Name _____

School/ Grade _____ Group _____

Activities Booklet

Bryant Watershed Project

Stream Days

Activities Booklet

The Stream Days Activities Booklet was written by Mary Ann Mutrux with assistance from Bryant Watershed Project staff and volunteers.

Illustrations by Mark S. Raithel, Missouri Department of Conservation, Missouri Stream Team curriculum. The booklet *Understanding Streams* by Bill Turner and the brochure *Life Within the Water* are available from the Missouri Department of Conservation.

The *SOS For America's Streams* film and related stream study materials were developed by the Save Our Streams Program of the Izaak Walton League of America.

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Stream Days Activities Booklet

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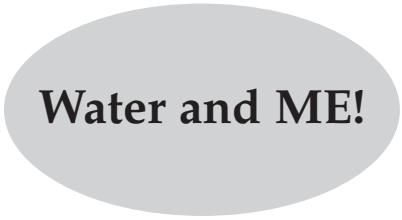
Water and ME!

Water is in you, around you and a part of your everyday life in many ways. Brainstorm all the ways that water plays a part of your life and then complete the water web.



Understanding Streams Pre-Reading Activity

Look on your Water and ME web. Do you have swimming, fishing or any other outdoor water activities that involve rivers or streams? If so, you are like millions of other people who enjoy all that streams and rivers have to offer. When you go to the Stream Day, you will get a real close look at streams. But, before adventuring out for a fun-filled day of activities, you need to have a general understanding of streams. Using the provided booklet called ***Understanding Streams*** by Bill Turner, follow the directions below.

Scope Out By Skimming

Before you read anything, it is a good idea to get a big picture about the reading. Flip through the ***Understanding Streams*** booklet and look at the pictures and headings. By taking time to scope out and skim you are helping prepare your mind for active reading.

In the box below write down key words that stand out in your mind after skimming through the booklet.

- When directed, compare your words in the box to that of a classmate.
- Circle all the words that your classmate and you both have.

Scan By Snaking

Before you read any section in this booklet take a peek at the contents by scanning the information. Using your index finger make a broad sweeping "S" pattern or snake down each column and look for familiar words. Finding familiar words before reading the information will help keep your mind on track. These words act like signposts for your mind to stay focused while you read.

The * symbol is your reminder to *scan by snaking* before reading each section.

Understanding Streams Reading Activity

Introduction **Scan by snaking*

Read the paragraphs on the front page of the booklet underneath the picture and then answer the following three questions.

1. What must we know to protect streams?

2. A clock consists of a face and several hands (hour, minute, second). A stream includes a watershed, floodplain, stream corridor and channel. What part of a stream (watershed, floodplain, stream corridor or stream channel) do you think might compare to the face of a clock? Explain your answer.

3. Explain how the parts of a clock and a stream are alike?

The Watershed **Scan by snaking*

Read page 2 about watersheds carefully and answer the following questions as you read.

1. What is a watershed and what does it include?

2. What will happen to a stream if the land in the stream's watershed is polluted somehow?

3. Complete the statement: "…every _____ is the product of its _____ and each of us _____ in a watershed."

4. What is the condition of a stream a reflection of?

5. List all the items that determine the runoff patterns of a stream.

6. How does runoff from timbered land or land with native grasses differ from cleared areas or cities?

7. Complete the chart below.

Wise Flood Plain Uses	
Urban Areas	**Rural Areas**

8. Star all the watershed land management practices below that help protect streams, and place an X by all the practices that can harm streams.

____Row cropping of erodible land

____ Building terraces

____Strip cropping

____Erosion from construction sites or strip-mining areas

____ Storm water control (Retention basins)

____ Careless handing of household or industrial chemicals

9. Thinking Question: Explain one way that any one of these poor land use practices could be changed to be a best management practice.

_____

_____

_____

The Floodplain **Scan by snaking*

Examine the picture at the bottom of page 3 and read the two sentences under the picture. Outline with your finger the location of the floodplain in the picture. Read page 3 and then answer the questions as you read.

1. Where is the floodplain located and what is its function?

2. What will result if floodplains do not function properly? Give an example.

Stream Checklist

Read through the lists for watershed and floodplain practices on pages 4 and 5. Skip the stream corridor and channel practices for now. Think about the streams and rivers that you have observed. Have you seen any evidence of any of these practices that can either harm or help streams? Record any observations you have in the provided spaces. If directed, work with a classmate and discuss your observations.

