Be a Biologist... Back in the Office

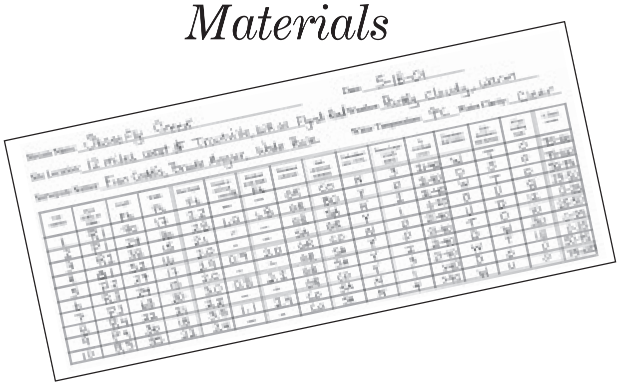
(30 minutes - three hour activity)

Objectives

Students will be able to:

1) Analyze a completed stream survey
2) Interpret the results
3) Write an authentic stream survey report
4) Draw conclusions about the health of a surveyed stream

Materials



- ❑ Pencils
- ❑ Calculators
- ❑ Copies of *Be A Biologist Student Worksheet* and *Data Summary Form, Stonefly Creek Survey* and *Key, Stream Data Survey Form* (Student Section)
- ❑ Computer spreadsheet program (optional)

Background

There are standard protocols implemented by scientists when conducting surveys to gain more information about fisheries, geology, archaeology, wildlife, soils, etc. Students practiced those skills during the *Kids in the Creek Program*, and used survey methods common for fishery biologists. Correctly taken information is critical when determining management strategies.

Procedure

1. Have students connect their mathematics and analytical skills with a data sample written by local fisheries biologists. Directions for students and the data sheet are in the Student Section.

   Open the discussion by informing students they will analyze stream survey data from a reach of Stonefly Creek. Why do scientists conduct studies of this nature? *Because they need to get a picture of the condition of the stream*. Discuss survey methods practiced during the *Kids in the Creek* Program because the same protocols have been followed by the biologists who conducted the survey in the Student Section.

2. Assign students to be responsible for one of the three tasks or levels that are detailed in the directions. Each level requires more time and work than the previous. Give them copies of the completed *Stonefly Creek Field Survey Form* and *Key*, from the Student Section. Ask students to follow the instructions using the *Data Summary Form* and interpret the results.

For **Level A**, filling in the data summary form might take 30 minutes to one hour, depending on whether the calculations are performed with a calculator or a computer spreadsheet program. Writing up results, **Level B**, may take an additional 30 minutes to one hour. The report from **Level B** and **C** 2-3 hours more. If they do not write a report, share the following sample *Stream Survey Report* written by a fishery biologist.

Stream Survey Report — Stonefly Creek

Introduction

Stonefly Creek was surveyed on May 18, 2001 by Finn Caddis, Brooke Angler, and Wade Poole. The creek is located 12 miles west of Troutville, Washington on Flyrod Road. The stream was surveyed to get a general picture of its condition and an assessment of its suitability for fish.

Methods

The stream was surveyed starting from a downstream point and working upwards. The stream was delineated into pools, riffles, and glides. Each unit was measured to determine its length, width, and maximum depth. The pool tail-crest of the pools was also measured so that the residual depth of the pool could be calculated by subtracting the pool tail-crest depth from the maximum depth. We visually estimated what substrate types were dominant and subdominant in each habitat unit. We visually estimated whether substrate was more or less than 35% embedded in each unit. We assessed the percentage of the unit that would provide overhead cover for fish. We determined the types of habitat features to be the dominant and subdominant cover types for fish in each unit. We measured the number of feet of eroding bank. For each unit we estimated the percent of the streambank that had vegetative cover.

Results

The reach we surveyed was 391 ft. in length or 0.074 miles. Average stream width was 17.7 ft and average stream depth 2.5 ft. In pools the average residual depth was 2.1 ft. Half of the units were riffles, and there were 40% pools and 10% glides. See Tables 1 and 2.

Table 1. Stream dimensions

Stream dimension	Measurement
Total reach length in feet	391 feet
Total reach length in miles (5,280 ft/mile)	0.074 miles
Average stream width	17.7 feet
Average stream depth	2.5 feet
Average residual pool depth	2.1 feet

Table 2. Habitat unit types

Unit type	Number	Percent
Pools	4	40%
Riffles	5	50%
Glides	1	10%

Gravel was the dominant substrate in 70% of the units and subdominant in the other 30%. Cobble dominated 20% of the units and sub-dominates 30%. Sand/silt/clay dominated 10% of the units and sub-dominate 30%. Boulder was the only subdominant in 10% of the units. See Table 3.

Table 3. Substrate composition

Substrate type	No. of units dominant in	% of units dominant in	No. of units sub-dominant in	% of units sub-dominant in
(Sa) Sand/Silt/Clay (<2 mm)	1	10%	3	30%
(Gr) Gravel (2-64 mm)	7	70%	3	30%
(Co) Cobble (64-256 mm)	2	20%	3	30%
(Bo) Boulder (>256 mm)	0	0%	1	10%

Wood was found in 70% of the units with 16 pieces counted. Expanding the number would yield an average of 216 pieces of wood per mile. See Table 4.

