BIOTIC INDEX CALCULATION WORKSHEET

Reproduce for Use

	A	x B	= C
TAXON	POLLUTION TOLERANCE VALUE	NUMBER FOUND	TOTAL TOLERANCE VALUE
Ephemeroptera (mayflies)	3.6		
Plecoptera (stoneflies)	1.0		
Trichoptera (caddisflies)			
Most caddisflies	2.8		
Hydropsychidae (common netspinning caddisflies)	5.0		
Odonata			
Anisoptera (dragonflies)	4.0		
Zygoptera (damselflies)	7.0		
Megaloptera (dobsonflies & alderflies)	2.0		
Coleoptera (beetles)	4.6		
Hemiptera (true bugs)			
Diptera (true flies)			
Chironomidae (midges)	6.0		
Simuliidae (black flies)	6.0		
Tipulidae (crane flies)	3.0		
Other Diptera	6.0		
Amphipoda (scuds)	6.0		
Isopoda (sowbugs)	8.0		
Oligochaeta (earthworms)	8.0		
Hirudinea (leeches)	10.0		
Turbellaria (planarians)	4.0		
Gastropoda (snails)	7.0		
		SUM	

$$\frac{\text{Sum of Total Tolerance Values}}{\text{Sum of the Number Found}} = \frac{\Sigma \text{ Total Tolerance Value}}{\Sigma \text{ Number Found}} = \text{Biotic Index For Sample}$$

Leaf Pack Network

The Leaf Pack Network (LPN) is a network of teachers and students investigating their local stream ecosystems by using the Leaf Pack Experiment Kit. After conducting their own leaf pack experiment, these schools share their data through the network, coordinated by the Stroud Water Research Center. These data shed light on the important connection between streamside forests and the ecology of rivers and streams. To learn more, visit the LPN at **www.stroudcenter.org/lpn/index.**

Calculating Biotic Index

To calculate the Biotic Index of a leaf pack sample, first count the number of individuals you found of each taxa and enter that number in Column B on the Biotic Index Calculation Worksheet (page 28). Next, multiply the Pollution Tolerance Value for each taxon by the number of individuals you found for that taxon (multiply A x B on Worksheet) and write the answer in Column C (Total Tolerance Value). Add all the Total Tolerance Values in Column C together, then divide by the sum of the Number Found (Column B). The answer is the Biotic Index for your sample. Use the chart at the bottom of this page to determine the water quality and degree of organic pollution represented by the Biotic Index value you calculated.

NOTE: Although originally designed to be used at the species level the Biotic Index is commonly used at the family level of classification. A modified version at the ordinal/family level is provided here. Modified versions of the Biotic Index reduce accuracy but are useful for quick assessments of water quality.

POLLUTION TOLERANCE VALUES

	TOLERANCE VALUE
Ephemeroptera (mayflies)	3.6
Plecoptera (stoneflies)	1.0
Trichoptera (caddisflies)	
Most Caddisflies	2.8
Hydropsychidae (Common netspinning caddisflies)	5.0
Odonata	
Anisoptera (dragonflies)	4.0
Zygoptera (damselflies)	7.0
Megaloptera (dobsonflies & alderflies)	2.0
Coleoptera (beetles)	4.6
Hemiptera (true bugs)	9.0
Diptera (true flies)	
Chironomidae (midges)	6.0
Simulidae (black flies)	6.0
Tipulidae (crane flies)	3.0
Other Diptera	6.0
Amphipoda (scuds)	6.0
Isopoda (sowbugs)	8.0
Oligochaeta (aquatic earthworms)	8.0
Hirudinea (leeches)	10.0
Turbellaria (planarians)	4.0
Gastropoda (snails)	7.0

Tolerance values based on a scale of 0-10. Values averaged from Hilsenhoff 1988.

BIOTIC INDEX	WATER QUALITY	DEGREE OF ORGANIC POLLUTION
<3.75	Excellent	Organic pollution unlikely
3.76-5.0	Good	Some organic pollution
5.1-6.5	Fair	Substantial pollution likely
6.6-10.0	Poor	Severe organic pollution likely

EPT Index (as a Percentage)

The EPT Index is a measure of the percentage of **E**phemeroptera (mayflies), **P**lecoptera (stoneflies), and **T**richoptera (caddisflies) found in the total number of macroinvertebrates in your sample. Because these three orders of macroinvertebrates tend to be sensitive to pollution, a high percentage of them in your sample indicates good water quality.

Calculating EPT Index

To calculate the percent EPT of the leaf pack sample, add the total number of mayflies, stoneflies and most caddisflies. *Note that you* **will not** *include the common netspinning caddisfly in your total EPT because this one group of caddisflies is not as sensitive to pollution.*

$$\frac{E + P + T}{\text{Total Number of Macroinvertebrates}} = \square$$

Change to a percent by multiplying the answer by 100

$$\_\_\_\_ \times 100 = \square \%EPT$$

Divide the EPT as described above by the total number of macroinvertebrates in your sample.

Biotic Index

If your Leaf Pack Experiment is designed to measure water quality, examine the quantity and diversity of the freshwater invertebrates in your Leaf Packs and combine this data with information about the pollution tolerance of specific organisms.

In controlled experiments and in field observations, scientists have learned that particular aquatic organisms are susceptible to specific types and levels of pollutants. Many freshwater invertebrates require a definitive range of physical and chemical parameters to flourish. The presence or absence of these organisms in a stream can be used to reveal the overall ecological quality of the water. The Biotic Index is a widely used method of estimating organic and nutrient pollution by comparing the abundance of organisms and their tolerance to environmental stress. Each organism is assigned a tolerance value ranging from 0 to 10 depending on the organism's sensitivity to changes in water quality. Tolerance values are higher for organisms that can survive poor water quality.