LET'S GO MUCKING
DATA ANALYSIS - WATER QUALITY

RIVERS ARE ALIVE

Activity Description

Aquatic macroinvertebrates are commonly referred to as 'bioindicators' because their presence or absence in a body of water can provide information about the water quality. After learning how to collect and identify macroinvertebrates with Rivers Are Alive, your students can use the University of Wisconsin's biotic index form to record and analyze their macroinvertebrate sample data.

Skip the gray section on the next page. Begin reading the instructions at letter 'A'. After reading the instructions, go to page 3 and circle all the macroinvertebrates that were in your sample. Then return to page 2 and do the math to determine your water quality index score. Once students understand why and how to use the biotic index form, challenge them with five additional mucking samples on page 6.

The aquatic macroinvertebrates on page 3 are divided into four groups:

Group 1: Sensitive to pollutants.
- These macroinvertebrates are easily disturbed by pollutants and will be less common in polluted water.

Group 2: Semi-sensitive to pollutants.
- These macroinvertebrates are slightly less sensitive to pollutants than Group 1.

Group 3: Semi-tolerant to pollutants.
- These macroinvertebrates are less sensitive to pollutants than Group 2.

Group 4: Tolerant to pollutants.
- These macroinvertebrates are not easily disturbed by pollutants and will be commonly found in all water conditions.

**If you do not have a water body near you or do not have the opportunity to collect your own sample. You may use the images on pages 4 and 5 as a mock sample. Allow your students to identify the macroinvertebrates first by using the identification key in Student Resources. Then, they can use this biotic index form to determine the water quality of the pond that the mock sample was taken from.

Let us know if you enjoyed doing this activity or if you have any suggestions for improvement. Find more fun activities and contact information at https://wildriversconservancy.org/learn-explore/rivers-are-alive/

Recording Form for the Citizen Monitoring Biotic Index

Name: _____ Date: _____

Stream Name: _____ Time: _____

Location: _____ Site: _____
(County, Township, Range, Section, Road, Intersection, Other)

At this point, you should have collected a wide variety of aquatic macroinvertebrates from your three sites. You will now categorize your sample, using the *Key to Macroinvertebrate Life in the River* to help you identify the macroinvertebrates found. **The number of animals found is not important; rather, the variety of types of macroinvertebrates and their tolerance to pollution tells us the biotic index score**. Before you begin, check off the habitats from which you collected your sample (see right).

☐ Riffles

☐ Undercut banks

☐ Snag areas, tree roots, submerged logs

☐ Leaf packs

1. You should have removed large debris (e.g. leaves, rocks, sticks) from your sample and placed this material in a separate basin (after removing macroinvertebrates from it).

2. Check the basin with the debris to see if any aquatic macroinvertebrates crawled out. Add these animals to your prepared sample.

3. Fill the ice cube tray half-full with water.

4. Using plastic spoons or tweezers, (be careful not to kill the critters – ideally, you want to put them back in their habitat after you're finished) sort out the macroinvertebrates and place ones that look alike together in their own ice cube tray compartments. Sorting and placing similar looking macroinvertebrates together will help insure that you find all varieties of species in the sample.

5. Refer to the *Key to Macroinvertebrate Life in the River* and the *Citizen Monitoring Biotic Index* to identify the aquatic macroinvertebrates:

A. On the back of this page, circle the animals on the index that match those found in your sample.

B. Count the number of types of animals that are circled in each group and write that number in the box provided. Do not count individual animals in your sample. Only count the number of types of animals circled in each group.

C. Enter each boxed number in work area below.

D. Multiply the entered number from each group by the group value.

E. Do this for all groups.

F. Total the number of animals circled.

G. Total the calculated values for all groups.

H. Divide the total values by the total number of types of animals that were found: **TOTAL VALUES (b.) / TOTAL ANIMALS (a)**.

I. Record this number.

SHOW ALL MATH (Use space below to do your math computations)

No. of animals circled from group 1 _____ x 4 = _____

No. of animals circled from group 2 _____ x 3 = _____

No. of animals circled from group 3 _____ x 2 = _____

No. of animals circled from group 4 _____ x 1 = _____

TOTAL ANIMALS (a):

TOTAL VALUE (b):

Index score:

How Healthy is the stream?
Excellent _____ 3.6+
Good _____ 2.6 - 3.5
Fair _____ 2.1 - 2.5
Poor _____ 1.0 - 2.0

Divide totaled value (b)_____by total no. of animals (a) _____for index score:

Report your results online at **www.uwex.edu/erc/wavdb** *or submit your data to your local coordinator.*
Call your local monitoring coordinator if you have questions about sampling or determining the Biotic Index Score.

Group 1: These are sensitive to pollutants. Circle each animal found.
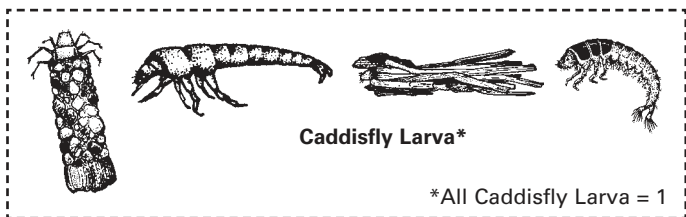
Stonefly Larva

Dobsonfly Larva

Alderfly Larva

Water Snipe Fly Larva

No. of group 1 animals circled:

Relative Size Key:

+ = larger than picture

– = smaller than picture
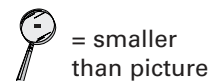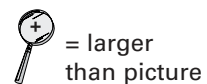
Group 2: These are semi-sensitive to pollutants. Circle each animal found.