Wise Watershed Practices	Wise Floodplain Practices
Unwise Watershed Practices	Unwise Floodplain Practices

Stream Corridor *Scan by snaking

Read page 6 about stream corridors carefully and answer the following questions as you read.

1. Define and describe a stream corridor.

2. Complete the concept map below.

Wooded Stream Corridor Examples		
Controlling _____	Filtering _____	Producing Wood _____ and Fish/Wildlife _____

The Stream Channel *Scan by snaking

Read page 7 and 8 about the stream channels carefully and answer the following questions as you read.

1. List and describe the two parts of a stream channel.

2. Compare and contrast meanders and channels.

3. When major changes occur in a watershed, floodplain or stream corridor, what ways might a stream channel adjust?

4. Explain what straightening stream channels, pushing gravel against eroding banks, and dumping old cars all have in common?

5. Complete the chart below

Cause	Effects
Stream straightening	
	Sediment clogs fish gills and destroys spawning habitat
Car bodies and other junk	

Return to the Stream Checklist on pages 4 and 5. Read over the Stream Corridor Practices and Stream Channel Practices.

6. Explain why you or others should avoid using heavy equipment and all-terrain vehicles in a stream corridor or channel.

Conclusion - Making Connections

The author of the *Understanding Streams* pamphlet compared a stream channel, floodplain, corridor and watershed to the parts of a clock because all of these parts work together as a whole. Answer question A or B below. A drawing box is provided if you wish to sketch any comparisons.

A. Explain specifically how a stream and its surrounding area is like a clock.

B. Compare a stream channel, corridor, floodplain and watershed to another object in detail.

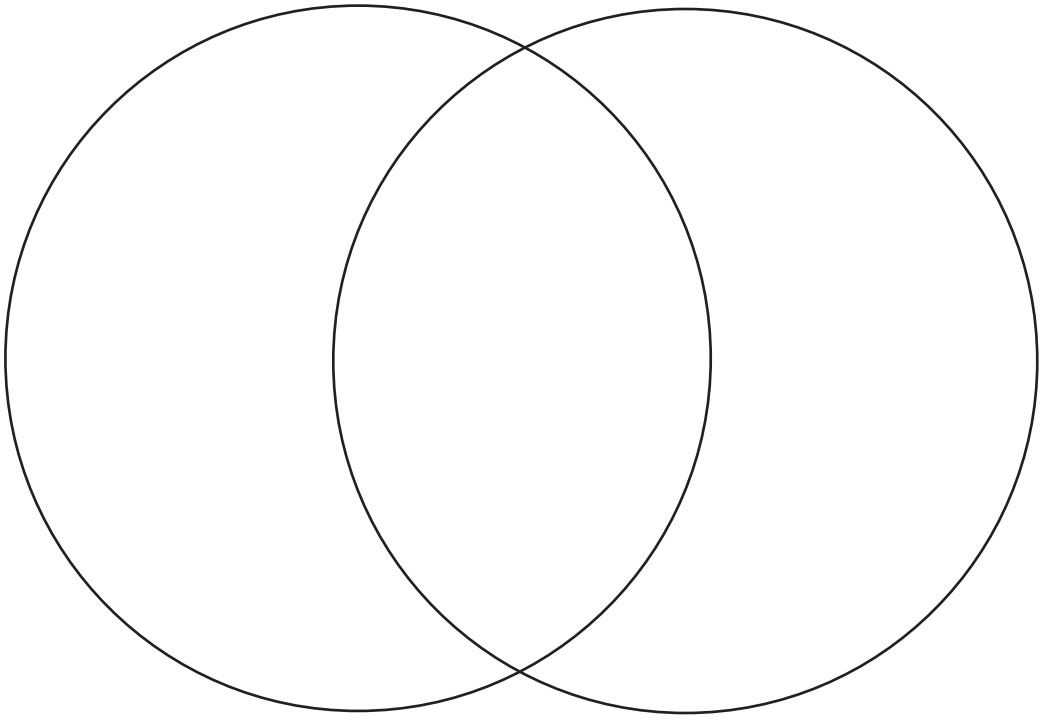
Biomonitoring Reading Activity

DIRECTIONS: Using the pre-reading skills from page 6 of this Stream Days booklet, become familiar with the provided brochure, ***Life Within the Water***. Look closely at page 4, which is titled **Biomonitoring**. Then read the page and answer the questions below as you read.

