects such as the mayfly, stonefly, and caddis fly larvae are sensitive to favorable habitats. Some, however, are either killed by the pollutants or are no longer able to reproduce. Other organisms, such as dragonflies, damselflies, and nymphs, (called facultative organisms) prefer good stream quality, but can survive polluted conditions.

1 Objectives:

Students will be able to:

- compile tables of the different kinds and quantiles of insects found in a shallow stream,
- create a classification system for the insects found,
- appraise the quality of the water based on the insects found.

CORRELATION TO NJCCCS:

The correlations in this publication were done prior to 2002 utilizing the older standards from 1994.

SCIENCE: 5.2 (1, 2, 4, 5)
5.5 (1, 2, 3, 4)
5.6 (3, 5, 6)
5.7 (1, 2, 4, 7)
5.12 (1, 3, 4, 5, 7)

Subject Areas

Biology, ecology

Duration

One to two hours

Setting

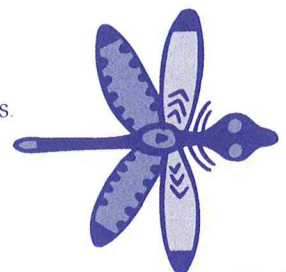
Outdoors.

Skills

Observing, collecting, comparing, analyzing, identifying.

Vocabulary

invertebrate, diversity, resistant, larvae, nymphs.



2 Materials

- swiftly moving stream
- Fine netting (2 ft. x 10 ft.)
- Jars (one per student)
- Insect field guides
- White sheet
- Student worksheets

3 Advance Preparation

- Have each student bring in an empty, average-sized jar.
- Locate a swiftly moving stream that is at least 3-4 inches deep, but not deeper than approximately 12 inches.
- Obtain a fine netting that will not allow small insects to pass through.
- Obtain several insect field guides.

4 Procedure

SETTING THE STAGE:

- Explain the relationships between insects and water quality.
- Discuss the best locations in a stream to collect the insects.
- Make sure students know how to classify.

THE ACTIVITY

- Select a stream to be tested and bring all the required materials.
- Locate an area of the stream that has a swiftly moving current. Have the students observe and record the kinds of insects found on the surface on the water.
- Stretch the netting across the stream perpendicular to the current. Secure the bottom of the net along the bottom of the stream with larger rocks and pebbles. Hold the top of the net above the surface of the water.
- Have a few students stand about 10-15 feet upstream and disturb the water by shuffling their feet on the bottom, being sure to kick up both large and small rocks.
- After this disturbed water has passed the point of netting, have the students quickly pick the bottom of the netting up out of the water without letting the top part of the netting drop into the water.

- Place the netting on a white sheet on the banks of the stream so that the insects can be observed. Have the students record the kinds and quantities of insects present in a data table.
- The students should now compare the types of insects found on the surface of the water to the types collected.
- After separating and observing the insects, place the insects in jars for further observations.

FOLLOW UP

- Have the students create a classification system of the insects found. Then have them use an insect guide to identify the type of insects found and check the accuracy of their classification system.
- Use field guides to identify the relationship between the kinds of insects and the indication their presence has on water quality. Write a brief paper on the water quality of the stream system.
- Have the students prepare several graphs of the types and quantity of insects found in the stream.

5 Extensions

- Have the students identify the various larvae found and the insects into which they will develop.
- Research the physical characteristics of the insects found at the surface of the water and the adaptations they have made to live there.
- Invite a limnologist to class to talk about the relationship between insects and water quality.

6 Resources Referenced

Biological Science: An Ecological Approach, Dubuque, Iowa: Kendall/Hunt Publishing Company, 1992.

Cunningham, William P. and Barbara Woodsworth Saigo, Environmental Science: A Global Concern, Dubuque, Iowa: Wm. C. Brown Publishers, 1995.

