Habitat Health

Grade Level

8 – 12

Idaho Content Standards

Science

8-9.ES.1.2.1; 8-9.ES.1.6.1; 8-9.ES.1.6.3; 8-9.ES.1.6.4; 8-9.ES.1.6.6; 8-9.ES.5.1.1

9-10.B.1.2.1; 9-10.B.1.6.1; 9-10.B.1.6.3; 9-10.B.1.6.4; 9-10.B.1.6.6; 9-10.B.3.2.5; 9-10.B.5.1.1

Mathematics

8.M.1.1.2; 8.M.1.1.8; 8.M.1.2.2; 8.M.1.2.5; 8.M.1.2.6; 8.M.1.2.7; 8.M.2.1.1; 8.M.5.2.1; 8.M.5.3.1;

9.M.1.1.2; 9.M.1.1.8; 9.M.5.2.1; 9.M.5.3.1

10.M.1.1.2; 10.M.1.1.8; 10.M.5.2.1; 10.M.5.3.1

Language Arts

8.LA.1.8.3; 8.LA.4.3.1

9.LA.4.3.1

Social Studies

6-9.GWH.2.5.2; 6-9.GWH.2.5.6

6-9.WHC.2.5.4

Time

Part One – 60 minutes

Part Two – 60 minutes

Skills

Gathering (observing, collecting, measuring, computing, recording); organizing (graphing, estimating, charting); analyzing (identifying components and relationships among components, discussing); interpreting (summarizing, identifying cause and effect, drawing conclusions); applying (decision making)

Vocabulary

Aquatic, benthic, channelization, dam, dissolved oxygen, ecosystem, environment, erosion, fish ladder, habitat, invertebrate, larva, macroinvertebrate, nymph, pH, pollution tolerance, pool, riffle, riparian zone, sediment, silt, substrate, turbidity

Summary

Students visit a local stream to visually (part one) and biologically (part two) assess the health of the stream. Based on the information they gather, students ultimately make a decision on why the habitat is or is not suitable for a trout release

Objectives

Students will…

- visit a local stream.
- identify physical characteristics of the stream and rate them based on what a healthy stream should look like.
- collect and identify macroinvertebrates.
- decide whether the habitat is suitable for trout.
- hypothesize why these types of assessments are important.

Background

Habitat is a place that provides a species with what it needs to survive: food, water, cover, and a place to raise young. In other words, habitat is home. For people, habitat might stretch from their house (where they have water, cover and a place to raise young) to the supermarket (where they buy food). All the places people go to get what they need to survive can be considered part of their habitat.

When it comes to finding a home, trout are some of the pickiest species of fish in the country. The ideal trout habitat is a fast-flowing stream with cold, clear, and clean water. The stream or

river should meander and offer a variety of depths over gravel and rocks, with both fast-moving and slower water. Diversity is very important in a habitat because it provides varying microhabitats (small, specialized habitats). For example, trout may seek deep pockets of water when water levels are low. Conversely, trout may seek riffles when temperatures are warm and dissolved oxygen levels decrease.

One way biologists look at the health of a stream is by conducting a visual survey. This involves looking at sections of the stream that are representative of different conditions. The class will conduct a visual survey of a stream or creek to assess if it is a suitable habitat for rainbow trout. To assess the stream, students must be familiar with the various parts of a stream. So what makes up a healthy stream habitat?

Water quality is a critical element of a stream's health. Trout need cool, clean, oxygen-rich water. The optimal temperature depends on species but generally trout prefer water that is around 50 to 60 degrees Fahrenheit. As water temperatures rise dissolved oxygen levels decrease. Warm water may cause eggs to hatch before the spring food supply is available. Additionally, as water temperatures rise, the amount of oxygen in the water decreases. Dissolved oxygen is the amount of oxygen mixed within the water and can be measured with most water quality kits. Trout need water that is rich in oxygen. Water becomes more oxygenated as it bubbles over rocks and boulders, and it is able to hold oxygen better at lower temperatures. pH stands for power of hydrogen and is a measure of the acidity or alkalinity of a solution. Solutions with a pH under 7 are considered acidic and those with a pH over 7 are considered basic. If the pH of the water varies out of the 6.5 - 8.5 range, it can affect the internal muscles and organs of the fish. Finally, trout need water that is free of pollution. Heavy metals and organic contaminants, found in storm water runoff, sewage and industrial wastewater, are harmful to trout. While nitrogen and phosphorus are important nutrients when present in low concentrations, high levels can cause excess algal growth. This becomes a problem when the algae die and the decomposition process depletes the dissolved oxygen in the water.