1. What are macroinvertebrates?

2. Why are macroinvertebrates used to monitor water quality?

3. Make a Venn diagram (two overlapping circles) and compare and contrast biomonitoring to chemical monitoring. Label the circles accordingly.



SOS Film

DIRECTIONS: Watch the ***SOS: Save Our Streams*** film about biomonitoring. Write down 7 to 10 facts from the film below. After the film compare your facts to other classmates. If you and a classmate recorded the same fact, initial each other's fact in the last column. However, a classmate can only initial your chart once, so keep comparing with other classmates in the provided time.

Film Fact	Initial

Optional Extension Activities

- Visit the Bryant Creek Watershed Atlas web site to learn more about these topics:

WATERSHEDS:

What is a Watershed?
http://www.watersheds.org/places/shed.htm
The Ozark Divide
http://www.watersheds.org/places/divide.htm
Bryant Watershed Introduction
http://www.watersheds.org/places/watershed.htm
Bryant Creek Tributaries
http://www.watersheds.org/places/tributaries.htm

STREAM CHANNEL:

Mapping the Meanders on Bryant Creek
http://www.watersheds.org/earth/meandering.htm
What is a Stream Table? How does it work?
http://www.watersheds.org/earth/streamtable.htm

KEEPING OUR STREAMS HEALTHY:

What is Nonpoint Source Pollution?
http://www.watersheds.org/earth/nps.htm
What You Can Do to Reduce Nonpoint Source Pollution
http://www.watersheds.org/earth/nps2.htm

BIOMONITORING AND MACROINVERTEBRATES

How do you do biomonitoring?
http://www.watersheds.org/nature/streamteam.htm
Macroinvertebrate Lunch instructional movie
http://www.watersheds.org/stream_movie.htm

STORIES ABOUT HODSGON MILL AND SPRING

http://www.watersheds.org/earth/springs.htm#hodgson
http://www.watersheds.org/places/restoration.htm
http://www.watersheds.org/places/millsites.htm#hodgson

- Make a diagram of a watershed, floodplain, stream corridor and channel that includes both wise and unwise land use practices in each area.
- Using index cards, write down the functions and characteristics of watersheds, floodplains, stream corridors and channels without using those specific terms. Match the cards in corresponding columns for each area.
- Create a chart of best management practices for all four of these areas.

ON THE BUS ACTIVITY

DIRECTIONS: On your trip to the Stream Day activities you will be traveling through a watershed. Examine the landscape and complete the box below with your observations.

Changes in elevation

Examples of natural land uses

Examples of human uses of land

STREAM TABLE ACTIVITY

CONNECTION QUESTION:

As you traveled to the creek today what did you notice about the changes in elevation? Explain why this change may have occurred.

List possible sources of water pollution that you observed on your trip to the Stream Day site today.

CONCEPTS:

- Every stream is the product of its watershed and each of us lives in a watershed.
- Stream erosion is a natural process that can be accelerated by human activities and negatively impact water quality and stream life.
- Humans impact streams with point and nonpoint water pollution.
- Sediment is Missouri's biggest nonpoint pollution problem.

IMPORTANT TERMS:

Watershed / Floodplain / Stream Corridor / Stream Channel
Sediment / Erosion / Deposition
Pool / Riffle
Point Source Pollution / Nonpoint Source Pollution

STREAM TABLE ACTIVITY RECORD SHEET (NEXT PAGE)

Complete as directed by the instructor

REFLECTION QUESTION:

Make a list of do's and don'ts that you can do around your home to protect water quality of streams.

Do	Don't

STREAM TABLE ACTIVITY NOTES / SKETCHES

DIRECTIONS: Complete as directed by the instructor.

STREAM CORRIDOR ACTIVITY

CONNECTION QUESTION:

What might the yard surrounding a building tell you about the condition inside the building?

CONCEPTS:

- A healthy wooded stream corridor provides three important functions: controls erosion, captures sediments, and provides animal and plant habitat.
- Humans impact the water quality of streams either negatively or positively depending on land management of the stream corridor.

IMPORTANT TERMS:

Stream Corridor
Erosion / Deposition / Sediment

STREAM CORRIDOR ACTIVITY RECORD SHEET (NEXT PAGE)

REFLECTION QUESTION:

Explain how you see a stream corridor differently now? What kinds of things will you look for when you visit a stream corridor next?

If time, sketch below any interesting item you found during the scavenger hunt activity.

STREAM CORRIDOR SCAVENGER HUNT

DIRECTIONS: Complete as directed by the instructor

Item	Number of Examples	Total # of Examples
Controlling Erosion		
Plants stabilizing soil		
Eroding soil		
Other		
Capturing Sediment and Plant Debris		
Deposits of sand		
Deposits of gravel		
Deposits of leaves, twigs, branches		
Other		
Provides Plant and Animal Habitat		
Types of Trees		
Types of Shrubs		
Types of Flowers		
Shaded Water		
Non Shaded Water		
Animal Homes		
Bird Songs		
Frog Calls		
Animal Tracks		
Animal Scat		
Animal Rubbings		
Animal Remains		
Mushrooms		
Insects		
Other		
Signs of Human Use		
Trash		
Roads / Trails		
Other		

MACROINVERTEBRATES ACTIVITY

CONNECTION QUESTION:

Make a list of everything that you know of that lives in the stream.

Circle those organisms in your list above that must get their oxygen from the water.

CONCEPTS:

- Water quality can be monitored by measuring the diversity of macroinvertebrates.
- The greater the diversity of macroinvertebrates the better the water quality of a stream.
- Unlike fish, macroinvertebrates in a riffle cannot escape water pollution.
- Excess sediment can bury and destroy macroinvertebrates and their habitats.

IMPORTANT TERMS:

Macroinvertebrates
Pool / Riffle
Dissolved Oxygen

MACROINVERTEBRATE ACTIVITY RECORD SHEETS (NEXT PAGE)

How to determine the water quality of a stream by collecting and identifying stream-bottom macroinvertebrates.

REFLECTION QUESTION:

Explain what you would tell someone who did not understand that water quality could be monitored with macroinvertebrates.

