



Understanding Indicator Species

Water Quality Investigation

For this activity you'll be thinking like a science detective while looking for evidence of organisms to figure out what the quality of the water is at three different rivers.

Objective: Students will be able to connect the presence of macroinvertebrates as a water quality indicator and hypothesize as to factors contributing to water quality.

What is an indicator species? an organism—often a microorganism or a plant—that serves as a measure of the environmental conditions that exist in a given locale.

What is an aquatic macroinvertebrate? An aquatic macroinvertebrate is an animal without a backbone that lives in aquatic environments and is large enough to be seen without the aid of a microscope or other magnification. Because water quality affects the health of macroinvertebrates they are commonly monitored by scientists and are the basis of this activity.

Macroinvertebrates are valuable indicators of the health of aquatic environments because they are benthic, meaning they are typically found on the bottom of a stream or lake and do not move extended distances. Therefore, they cannot easily or quickly migrate away from pollution or environmental stress. Different species of macroinvertebrates react differently to environmental stresses – like pollution, sediment loading and habitat changes – quantifying the diversity and density of different macroinvertebrate populations at a given site can create a timely picture of the environmental conditions of that body of water.

While tolerant organisms can live in both impaired and unimpaired waters, intolerant organisms can only survive in unimpaired waters. Both tolerant and intolerant species can occupy the same habitat, but it is the lack of intolerant species (not just the presence of tolerant species) that indicate an impaired river.

For this activity, you will be asked to analyze three different rivers. Take a look at the charts below to count the number of sensitive, somewhat sensitive/tolerant, and tolerant species that are found at River A, B, and C.

| Macroinvertebrate | Number of species found at River A, B, and C | | |
|-------------------|--|---------|---------|
| | River A | River B | River C |
| Mayflies | 35 | 15 | 0 |
| Stoneflies | 65 | 35 | 0 |
| Caddisflies | 30 | 20 | 0 |
| Dobsonflies | 30 | 20 | 0 |
| Midges | 0 | 20 | 30 |
| Crane Flies | 25 | 13 | 12 |
| Dragonflies | 20 | 20 | 10 |
| Scuds | 5 | 15 | 30 |
| Pouch snails | 0 | 15 | 25 |
| Tubifex worms | 0 | 15 | 35 |
| Leeches | 0 | 15 | 35 |

Count the different macros above and fill in the boxes below.

The tables below will help you determine the number of sensitive, somewhat sensitive/tolerant, or tolerant macroinvertebrates are at River A, B, and C.



River A

| Sensitive | Somewhat Sensitive/Tolerant | Tolerant |
|---|---|--|
| # of Stoneflies: # of Mayflies: #of Caddisflies: # of Dobsonflies: | # of Crane Flies: # of Dragonflies: # of Scuds: | # of Midges: # of Pouch Snails: # of Midges: # of Leeches: # of Tubifex Worms: |

River B

| Sensitive | Somewhat Sensitive/Tolerant | Tolerant |
|---|---|--|
| # of Stoneflies: # of Mayflies: #of Caddisflies: # of Dobsonflies: | # of Crane Flies: # of Dragonflies: # of Scuds: | # of Midges: # of Pouch Snails: # of Midges: # of Leeches: # of Tubifex Worms: |

River C

| Sensitive | Somewhat Sensitive/Tolerant | Tolerant |
|---|---|--|
| # of Stoneflies: # of Mayflies: #of Caddisflies: # of Dobsonflies: | # of Crane Flies: # of Dragonflies: # of Scuds: | # of Midges: # of Pouch Snails: # of Midges: # of Leeches: # of Tubifex Worms: |

Take the time to analyze the Macroinvertebrate Data Sheets and use the data to answer the questions below.

What were the similarities and differences between the three sites?

Which stream has the highest level of water quality?

Which stream has the lowest level of water quality?

Below are pictures of 3 different Rivers around the world. Make an educated guess about which River on your data sheet each picture may represent. Type River A, River B, or River C below and explain why you chose that response.



Which river do you think this is and why?



Which river do you think this is and why?



Which river do you think this is and why?

You have reached the end of your activity! YAY!