The **riparian zone** is the transitional area between a body of water and the surrounding lands. In other words, it is the green zone between the edge of the stream and the land around it. A healthy riparian vegetation zone is one of the most important elements for a healthy stream ecosystem. Ideally, the land along the stream is covered with lush shrubs, plants and grasses, and a thick canopy of overhanging trees. The riparian zone offers many benefits to trout.

- Root systems protect banks from erosion, thereby limiting the amount of silt that can damage eggs in the stream.
- The vegetation also stabilizes water levels by alternately soaking up rainfall and releasing moisture.
- Thick summer foliage over the stream keeps the waters shaded and cool.
- Fallen trees in the stream provide habitat, trapping gravel to create perfect spawning sites. Additionally, slow-flowing pools are formed by these trees, providing rearing areas.
- Leaf litter provides food for many aquatic insects.
- In colder climates, streamside vegetation can keep the water slightly warmer for young fish.
- The plants and their roots reduce the amount of pollutants that reach the stream via surface runoff.

Riffles are portions of a stream that are shallow and fast. They often have bedrock, cobble stones, and sometimes boulders, which are essential elements for trout survival. Riffles are necessary for many reasons.

- They break up the flow of water and allow oxygen to mix with it. This increases the dissolved oxygen in the stream and also cleanses trout eggs of silt and waste.
- They provide a habitat and breeding ground for the aquatic insects on which trout feed.

- The broken water surface helps to hide the trout from predators.
- They protect young trout with hiding spaces between boulders and within white-water areas.

Pools are areas of deeper and slower water that are generally formed around stream bends or obstructions such as logs, root wads, or boulders. **Pools** are equally as important as riffles.

- They allow fish to rest and provide feeding areas.
- They slow water so that the organic materials can settle, decompose, and produce carbon dioxide and other nutrients needed by plants

Biologists consider a one-to-one pool to riffle ratio as part of a healthy spawning stream

Scientists also can assess the health of a stream by conducting a biological survey. This involves the collection of insects and crustaceans that live in the stream. These organisms are referred to as **benthic macroinvertebrates** (or simply macros); benthic means bottom-dwelling, macro means large enough to see with the naked eye and invertebrate means they have no backbone. These animals live on rocks, logs, sediment, debris and aquatic plants during some period in their life. Macros include crustaceans such as crayfish, mollusks such as clams and snails, aquatic worms and the immature forms of aquatic insects such as stonefly and mayfly nymphs.

Macros are great indicators of water quality because...

- they differ in their sensitivity to stress in the waterway. Some are very sensitive to pollutants in the water. Others are less sensitive to pollution and can be found in almost any stream.
- they usually live in the same area of a stream for most of their lives. Sampling macros is a good indication of what the water quality has been for the past few months. If the water quality is generally poor, or if a polluting event occurred within the past several months, it will be reflected in the macroinvertebrate population.
- they are easily collected in many streams and rivers and do not require any expensive equipment.

Macroinvertebrates are generally broken up into three categories: pollution intolerant, moderately pollution tolerant and pollution tolerant. Depending upon the type and number of macros found, the water quality can be rated as excellent, good, fair or poor. A stream with excellent water quality should support a diversity of invertebrates from all three pollution tolerance groups.

Advance Preparation

Check with your administration about any special rules or precautions for participants

on a creek-side field trip. Whenever possible, schedule field trips away from the rainy season, when flows may be flashy. If you plan to incorporate releasing your trout with this stream assessment, make sure you have chosen a site that is approved by Idaho's Department of Fish and Game. When choosing a study site, first visit the site to determine if it is safe for the students. Check for walking conditions, potentially dangerous wildlife, poisonous plants, etc. Site should also be easily accessible. Be aware of the potential impact your class may have walking through the area. Please avoid sensitive areas and try to find a section with paths already created

— PART ONE —
VISUAL ASSESSMENT

Materials

- Copies of *Visual Survey* worksheet for each student (pages 131-133)
- Clipboards to write on
- Thermometer (to measure air and water)
- Water quality kit (to measure pH)
- First Aid kit

Procedure

Warm Up

Explain that students will be visually assessing a stream to determine if it is a suitable habitat for their trout. What do they think it means to visually assess or survey an area? Visually assessing a stream involves making a judgment on the quality of the stream by looking at certain characteristics of it. Hand out the *Visual Survey* worksheet and clipboards if available. Review all the characteristics they will assess, why they are important, and how the final score of the stream will be found.