MACROINVERTEBRATE ACTIVITY: SAMPLE RECORD SHEET

DIRECTIONS: Complete as directed by the instructor

Stream _____ Site Location _____

Watershed _____

Collection date _____ Collectors _____

Weather conditions (last 3 days) _____

Average depth at site _____ Average width at site _____

Stream-water temperature F° _____ C° _____

Stream-flow rate ☐ High ☐ Normal ☐ Low

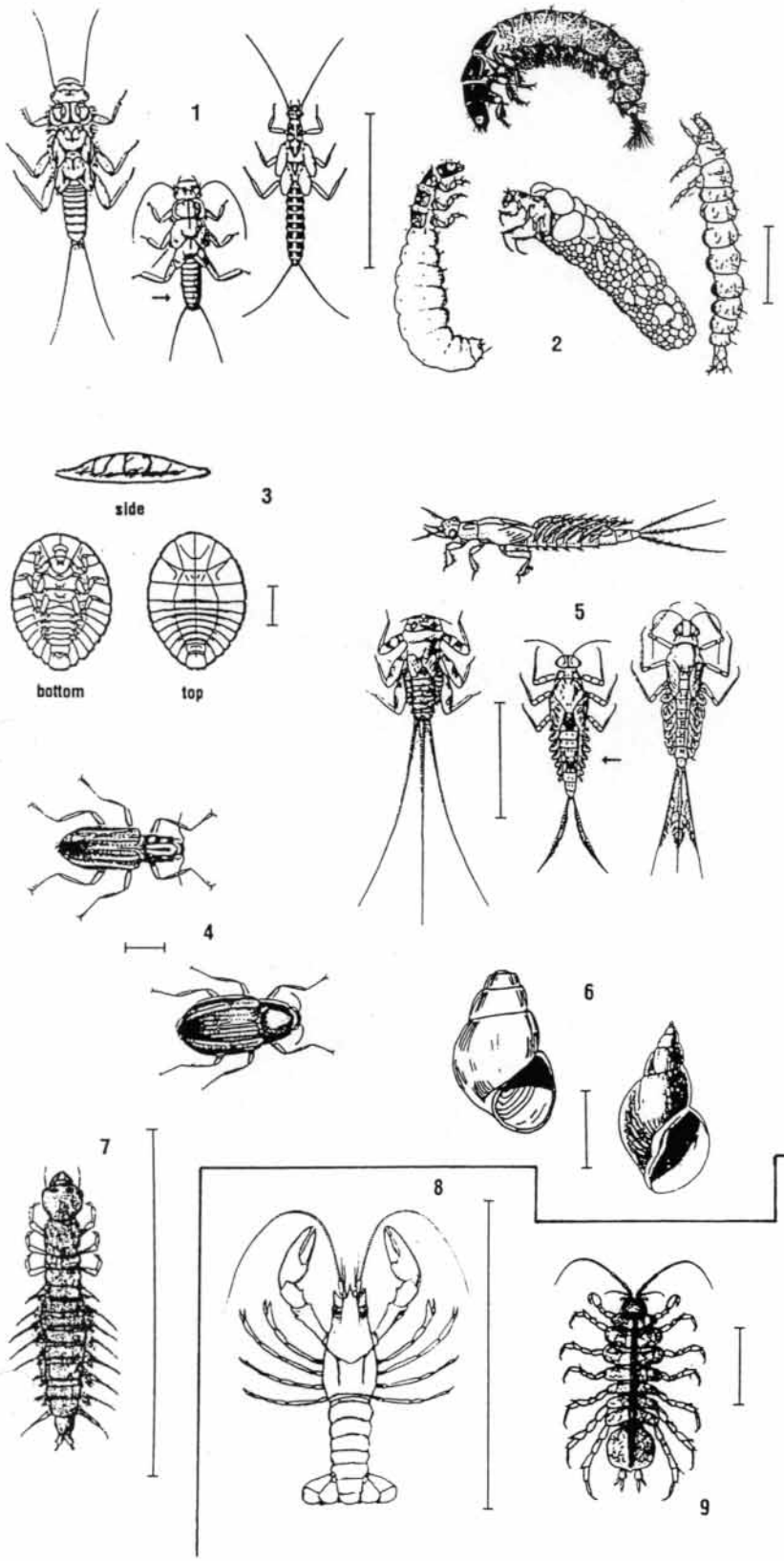
Stream appears ☐ Clear ☐ Cloudy ☐ Muddy

Macroinvertebrate Count

Sensitive	Somewhat Sensitive	Tolerant
☐ ____ caddisfly larvae ☐ ____ hellgramite ☐ ____ mayfly larvae ☐ ____ gilled snails ☐ ____ riffle beetle adult ☐ ____ stonefly larvae ☐ ____ water penny larvae	☐ ____ beetle larvae ☐ ____ clams ☐ ____ crane fly larvae ☐ ____ crayfish ☐ ____ damselfly larvae ☐ ____ dragonfly larvae ☐ ____ scuds ☐ ____ sowbugs ☐ ____ fishfly larvae ☐ ____ alderfly larvae	☐ ____ aquatic worms ☐ ____ blackfly larvae ☐ ____ leeches ☐ ____ midge larvae
boxes checked x 3 = _____ index value	boxes checked x 2 = _____ index value	boxes checked x 1 = _____ index value

WATER QUALITY RATING ☐ Excellent (>22) ☐ Fair (11-16)

Total Index Value = _____ ☐ Good (17-22) ☐ Poor (<11)



Stream Insects & Crustaceans

GROUP ONE TAXA

Pollution sensitive organisms found in good quality water.

1 *Stonefly: Order Plecoptera.* 1/2" - 1 1/2", 6 legs. with hooked tips, antennae, 2 hair-like tails. Smooth (no gills) on lower half of body. (See arrow.)

2 *Caddisfly: Order Trichoptera.* Up to 1", 6 hooked legs on upper third of body, 2 hooks at back end. May be in a stick, rock or leaf case with its head sticking out. May have fluffy gill tufts on lower half.

3 *Water Penny: Order Coleoptera.* 1/4", flat saucer-shaped body with a raised bump on one side and 6 tiny legs on the other side. Immature beetle.

4 *Riffle Beetle: Order Coleoptera.* 1/4", oval body covered with tiny hairs, 6 legs, antennae. Walks slowly underwater. Does not swim on surface.

5 *Mayfly: Order Ephemeroptera.* 1/4" - 1", brown, moving, plate-like or feathery gills on sides of lower body (see arrow), 6 large hooked legs, antennae, 2 or 3 long, hair-like tails. Tails may be webbed together.

6 *Gilled Snail: Class Gastropoda.* Shell opening covered by thin plate called operculum. Shell usually opens on right.

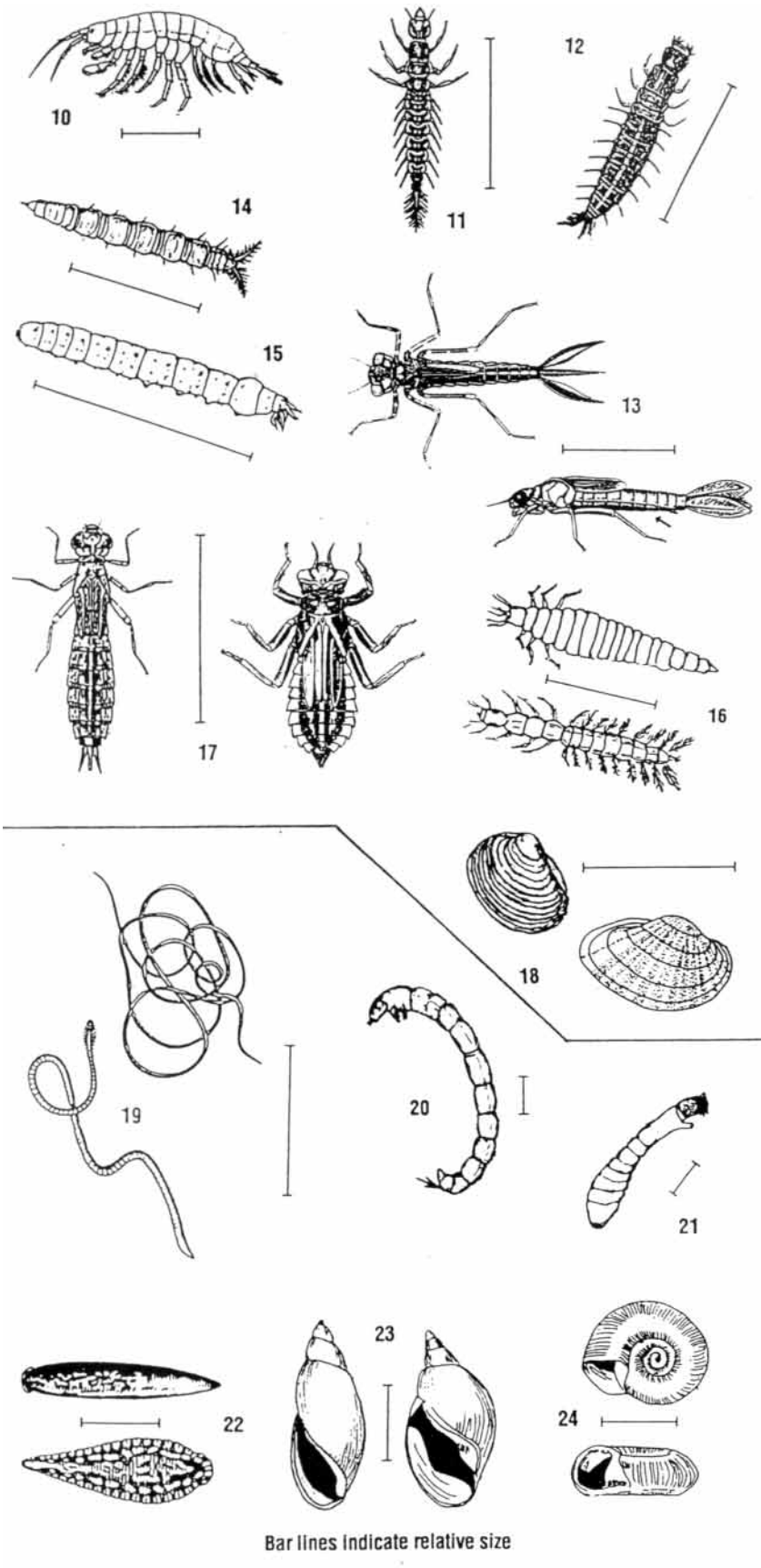
7 *Dobsonfly (Hellgrammite): Family Corydalidae.* 3/4" - 4", dark-colored, 6 legs, large pinching jaws, eight pairs feelers on lower half of body with paired cotton-like gill tufts along underside, short antennae, 2 tails and 2 pairs of hooks at back end.

GROUP TWO TAXA

Somewhat pollution tolerant organisms can be in good or fair quality water.

8 *Crayfish: Order Decapoda.* Up to 6", 2 large claws, 8 legs, resembles small lobster.

9 *Sowbug: Order Isopoda.* 1/4" - 3/4", gray oblong body wider than it is high, more than 6 legs, long antennae.