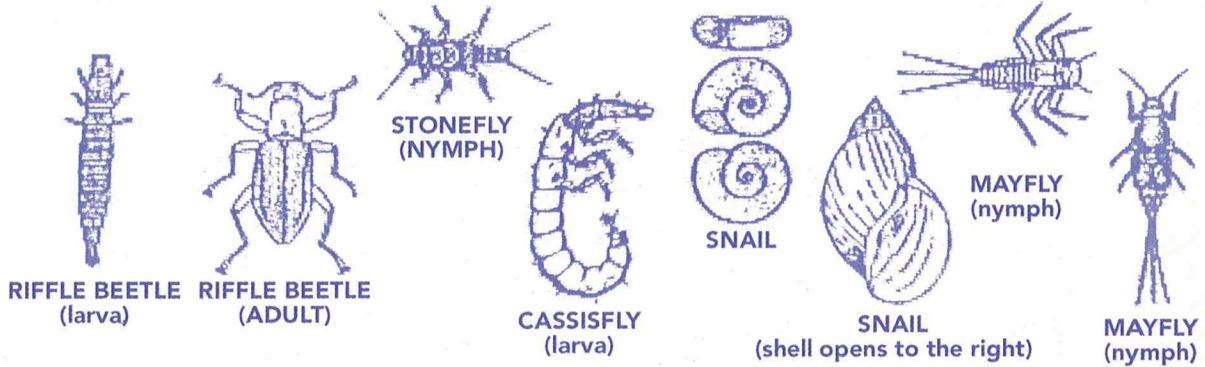
Project Wet: Curriculum and Activity Guide, Watercourse and Western Regional Environmental Education Council, 1995.

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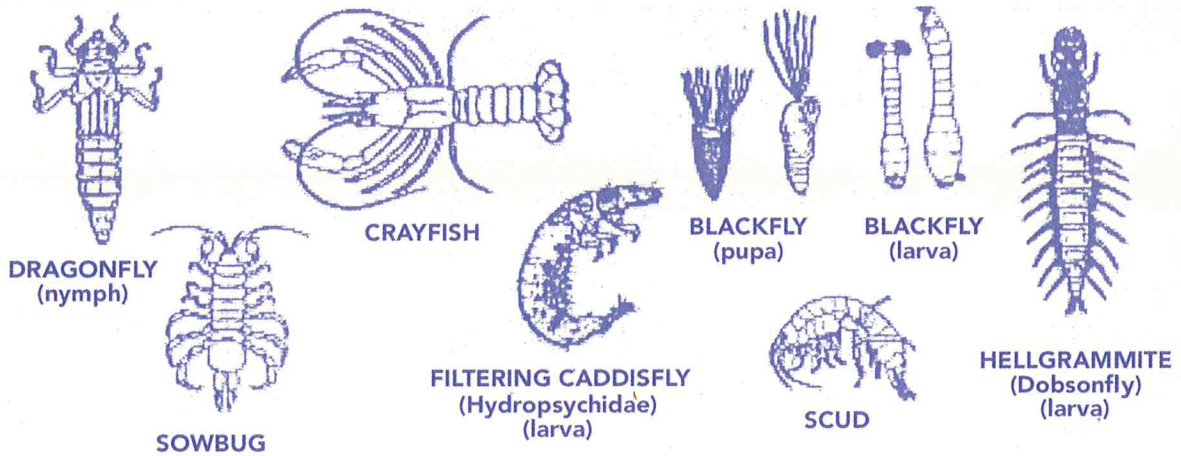
MACRO INVERTEBRATE GROUPS

Beginner's Protocol Picture Key

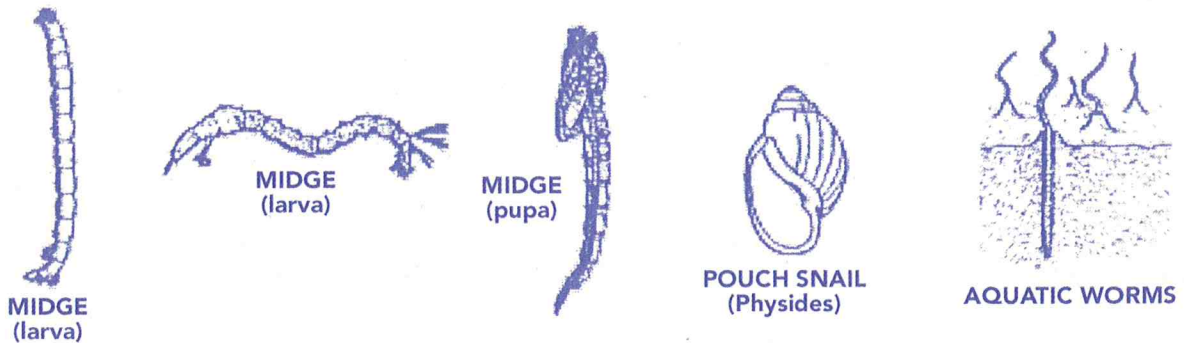
GROUP ONE: These organisms are generally pollution intolerant. Their dominance generally signifies EXCELLENT-GOOD WATER QUALITY.



GROUP TWO: These organisms exist in a WIDE RANGE OF WATER QUALITY.



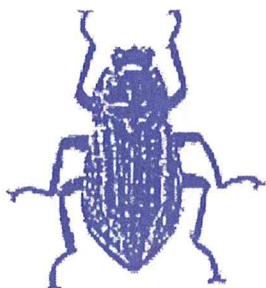
GROUP THREE: These organisms are generally tolerant of pollution. Their dominance generally signifies FAIR-POOR WATER QUALITY.



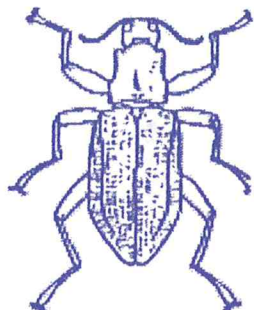
Indicating Insects

BIOASSESSMENT OF STREAMS

GROUP ONE Bugs



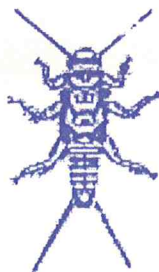
RIFFLE BEETLE
(adult)



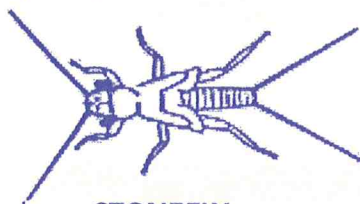
RIFFLE BEETLE
(adult)



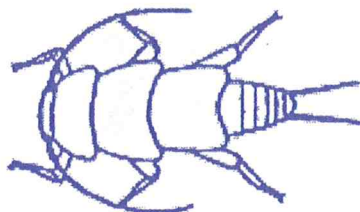
RIFFLE BEETLE
(larva)



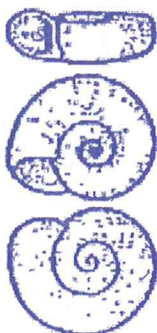
STONEFLY
(nymph)



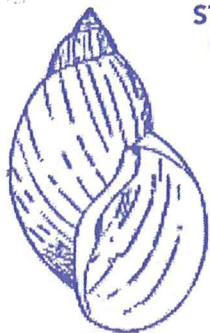
STONEFLY
(nymph)



STONEFLY
(nymph)



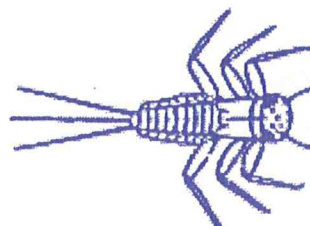
SNAIL



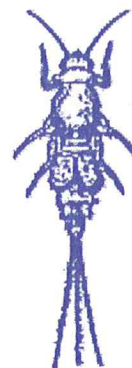
SNAIL
(shell opens to the right)



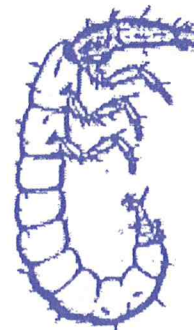
MAYFLY
(nymph)



MAYFLY
(nymph)



MAYFLY
(nymph)



CADDISFLY
(larva)

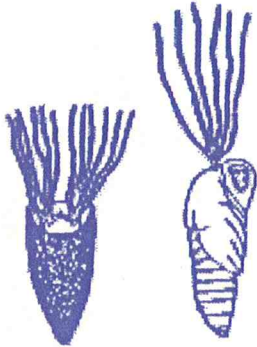


CADDISFLY
(larva)

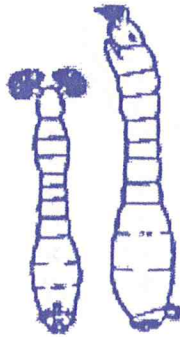
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BIOASSESSMENT OF STREAMS