Review safety issues concerning the trip to the stream.

1. Students should stay with their assigned groups.
2. Students should wear old athletic shoes or boots.
3. Students should not enter the stream without supervision. If they do enter the stream, make sure that participants know never to go deeper than their knees.
4. Students should not touch wildlife.
5. Students should come prepared and appropriately dressed for the weather.

The Activity

1. Remind students that the trip is for scientific purposes and they must think and act like a scientist would.
2. If you plan to release your trout on this day, begin acclimating the trout to the water temperature (see "Releasing Your Trout" on page 151).
3. Take the initial measurements together (temperature, pH, and any others you see fit) as a class.
   - To measure temperature, let a thermometer sit in the water for about 5 minutes.
   - To measure pH use a water quality test kit and follow the directions included.
   - Experiment with other tests if possible! Other parameters include: dissolved oxygen, turbidity, coliform, nitrates/nitrites.
4. Define the stream walk boundaries; make sure students understand that staying within the boundaries protects both them and the wildlife.
5. Break up students into groups. Depending on the grade level and time available, assign each group to one characteristic on the worksheet or have each group assess all of the characteristics.
6. Allow students time to walk around within the boundaries and observe the characteristics of the stream.

Wrap Up

1. Regroup and have everyone share their observations and how they came up with their assessment scores. If each group evaluated all the characteristics, find an average or agreed upon score for each characteristic. Determine the stream score together.
2. Would they want to release their trout here?
3. Do they think this is an accurate way of assessing a stream? What faults might there be in assessing a stream this way?

— PART TWO —

BIOLOGICAL ASSESSMENT

IN-CLASS OPTION: If you cannot visit a stream to collect macroinvertebrates, consider a Leaf Pack Study. This allows you to easily collect and bring macroinvertebrates back to the classroom. Information can be found at http://sftrc.cas.psu.edu/LessonPlans/Water/LeafPack.html.

Materials

- Waders
- Kick net(s)
- Copies of *Biological Survey* worksheet (page 134)

- Copies of *Macroinvertebrate Identification* sheet (page 135)
- Magnifying glasses
- 4 – 5 ice cube trays
- Pipettes or plastic spoons to handle macros
- First Aid kit

Procedure

Warm Up

Explain that students will be biologically assessing a stream to determine if it is a suitable habitat for their trout. How do you biologically survey a stream? This type of survey involves the collection of benthic macroinvertebrates - insects and crustaceans that live in the stream. Break down and explain the meaning of the name 'benthic macroinvertebrate.' Benthic means bottom-dwelling, macro means it can be seen by the naked eye, and invertebrate means without a backbone.

Review why biologists like to collect these organisms as indicators of water quality.

1. Macroinvertebrates differ in their sensitivity to stress in the waterway. Some are very sensitive to pollutants in the water.
2. Macroinvertebrates usually live in the same area of a stream for most of their lives and reflect the history of the water quality for a few months. If the water quality is generally poor, or if a polluting event occurred within the past several months, it will be reflected in the macroinvertebrate population.
3. Macroinvertebrates are an easy and cheap way to determine the water quality - almost anyone can do it and no expensive equipment is involved.

The Activity

1. Review safety concerns and rules (found in Part One's warm up).
2. Depending on the availability of waders and kick nets, either small groups can go one at a time to collect samples or groups can all go out on their own.
3. First you will want to first demonstrate how to collect the macroinvertebrates.
4. If possible select a shallow area (knee high) with gravel/cobble bottom and fairly fast current (make sure the current is not too fast to safely wade in).
5. To collect a sample with a kick net you will need one person to hold the net while the other stirs up the macros.
6. Have one person place the net bottom firmly against the streambed in the middle of the current, with the current flowing directly into the net. The person holding the net should be standing downstream from the net, facing upstream.
7. The other participant then disturbs the area directly upstream and in front of the net. To do this, pick up rocks and gently rub them to wash off any macroinvertebrates directly into the net. Once a rock is cleaned, put it aside and continue the process covering an area of about one meter wide by one meter long.
8. Next the stream bed in front of the net must be kicked up. Dig your feet into the ground there, stirring up the gravel or other substrate.
9. Finally, lift the net up and out of the water careful so as not to wash anything off.
10. While the net is being brought back to the bank, replace the rocks where you sampled.
11. Fill the ice cube trays with water and begin sorting through the macroinvertebrates found in the net. Sort by placing the same organisms together in the tray. Begin the process of identifying the species with the help of the Macroinvertebrate Identification sheet.
12. Once the net has been thoroughly combed over, go through the tray and count how many of each macroinvertebrate type you have found.
13. Record this information on the *Biological Survey* worksheet.
14. Allow others to repeat the procedure in different areas and record results.