Bar lines indicate relative size

GROUP TWO TAXA continued

10 *Scud: Order Amphipoda.* 1/4", white to grey, body higher than it is wide, swims sideways, more than 6 legs, resembles small shrimp.

11 *Alderfly larva: Family Sialidae.* 1" long. Looks like small hellgrammite but has 1 long, thin, branched tail at back end (no hooks). No gill tufts underneath.

12 *Fishfly larva: Family Corydalidae.* Up to 1 1/2" long. Looks like small hellgrammite but often a lighter reddish-tan color, or with yellowish streaks. No gill tufts underneath.

13 *Damselfly: Suborder Zygoptera.* 1/2" - 1", large eyes, 6 thin hooked legs, 3 broad oar-shaped tails, positioned like a tripod. Smooth (no gills) on sides of lower half of body. (See arrow.)

14 *Watersnipe Fly Larva: Family Athericidae (Atherix).* 1/4" - 1", pale to green, tapered body, many caterpillar-like legs, conical head, feathery "horns" at back end.

15 *Crane Fly: Suborder Nematocera.* 1/3" -2", milky, green, or light brown, plump caterpillar-like segmented body, 4 finger-like lobes at back end.

16 *Beetle Larva: Order Coleoptera.* 1/4" 1", light-colored, 6 legs on upper half of body, feelers, antennae.

17 *Dragon Fly: Suborder Anisoptera.* 1/2" - 2" 6 hooked legs. Wide oval to round abdomen.

18 *Clam: Class Bivalvia.*

GROUP THREE TAXA

Pollution tolerant organisms can be in any quality of water.

19 *Aquatic Worm: Class Oligochaeta.* 1/4" - 2", can be very tiny; thin worm- like body.

20 *Midge Fly Larva: Suborder Nematocera.* Up to 1/4", dark head, worm-like segmented body, 2 tiny legs on each side.

21 *Blackfly Larva: Family Simulidae.* Up to 1/4", one end of body wider. Black head, suction pad on end.

22 *Leech: Order Hirudinea.* 1/4" - 2", brown, slimy body, ends with suction pads.

23 *Pouch Snail and Pond Snails: Class Gastropoda.* No operculum. Breathe air. Shell usually opens on left.

24 *Other snails: Class Gastropoda.* No operculum. Breathe air. Snail shell coils in one plane.

DISSOLVED OXYGEN ACTIVITY

CONNECTION QUESTION:

Explain what would happen to you if you could not breathe any oxygen?

CONCEPTS:

- Stream life is dependent on dissolved oxygen in the water.
- Water quality and water temperature determines the amount of dissolved oxygen in the water.
- Dissolved oxygen can be measured directly with a chemical test kit, or indirectly by collecting and identifying macroinvertebrates.
- Excessive sediment and the lack of shade can reduce dissolved oxygen levels.

IMPORTANT TERMS:

Dissolved Oxygen
Milligrams
Liter
Saturation

DISSOLVED OXYGEN ACTIVITY RECORD SHEET (NEXT PAGE)

Complete as directed by the instructor

REFLECTION QUESTION:

The amount of oxygen in our atmosphere is basically constant. Explain why the dissolved oxygen needed by organisms living in the water is not constant?

DISSOLVED OXYGEN ACTIVITY RECORD SHEET

DIRECTIONS: Complete as directed by the instructor.

Item	Measurement	Significance
Date / Time		
Recent Rainfall		
Weather Conditions		
Air Temperature		
Water Temperature		
Dissolved Oxygen in mg/L		
Dissolved Oxygen in % Saturation		
Other		

EXTENSION QUESTION:

How might the amount of dissolved oxygen vary over the course of a day?

BACK ON THE BUS ACTIVITY

DIRECTIONS: On your bus trip to the Stream Day activities you traveled through a watershed. Examine the landscape and complete the box below with your observations.

Back On the Bus

Examples of wise land use practices

Examples of unwise land use practices

Stream Day Assessment Opportunities

1. Pick one of the assessment opportunities listed below that is allowed by your teacher.
2. Decide whether your project is going to cover general information about a stream's components (watershed, floodplain, stream corridor, and channel) or specific information about any one area covered during the stream day (stream table information, macroinvertebrates, dissolved oxygen, or stream corridors).
3. Using your completed booklet and any other provided resources review the information you are going to cover. The Bryant Creek Watershed Atlas is a great resource (see booklet page 16).
4. Read over the Assessment Opportunities Scoring Guide. You will be graded accordingly.
5. Create a rough draft of your project on paper using your booklet and other provided resources. Be sure that your project meets all criteria in the scoring guide. Be sure to edit for grammar and spelling. If directed, get your rough draft approved by your teacher or other designated adult.
6. Create a final copy making corrections, additions and subtractions as designated.
7. Be prepared to share your project with the class if directed.