Table 4. Woody debris, >4 inches diameter and >6 ft. in length

Parameter	Answer
Number and percent of units with one or more pieces of wood:	7 units, 70%
Total number of pieces of wood:	16
Number of pieces of wood per mile:	216 pieces per mile

Seventy percent of the units had 21-40% fish cover, 20% more than 40%, and 10% have 6-20%. Wood material was the dominant cover type in 40% of the units and subdominant in 10%. Depth dominated 30% and sub-dominated in 10%. Turbulence dominated in 10% and sub-dominated in 30% of the units. Undercut banks and overhanging vegetation both dominated in 10% of the units and sub-dominated in 20%. Substrate sub-dominated in 10% of the units. See Tables 5 and 6.

Table 5. Fish habitat cover

Cover Category	Number	Percent
0-5% cover:	0	0%
6-20% cover:	1	10%
21-40% cover:	7	70%
>40% cover:	2	20%

Table 6. Dominant and subdominant fish habitat cover types

Fish habitat cover type	No. of units dominant in	% of units dominant in	No. of units sub-dominant in	% of units sub-dominant in
U = Undercut banks	1	10%	2	20%
S = Substrate	0	0%	1	10%
D = Depth	3	30%	1	10%
O = Overhanging vegetation	1	10%	2	20%
W = Wood material	4	40%	1	10%
T = Turbulence	1	10%	3	30%
A = Aquatic/emergent vegetation	0	0%	0	0%

We measured 78 ft. of eroding bank which is almost 9% of the streambanks in the unit. Thirty percent of the banks had 0-25% bank cover, making them susceptible to erosion. Twenty percent of the banks have 26-50% cover, 20%, 51-75% cover, and 30%, 76-100% cover. See Tables 7 and 8.

Table 7. Embeddedness and bank erosion

Parameter	Answer
Number and percent of units that are >35% embedded	5 units, 50%
Total number of feet of eroding bank:	78 ft
Percentage of bank eroding (remember that since the stream has 2 sides you need to multiply the stream length by 2 to get the total length of streambank)	9%

Table 8. Amount of streambank with cover

% Streambank cover by Category	Number	Percent
0-25% cover:	3	30%
26-50% cover:	2	20%
51-75% cover:	2	20%
76-100% cover:	3	30%

Discussion

Stonefly Creek is a smaller size trout stream with average width near 18 feet and deeper areas of 2 to 3.5 feet. There were several pools which provide holding areas for fish, especially when water depths decrease. Riffles provide good areas for insect production. Fish often utilize riffles for feeding and can find shelter from the current behind larger substrate or behind wood or near streambanks. Glides may also provide spawning areas. The reach had many areas with gravel as the dominant or subdominant substrate. This could indicate that there was spawning habitat in the reach. Larger cobbles and boulders help provide areas for fish to hide and for insect production. However, half of the units were >35% embedded. This could signal problems in the stream. Embeddedness reduces the suitability of areas for spawning. Sediment that is embedded in larger substrate reduces the interstitial spaces used for insect production and used by fish for cover. There was an abundance of woody debris in this reach and 70% of the units had wood. The wood indicates there is a healthy source of it in the adjacent and upstream riparian areas. Wood is important for providing fish cover, creating pools, and protecting streambanks from erosion. Wood, depth, and turbulence are the most common fish habitat cover types. There was a variety of fish cover types. Almost all units have at least 21-40% overhead fish cover. There were eroding banks within five adjacent units. It is of concern that almost 9% of the banks were eroding. The areas with eroding banks had 0-25% or 26-50% bank cover. Lack of vegetation on the banks could be contributing to the bank erosion. Units with no erosion had 51-75% or 76-100% bank cover. The vegetative cover in these units appeared to be protecting the banks from erosion. The erosion may be contributing to the embeddedness as four of the five units with erosion had over 35% embeddedness. It would be worthwhile to investigate the reasons the banks are eroding. There could be land management practices on this stream that are leading to instability of the banks. The stream may require some restoration work to reduce the erosion such as planting of riparian vegetation.

It would be good to know year-round stream flows and temperatures in this creek and the size and type of riparian vegetation that predominates the area. An aquatic invertebrate survey is recommended to determine the species of insects and their abundances in the stream. It would also be worthwhile to survey the fish population by snorkeling, electro-fishing, or by rod and reel sampling.

Wrap Up

Stimulate discussion with the following questions: What is the significance of the stream size? What are the importance of pools, riffles, and glides for providing fish cover, food production, and for different size classes of fish? What types of activities do the different substrate sizes tend to provide for spawning, fish hiding, insect production, pool formation? What does the embeddedness mean for spawning, insect production, and fish hiding? What function does woody debris provide? What is the importance of cover? What does the quantity of bank erosion say about the stream s health? What does the amount of bank cover say? Thinking about other stations at *Kids in the Creek*, what other information would you want to know about this stream?

Assessment

Ask students to:

- ❑ Explain the components necessary for healthy stream habitat.
- ❑ List the components that may be influenced by land management activities.
- ❑ Debate the many ways of looking at the evidence.
- ❑ Compare stream structure and gradient information of different creeks to the *Stream Habitat Survey Form* filled out on the field trip. What differences are noticeable? Rate the quality of each habitat and predict what fish and macroinvertebrates could live there.
- ❑ Discuss the answers relating to *Habitat Sense* from the *Kids in the Creek Scavenger Hunt.*

Extensions

- ❑ Enter the *Habitat Sense* student data into spreadsheets or onto the blank *Data Summary Form* (Student Section). Summarize and analyze it. Write a brief report with the following headings: introduction, study area, methods, results, and discussion.
- ❑ Take a survey of a local creek, using the blank *Stream Habitat Survey* or the *Stream Survey Data Forms* (similar to the Stonefly Creek form) to fill in the appropriate information; use the *Data Summary Form* to create a report. All three are in the Student Section.