Wrap Up

1. Review the data found.
   - Did different groups get different macroinvertebrate scores?
   - Did students find a wide variety of species found or were there only a few species found?
   - Do you think, based on the macroinvertebrate score, that this would be a suitable place for a trout release?
2. Does the score given in this survey match up with that from the visual survey?
3. Do they think this is an accurate way of assessing a stream? What faults might there be in assessing a stream this way? How does it compare to the visual survey?

Assessment

1. Students identify the two characteristics that scored the lowest on the visual survey. Have students write a paragraph explaining how the two characteristics could be improved, citing two suggestions for each characteristic.
2. Have students present data from the biological survey in graph-form, showing the numbers for each type of macroinvertebrate found. Supplement the graph with an explanation why the stream got the score it did – diversity in species found, pollution tolerance of those species, etc.
3. Students explain in a paragraph why they believe the visual or biological survey is the better of the two surveys when assessing stream health. Discuss factors such as accuracy, ease, safety, costs, and time taken to complete the survey

Extension

1. Investigate other ways scientists assess stream and habitat quality.
2. Investigate how adaptations of the benthic macroinvertebrates allow them to inhabit different niches in an aquatic ecosystem.

Related Reading

Come Back, Salmon by Molly Cone

The Magic School Bus Hops Home, A Book About Animal Habitats by Pat Relf

Salmon Stream by Carol Reed-Jones

Make Your Own Kick Net

Materials:

- 3.5' x 4' nylon mesh (1/16" mesh)
- 2 broom handles or wooden dowels
- Staple gun and staples
- Needle and thread, sewing machine, or duct tape

Directions

1. Hem the 4' sides of the mesh by folding over and sewing parallel to the edge. You could also just duct tape over the edge to prevent it from fraying.
2. Lay the netting out flat and lay the dowels out along the short sides.
3. Roll 6" of netting around each dowel and staple.

Student Worksheet 1 of 3 Name: _____

Visual Survey

Date _____

Stream Name _____

Outside Temperature _____ Weather Today _____

Weather Yesterday _____

For all of the characteristics below, pick out the description that best matches your stream. You may have to use your judgment and estimate for some characteristics. Next to that description is a score for the characteristic you are judging. Circle that score and write it on the last page under "Assessment Scores"

Water Temperature _____

< 13°C <55°F	10
13° – 24°C 55°- 75°F	7
>24°C >75°F	3

pH _____

6.0 – 7.5	10
5.5 – 6.0	7
<5.5 or >7.5	3

Riparian Zone

The riparian zone is the area right next to the stream that is covered with plants, including trees and shrubs. The riparian zone is important for several reasons. The plants stabilize the stream banks, preventing erosion. The plants also shade the water, keeping the water temperatures cooler. Additionally, plants drop leaves into the stream, providing food for aquatic insects. Mowed grass does not qualify as a healthy riparian zone.

The riparian zone is two times as wide as the stream.	10
The riparian zone is as wide as the stream.	8
The riparian zone is half as wide as the stream.	5
The riparian zone is one third as wide as the stream.	3
The riparian zone is less than one-third as wide as the stream.	1

Water clarity

Student Worksheet 2 of 3

Name: _____

Water clarity refers to how clear water is, or how well you can see through it. When water is clear, it means there are few things mixed in with it. Turbidity is the opposite of clarity and refers to how cloudy or murky the water is. Most often water becomes cloudy from sediments and soil, which can harm fish and other aquatic life. Water often looks turbid after a storm because of soil carried by runoff into the stream. Clarity of the water is an easy feature to assess. The deeper an object in the water can be seen, the lower the amount of turbidity. If the water is less than 3 feet deep, do not assess this characteristic.

Can see 3 – 6 feet deep into the water.	10
Can see 1.5 – 3 feet deep into the water.	7
Can see only 0.5 – 1.5 feet deep into the water.	3
Cannot see deeper than 0.5 feet.	1

Nutrients

High levels of nutrients in the water (especially phosphorus and nitrogen) can cause too much algae or too many aquatic plants to grow. The presence of some aquatic vegetation is normal in streams. Algae and plants provide habitat and food for all stream animals. However, too much aquatic vegetation is not good for most stream life. Too many plants can cause a decrease in dissolved oxygen in the water. As the amount of nutrients in the water increases, the water becomes greenish in color. Clear water and a diverse aquatic plant community are ideal for a healthy stream.

Clear water; little algae present; low quantities of aquatic vegetation	10
Fairly clear or slightly greenish water along the stream; moderate amounts of algae on stream substrate	7
Greenish water along the stream; overabundance of lush green macrophytes; abundant algal growth	3
Pea green, gray or brown water along the entire reach; dense stands of aquatic vegetation clog stream; thick algae mat in stream	1

Barriers to fish movement

Barriers that block the movement of fish or other aquatic organisms must be considered in the overall stream assessment. If the barriers are high enough, they can prevent the movement and migration of fish or deny access to important feeding grounds. Some barriers are natural (waterfalls or boulder dams) while some are developed by humans. Note the presence of barriers, their size and whether there are ways the fish can get around the barrier, such as a fish ladder.

No barriers to movement	10
Seasonal low water levels will prevent movement	7
Dams, culverts, or other diversions (less than one foot high) are within the reach	3
Dams, culverts or other diversions (greater than one foot high) are within the reach	1

In stream fish habitat

Student Worksheet 3 of 3

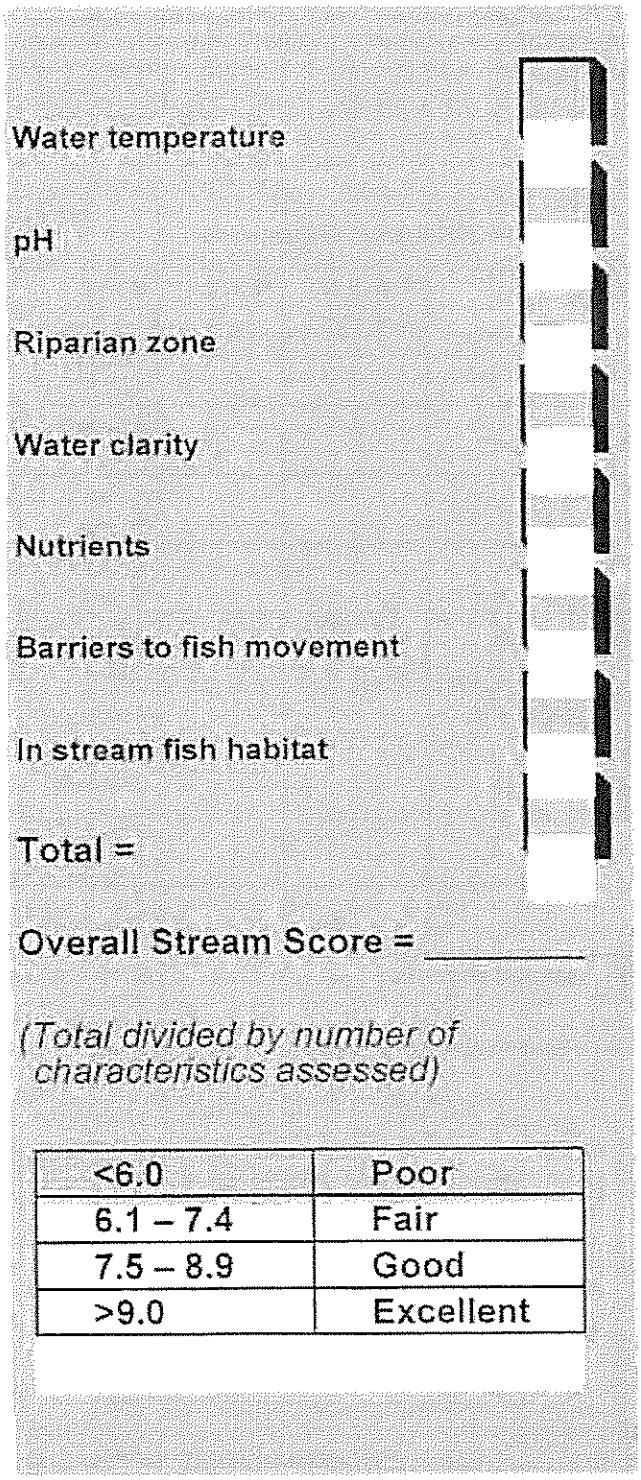
Name: _____

This measures the availability of habitat for fish. The health of a fish community is dependent on the variety and amount of habitat and cover. How many of the following cover types are present in this site?

Cover types:

- Logs/large woody debris – fallen trees or parts of trees that provide hiding places for fish
- Deep pools – areas with a smooth, undisturbed surface and generally slow current
- Overhanging vegetation - trees, shrubs, or other vegetation that hangs over the stream, providing shade and cover
- Boulders/cobbles – boulders are rounded stones more than 10 inches in diameter or large slabs more than 10 inches in length; cobbles are stones between 2.5 and 10 inches in diameter
- Undercut banks – eroded areas extending horizontally beneath the surface of the bank forming underwater pockets for the fish to hide in
- Thick roots – dense roots or rootlets (generally from trees) at or beneath the water surface
- Dense aquatic vegetation beds – beds of aquatic vegetation thick enough to provide fish cover
- Riffles – areas characterized by broken water surface
- Backwater pools – areas cut off from the main channel (or connected as a side channel) with no flow except in periods of high water

>7 cover types available	10
6 – 7 cover types available	8
4 – 5 cover types available	5
2 – 3 cover types available	3
None – 1 cover type available	1



<6.0	Poor
6.1 – 7.4	Fair
7.5 – 8.9	Good
>9.0	Excellent

Student Worksheet

Name: _____

Biological Survey

Mark a check next to the name of any macroinvertebrates you have found while sampling. Use the Macroinvertebrate Identification sheet for help identifying. Only macroinvertebrates listed below are counted towards the macroinvertebrate score. Write the total number of individuals (estimate if there are greater than 20 individuals) found in each organism type under the number column. Count the number of boxes checked under each organism type (intolerant, moderately tolerant, and tolerant) and mark that total at the bottom of the column. Determine the index values for each column and total the three index values to find the macroinvertebrate score.

Pollution Intolerant Organisms			Moderately Tolerant Organisms			Pollution Tolerant Organisms		
Name	Present (check)	Number	Name	Present (check)	Number	Name	Present (check)	Number
Stonefly larvae			Dragonfly nymph			Midge larvae		
Mayfly larvae			Damselfly nymph			Blackfly larvae		
Caddisfly larvae			Alderfly larvae			Lunged snails		
Dobsonfly (Hellgrammite)			Crane fly larvae			Leeches		
Water penny larvae			Scuds			Aquatic worms		
Riffle beetle adult			Sowbugs			Mosquito larvae		
Gilled snails			Crayfish			Other snails		
			Clam or mussel					
			True bugs					
No. of boxes checked _____ x 3 = _____ index value			No. of boxes checked _____ x 2 = _____ index value			No. of boxes checked_____ x 1 = _____ index value		

Column 1 index value + column 2 index value + column 3 index value = macroinvertebrate score

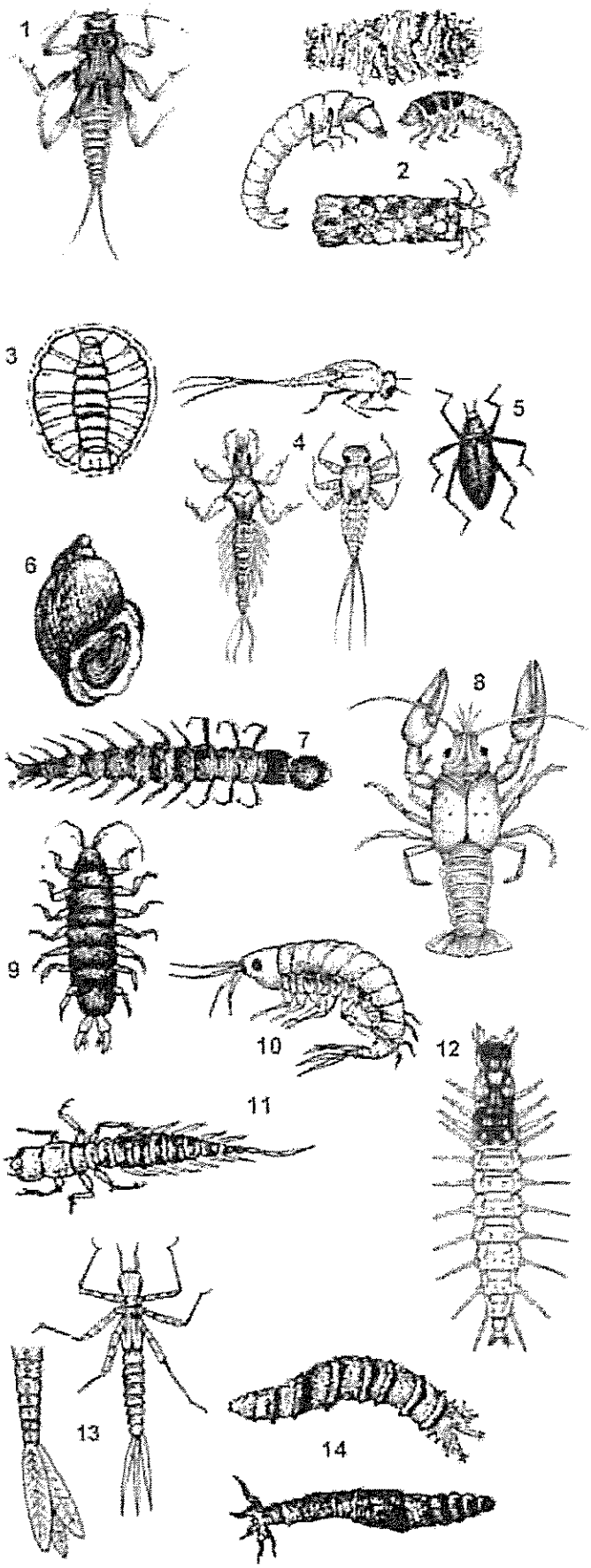
Macroinvertebrate score = _____

Excellent = >22

Good = 17 – 22

Fair = 11 – 16

Poor = <11



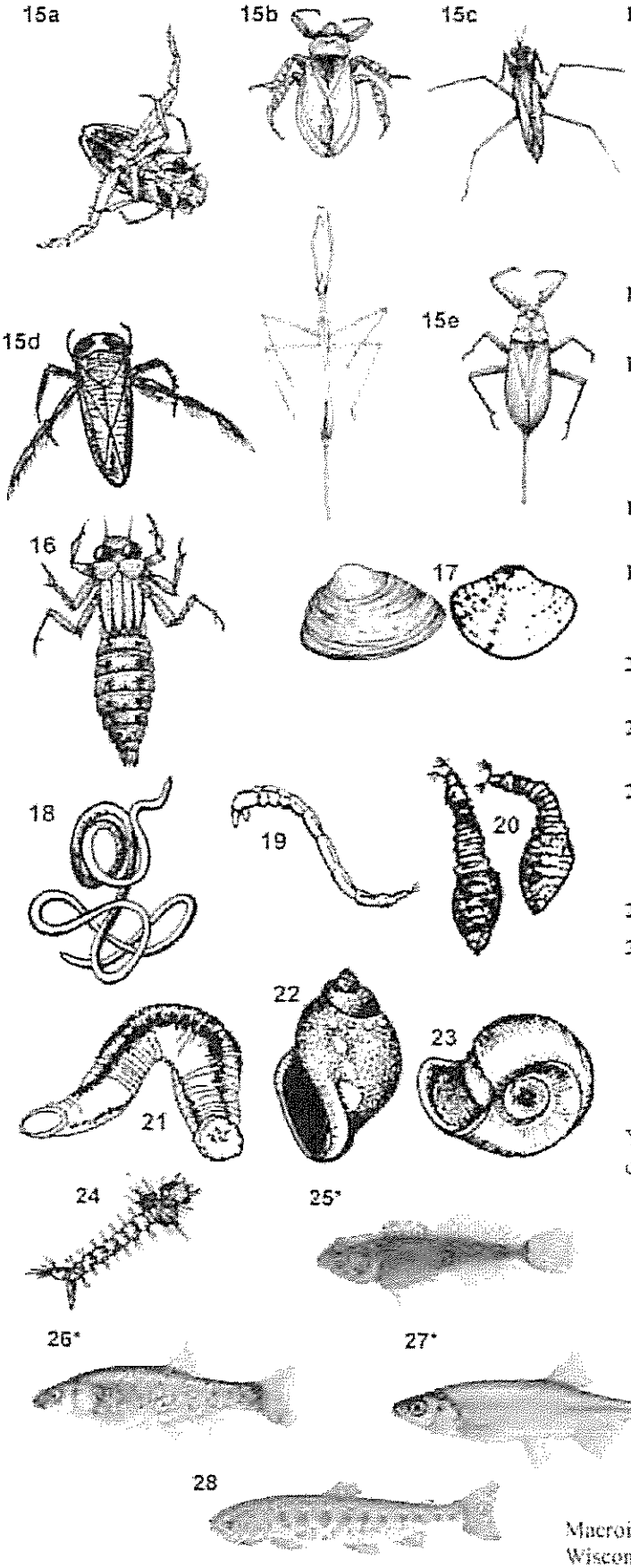
Macroinvertebrate Identification

POLLUTION INTOLERANT SPECIES

1. **Stonefly nymph:** 5—35 mm; 6 legs; antennae; two hair-like tails, no gills on abdomen
2. **Caddisfly larva:** 2—40 mm; often found in "houses" made of pebbles, wood, sticks, leaves, sand or shells; 6 legs; 2 hooks at back end; may have fluffy gill tufts on lower half; move with characteristic wiggling—back and forth then up and down
3. **Water Penny:** 3—5 mm; flat, saucer-shaped body; brown, black or tan colored
4. **Mayfly nymph:** 3—30 mm; 6 legs; usually 3 hair-like tails (some species have 2); feathery gills line sides of abdomen
5. **Riffle Beetle (adult):** 1—6 mm; "beetle" appearance; hardened, stiff body; black in color; oval body covered with tiny hairs
6. **Gilled Snail:** 2—70 mm; with point held up, opening is on your right and faces you; shell opening covered by thin plate (operculum)
7. **Dobsonfly (Hellgramite):** 10—90 mm; 6 legs; 7—8 pairs of lateral filaments on abdomen with paired gill tufts along underside; large pinching jaws; 2 tails and 2 pairs of hooks at back end

MODERATELY TOLERANT SPECIES

8. **Crayfish:** 3—15 cm; eyes on stalks; long antennae; 2 large claws; yellow, green, white, pink, or dark brown in color
9. **Sowbug:** 5—20 mm; gray oblong body wider than it is high; more than 6 legs; long antennae
10. **Scud:** 5—20 mm; shrimp-like, white to clear to pink in color; distinct black eyes; swims on side
11. **Alderfly larva:** 20—30 mm; looks like small hellgrammite but has 1 long, thin, branched tail at back end (no hooks); no gill tufts underneath
12. **Fishfly larva:** 10—90 mm; looks like small hellgrammite but often a lighter reddish-tan color and no gill tufts underneath