Power Point - Create a PowerPoint presentation with at least 10 slides. These slides should include a cover slide and conclusion slide. Information on each slide can be in simple statements or in bullet form. Pictures in the PowerPoint should reflect the content of the slides. You can use pictures from the Bryant Creek Watershed Atlas web site. Go to http://www.watersheds.org/streamdays/ for further directions.

Poem - Write a poem with at least 6 rhyming verses that give specific detail about your topic. Your final should be neatly printed in large dark print or typed. An appropriate picture should be on the poem. Use color to complement the presentation of the poem.

Children's Story Book - Write a children's storybook about your topic. Include a cover page with a title, picture and your name. Each page should have an at least 3 complete sentences with an appropriate picture. Your pictures can be drawn, taken from computer clip art, the Internet, or cut out of magazines or newspapers (get permission before cutting). Your final copy can be typed or hand written on construction or typing paper.

Concept Map - On large bulletin board paper or poster board, create a concept map of your topic. Make sure your concept map is the appropriate design for your topic (types include: webs, tree diagrams, Venn diagrams). The information in your concept map must be appropriately distributed to show the relationship between the topic and subtopics. Use color in your final copy to emphasis relationships and include pictures as well (see picture guidelines in the Children's Story Book project description.).

Three Dimensional Model - Create a three-dimensional model of your topic. Use at least 8 different types of materials. Include tags that label all significant parts that can be clearly seen and read.

Stream Day Assessment Opportunities
Scoring Guide

DIRECTIONS: Your project will be graded according to the criteria listed below.

Criteria	Quality 10 - 9 Points	Near Quality 8 Points	Incomplete Work 6 - 0 Points
Content	The information in the project is accurate, correct and complete.	The information in the project is basically accurate and correct, but needs more detail.	The information in the project is either inaccurate or very incomplete.
Project Description	The project is organized as described in the project description.	The project meets nearly all of the project descriptions.	The project does not meet major parts of the project description.
Organization	The project information is organized in a clear manner that connects all parts in an organized fashion.	The project information is organized in a fairly clear manner.	The project lacks clear organization.
Communication	The information in the project is clearly communicated in written form.	The information in the project is communicated clearly in written form in most of the project.	The written information is not communicated clearly for most of the project.
Presentation	The project is neatly presented without distracting spelling or grammar errors.	The project has a few minor distracting language errors.	The project contains distracting language errors.

Total Points: _____ Percentage: _____ Grade: _____
COMMENTS:

Glossary of Terms

Deposition - the accumulation of material dropped because of movement of the transporting agent (water or wind)

Dissolved Oxygen - oxygen dissolved in water but still in a gaseous state

Erosion - the wearing away of the land surface by running water, wind, ice or other geological agents

Flood Plain - contiguous level land situated on either side of a channel, which is subject to overflow flooding. A river's bottom land is a flood plain.

Liter - the metric unit for volume (one liter equals 1000ml)

Macroinvertebrates - Animals that have no backbone and are visible without magnification. Stream-bottom macroinvertebrates include such animals as crayfish, mussels, aquatic snails, aquatic worms, and the larvae of aquatic insects.

Milligram - metric measurement of mass (1000 mg equals one kilogram)

Nonpoint Source Pollution - any pollution whose sources cannot be pinpointed (also known as polluted runoff). Common sources include farmland, construction sites, streets and parking lots.

Point Source Pollution - a specific source of pollution, such as a discharge pipe or smokestack

Pool - That portion of a stream that is deep and slow moving

Riffle - That portion of a stream, usually rocky, that is shallow and fast flowing

Saturation - the point at which no more of a substance can be can absorbed

Sediment - Soil, sand or minerals washed from land into waterways.

Stream Channel - the part of a stream with flowing water

Stream Corridor - the banks of land (and the plant and animal communities) immediately adjacent to a stream, which usually experience regular flooding. Generally the corridor will be 100 - 200 feet wide. (also known as the riparian zone).

Watershed - the land area that drains toward a natural surface water system such as a stream, river, lake or wetland.