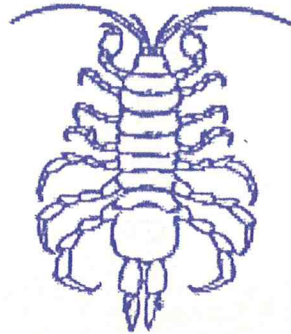
GROUP TWO Bugs



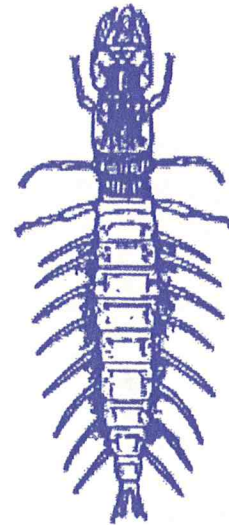
BLACKFLY
(pupa)



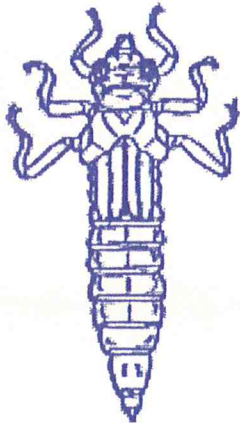
BLACKFLY
(larva)



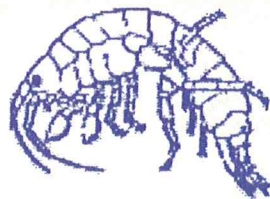
SOWBUG



HELLGRAMMITE
(Dobsonfly)
(larva)



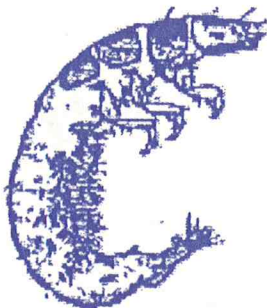
DRAGONFLY
(nymph)



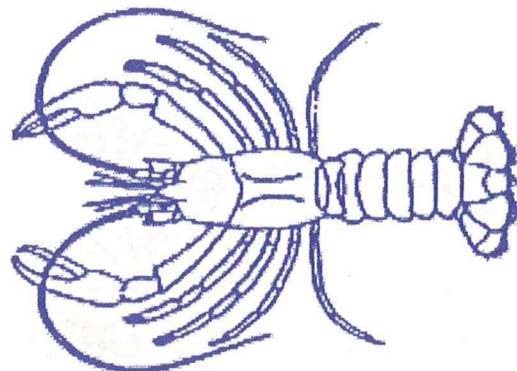
SCUD



SNIPE FLY
(larva)



FILTERING CADDISFLY
(Hydropsychidae)
(larva)

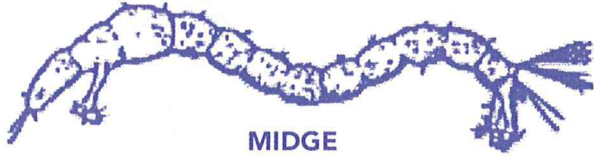


CRAYFISH

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BIOASSESSMENT OF STREAMS

GROUP THREE Bugs



MIDGE
(larva)



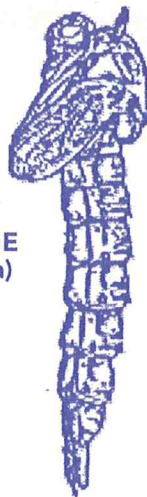
MIDGE
(pupa)



MIDGE
(larva)



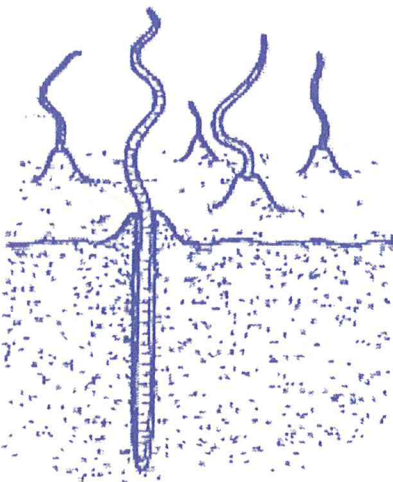
MIDGE
(larva)



MIDGE
(pupa)



MIDGE
(pupa)



AQUATIC WORMS



SNAIL
(shell opens to the left)