Caddisfly Larva*

*All Caddisfly Larva = 1

Dragonfly Larva
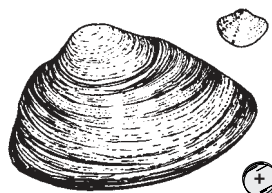
Water Penny
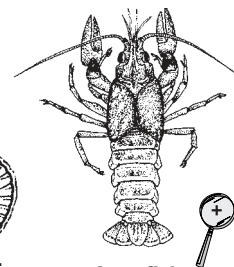
Crawfish

No. of group 2 animals circled:

Crane Fly Larvae

Freshwater Mussel or Fingernail clam

Mayfly Larva

Damselfly Larva

Damselfly tail (side view)

Riffle Beetle Larva*

Riffle Beetle Adult*

*All Riffle Beetles = 1

Group 3: These are semi-tolerant of pollutants. Circle each animal found.

Black Fly Larva

Non-Red Midge Larva

Snails: Orb or Gilled (right side opening)

*All Snails = 1

Amphipod or Scud

No. of group 3 animals circled:

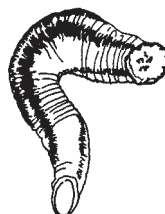## Group 4: These are tolerant of pollutants. Circle each animal found.

Pouch Snail (left side opening)

Isopod or Aquatic Sowbug

Bloodworm Midge Larva (red)

Leech

Tubifex Worm

No. of group 4 animals circled:

For more information, call (608) 265-3887 or (608) 264-8948.
Download and print data sheets from
watermonitoring.uwex.edu/wav/monitoring/sheets.html

Water Action Volunteers

Macroinvertebrate River Sample

Sample A: Water Snipe Fly Larva, Dragonfly Larva, Non-Red Midge Larva, Orb Snail

No. of animals circled from group 1 _____ x 4 = _____

No. of animals circled from group 2 _____ x 3 = _____

No. of animals circled from group 3 _____ x 2 = _____

No. of animals circled from group 4 _____ x 1 = _____

TOTAL ANIMALS (a):

TOTAL VALUE (b):

Index score:

How Healthy is the stream?	
Excellent	3.6+
Good	2.6 - 3.5
Fair	2.1 - 2.5
Poor	1.0 - 2.0

Site Number

Divide totaled value (b)_____by total no. of animals (a) _____for index score:

Sample B: Aquatic Sowbug, Leech, Scud, Tubifex Worm

No. of animals circled from group 1 _____ x 4 = _____

No. of animals circled from group 2 _____ x 3 = _____

No. of animals circled from group 3 _____ x 2 = _____

No. of animals circled from group 4 _____ x 1 = _____

TOTAL ANIMALS (a):

TOTAL VALUE (b):

Index score:

How Healthy is the stream?	
Excellent	3.6+
Good	2.6 - 3.5
Fair	2.1 - 2.5
Poor	1.0 - 2.0

Site Number

Divide totaled value (b)_____by total no. of animals (a) _____for index score:

Sample C: Stonefly Larva, Dobsonfly Larva, Caddisfly Larva, Crane Fly Larva, Alderfly Larva

No. of animals circled from group 1 _____ x 4 = _____

No. of animals circled from group 2 _____ x 3 = _____

No. of animals circled from group 3 _____ x 2 = _____

No. of animals circled from group 4 _____ x 1 = _____

TOTAL ANIMALS (a):

TOTAL VALUE (b):

Index score:

How Healthy is the stream?	
Excellent	3.6+
Good	2.6 - 3.5
Fair	2.1 - 2.5
Poor	1.0 - 2.0

Site Number

Divide totaled value (b)_____by total no. of animals (a) _____for index score:

Sample D: Damselfly Larva, Black Fly Larva, Scud

No. of animals circled from group 1 _____ x 4 = _____

No. of animals circled from group 2 _____ x 3 = _____

No. of animals circled from group 3 _____ x 2 = _____

No. of animals circled from group 4 _____ x 1 = _____

TOTAL ANIMALS (a):

TOTAL VALUE (b):

Index score:

How Healthy is the stream?	
Excellent	3.6+
Good	2.6 - 3.5
Fair	2.1 - 2.5
Poor	1.0 - 2.0

Site Number

Divide totaled value (b)_____by total no. of animals (a) _____for index score:

Sample E: Mayfly Larva, Water Penny, Orb Snail, Scud

No. of animals circled from group 1 _____ x 4 = _____

No. of animals circled from group 2 _____ x 3 = _____

No. of animals circled from group 3 _____ x 2 = _____

No. of animals circled from group 4 _____ x 1 = _____

TOTAL ANIMALS (a):

TOTAL VALUE (b):

Index score:

How Healthy is the stream?	
Excellent	3.6+
Good	2.6 - 3.5
Fair	2.1 - 2.5
Poor	1.0 - 2.0

Site Number

Divide totaled value (b)_____by total no. of animals (a) _____for index score: