Study Materials for Stream-Monitoring Workshops

Registration is very important! If there is a change due to weather conditions or other reasons the coordinator will contact persons that have registered to let them know about the changes. If you do not register, you will not be contacted. If you prefer not to complete the on-line form please call (304) 926-0499 Ext. 1040; leave a voice-mail message providing your name, affiliation, phone number, Email address and the date of the workshop you are planning to attend; or send an Email to the coordinator, providing the same information. Please **register four business days** in advance of the workshop you plan to attend. **Note**: Download times for certain files provided here may be long if you do not have a high-speed Internet connection.

Selected chapters and section from the Volunteer Monitoring Manual

Elements of a Stream Study (Chapter 2)

- Basic Concepts
- Designing the Stream Study
- Safety Considerations

Watershed Survey Methods (Chapter 3)

- How to Conduct a Watershed Survey
- The Visual Assessment

Invertebrates and Habitat (Chapter 4)

- Stream Habitat Walk
- Streamside Bioassessment

Water Quality Conditions (Chapter 5)

- Stream Flow
- pH
- Conductivity
- Dissolved Oxygen
- Turbidity
- Alkalinity
- Phosphorous
- Nitrates
- Fecal Bacteria
- Quality Assurance and Quality Control

Appendices

- Determining Latitude and Longitude
- Glossary
- Level-One Survey Data Sheet

Determine your overall chemical integrity

The coordinator has written modules that describe the protocols or standard operating procedures (SOPs) for completing bioassessment surveys. These modules are available as a portable document file download. The hyper-links are located in the Program Manuals**,** Survey Forms and Additional Resources section of the program's web page. To review the level-one procedures, **click-here** (a printed copy will be provided for workshop participants).

Before beginning a monitoring and/or restoration project it is very important for you to describe your **study design**. Think carefully about the why, what, where, when and how questions, and consider the quality assurance and quality control (QAQC) measures that are necessary to insure accuracy and precision. Your approach should be similar to the scientific method. The questions you ask the methods you choose, and the way the data is analyzed and checked should be written into your study design. It's worth taking the time to figure out what you want to do. Your monitoring is much more likely to be successful and sustainable over a longer time, with the right plan.

Resources that provide an overall introduction to water monitoring

1. What types of bioassessment equipment will you need?
2. Citizen's guide to lake and stream monitoring
3. WV Save Our Stream's Field Kit (A custom designed kit from LaMotte)
4. River Network's Newsletter - River Voices: How a River Works
5. Wisconsin's Water Action Volunteers - Habitat evaluation fact sheet
6. Habitat assessment procedures: A flash presentation from Virginia Save Our Streams
7. Introduction to acid mine drainage
8. WV Save Our Streams Slide Show: ppt slide show that provides an introduction to program methods

Resources for specific procedures and additional information

1. Bacteria Monitoring Manual for Citizen Scientists
2. Pebble count collection procedures
3. The velocity head rod (VHR) method for measuring stream flow
4. QuickTime video (Riparian Magic); for additional information about riparian buffers click-here
5. Example of a completed level one survey

Benthic macroinvertebrate resources

1. Guide to aquatic invertebrates
2. Basic macroinvertebrate identification
3. Bouchard, R.W. 2004. Guide to Aquatic Invertebrates of the Upper Midwest: Identification Manual for Students, Citizen Scientist's and Professionals. University of Minnesota
4. Introduction to macroinvertebrates video
5. Virginia Save Our Streams: Virtual field training; Virtual macroinvertebrate training
6. WV Save Our Streams: Macroinvertebrate practice quiz

The table below provides a list of common macroinvertebrates that may be encountered during stream studies. The major taxonomic categories (e.g. Phylum, Class and Order) are listed along with several examples (family groups) below each major group; only the common names are provided. Not all kinds that may be encountered are listed here. **Note**: Hemipterans are not generally used to assess the health of flowing water due to their ability to use atmospheric oxygen. Plecopterans are given a very low tolerance rating; however some families can tolerate slightly acidic conditions.

Order Ephemeroptera	Order Plecoptera	Order Trichoptera	Order Odonata	Order Coleoptera
Armored mayfly (L)	Brown stonefly (L)	Case-maker caddisfly (L)	Clubtail dragonfly (M)	Diving beetle (H)
Brush-legged mayfly (L)	Common stonefly (L)	Common netspinner (M)	Darner dragonfly (L)	Long-toed beetle (M)
Burrowing mayflies (M)	Giant stonefly (L)	Finger-net caddisfly (L)	Skimmer dragonfly (H)	Riffle beetle (L)
Flatheaded mayfly (L)	Patterned stoneflies (L)	Free-living caddisfly (L)	Spiketail dragonfly (L)	Water penny (L)
Minnow mayflies (M)	Roach-like stonefly (L)	Giant-case caddisfly (M)	Broadwing damselfly (M)	Whirligig beetle (M)
Square-gilled	Winter	Hooded-	Narrowwing	Order

mayflies (M)	stoneflies (L)	case caddisfly (M)	damselfly (H)	Hemiptera
Spiny crawler mayfly (L)	Order Diptera	Humpless-case caddisfly (L)	Spreadwing damselfly (H)	Backswimmer (H)
Class Arachnida	Biting midge (H)	Longhorn-case caddisfly (L)	Order Megaloptera	Giant water bug (H)
Water mites (H)	Black fly (M)	Micro-case caddisfly (L)	Alderfly (M)	Water boatman (H)
Class Crustacea	Crane fly (M)	Northern-case caddisfly (L)	Hellgrammite/Fishfly (L)	Water scorpion (H)
Aquatic sowbug (H)	Dance fly (H)	Saddle-case caddisfly (L)	Class Bivalvia	Water striders (H)
Crayfish (M)	Dixid midge (M)	Snail-case caddisfly (L)	Asian clam (M)	Class Gastropoda
Scud/Sideswimmer (M)	Horse fly (H)	Tube-net caddisfly (M)	Pea clam (M)	Pebble snails (L)
Phylum Annelida	Net-wing midge (L)	Uenoid-case caddisfly (L)	Mussel (L)	Rock snails (M)
Aquatic worms (H)	Non-biting midge (H)	Order Lepidoptera	Phylum Platyhelminthes	Orb snails (H)
Leeches (H)	Watersnipe fly (L)	Aquatic moth (M)	Flatworms (H)	Pouch snails (H)

General tolerance rating scale

Low (L)				Moderate (M)			High (H)			
0	1	2	3	4	5	6	7	8	9	10

Level-one stream score: After your collections are sorted, identified and the abundance is estimated using these codes (A) > 50; (C) 5-50; (R) < 5, the collections are assessed using three different metrics. An overall stream score is determined using a point value scale, which is based on reference conditions. The point values are added to determine the overall stream score. The calculations are described in more detail below. First, transform the relative abundance rating code into numbers: (A = **6;** C = **3**; R = **1**). Follow the instructions and use the table to complete all the necessary calculations.

1. Multiply the relative abundance number by the tolerance to calculate the tolerance score. Add the entire tolerance score column and the relative abundance column. Divide the total tolerance by the relative abundance total. This is calculation is called the **Biotic Index**.
2. Calculate the total number of kinds. This calculation is called the **Total Taxa**.
3. Calculate the total number of kinds from the stoneflies, mayflies, caddisflies and common netspinner groups by adding the kinds together. This calculation is called **EPT Taxa**.
4. After completing these calculations determine their point value by comparing your calculated value to the values in the table. The assigned point values at the top of the table. The point values from each calculation are added together to determine your overall stream score and rating.

The **light-gray shading** indicates that multiple kinds are possible within the category.

Insect groups	Relative Abunda	Tolera nce	Tolera nce	Num ber of	**Non-Insect**	Relative Abunda	Tolera nce	Tolera nce	Num ber of

	nce		Score	Kinds (Taxa)	**groups**	nce		Score	Kinds (Taxa)
Stoneflies		2			Crayfish		5		
Mayflies		3			Sideswimmer		5		
Case-building caddisflies		3			Aquatic sowbug		7		
Net-spinning caddisflies		4			Operculate snails		5		
Common netspinner		5			Non-operculate snails		7		
Dragonflies		4			Clams		6		
Damselflies		7			Mussel		4		
Riffle beetle		4			Aquatic worm		10		
Water penny		3			Leech		10		
Other beetles		7			Flatworm		7		
Fishfly/Hellgrammite		3				Total Abundance		Total Tolerance	Total Kinds (Taxa)
Alderfly		6							
Non-biting midge		8							
Black fly		6			Other invertebrates (describe)				
Crane fly		4							
Watersnipe fly		3							
Other flies		6			If known, the coordinator will assign a tolerance value				

Note: Using an actual count will improve the accuracy of your stream score and rating.

Metrics	Calculated Values	Point Values	**8**	**6**	**4**	**2**
Total Taxa			> 18	18 - 12	11 - 6	< 5
EPT Taxa			> 10	10 - 7	6 - 3	< 3
Biotic Index			< 4.0	4.0 – 5.2	5.3 – 6.5	> 6.5
Stream score						

Rating Scale	> 20 Optimal	20 - 15 Suboptimal	14 - 9 Marginal	< 9 Poor

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