13. **Damselfly larva:** 15—30 mm; 6 legs; no gills on sides of abdomen; 3 paddle-shaped tails; large eyes
14. **Cranefly larva:** 10—100 mm; plump, caterpillar-like body; no true legs; milky, light brown, or greenish in color; finger-like appendages that extend from back end



15. **True Bugs:** 1—65 mm; head and eyes often well developed; 3 pairs of legs may be dissimilar; wings, when at rest, are held close over the back and overlap
    a. Backswimmer
    b. Giant water bug
    c. Water strider
    d. Water boatman
    e. Water scorpion (2 species)
16. **Dragonfly larva:** 20—50 mm; large eyes, 6 legs; wide, oval abdomen; no tail
17. **Clams:** two shells attached by a hinge

POLLUTION TOLERANT SPECIES

18. **Aquatic Worm:** 1—70 mm; long, thin body; can be very tiny; red, tan, black, or brown in color
19. **Midge fly larva:** 2—20 mm; hardened, dark head capsule; worm-like, segmented body; 2 tiny legs on each side
20. **Blackfly larva:** 3—12 mm; bowling pin-shaped body; single proleg directly under head; black head
21. **Leech:** 5—100 mm; brown, slimy body; usually much wider than aquatic worms; suction pad on end
22. **Lunged snail and pond snail:** 2—70 mm; with point held up and shell opening facing you, opening is on your left; no plate-like covering over shell opening
23. **Other snails:** no operculum; shell coils in one plane
24. **Mosquito larva:** 8—12 mm; well developed head; no legs; tube-like siphon at end of abdomen; will cling to surface of the water

FISH

You may find the following fish while sampling. They do not count towards the survey but are fun to identify!

25. Sculpin
26. Dace
27. Shiner
28. Juvenile trout

Macroinvertebrate illustrations provided by University of Wisconsin - Extension and the Wisconsin Department of Natural Resources.

* *Fish illustrations © Joseph Tomelleri*