

Stream Substrate Habitat

Lesson Abstract

Summary:	Students conduct random sampling of habitat material found in a stream to determine benthic invertebrate fauna diversity.
GLE:	SC7.1.A.6, 7.1.B.6, 7.1.C.6, 7.1.D.6, 7.1.E.6,
Subject Areas:	Science, Mathematics
Show-Me Standards:	Goals – 1.3, 1.4, 1.8 Strands – SC 3, 4, 5, 7, 8; MA 1, 2, 3
Skills:	Measuring, random sampling
Duration:	1 class period (50 minutes)
Setting:	Site on a shallow, gravel or sand bottom stream
Key Vocabulary:	Random sampling, habitat, substrate, cobble, bow caliper, interstitial spaces, Dependant Variable, Independent Variable

Rationale:

- There is a diversity of insects that live in and around water.
- Stream bottom material influences the type of organisms in a stream.
- Substrate is a function of stream stability reflecting the conditions of a stream channel, riparian corridor, flood plain, and watershed.
- Benthic invertebrates living in running water show preference to various bottom types.
- Benthic invertebrates not only need specific chemical water quality parameters, but they need substrate habitat providing adequate living space.
- Habitat is important in animal survival.

Student relevance:

- Substrate habitat is one component that helps determine benthic diversity.

Learning Objectives:

Upon completion, students will be able to . . .

- Determine the average size substrate material in a cross-section of a riffle or other part of a stream.
- Identify that some species prefer a particular substrate.

- Use a random number table.

Students Need to Know:

- Insects live around bodies of water.
- Insects and other animals live in water and are dependent on a wide variety of variables, including substrate composition.

Teachers Need to Know:

- Most benthic invertebrates living in water show preference to various bottom types.
- Some species prefer a particular substrate; thus, as the stream bottom changes from place to place so does the benthic invertebrate fauna.
- The more diversity in stone size within a stream provides more variety of space available for colonization by benthic invertebrates.
- Sandy bottoms often have the fewest kinds of benthic invertebrates.
- Silt reduces the fauna among stones because it fills in interstitial spaces.
 - Interstitial spaces are the gaps between different sized stones where macroinvertebrates colonize.
- The benthic invertebrate in clean, stony riffles are greater in species diversity than those in silty riffles and pools.
- Often the upstream end of a riffle has a more diverse and abundant benthic fauna because organic matter used as food reaches this area first.
- This system should be used to compare streams whose geographical, geological, and watershed characteristics are similar.
- Muddy or sand bottom streams in northern Missouri are difficult to measure using this system.

Resources:

The following materials are available from the Missouri Department of Conservation, P.O. Box 180, Jefferson City, MO 65102-0180, (573)751-4115.

Aquatic Field and Classroom Activities
Life within the Water

A Monitor's Guide to Aquatic Macroinvertebrates - Available from the Izaak Walton League of America (IWLA), 707 Conservation Lane, Gaithersburg, MD 20878, 1-800-284-4952. (\$5 each with 10% discount for ordering 10 or more)

Materials Needed for Lesson:

Transparency of *Stream Cross Section of Riffle* (provided)

Random Number Chart (provided)

Tape measure that will stretch across a stream (one per team)

Bow caliper—measures external diameter, obtain at an office supply store (one per team)

Two clipboards (optional)
Graph paper
Pencils

Procedure:

- Prior to field trip, show transparency of *Stream Cross Section* and discuss where aquatic life live.
- Divide students into at least two teams.
- Have each team select a stretch of river channel where the water is less than knee deep.
- Stretch a measuring tape across the selected sites.
- Remove 100 rock samples from the stream bed in a riffle. Remove one rock from the stream for each random number on the chart where that number is found on the tape measure.
- Have each team align their rocks from smallest to largest based upon the axis as it would be found in the stream.
- Measure and record all stones using a bow caliper. Have students take turns.
- Measure to the nearest centimeter along the horizontal or longest axis.
- Graph in groupings of five centimeters along the X axis (Dependent Variable) and number of stones along the Y axis.(Independent Variable)
- The graph is interpreted as the greater number of points along the Y axis, the greater the interstitial spaces, the greater the potential for habitat diversity.

Evaluation Strategies:

- Check measurements done by students and observe students' sampling techniques.
- Have students write a paragraph explaining which site has greater substrate diversity and why.

Extension Activities:

- Detailed water quality monitoring.
- Attend Stream Team Volunteer Water Quality Monitoring Workshops

Scoring Guide:

Substrate Habitat

Teacher Name: _____

Student Name: _____

CATEGORY	4	3	2	1
Accuracy of Plot	All points are plotted correctly and are easy to see. A ruler is used to neatly connect the points or make the bars, if not using a computerized graphing program.	All points are plotted correctly and are easy to see.	All points are plotted correctly.	Points are not plotted correctly OR extra points were included.
Neatness and Attractiveness	Exceptionally well designed, neat, and attractive. Colors that go well together are used to make the graph more readable. A ruler and graph paper (or graphing computer program) are used.	Neat and relatively attractive. A ruler and graph paper (or graphing computer program) are used to make the graph more readable.	Lines are neatly drawn but the graph appears quite plain.	Appears messy and "thrown together" in a hurry. Lines are visibly crooked.
Title	Title is creative and clearly relates to the problem being graphed (includes dependent and independent variable) and is printed at the top of the graph.	Title clearly relates to the problem being graphed (includes Dependent and Independent Variable) and is printed at the top of the graph.	A title is present at the top of the graph.	A title is not present.
Labeling of X axis	The X axis has a clear, neat label that describes the units used for the Independent Variable (e.g.: days, months, participants' names).	The X axis has a clear label that describes the units used for the Independent Variable.	The X axis has a label.	The X axis is not labeled.
Labeling of Y axis	The Y axis has a clear, neat label that describes the units and the Dependent Variable (e.g.: % of dog food eaten; degree of satisfaction).	The Y axis has a clear label that describes the units and the dependent variable (e.g.: % of dog food eaten; degree of satisfaction).	The Y axis has a label.	The Y axis is not labeled.

Rubric Made Using: **RubiStar** (<http://rubistar.4teachers.org>)

Random Number* Chart

53	49	99	111
18	182	31	51
72	281	41	71
128	94	29	82
36	133	33	213
212	206	77	242
45	25	28	144
10	52	150	170
65	66	147	210
125	35	175	55
42	81	88	28
89	27	13	84
95	63	101	179
200	122	222	110
16	54	145	68
214	251	19	233
108	56	103	263
67	24	280	155
250	98	177	11
39	59	15	202
130	20	17	267
14	61	239	129
298	142	180	198
13	76	166	140
300	93	86	260

*Random numbers based on a 25-foot tape measure being used.

Stream Cross Section of Riffle

