

Biological Indicators Worksheet

Biological indicators are living things that can tell us (indicate) how healthy the environment is. During the field trip, benthic invertebrates or “water bugs” will be discussed in detail, and students will learn how they are used as biological indicators of water quality. Benthic macroinvertebrates are the “bugs” that live in the bottoms of creeks, streams and rivers and are usually the larval form of many flying insects. They are used as indicators of long-term water quality, and you can tell a lot about the health of a stream by what you find living in it. In this activity you will use actual benthic invertebrate data that was collected locally to quantify water quality using the Family Biotic Index.

Family Biotic Index | This index uses known pollution tolerance values for families of benthic macro invertebrates to calculate an overall pollution tolerance value for an entire community. The final value can be interpreted using the following chart:

Family Biotic Index	Water Quality	Degree of Organic Pollution
0.00-3.75	Excellent	Organic pollution unlikely
3.76-4.25	Very Good	Possible slight organic pollution
4.26-5.00	Good	Some organic pollution probable
5.01-5.75	Fair	Fairly substantial pollution likely
5.76-6.50	Fairly Poor	Substantial pollution likely
6.51-7.25	Poor	Very substantial pollution likely
7.26-10.00	Very Poor	Severe organic pollution likely

Group (i)	Frequency Value (n)	Tolerance Value (a)	Product (n x a)
Crane Fly	3	3	9 add
Dobinsonfly	2	0	0 multiply
Common Stonefly	6	1	6
Water Beetle	4	7	28
Total (N):		20	43

$$FBI = \frac{\sum n_i \times a_i}{N}$$

n = number of specimens in taxa i
 a = tolerance value of taxa i
 N = total number of specimens in sample

$$FBI = \frac{\sum n_i \times a_i}{N} = \frac{43}{20} = \boxed{2.15}$$

In this example the FBI was 2.15. Using the chart above, we can interpret this value to understand that the water quality is excellent and organic pollution is unlikely. Organic pollution can include gasoline, pesticides, detergents, or grease.

Using the instructions and example above, fill out the following chart to calculate the Family Biotic Index and make a statement about water quality based on the value. Note that this is actual data collected from Jackson Creek in Jackson Park!

Group (i)	Frequency Value (n)	Tolerance Value (a)	Product (n x a)
Non-biting Midges	29	7	
Riffle Beetles	1	1	
Freshwater Scuds	1	4	
Flathead Mayflies	5	4	
Water Mites	3	4	
Net-Spinner Caddisflies	5	4	
Micro Caddisflies	1	4	
Common Stonefly	1	2	
Prong-gilled Mayflies	13	1	
	Total (N):		

$$FBI = \frac{\sum n_i \times a_i}{N} \quad FBI = \frac{\quad}{\quad} =$$

WRITE YOUR OWN WATER QUALITY STATEMENT IN THE SPACE PROVIDED BELOW: