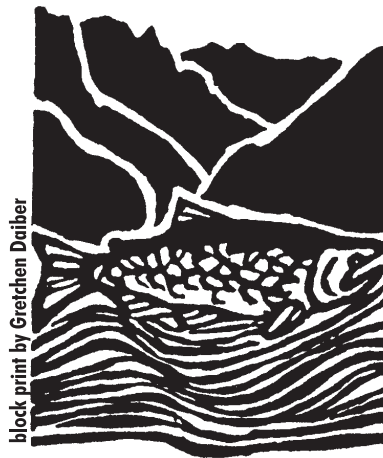




*Wenatchee River*  
**SALMON**  
**FESTIVAL**

**TEACHER PACKET**

"spawnsored" by



Na-sik-elt River  
 Discovery Program



Susan Thomas  
 Wenatchee National Forest



text by

Rachel Zylman-Little  
 Leavenworth National Fish Hatchery

supported by Salmon Festival Planning Team

“If I had influence with the good fairy who is supposed to preside over the christening of all children, I should ask that her gift to each child in the world be a sense of wonder so indestructible that it would last throughout life. If a child is to keep alive his inborn sense of wonder without any such gift from the fairies, he needs the companionship of at least one adult who can share it, rediscovering with him the joy, excitement and mystery of the world we live in.”

—Rachel Carson

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**C**elebrate the annual return of the summer chinook salmon to the Wenatchee River! Each October, the U.S. Fish & Wildlife Service - Leavenworth National Fish Hatchery and the U.S. Forest Service - Wenatchee National Forest co-host this exciting, family-style, hands-on educational event. This four-day festival celebration allows thousands of people of all ages to share in the "salmon experience." The Salmon Festival's primary focus is to provide high quality natural resource education. Additionally, it highlights the cultural significance of salmon, enhances outdoor recreation, and promotes interest and support for a broader environmental education program in North Central Washington.

This educational guide was developed to strengthen and build upon the student learning outcomes of each Salmon Festival activity. The guide begins with classroom interactive, hands-on lessons that easily integrate into a teacher's busy schedule. Through this pre-work students anticipate and prepare for their field trip. Staff redesigned many of the Salmon Festival events to build and expand upon knowledge and skills explored in this classroom pre-work. After students return to the classroom, they reinforce and demonstrate their understanding of particular Salmon Festival themes through follow-up lessons.

Salmon Festival themes and goals parallel themes and goals adopted by the Washington state Superintendent of Public Instruction. In 1990, the Washington State Legislature included environmental education in the Mandatory Areas of Study in public schools.

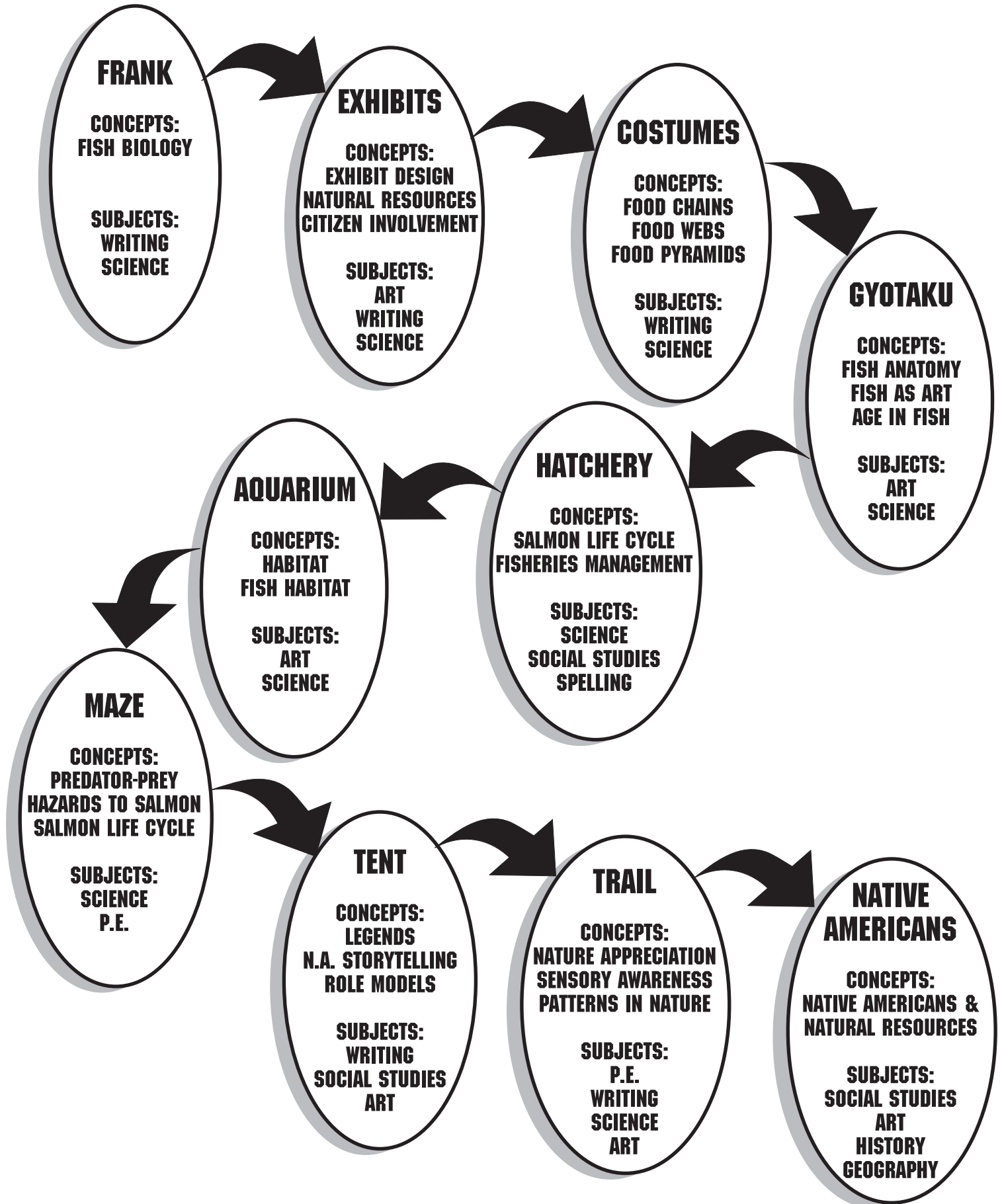
...instruction about conservation, natural resources and the environment shall be provided at all grade levels in an interdisciplinary manner with an emphasis on solving the problems of human adaptation to the environment (WAC 180-50 115).

Washington's environmental education mandate contains specific goals and objectives which are correlated in each lesson of this guide. This guide serves two purposes: it enhances the learning experience provided by the Salmon Festival, and it supports the state environmental education mandate.

Agencies and the community can work together in many ways to increase people's knowledge of Washington State's natural resources. The Salmon Festival is one spectacular example of these cooperative ventures. A comprehensive, year-round program is needed in North Central Washington, one that would encompass many agencies and organizations committed to educating youth about our natural resources. The idea of this broad educational effort gave birth to what is now called the Na-sik-elt River Discovery Program. Na-sik-elt's overall objective is to provide an interactive year-round educational approach towards the appreciation and conservation of our planet's resources.

The Salmon Festival and Na-sik-elt staff hope that this guide serves as a useful tool in your classroom and becomes part of a larger educational program, impressing students that the environment requires immediate and continued attention of everyone to conserve and protect our Earth.

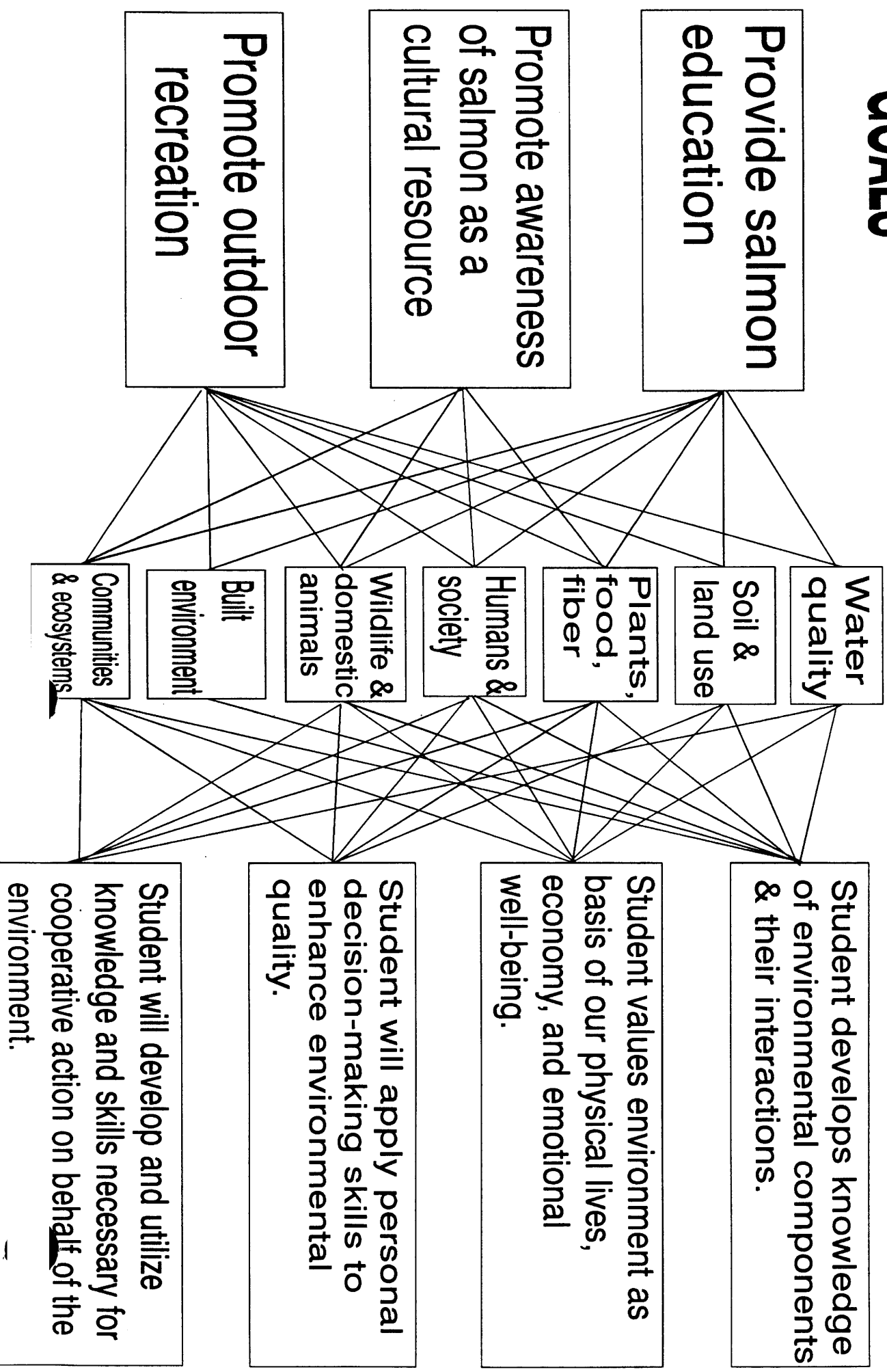
# PROGRAM PLAN



# SALMON FESTIVAL GOALS

## EE MANDATE THEMES

# EE MANDATE GOALS



“Many people go fishing all of their lives without knowing that it is not fish they are after.”

—Henry David Thoreau

# **FISHING FOR FRANK & FRANCES:**

## What You Always Wanted To Know About Fish

Your students will have the unique opportunity to talk with a fish, nose to snout! Take advantage of this special encounter with a fish (biologist) by preparing questions in advance.

**Environmental Education Objective:** Frank and Frances (representing fish of the Columbia drainage) will show how interest groups stimulate public awareness and effect change. (Goal IV, Objective B)

### CLASSROOM PRE-WORK:

#### **FOOD FOR THOUGHT**

Concept:

Fish biology and habitat

Objectives:

1. Students will generate questions to investigate during the Salmon Festival unit.
2. Students will answer their own questions through classroom lessons.

Skills:

questioning, investigation

Materials:

construction paper (various colors) crayons/pencils/pens butcher paper scissors staples or thumbtacks cut-out of large fish on bulletin board

Procedure:

#### **BEFORE CLASS**

1. Cut a large fish with a big mouth out of butcher paper. Decorate the fish however you like.
2. Staple the edges of the paper fish to a classroom bulletin board, leaving the body puffed and the mouth open.

#### **DURING CLASS**

1. Distribute scissors and colored paper.
2. Students should cut six fish out of paper, and write their names on each fish.
3. Collect three of the paper fish from each student. Keep them in a container in the classroom so that these paper fish are available to students throughout the unit.
4. Tell students to write something they want to know about fish or a question about fish on each paper fish. Explain that, at the Salmon Festival, students will be able to ask a fish some of the questions they write down.



5. Collect these fish and “feed” them to the bulletin board fish.
6. If students think of more questions to ask the fish, tell them that they can get their other paper fish back from you to write down the questions. You may want to “pre-screen” the additional questions.
7. The day before your Salmon Festival field trip, open up the large bulletin board fish and read the question from one fish.
8. Ask the student who wrote that question to answer it. If the student cannot answer the question but the material has been covered, ask other students to help.
9. Write the answer on the back side of the small paper fish. If the answer is not known or unclear, save the question to take to the Salmon Festival.
10. Continue this process, one question at a time, until all the question have been reviewed.
11. Bring up to six unanswered questions to the Salmon Festival so that Frank or Frances can answer student questions.

## **SALMON FESTIVAL ACTIVITY: FISHING FOR FRANK & FRANCES**

### Concept:

Fish biology and habitat

### Objective:

1. Students will answer their prepared questions by asking a “fish.”

### Skills:

investigation

### Materials:

**BRING TO THE SALMON FESTIVAL UP TO SIX PAPER FISH WITH STUDENT QUESTIONS FROM PRE-ACTIVITY STEP #11.**

### Procedure:

Salmon Festival Staff will guide your students on an imaginary fishing expedition. Students will cast a pole to try and catch fish. When a student catches Frank or Frances Fish, the student can ask the fish one of the prepared questions brought from class. The fish will answer the question before returning to the fishing pond, to be caught and questioned by another student.

1. Students ask Frank or Frances their question from small paper fish, developed in the classroom.
2. Write down Frank or Frances’ answer on the back of the paper fish.

## CLASSROOM FOLLOW-UP: **FISH TALES**

### Concept:

Fish biology and habitat

### Objective:

1. Students will teach each other the answers to their prepared questions.

### Skills:

public speaking reading

### Materials:

paper fish from pre-work and Salmon Festival activities

### Procedure:

1. Students read their question out aloud and then share responses from Frank or Frances.

### Extensions:

- A. Schools of Fish: Make a classroom display of the small fish, with their questions and answers. Perhaps the fish could be hung off of a fishing pole, strung on a chain or suspended in a shoebox aquarium.
- B. Slimy Sleuth: Students may want to pursue their questions further by researching topics in fish biology. See bibliography for potential "informants".

Questions your students may ask about fish: Fishley's Believe It or Not!

### **Do fish breathe?**

Yes, fish need oxygen just like humans. Humans get oxygen out of the air; fish get oxygen out of the water. Humans have lungs; fish have gills. Their gills are able to take out the oxygen that is dissolved in water.

### **Do fish sleep?**

Most fish rest quietly, which is similar to human sleep. Fish do not have eyelids, so they can't close their eyes. It's like when humans sleep, but don't shut their ears. Some fish rest on the bottom. Some fish, like wrasses, cover themselves up while resting by burying into sand. The parrotfish makes a small cocoon every night, kind of like a sleeping bag. Some fish rest during the night and eat during the day; other fish rest during the day and hunt for food at night.

**Do fish get cold?**

They can. Most fish swim slowly and eat less when they are cold. Some fish in the Arctic have special blood so that they don't freeze, even if the water freezes. Fish can also get too hot and die from heat. Certain kinds of fish are used to certain temperatures. A fish from Hawaii would be too cold in the Wenatchee River; a salmon from the Wenatchee would be too hot in Hawaii.

**Do fish drink water?**

Fish that live in salt water must drink large quantities of water. Fish that live in freshwater do not have to drink. Doesn't salt water make you thirsty?

**Do fish pee?**

Yes, most fish urinate to maintain the salt balance in their body.

**Do fish feel pain?**

There is no official, scientific "party line" answer for this one. Do you think being pulled by a metal hook through your lip would hurt? The nervous systems of some fish are so sensitive that they detect electromagnetic fields and water particle movement. Humans cannot. Fish will avoid things that injure them, so maybe they feel pain.

**Do fish think?**

Fish do have brains, although not as large or complex as humans. Many fishes can demonstrate a memory of colors and shapes. Some predatory fish seem to "plan" attacks by hiding, waiting, and then ambushing prey.

**Can fish see out of an aquarium?**

Yes, fish can see outside of the glass. Fish near the water surface can also see objects above the water. A fish's field of vision above the water is cone-shaped.

**Do fish see color?**

Humans don't know if all fish can see color, but many kinds of fish can. As an example, sticklebacks will attack another fish if its bottom fins are red, but it will not attack a second fish of the same shape but different color. Some fish, such as flounder, are able to change the color of their skin to match the color of the ocean floor. Tropical fish, as well as spawning salmon, carry beautiful capes of color. Some poisonous marine prey species are colored in brilliant oranges or red, as a warning to potential predators, including fish.

**What is the plural of "fish"? Is "fishes" a word?**

If you have one guppy, you have a fish. If you have two guppies, you have a "fish". If you have one guppy and one goldfish, you have "fishes". "Fish" can be singular or plural, as long as you mean only one kind of fish. "Fishes" is the plural when you are referring to two or more different kinds of fish.

**How many different kinds of fishes are there?**

Humans don't know yet. So far, people have discovered or described or named over 20,000 different species (kinds) of fishes. There are probably thousands more undiscovered species swimming around, in South American rain forests or the deep sea or the Arctic, etc. There are seven kinds of salmon; five kinds of salmon on our side of the Pacific. Other salmon are found on the other side of the Pacific and in Europe.

**How long can fish live out of water?**

This depends on the kind of fish. The African lungfish is adapted to survive drought periods. African lungfish can live for as long as six to seven years out of water. But other fish, such as the white cloud that lives in South America, will die after 15 seconds out of water.

“Never doubt that a handful of  
committed people can change the world.  
Indeed, it is the only thing that ever has.”

Margaret Mead

## **EXHIBITS: SHOW and TELL**

Your students will explore dozens of informative exhibits and interact with people involved in natural resource education and conservation. This community of exhibitors represents state, federal, county agencies and non-profit organizations.

### Environmental Education Objectives:

1. Exhibitors will demonstrate how cooperation among communities is essential to improve, maintain and enhance environmental quality. (Goal IV, Objective A)
2. Exhibitors will show how interest groups stimulate public awareness and effect change. (Goal IV, Objective B)

### CLASSROOM PRE-WORK: SHOW AND TELL

#### Concept:

Exhibit design and construction

#### Objective:

1. Students will create an exhibit for display at the Salmon Festival.

#### Skills:

creative expression  
technical communication

#### Materials:

various, depending on class project

#### Procedure:

1. Tell students that they have received a special invitation to display something at the Salmon Festival.
2. Help and encourage students to create an exhibit for display at the Salmon Festival. The exhibit may include a science experiment on water, projects on salmon or wildlife, wetland, riparian environments, habitats, pictures or collages of environmental education assignments, or any additional projects.

# **SALMON FESTIVAL ACTIVITY: EXHIBITS**

**Concept:**

Community involvement in natural resource conservation.

**Objective:**

1. Students will learn by interacting with Salmon Festival exhibitors.

**Skills:**

investigation, observation

**Materials:**

pencils

Student Activity Sheet #1, "Festival Fun" - one per student

**BRING THESE TO THE FESTIVAL FOR EACH STUDENT TO COMPLETE**

**Procedure:**

1. Through questions and observations, students complete scavenger hunt activity sheet during Salmon Festival.

## **CLASSROOM FOLLOW-UP ACTIVITY: EXHIBIT EXPRESSIONS**

**Concept:**

Participation in the natural resource community

**Objective:**

1. Students will demonstrate what they learned from interacting with Salmon Festival exhibitors.

**Skills:**

letter writing, reasoning

**Materials:**

paper, pencils

**Procedure:**

1. Write a letter to your favorite exhibitor. Include:
  - thank you for exhibiting
  - why you liked their exhibit best
  - one question
  - your return address

As a class, pick one letter to actually send, so that exhibitors don't get overwhelmed with fan mail!

2. Would you like to work for any of the exhibitors someday? Which group and why?
3. Draw a picture of your favorite display from Salmon Festival.

**EXHIBITS: FESTIVAL FUN**

**EXHIBITS & DISPLAYS:**

Answer the following questions while viewing the displays and exhibits.

1. List three groups that have displays at the Festival. What do they do to help the Earth?
  - A.
  - B.
  - C.
2. People who work for the U.S. Fish and Wildlife Service wear special clothes. What color are they?
3. Find the wetlands display from the Department of Ecology.  
Find the small clear box with blue water in it. What purpose does the grass have?
4. What do you do at the Audubon display? What did you learn?
5. Ask someone who works for the U.S. Forest Service to sign your worksheet.

**NATIVE AMERICANS**

1. What natural objects do you see in the Native American's costumes?
2. What instruments do they use during the ceremony?
3. Which craft did you like the best? Why?
4. List 2 things that are the same about your house and the teepee.
  - 1.
  - 2.
5. List 2 things that are different about your house and the teepee.
  - 1.
  - 2.
6. What are the names of the tribes here at the Salmon Festival?  
Where do they come from?





“... All things are connected like the blood which unites one family. All things are connected, whatever befalls the earth befalls the sons of the earth. Man did not weave the web of life; he is merely a strand in it. Whatever he does to the web, he does to himself. . .”

Chief Seattle

# SALMON FESTIVAL COSTUMES

## LIFE'S PARADE

Your students will be transformed through colorful costumes, depicting plants and animals in the salmon's community. Through interactive simulations, students will learn how we are all connected in the web of life. Students will study the concept of food chains (classroom pre-work), then build on that knowledge to understand food webs (Festival activity) and then expand to food pyramids (classroom follow-up).

**Environmental Education Objective:** These activities will help students to recognize that the earth's living and non-living components are interrelated. (Goal I, Objective A)

### CLASSROOM PRE-WORK: DON'T BREAK THE CHAIN

Concept:

Food chains

Objectives:

1. Students will demonstrate their understanding of food chains by placing elements of the chain in the correct order. (Part 1)
2. Students will learn about food webs by adding side links to their food chains. (Part II)

### PART 1: CHAIN GANG

Skills:

identifying systems in nature making models classifying

Materials:

scissors crayons glue Student Activity Sheet #2, "Don't Break the Chain"; one per student

Procedure:

1. Introduce and discuss food chain concept. Plants get energy from the sun. Green plants can make their own food by using energy from the sun. Animals get their food by eating plants or other animals. A simple order of a plant being eaten by an animal, which in turn is eaten by another animal, is called a food chain. An example of a food chain would be:



2. Distribute Student Activity Sheet #2 "Don't Break the Chain."
3. Students color pictures on Student Activity Sheet #2 "Don't Break the Chain."
4. Students cut out rectangular shapes from Student Activity Sheet #2 "Don't Break the Chain."

5. Students arrange links in order of consumption to form a basic food chain.
6. Teacher checks each student's arrangement for accuracy.  
Example: sun-leaves-insect-small fish-salmon-bear-human
7. Instruct students to glue the ends of the first rectangle together, to form a circle. Glue ends of next rectangle, thread through circle, and press ends to links in a paper chain. Each food chain item should be linked to others in the proper order.

**\*\*NOTE\*\***

If you stop here for the day, hang chains around the classroom so that students can build upon their food chains during the next activity.

## PART II: WEB OF LIFE

**Skills:**

identifying systems in nature making models classifying

**Materials:**

scissors crayons glue Student Activity Sheet #3 "Web of Life," one per student student food chains from Part I

**Procedure:**

1. Have students share their food chains and explain the relationship between links.
2. Distribute Student Activity Sheet #3 "Web of Life".
3. Students complete Student Activity Sheet #3 "Web of Life" by creating their own pictures for the links without pictures.
4. Students color and cut out rectangle shapes from Student Activity Sheet "Web of Life."
5. Tell students that they should add links from Student Activity Sheet "Web of Life" to their base food chain from the Part I. Instead of only adding links in straight line, though, students will add the new links to the sides or ends of any link, as long as the food relationship is appropriate.

**Example:**



6. Draw a classroom base chain from Student Activity Sheet #2 “Don’t Break the Chain” on the blackboard.
7. Ask students to share their newly formed chain and the relationships within it. After each student responds, have him/her add his/her new links to the classroom base chain.
8. After everyone has added their link to the classroom food chain, introduce the concept of food \_ webs by titling the blackboard drawing “food Web”. Discuss that in nature, many food chains link together or overlap, making a food web.

## SALMON FESTIVAL ACTIVITY: CAUGHT IN A WEB

Concept: Food Webs

Objective:

1. Students will demonstrate their understanding of the pre-work by creating a model food web.

Skills:

kinesthetic development, demonstrating interdependency, controlling variables

Procedure:

Salmon Festival Staff will expand on the concept of food webs. In costumes depicting plants and animals, your students will construct a food web, as introduced earlier in the classroom pre-work.

## CLASSROOM FOLLOW-UP ACTIVITY: NATURE’S PYRAMID

Concept:

Food pyramids

Objectives:

1. Students will recognize plants as the basis of living communities.
2. Students will learn about food pyramids through models of a living community.

Skills:

identifying systems in nature, classifying

Materials:

paper, pencils

Location:

This physical activity should be conducted in an open area, on a soft surface, such as a grassy school yard.

Food is the main source of energy for animals in the environment. The sun is the original source of this energy. Green plants utilize energy from the sun to make food. Because they make their own food, they are called producers. The animals eat either the plants or other animals to get their supply of energy. These animals, who cannot make their own food, are referred to as consumers. Many examples of this type of energy transfer can be seen. These relationships are called food chains or food webs. Scientists diagram food chains in the form of a pyramid to show the true relationship of energy transfer in the environment.

**Procedure:**

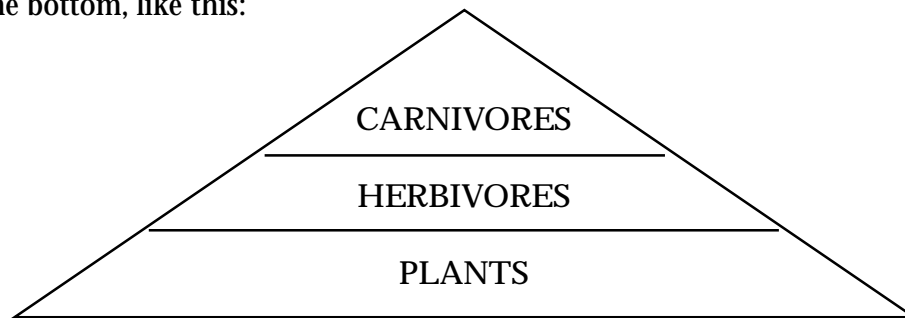
1. Students secretly write on a piece of paper the name of a plant or animal that lives locally.
2. Teacher asks: "From what source does the Earth get energy?" answer: sun "What form of life is first to use that energy?" answer: plants "How do other forms of life get that energy?" answer: by eating plants
3. Teacher announces that the class will be forming a food pyramid. The teacher then asks all "plants" to step forward.
4. Explain that students who wrote a plant on their paper will be on the bottom of the pyramid because all animals depend on them directly or indirectly. All "plants" kneel down on all fours, close together in line.
5. The remaining students share their animal and tell the group whether their animal is a plant-eater or a meat-eater.
6. All plant-eaters (herbivores) stand in a line behind the plants. All meat-eaters (carnivores) stand in line behind the herbivores.
7. The herbivores climb on top of the plants and the carnivores on top of the herbivores to form a pyramid.
8. In most cases, many more students chose a carnivore instead of a plant or herbivore. (It's perceived as a lot more fun to be a wolf than a lupine or mallard!) Thus, with so many tops and so few supporting plant levels, it will be impossible to build a stable pyramid.
9. Challenge the children to reconstruct their own pyramid into one that will easily support the whole class.
10. Demonstrate the importance of plants by pulling one of the students representing a plant out of the pyramid.

**Discussion:**

As demonstrated, the higher up in the food chain, the fewer the number of animals there are.

Extension A:

1. Return to the classroom and ask students to be seated.
2. Ask all students who were plants in the final pyramid to raise their hands.
3. Write this number low on the blackboard and label this number “Plants.”
4. Ask the students who were herbivores to raise their hands. Write this number on the blackboard above the “Plant” number. Label the new number “Herbivores.”
5. Ask the students who were carnivores to raise their hands. Write this number on the blackboard above the “Herbivore” number. Label this new number “Carnivores.”
6. Draw a triangle around the numbers and their labels, with the base of the triangle on the bottom, like this:



7. Explain to students that this drawing is called a **food pyramid**. This drawing shows who eats who, like a food chain, but it also includes the numbers of animals or plants in the community.

Extension B:

1. Make student copies of “There Once Was a Flower”.
2. Have the entire class sing this food chain song to the tune of “Old Woman Who Swallowed a Fly.”

## Student Activity Sheet #4 "THERE ONCE WAS A FLOWER"

There once was a flower that grew on the plain,  
Where the sun helped it grow, and so did the rain  
Links in a food chain.

There once was a bug who nibbled on flowers,  
Nibbled on flowers for hours and hours!  
The bug ate the flower that grew on the plain,  
Where the sun helped it grow, and so did the rain  
Links in a food chain.

There once was a bird who gobbled up bugs,  
And creepies and crawlies, and slimies and slugs.  
The bird ate the bug, who nibbled on flowers,  
Nibbled on flowers for hours and hours!  
The bug ate the flower that grew on the plain,  
Where the sun helped it grow, and so did the rain  
Links in a food chain.

There once was a snake who often grabbed birds,  
And swallowed them whole, or so I have heard.  
The snake ate the bird, who gobbled up bugs,  
And creepies and crawlies, and slimies and slugs.  
The bird ate the bug, who nibbled on flowers,  
Nibbled on flowers for hours and hours!

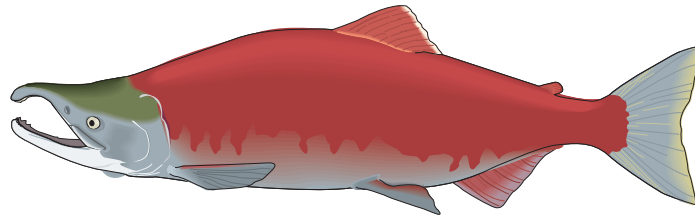
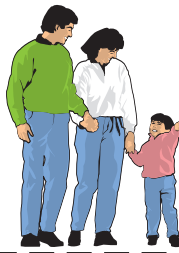
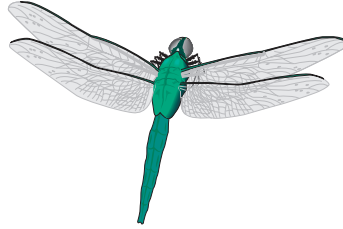
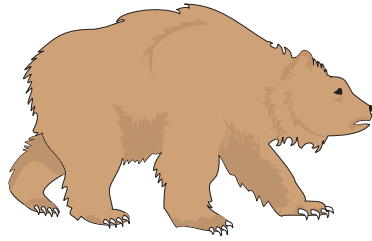
The bug ate the flower that grew on the plain,  
Where the sun helped it grow, and so did the rain  
Links in a food chain.

There once was a fox, and I'll make a bet:  
He'd eat anything he could possibly get.  
The fox ate the snake, who often grabbed birds,  
and swallowed them whole, or so I have heard.  
The snake ate the bird, who gobbled up bugs,  
And creepies and crawlies, and slimies and slugs.  
The bird ate the bug, who nibbled on flowers,  
Nibbled on flowers for hours and hours!  
the bug ate the flower that grows on the plain,  
Where the sun helped it grow, and so did the rain  
Links in a food chain.

The fox, he grew older and died one spring day,  
But he made the soil rich, when he rotted away.  
A new flower grew where he died on the plain.  
And the sun helped it grow, and so did the rain  
Links in a food chain.

*Author unknown*



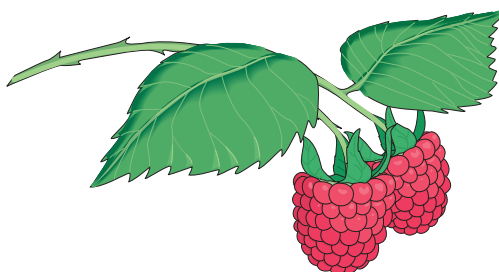
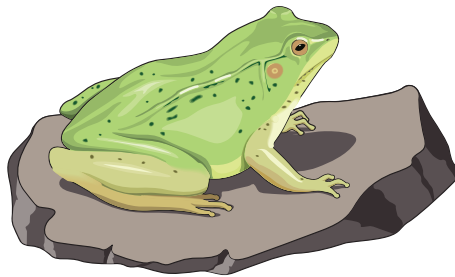


**DRAW THE  
LAST FOOD  
YOU ATE**



**DRAW YOUR  
FAVORITE  
ANIMAL**

**DRAW YOUR  
FAVORITE  
ANIMAL'S  
FOOD**



“One way to open your eyes to unnoticed beauty is to ask yourself, ‘What if I had never seen this before? What if I knew I would never see it again?’”

Rachel Carson

## GYOTAKU: ART OF JAPANESE FISH PRINTING

Share an exciting, cultural, artistic expression similar to the way Japanese fishermen record their day's catch. Your students will capture their Salmon Festival experience through intricate fish prints.

Environmental Education Objective: These activities will foster the concept that appreciation for nature's intricacy and beauty promotes creative expression. (Goal 11, Objective C)

### CLASSROOM PRE-WORK: BLUEPRINT OF A FISH

#### Concepts:

- External fish anatomy
- Functional anatomy

#### Objectives:

1. Students will be able to classify animals as fish or non-fish. (Part 1)
2. Students will name the external features of a fish. (Part II)
3. Students will describe functions and adaptations of the external features of a fish. (Part II)

## PART I: SOMETHING'S FISHY AROUND HERE

What is and isn't a fish?

Skills: classifying cooperative learning comparing and contrasting listing

#### Procedure:

1. Help your students generate a list on the blackboard of animals that live in the water. Accept a variety of answers, including birds, mammals, fish, amphibians, and all animals that live in rivers, lakes or the sea.
2. Explain that all of these animals are called aquatic, which means they live in or on the water for at least part of their lives.
3. Ask your students to review the list. Are any of the animals fish? Are all of the animals fish?

Examples:

**FISH**

stingray  
halibut  
sockeye  
shark  
bass  
steelhead  
tuna  
eel  
char  
skate

**NOT FISH**

tadpole  
frog  
lobster  
fly  
snail  
mayfly  
water moccasin  
manatee  
snake  
whale

**NOT FISH**

sea anemone  
turtle  
alligator  
lizard  
otter  
penguin  
dolphin  
periwinkle  
clams

4. Ask your students if they can describe what makes an animal a fish.
5. Explain that there is no one thing that makes an animal a fish. It takes five different things to define a fish because there are so many different kinds of fish and so many aquatic animals that are not fish.
6. Challenge the students to list the five things that define fish.
  - A. uses gills to breathe
  - B. cold-blooded
  - C. fins, instead of arms and legs
  - D. scales
  - E. aquatic
7. Review the list of fish characteristics. Ask the students to name another animal, besides fish, that has each of the five individual characteristics.

Example:

  - A. uses gills to breathe = some salamanders
  - B. cold-blooded = reptiles: snakes, lizards, or amphibians: frogs, salamanders
  - C. fins = whales, seals, dolphins
  - D. scales = reptiles have scales and birds have scales on their feet
  - E. aquatic = alligator, beaver, whales, penguins, etc
8. With this list of fish characteristics, review the list of aquatic animals on the blackboard, and ask students if each animal is a fish or not. Remind students that although some other animals share some fish characteristics, almost all fish have all five characteristics.

## PART II: SKETCH A SALMON

### Skills:

biological illustration

### Materials:

paper pencil

Teacher Reference A, "External Fish Anatomy"

### Procedure:

#### **\*\*BEFORE CLASS\*\***

Create a visual aid using "External Fish Anatomy." Suggestions: overhead transparency, blackboard drawing, bulletin board cut-out.

#### **\*\*DURING CLASS\*\***

1. Lead a discussion on how humans swim. -Do you know how to swim? -What makes you move through the water? -How do you turn while in the water? -Do you always swim in a straight line? -Is it easier to swim on the surface or underwater? -How do you stop swimming in water?

Is it hard to hold your breath underwater?

How do you switch from swimming on the surface to swimming underwater?

2. Lead a discussion on how fish swim, applying above questions to fish. Do fish swim better than people? Why?
3. Use Teacher Reference A, "External Fish Anatomy," to make a visual aid. Point to features of the salmon, and ask students if they know what each of those features are called. As a class, label each feature. Continue to next step, even if some features are left unlabeled.

#### **\*\*NOTE\*\***

Both scientific and functional names for each anatomical feature have been included. Teachers can decide to what extent they want to introduce and discuss the scientific terms. It might be surprising how many students are familiar with these words!

4. Ask students what each feature is and why it is important to the fish. After reviewing a feature, label it with its functional and/or scientific name.

## EXTERNAL ANATOMY VOCABULARY

This list explains how fish use the features labeled with functional names and what the corresponding scientific names are (in parenthesis).

eye = seeing predators, food and other salmon

nostril (nare) = smelling the water

sensing strip (lateral line) = feeling movement in the water

balance fin (dorsal fin) = to keep fish from tipping over; to communicate with or signal other salmon

mystery fin (adipose fin) = no humans know for sure

power fin (caudal fin) = to push fish forward through the water

rudder fin (anal fin) = to help the fish steer

braking fins (pelvic fins) = to help the fish stop

turning fins (pectoral fins) = to turn the fish from side to side or to keep the fish in one place

gill cover (operculum) = to protect the gills from getting hurt

5. Distribute clean paper, blank on both sides.

6. Ask students to draw a salmon and label the features of its external anatomy.

**\*\*NOTE\*\***

Keep student drawings for use after the Festival!

## **SALMON FESTIVAL ACTIVITY: GYOTAKU**

Concept:

Combining art and science

**\*\*NOTE\*\***

This popular festival activity will be limited to a specific number of classes, so reservations are required.

Objectives:

1. Students will learn how to make a fish rubbing. (Part I)
2. Students will use fish print to apply newly acquired anatomical knowledge. (Part 1)
3. Students will observe a fish scale under a microscope. (Part II)

### **PART I: RUB-A-CHUB**

Making a fish rubbing

Skills:

use of color and paint

Materials:

to be provided by Salmon Festival staff

**Procedure:**

The art of gyotaku (gyo=fish, taku=rubbing) originated in Japan during the early 1800s and was first practiced by fishermen to preserve a record of their catch. A gyotaku is made when watercolors are painted on the actual fish and then rice paper or fabric is applied and gently rubbed. The result: a mirror image, rich in detail and color (a perfect catch of the Salmon festival experience). Salmon Festival staff will guide each student in the creation of a fish print. Students may take their artwork home.

## **PART II: RING OUT THE NEW YEAR!**

### **Examining growth on fish scales**

**Skills:**

using a microscope

**Procedure:**

Students will observe fish scales under a microscope. Like rings on a tree, the scale's concentric circles indicate the age and growth of a fish.

### **CLASSROOM FOLLOW-UP ACTIVITY: BLUEPRINT OF A FISH-The inside story**

Concept: Internal fish anatomy and function

**Objectives:**

1. Students will learn and identify internal fish anatomy and function. (Part I)
2. Students will estimate the age of a fish by studying the rings on its scale. (Part II)

## **PART I: THE INSIDE STORY internal fish anatomy**

**Skills:**

comparing and contrasting biological illustration

**Materials:**

student drawings from Gyotaku Classroom Pre-work, Part II

pencils

visual aid from Teacher Reference Sheet B.: "Internal Anatomy"

**Procedure:**

**\*\*BEFORE CLASS\*\***

1. Create a visual aid from Teacher Reference Sheet B. "Internal Anatomy." This visual aid may be an overhead transparency, a worksheet, bulletin board, poster, etc. It will be used in step 4.



**\*\*DURING CLASS\*\***

1. Ask students to name parts inside their own bodies. Keep a list of these answers on the blackboard.
2. Review each body part on the list with students by asking “Do fish have this?”

Examples

Humans	Fish
lungs .....	no
heart .....	yes
blood .....	yes
skin .....	yes
stomach.....	yes
brain .....	yes
eyes .....	yes
ears .....	yes
nose .....	yes
teeth .....	yes
throat .....	yes
liver .....	yes
kidneys .....	yes
intestine .....	yes
backbone .....	yes
muscles .....	yes

3. Ask students if they can think of any internal body parts that fish have that people do not have.

Examples: gills, swim bladder

4. Using the visual aid for internal fish anatomy, ask students to help you label the organs. Be sure to include all the body parts from the list generated in steps 2 and 3.
5. Distribute student drawings from Gyotaku Classroom Pre-work, Part II.
6. Tell students to place their drawings face down on their desks.
7. Instruct students to trace the outline of their salmon from the other side of the paper. Students should have a drawing of external anatomy on one side of the paper, and only a silhouette on the other side.
8. Tell students to draw the salmon's organs inside the salmon silhouette.
9. Ask students to label the organs in their drawings.

**Extension:**

- A. Create a school of salmon in your classroom. Use string or fish line to hang the student drawings from the ceiling. As the drawings move in the air, the pictures will alternate between external and internal anatomy.

## **PART II: OLD FISH, NEW FISH, RED FISH, BLUE FISH**

### **Age Estimates in Fish**

**Skills:**

counting and interpreting data

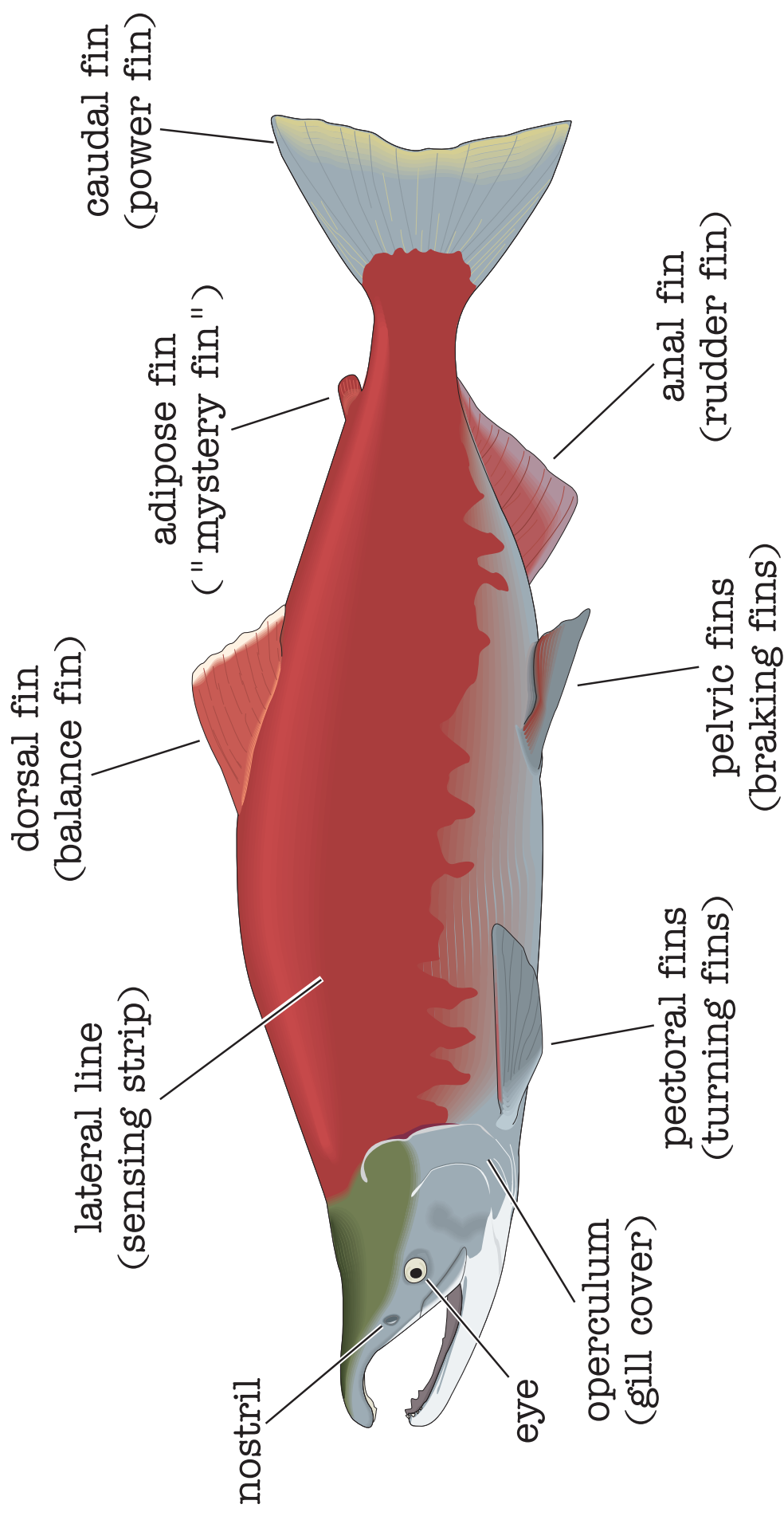
**Materials:**

Student Activity Sheet #5, "Notes on a Scale"-one per student

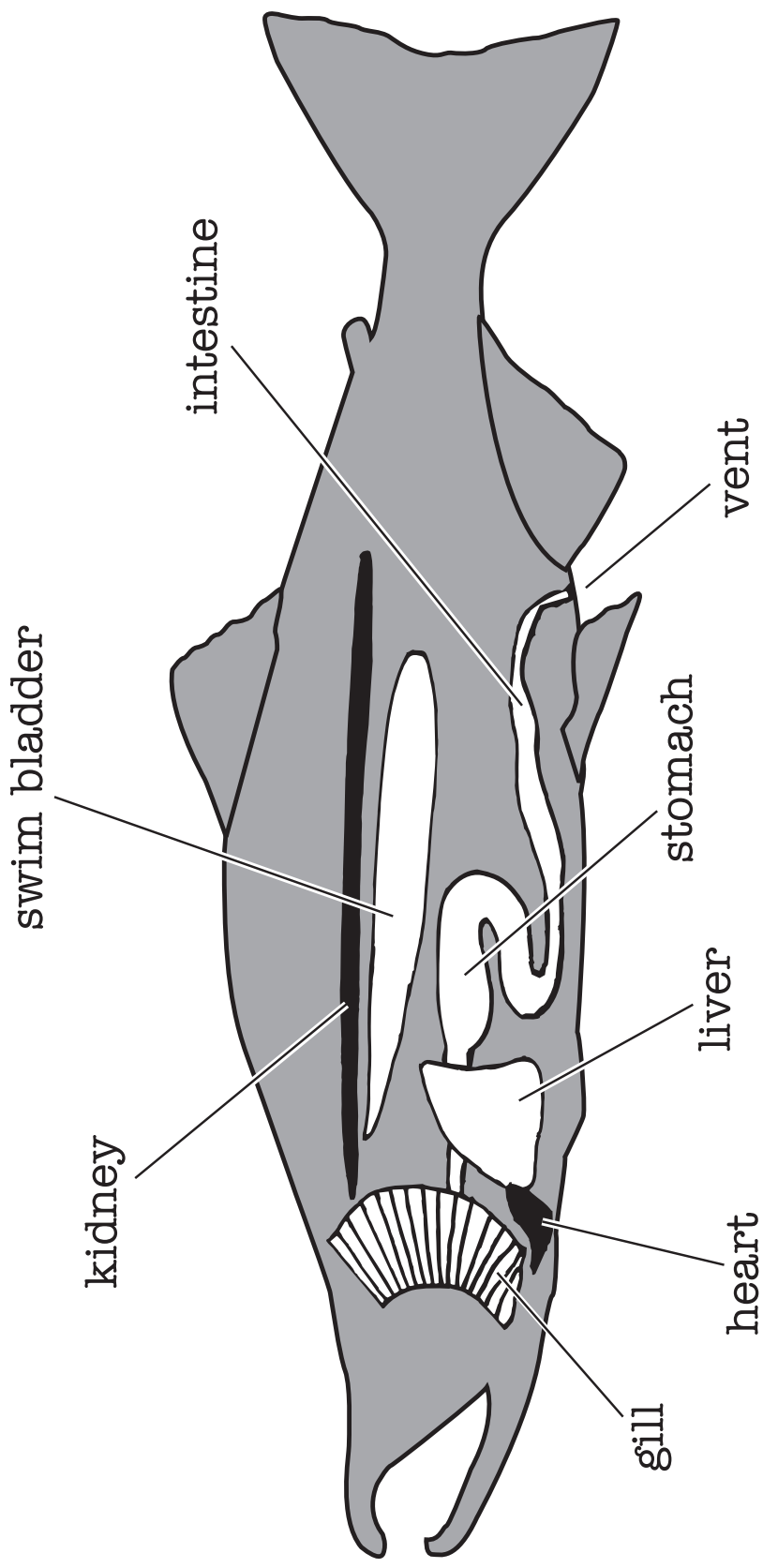
**Procedure:**

1. Ask a few students how old they are.
2. Ask other students if there is any way to tell how old students are without asking them.
3. Demonstrate that size is not a good indicator of age. For example, the tallest or largest student in your class is not necessarily the oldest student.
4. Ask your students if they know of any way to tell how old a fish is, since we can't ask a fish "How old are you?"
5. If your class did not participate in the Salmon Festival Gyotaku Activity during their field trip, explain that you will show them how to tell how old a fish is.
6. Remind students that one of the five characteristics of a fish is that it has scales.
7. Distribute Student Activity Sheet # 5, "Notes on a Scale."
8. Students complete Activity Sheet #5, "Notes on a Scale."

# External Fish Anatomy

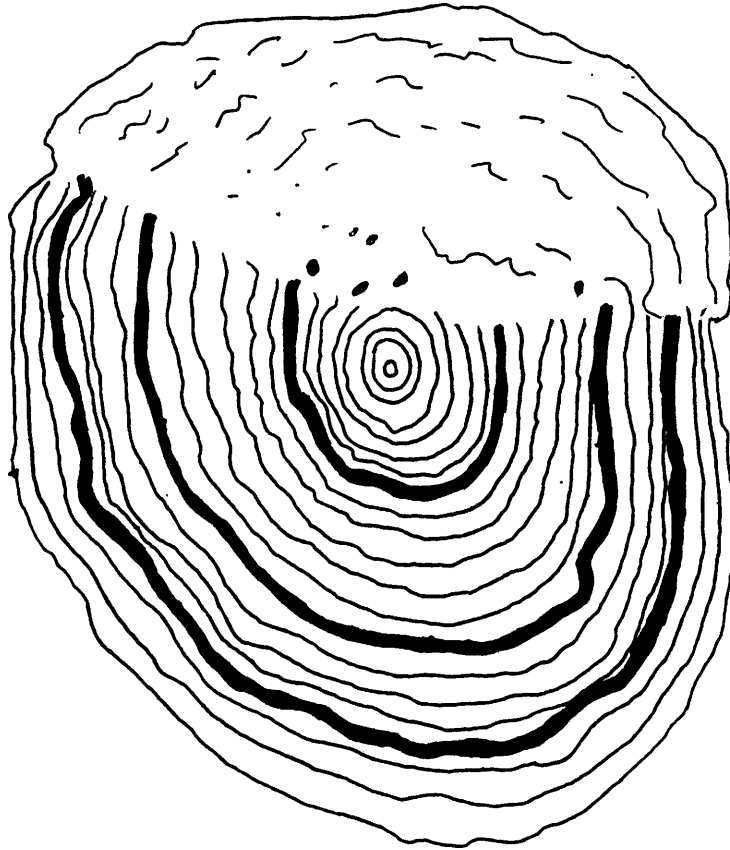


# Internal Fish Anatomy



## NOTES ON A SCALE

When a salmon grows, its scales grow, too. Salmon add rings to their scales to make them bigger. This is a picture of a salmon scale and its rings.



Salmon grow very slowly during winter.  
Salmon make thick rings when they grow slowly.  
How many thick winter rings are on this scale?

There is one winter during each year.

If you count the number of thick winter rings on a salmon scale,  
you are really counting how many years the salmon has lived.

How old is this salmon?

# HAPPY BIRTHDAY DEAR SALMON...

“Lateral lines are special fish-only sensory organs that alert the salmon to motion nearby. We humans lost our lateral lines when our ancestors left the ocean... but maybe not, thus explaining good vibes and bad vibes.”

Brad Matsen

## **HATCHERY TOUR: WHAT'S HATCHING?**

Your students will be invited behind the scenes of the Leavenworth National Fish Hatchery: peek at our new arrivals in the nursery, hold a salmon egg up to the light to see the fish inside, and watch the yearling salmon eat lunch.

### **Environmental Education Objectives:**

This activity will show that a viable economy is dependent upon responsible use of our natural resources. (Goal II, Objective B)

This activity will show how cooperation among communities is essential to improve, maintain and enhance environmental quality. (Goal IV, Objective A)

### **CLASSROOM PRE-WORK:**

#### **WHICH CAME FIRST, THE SALMON OR THE EGG?**

#### **Concept:**

Salmon life cycles

#### **Objectives:**

1. Students will understand the concept of life cycles.
2. Students will learn key vocabulary words describing the salmon life cycle.
3. Students will learn the salmon's life cycle.

#### **Skills:**

identifying cycles in nature making models of life cycles

#### **Materials:**

Teacher Reference Sheet C, "Guided Imagery"

Teacher Reference Sheet D, "The Completed Circle"

Student Activity Sheet #6, "Complete the Circle"-one per student

#### **Procedure:**

1. Introduce students to the concept of life cycles. Stress that life runs as a circle, because usually by the time an animal dies, it has already produced young.
2. Ask students to complete the first section of the student activity sheet #6, "Complete the Circle." Students will cut out pictures of the chicken life cycle stages and arrange them in correct order.
3. Lead a guided imagery activity for your students. See Teacher Reference Sheet "Guided Imagery" at the end of this lesson. Explain that students should close their eyes and imagine that the events in the story are happening to them.
4. After reading vocabulary words in the story, write them on the board.

5. Make posters or large flash cards that depict salmon life stages to help illustrate and explain vocabulary words. Be sure to explain the definitions of each vocabulary word on the blackboard. See Teacher Reference D “The Completed Circle.”
6. Have students complete the second section of student activity sheet #6 “Complete the Circle.” Students will need to provide the missing information in the salmon life cycle. The missing information may be in the form of vocabulary words or pictures.
7. Vocabulary study
  - A. Ask students to write a story from a salmon’s point of view, using five of the vocabulary words.
  - B. Have students draw pictures to illustrate some of the vocabulary words.
  - C. Instead of a “spelling bee”, have a “spelling sea”, where all of the words to be spelled relate to salmon and include vocabulary words.
  - D. Incorporate some of the vocabulary words into your weekly spelling lesson.
  - E. Act out each vocabulary word.

## Vocabulary Words

adult = the age of an animal or plant when it is able to reproduce

anadromous = fish that migrate from salt water to fresh water.

egg = first stage of the salmon life cycle

fertilization - the process of mixing eggs and sperm to make a new fish

fingerling = a young fish, about the size of a finger; a salmon less than one year old

fry = a young fish, from the age of first hatching to fingerling size

hatchery = a place for where people spawn fish and raise the young fish.

life cycle = the way that plants or animals are born, live, reproduce and die

migration = a trip made by animals to find food or to new habitat or other animals of their kind.

nest = nest dug in gravel by female salmon to put her eggs in. .

smolt = a stage in the salmon’s life when the salmon’s body changes to prepare it for migration and living in salt water.

spawn = laying eggs and fertilizing them (verb)

spawning (salmon) = word used to describe salmon that are ready to spawn

yolk sac = food supply for newly hatched fry.

### Extensions:

- A. Create a life cycle bulletin board displaying the different life stages of salmon. Use posters, magazine clippings or student drawings.
- B. Students can use graphics from the “Complete the Circle” activity to create salmon life cycle mobiles. Have students bring a clothes hanger from home. Students can hang their illustrations from the straight bottom portion of the hanger or mold the hanger into a circular shape.



## Teacher Reference Sheet C

### GUIDED IMAGERY: A SALMON'S LIFE

I will be reading a story about salmon. Try to imagine that the things in the story are happening to you... you become a salmon and see what the salmon sees, feel what the salmon feels, do what the salmon does. Get comfortable. Close your eyes.

It's dark. You hear water gushing above you. You are so tiny that when you curl up, you could fit inside a pea. You can feel cool, clear water seeping through your white eggshell and the water tastes sweet. Once in a while, the water rushes past your eggshell a little faster and rocks you gently back and forth. Rest.

One day, as you are wiggling inside your eggshell, your head pops through the shell! You're a fry, a tiny little salmon! You can see other shapes in the dim light... you are surrounded by gravel and your thousands of brother and sister salmon. They are just hatching too! Cool water slips and glides through your gills when you breathe. You get food from the big, soft, orange yolk sac attached to your belly.

You have used up all the food in your yolk sac... your body is growing bigger. Now you have strong fins. But you're hungry, and it's time to find something to eat. Wiggle and squeeze to move between the pieces of gravel and towards the light. Suddenly, you are above the gravel! It's very bright, and the water pushes you backwards.

You get pushed into a dark area, the water is shallow and you can rest. You like it here. Soon, you learn to swim out from your hiding spot, quickly grab a tiny bug floating by, and rush back to your hiding spot. It seems like you're always hungry; always eating, then hiding, eating, then hiding. As you get bigger, you become a fingerling, a salmon as big as a person's finger.

Many of your brothers and sisters are not so good at hiding. Once, a flash of blue and white feathers appears from the top of the water, with a long black beak. The kingfisher swims around underwater until it catches and eats many salmon fingerlings.

The days begin getting shorter; the water gets colder, and you don't feel like swimming around and playing too much. Eventually the water freezes during winter, but you don't mind. You just rest in your hiding spots mostly, and get something to eat once in awhile.

Slowly, the days get longer, the water becomes warm, and you start feeling like exploring again. It's fun to watch those bugs float towards you, and then feel them crunch in your mouth. But tiny bugs aren't enough to fill you up anymore. You like to eat other fish smaller than you. You wait behind a log, because you are too big for your old hiding places. You wait and a small fish swims towards you, chasing tiny bugs. Suddenly, you use your muscles to surge out from behind the log. The small fish sees you, and tries to swim away. But you catch the fish with your teeth, and swallow it in one bite!

You have lived in the stream almost a year now, and the colors on your body are changing. You used to be a dark green color, with large black spots on your side. Now you notice that the spots are fading, and the green is becoming a bright silver color. What a pretty smelt you have become! You decide to swim downstream, because that is what smelts do. The stream joins another stream, and then a river. The water flows over smooth, round rocks, past tree roots and old logs. The river gets wider and deeper as you keep swimming downstream.

Finally, the huge river opens up to a new kind of place. You can hear waves rolling up onto the beach. The water begins to taste salty. The water smells different. You notice thousands of small fish swimming around... just the right size to eat! You like it here. You see strange, whitish bells floating through the water. They're called jellyfish. Crabs with skinny long legs walk along the sandy bottom. You see many new and strange animals, you don't have to worry because most of them are too small to eat you. You stay in the area for a few months, eating as much as you can...

You have grown faster this summer than ever before. As you get bigger, you get more and more curious about the rest of the ocean. You decide to explore deeper water, and look for more food. You swing your tail muscles back and forth, which makes you swim fast. When you go further out into the ocean, you find new kinds of food. Sometimes you chase white squid. They are slippery to swallow, but you like to eat them, 10 legs and all! Mostly, though, you like to small, shiny fish called herring.

But some animals like to eat you, too. You hear a deep, sweeping noise behind you. It gets closer. You turn around to see what it is and a big, black and white orca whale is swimming right at you, with its mouth open to eat you! You see hundreds of white teeth in that big mouth, and you turn around quickly to get away. You swim as hard as you can, and just barely escape.

On another day, you feel something moving through the water towards you, but you can't quite see what it is. You see lots of fish moving through the water, but they don't look like they are being pushed instead of swimming. You decide to swim away; something doesn't seem right. As you watch, you see other salmon being swept up into a big net. The net gets pulled towards a boat, and then, all the salmon get pulled out of the water. Luckily, you didn't get caught in the net, but thousands of other salmon did. You have many adventures as an adult salmon during your three years in the ocean.

You weigh 50 pounds! It's time for you to move again. You swim back through the ocean, back to the river you left three years ago. When you get back to the river, it smells familiar. The water is fresh and sweet, not salty. There are many salmon swimming with you. You swim upstream, against the current. The big river pushes against you and makes it hard to swim. You swim past the rocks, past the trees, past other streams. You come to another stream on the side of the river. You smell the water. It smells like home, so you swim up that stream. Soon, you recognize a river bend, the rocks look like what you remember, and there are some of your old hiding places. The water is getting very shallow. You are so big now that your back sticks out of the water.

Ahead of you, a female salmon spawner is making a nest in gravel, called a redd. She lays thousands of bright orange eggs in the nest and a male salmon spawner adds white, cloudy sperm to fertilize the eggs. You have taken a long, long journey to reach the spawning grounds.

You have completed the life cycle of salmon. You are very tired, and your body rolls over on its side. You think about the bright orange eggs in the nest, how they will hatch and then grow up in the stream where you grew up.

Remember the favorite things you saw during your salmon life, remember the places you visited, remember the sounds you heard, the smells you smelled, the way you felt. When you have remembered and thought about all those things and you feel ready, you may open your eyes... Be quiet, some salmon are still remembering....

## SALMON FESTIVAL ACTIVITY: HATCHERY TOUR

### Concept:

Salmon life cycle

### Objectives:

1. Students will investigate the nursery environment of Leavenworth National Fish Hatchery.
2. Students will observe three stages of the salmon's life cycle.

### Skills:

listening, investigating

### Procedure:

Leavenworth National Fish Hatchery staff will help your students investigate the nursery environment, understand how the salmon's needs are met at the hatchery, and see almost two million salmon eggs, fry and fingerlings.

## CLASSROOM FOLLOW-UP: WHAT ABOUT TOMORROW?

### Concept:

Fisheries management and conservation

### Objective:

1. Students will understand the need to share resources.

### Skills:

simulating controlling variables

### Materials:

model "river" (15 to 20 feet long)  
salmon tokens (1 or less per student; can be paper cut-outs)  
toy boat  
portion of netting  
teddy bear  
feather  
reward (suggest M&Ms or gummy fish)

### Procedure:

**\*\*BEFORE CLASS\*\***

1. Create a 15 to 20 foot long model "river." This river can be shown in several ways: blue paper, masking tape on the floor, chalk on school grounds. Students will be given very specific areas of the river to stand on.
2. Make salmon tokens and collect other materials.

**\*\*DURING CLASS\*\***

1. Establish learning expectations. Example: "When we are done, you will be able to tell me the two special rules about using nature."
  1. Share resources with other people and wildlife.
  2. Save some of nature for future people and wildlife.
2. Introduce your "river" as the Columbia River. If your students are not familiar with where the Columbia River flows in our state, this would be a good time to take it out on the map. See "Salmon of the Columbia" brochure.
3. Show students the "salmon" tokens and explain that the salmon need to swim from the ocean (at the bottom of the river) to the spawning grounds (top of the river).
4. Ask students why the salmon need to go to the spawning grounds. (Answer: to lay and fertilize their eggs to make more salmon.)
5. Demonstrate, then let students practice moving the salmon tokens from the ocean, upstream to the spawning grounds by sliding them along the paper Columbia River. This is a salmon run. Collect all the salmon.
6. Divide students into user groups, such as commercial gillnetters, sports anglers, bears, eagles.
7. Give each user group a symbol to represent themselves (net for gillnetters, boat for anglers, teddy bear for bears, feather for eagles). As each group receives its symbol, ask them to explain why they need salmon or how they use salmon.
8. Assign each user group to areas on the river appropriate to their role. Gillnetters at mouth of river; sports anglers further upstream; bears further still upstream; eagles just downstream from the spawning ground.
9. Explain to the groups, "As a salmon swims by your area, you may pass it on or catch it. Each salmon you catch may be exchanged for one reward."
10. Begin the salmon run in the ocean, below the mouth of the river. Slowly move the salmon tokens upstream, towards the spawning grounds.
11. Few salmon, if any, will get past the gillnetters. Quite likely no salmon will get as far upriver as the bears and eagles.
12. After all the salmon are caught, trade one reward for each salmon.
13. Discuss the feelings of each group. Do the gillnetters like to have bears and eagles in the mountains? How do the sport anglers feel towards the commercial gillnetters? How do the bears and eagles feel about humans (anglers and gillnetters)?

14. Help the class develop one rule for dividing up the salmon. Write the rule on the blackboard. This rule should be based on sharing the salmon resource with all user groups.
15. Try another salmon run, but apply the “rule” to each group’s catch. The students will most likely distribute the salmon among all current users and not allow any to escape to the spawning grounds.
16. Distribute rewards according to who has the salmon.
17. As students are enjoying their rewards, ask “What about next year?”
18. Continue the discussion with more questions.

“What will happen next year if no salmon get to the spawning grounds this year to make new salmon?”

(Answer: There will be no more new salmon.)

“What will happen next year to the bears if all the salmon are caught this year?”

(Answer: Bears will go hungry, starve, die.)

“What will happen next year to the eagles if there are no more salmon?”

(Answer: Eagles will go hungry, starve, die.)

“What will happen to the sports anglers and gillnetters if there are no salmon next year?”

(Answer: Gillnetters will lose their jobs. Sports anglers will not get to have any fun fishing.)

19. Ask “What do we need to do so that there will be some salmon in the river next year and every year in the future?” (Perhaps make another rule.)
20. Help the class develop a rule that allows at least two salmon to travel to the spawning grounds. This rule should be developed with the idea that the user groups need to share with future user groups. If more salmon are allowed to the spawning grounds, they will make more salmon that can be caught in the future.

Discussion questions: How did you feel when eagles didn’t get any salmon? How did you feel when eagles did get salmon? Are your rules good for people? wildlife? salmon? Is there anyone or anything not represented in this game? (Possible answers: Native Americans, fisheries law enforcement, hatcheries, commercial fishing in the ocean, other predators, dams as mortality agents.)

**\*\*NOTE\*\*** We must share our natural resources with current and future users. When we save some resources for future users, it is a special type of sharing, called “conservation.”

**Extension:**

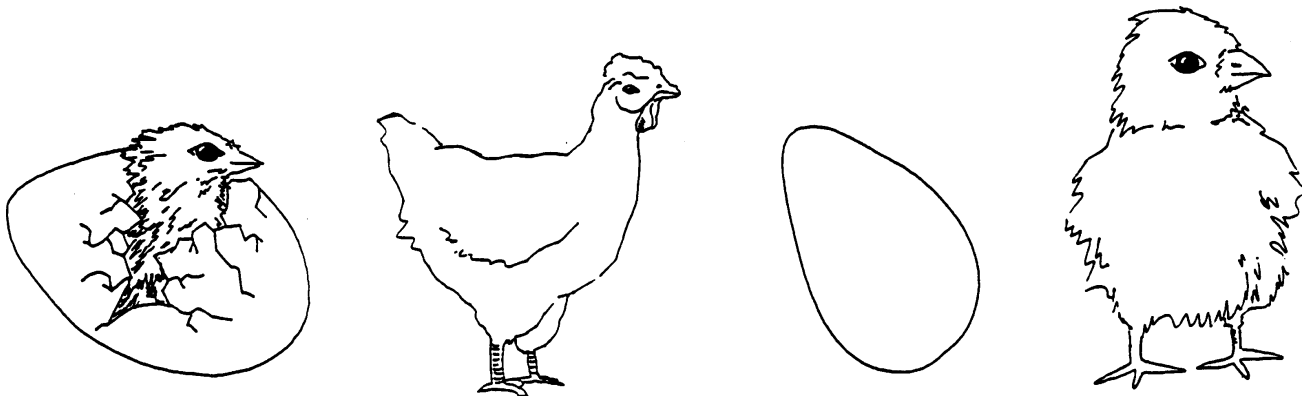
**Experiment with variations, which could include:**

- A. Change the numbers of salmon available, either more or less. Do the “rules” need to change?**
  
  - B. All user groups, except one, follow the rules established by the class.**
- + Activity adapted from Jay Moeller, Klondike Gold Rush National Historic Park.**

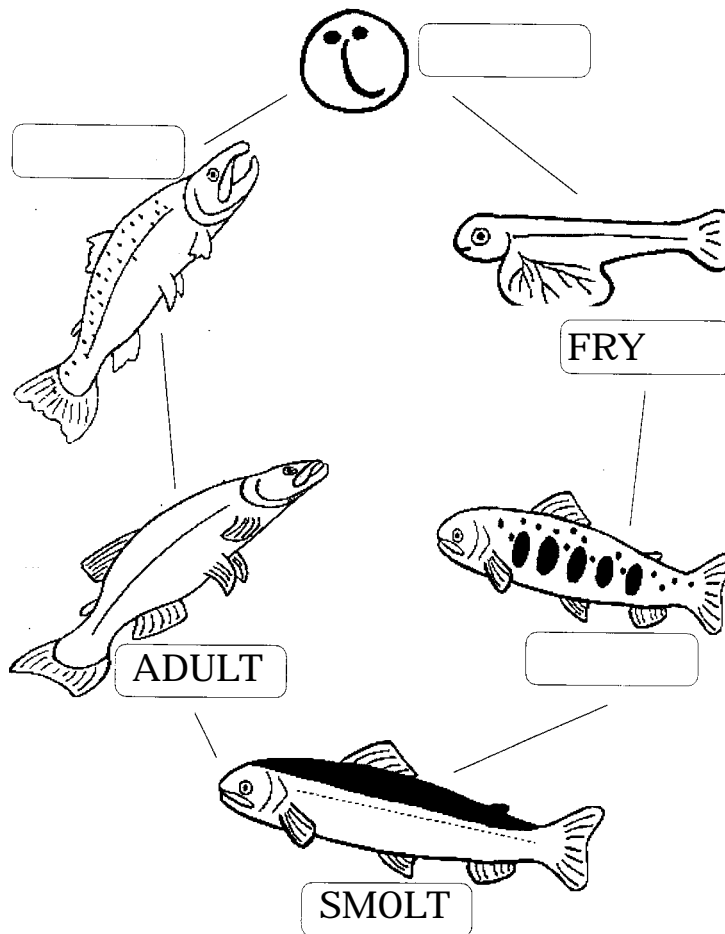
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COMPLETE THE CIRCLE

1. Cut out the pictures on the top half of the worksheet.
2. Arrange chicken pictures in a circle, from youngest to oldest. This circle is the LIFE CYCLE of the chicken.
3. Glue the chicken LIFE CYCLE on the back of this worksheet.
4. Finish the drawing of the salmon LIFE CYCLE. You may need to draw pictures or fill in the boxes with the names of the salmon ages.



COMPLETE THE CIRCLE

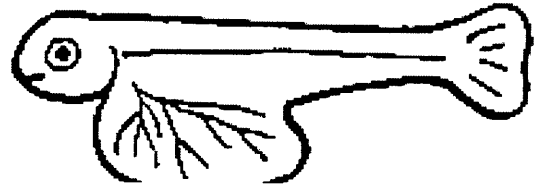
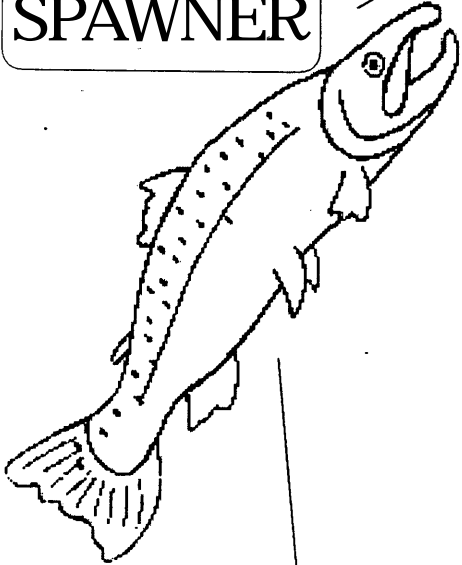


# COMPLETE THE CIRCLE

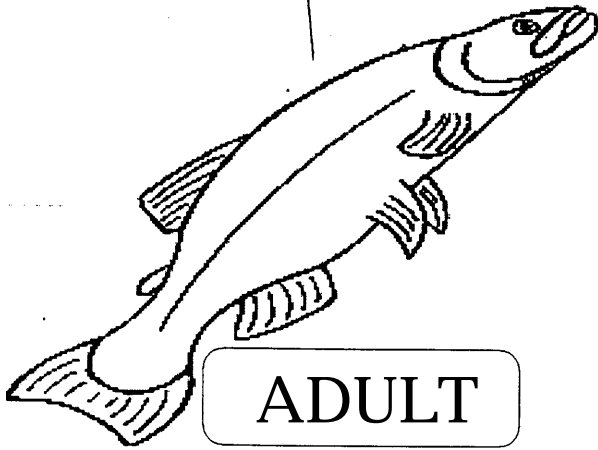


EGGS

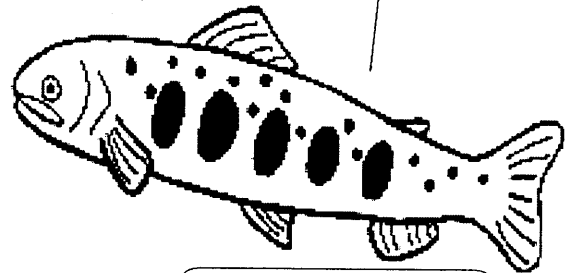
SPAWNER



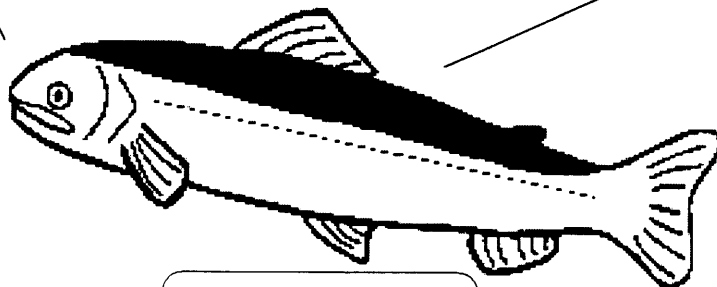
FRY



ADULT



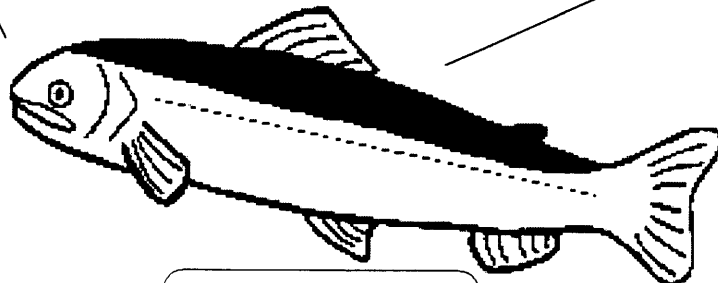
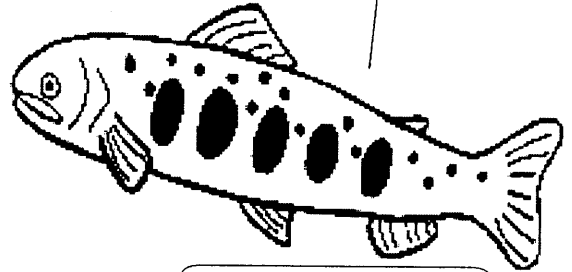
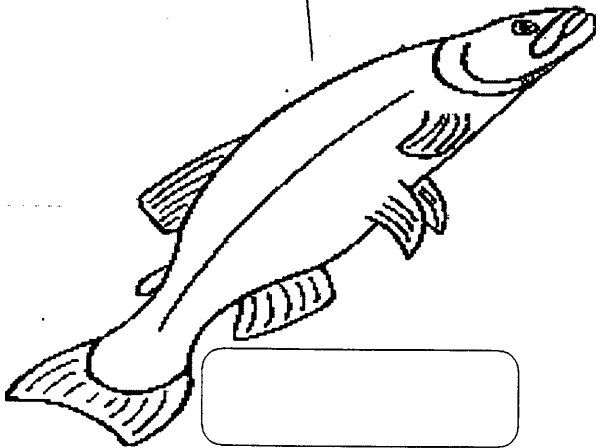
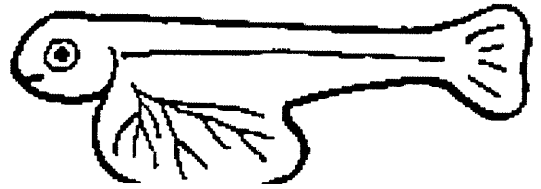
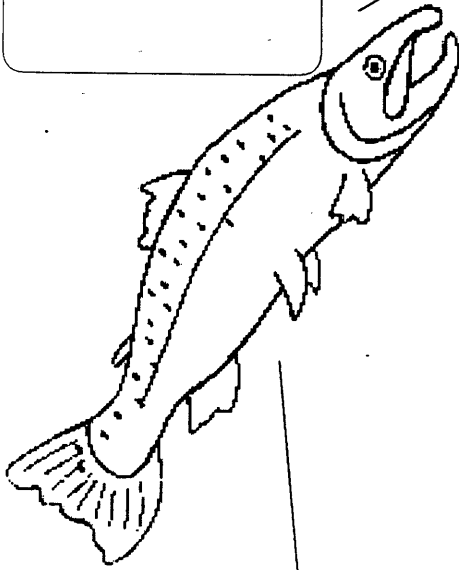
FINGERLING



SMOLT



# COMPLETE THE CIRCLE



“Swift or smooth, broad as the Hudson or narrow enough to scrape your gunwales, every river is a world of its own, unique in pattern and personality. Each mile on a river will take you further from home than a hundred miles on a road.”

Paul Brooks

## OUTDOOR AQUARIUM: THROUGH THE LOOKING CLASS

Immerse yourself in the aquatic world. Watch shimmering silver and graceful green fish glide past underwater windows.

### Environmental Education Objectives:

This activity will help students to recognize that the earth's living and non-living are interrelated. (Goal I, Objective A)

## CLASSROOM PRE-WORK: WHO NEEDS HABITAT?

### Concept:

Components and definition of habitat

### Objectives:

1. Students will understand the word "habitat" and be able to name its components.
2. Students will understand that all animals need habitat.
3. Students will recognize components of fish habitat.

## PART I: EVERYBODY FINDS A HOME

### Definition of habitat

### Skills:

classifying making models

### Materials:

drawing paper crayons

### Procedure:

1. Ask each student to draw a picture of where he or she lives, including details such as a place to cook and keep food, a place to sleep, a neighborhood to play in.
2. When the drawings are finished, have a discussion with the students about what they drew. Ask the students to share their pictures and point out the things they need to live.
3. Make a "neighborhood" of the drawings by hanging them together on a bulletin board or wall. Point out that everyone has a home.
4. Discuss with students the differences and similarities among the homes.
5. Talk about the things every animal needs in its home: food, water, shelter, and space to live, arranged in a way that the animal can survive.
6. Emphasize that although the "homes" are different, every animal (people, pets, farm animals, and wildlife) needs a home.

7. Talk about the idea that a home is actually bigger than a house. In some ways, it is more like a neighborhood. People go outside of their home to get food at a store, for example. For animals, we can call that neighborhood where all the survival needs are met a “habitat.”

Activity adapted with permission from Project WILD.

## PART II: SALMON SUBDIVISION

### Components of fish habitat

#### Skills:

listening, habitat, map reading, drawing

#### Materials:

student drawings from Part I

Teacher Reference Sheets E, “Salmon Shelter” and F. “Happy Habitat”

#### Procedure:

##### **\*\*BEFORE CLASS\*\***

Use Teacher Reference Sheets E, “Salmon Shelter” to make visual aids. Create posters, bulletin board art, overhead transparencies or blackboard drawings. These visual aids will help you explain components of fish habitat.

##### **\*\*DURING CLASS\*\***

1. Review the student drawings and remind the class that fish need habitat, too. Compare how humans and fish meet their needs in their habitats.

2. Show your visual aids to the class. Explain that it is a drawing of fish habitat, where salmon can find food, water, shelter and space.

3. Discuss each element of habitat, and point to it in the drawing.

- A. Food: insects, which are found sometimes just floating through the water. In autumn, leaves drop into stream and eventually provide food for aquatic insects that are eaten by fish. Many aquatic insects live attached to rocks or logs. (Remember your food chains!)

**\*\* Draw a salmon in the habitat where it can find food.**

- B. Water: fish are surrounded by water, but still drink it! Salmon need especially clean, cold water. When water runs fast, it looks white. Sometimes fish hide in this “whitewater” so predators can’t see them.

**\*\*Draw a salmon in the habitat where it can find cold, clean water.**

C. Shelter: Objects inside the stream provide shelter. Fish can rest behind logs or rocks. Fish like to hide behind rocks and logs, to avoid being eaten. Trees, bushes, and other plants by the stream provide shade for the fish, because fish can get sunburn or too hot in full sunlight. The shade from trees, bushes, and other plants gives fish a place to hide from predators. Large rocks slow the water, trap gravel for spawning, protect the bank from erosion, and create pools, where fish can rest. Roots provide shade, hiding and resting areas. Fallen logs in the stream trap gravel for spawning habitat and create pools and cover. Some aquatic insects eat wood or the tiny aquatic plants that grow on it.

**\*\*Draw a salmon in the habitat where it can find shelter.**

D. Space: All fish need enough room to move around their habitat, to eat, to sleep, to hide from predators. Young salmon fry set up territories within the stream. If another fry comes into its territory, a fry will attack.

**\*\*Draw a salmon in the habitat where it can find space.**

### **SALMON FESTIVAL ACTIVITY: OUTDOOR AQUARIUM**

**Concept:**

Fish habitat and observation

**Objective:**

1. Students will make and record observations of movement and habitat use by live fish.

**Skills:**

observing, writing

**Materials:**

**BRING THESE TO THE FESTIVAL FOR EACH STUDENT TO COMPLETE!!**  
Student Activity Sheet #1 "Festival Fun," one per student  
Student Activity Sheet #1 found in EXHIBIT section  
pencils

**Procedure:**

Visit the outdoor aquarium with your class. Spread students out around the aquarium, so that they can make individual observations. Students should complete the "Outdoor Aquarium" section of Student Activity Sheet #1, "Festival Fun."

### **CLASSROOM FOLLOW-UP ACTIVITY: HAPPY HABITAT**

**Concepts:**

Components of fish habitat

**Objective:**

1. Students will demonstrate an understanding of fish habitat by creating a model of fish habitat.

**Skills:**

cooperative learning communicating making models

**Materials:**

Teacher Reference Sheet F. "Happy Habitat"  
construction paper  
scissors  
markers, crayons, colored pencils  
glue, paste or staples  
cut-outs of salmon life stages

**Procedure:**

Students work cooperatively to create a paper mural of habitat that would make healthy, happy salmon.

1. Divide your class into equal groups of 4-6 students and explain to the class that they are to create a healthy, happy habitat for salmon. Each group will be responsible for creating a stream that should contain all four components of fish habitat: food, shelter, water and space.
2. Lead the groups through activities on Teacher Reference F "Happy Habitat." If appropriate, distribute sheet directly to students.
3. Make art supplies available to the students.
4. After each group completes its stream, ask students to share their projects with the class. Streams can range in size from a twisting ribbon of blue along a 8 1/2" x 11" piece of paper to blue butcher paper, winding down the walls of a hallway. As streams are shared, ask other students to check if any habitat elements are missing from the streams.
5. Each group should draw a smiling salmon in its happy habitat!

**Extension:**

- A. Add pictures of other animals that live in or near salmon habitat to the stream murals. Remember the food chains from the COSTUMES section. Think about animals like kingfishers, bears, eagles, otters, trout, beavers, or people.

Teacher reference E

Salmon shelter



## Teacher Reference F “Happy Habitat”

### HAPPY HABITAT!

Create habitat for salmon that would make them happy and healthy.

Remember the four parts of habitat: food, water, space and shelter.

The lists below will help you.

#### Water

Make water for the salmon habitat.

1. Make a long, winding and curving stream.
2. Remember that all salmon need cool, clean water. Spawning salmon need deep water because they are big. Fry need shallow water because they are small.
3. Name the stream, maybe using a local or Native American name.
4. Write down one thing on the back of your stream that you will do to take care of your stream.

#### Food

Make food for the salmon habitat.

1. Think about your food chains. What do salmon eat? (insects, smaller fish).
2. You must create food for the salmon. You can draw pictures of salmon food, or cut out pictures from magazines.
3. Remember: salmon don't eat pizza!

#### Shelter

Make shelter for the salmon habitat.

1. Make a list of objects the salmon use for shelter. (Bushes and trees along the stream made shade and keep the water cool.  
Low branches over the water give salmon places to hide from predators.  
Salmon fry and fingerlings hide around fallen logs, boulders, plant roots.)
2. Decide how to show salmon shelter. Your group can draw pictures or cut shapes out of construction paper.
3. Add shelter to your salmon habitat.

#### Space

Make space in the salmon habitat.

1. List the different kinds of space that salmon need. (deep pools for resting, gravel for egg nests, fry and fingerlings like shallow water)
2. Make gravel. You can draw gravel or cut out construction paper to make gravel. Use brown, grey, white and black colors. Make different sizes of gravel. No pieces of gravel should be bigger than your hand.



“Behold the turtle. He makes progress  
only when he sticks his neck out.”

James Bryant Conant

## FISH MAZE: A-MAZING SALMON

Your students will experience the many challenges of aquatic life and migration when they discover themselves as salmon, first curled up inside a tiny egg, then hatching and struggling to survive and complete the salmon's amazing life cycle!

### Environmental Education Objectives:

These activities will show students that populations respond to the limiting factors of the environment. (Goal I, Objective B)

These activities will demonstrate how technology can modify the environment. (Goal 11, Objective E)

## CLASSROOM PRE-WORK: WHO'S EATING WHOM?

### Concept:

Predation, emphasizing salmon

### Objectives:

1. Students will learn about predator-prey relationships.
2. Students will identify natural and human predators and obstacles.

## PART I: PREDATOR PUZZLE

### Skills:

solving puzzles  
classifying

### Materials:

Student Activity Sheet #7, "A-mazing Salmon"-one per student  
pencils

### Procedure:

1. Distribute Student Activity Sheet #7, "A-mazing Salmon."
2. Have students complete the maze.
3. Discuss the many obstacles pictured in the fish maze.
4. Instruct students to place a red circle around the natural threats in the maze.
5. Instruct students to place a blue "x" over the human-related threats in the maze.

## PART II: QUICK FROZEN PREDATORS

### Concept:

Prey-predator Relationships

### Skills:

motor skills strategizing

### Materials:

string or cones or chalk to delineate playing field  
handkerchiefs for arm bands  
cards or pieces of cardboard or paper for food tokens

### Location:

a playing area 50 to 75 feet long

### Procedure: +

#### \*\*BEFORE CLASS\*\*

Make food tokens. Food tokens can be cards, pieces of cardboard or paper. Attach a picture of one food item to each token.

The number of food tokens needed will be determined by your class size. Each student representing a salmon will need three food tokens. The game requires a ratio of one student representing a predator for each five students representing salmon.

For example, if your class has 24 students,

20 students play salmon (four groups of five students) \_

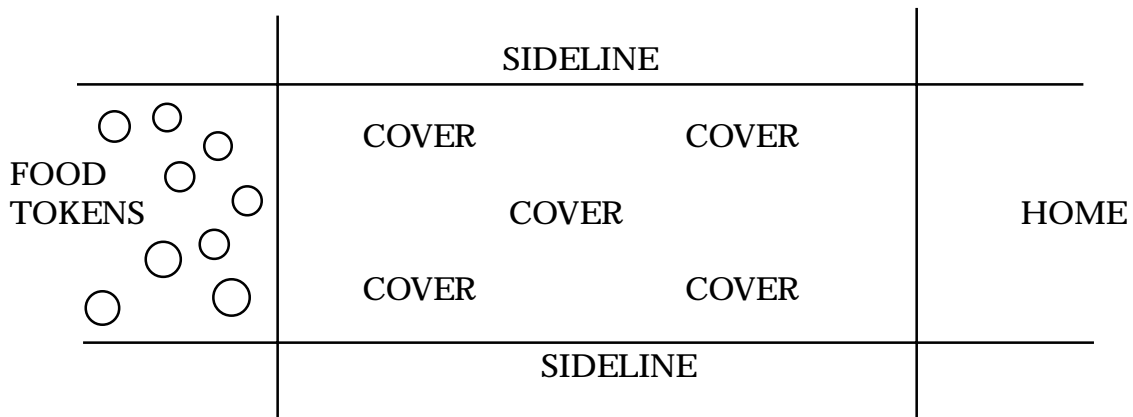
4 students play predator

60 food tokens are needed (20 salmon x 3 tokens/salmon)

Extension activities may require more or less food tokens.

#### \*\*DURING CLASS\*\*

1. Lay out the field as shown in the diagram (dimensions are not critical). Set out three food tokens for each player.



2. Bring the students together. Have them pick an animal that is a predator on salmon (bald eagle, squawfish, kingfisher, orca, sea lion, bear, human, etc.)
3. Ask for volunteers to be predator. Make sure the ratio is maintained: one predator for every five salmon. Have the predators wear arm bands, and explain that their job is to catch salmon to eat.
4. The remaining students will represent salmon. To survive, however, they must make three trips to their food source and back to their home (collecting one food token per trip) without being captured by any predator.
5. Ask students what salmon use for shelter (logs, rocks, undercut banks, branches near the water, whitewater, etc.) Explain that these types of shelter will be represented on the playing field by string or chalk.
6. Predators range throughout the playing field and capture their prey by tagging it. The prey may escape, however, by putting one foot within a cover area or by freezing absolutely still; only blinking and breathing are allowed. (This method is used by salmon trying to hide from predators.) Tagged or captured prey must give their food tokens to the predator and then go to the sidelines. Each predator must capture two prey to survive.
7. The game begins with the prey safe in their home shelter. Remind “salmon” students that they must leave home to eat and survive.
8. Let students play the game until all prey are captured or for no more than seven or eight minutes; captured prey will soon grow restless. Then, count the number of successful predators and prey animals. Switch roles, and play until everyone has been predator and prey.

Extensions:

- A. Experiment with different amounts of food, size of playing field and/or number of predators.
- B. Lead a discussion on behavior of prey and predators. What was the predators' best hunting strategy? Strike fast or hunt slow? Did the predators work together? How did the prey stay safe? What was their strategy?

Activity adapted with permission from Project WILD.

## SALMON FESTIVAL ACTIVITY: FISH MAZE

### Concepts:

Predator of salmon

### Objective:

1. Students will be able to identify five salmon predators.

### Skills:

motor skills, puzzle solving

### Procedure:

As you move through the life-sized maze, imagine yourself as a salmon making your roundtrip journey to the ocean and then back up river to spawn. It's a dangerous and scary trip where you may be eaten by a predator.

## CLASSROOM FOLLOW-UP ACTIVITY: THE OBSTACLE COURSE

### Concepts:

Limiting factors affecting Pacific Salmon  
Natural and human obstacles

### Objectives:

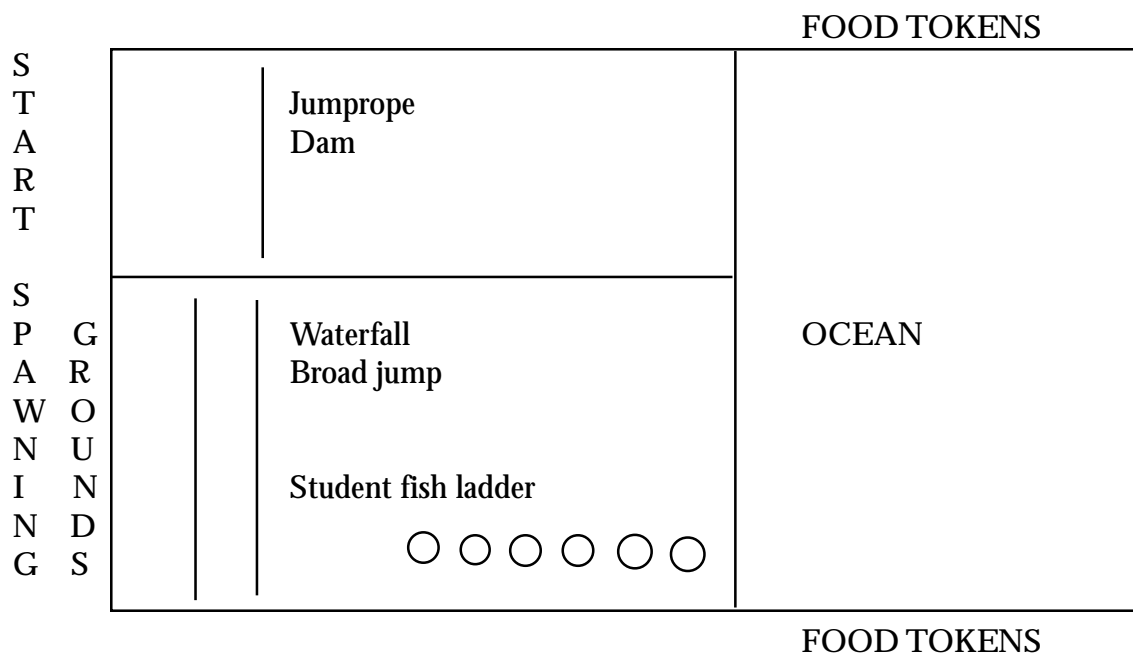
1. Students will see how predators limit salmon populations throughout the life cycle.
2. Students will learn about human-made obstacles and threats salmon encounter while returning to spawning grounds.

### Skills:

simulation, kinesthetic concept development

### Materials:

a jump rope (1-15 feet long)  
about 500 feet of rope or string or traffic cones to mark boundaries  
two medium cardboard boxes  
100 tokens (3xS cards, poker chips etc.)  
large playing area (100 feet x 50 feet)



**Procedure:**

1. Lead discussion in life cycle and migration of the salmon.
2. Set up playing field as shown in diagram, including spawning grounds, downstream, upstream, and ocean. Assign roles to each of the students as follows:

2 students operate the jump rope, which represents the turbines in hydroelectric dams. When all students have passed through turbine, these students move to the upstream side to become the waterfall-broad jump monitors (see diagram on previous page.)

2 students are predatory wildlife, located downstream from turbines. Later in the activity when all the salmon are in the sea, these same two predators will patrol the area above the “broad jump” waterfalls. There they will feed on salmon just before they enter the spawning ground (see diagram on previous page.)

2 students to be humans in fishing boats in the ocean. They must keep one foot in a box to reduce their speed and maneuverability.

2 students to give out tokens, one on each side of the “ocean”

all remaining students become salmon.

**NOTE**

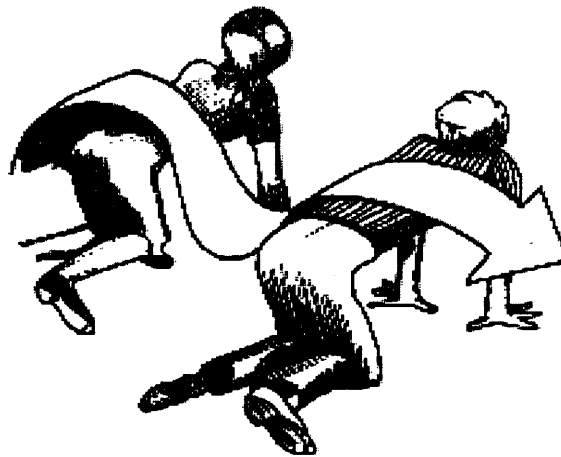
If this game seems overwhelming or too complicated, have students play the game without the ~ elements of the “dam” or “predators” in steps 3, 4 and 5. After the class can play the according to \_ the rules, you may want to add those steps.

3. All salmon begin in spawning ground. Students must go through turbines, they can slip under rope but not around it. Salmon are dead if they are hit by the turbine (jump rope)

NOTE: any salmon that die in the activity become part of the fish ladder. The student is no longer a fish, but becomes part of the physical structure of the human-made ladders now used by migrating salmon to get past barriers such as dams. The students who become the fish ladder kneel on the ground on all fours, a body-wide space between them.

4. Predators must catch the salmon with both hands. If caught, a salmon becomes a part of the fish ladder. Predators and fishermen must escort each “dead” salmon to the ladder.

## TRAVEL THROUGH FISH LADDER



5. The salmon must move back and forth across the ocean area to gather four tokens. Each token represents one year of growth and only one token will be given at a time for each crossing. Once each fish has four tokens that fish can begin migration upstream. While in the open ocean, the salmon can be caught by fishermen in boats. Fishermen must keep one foot in a box to reduce their speed and maneuverability and tag the salmon with both hands. If caught, the fisherman escorts the catch to freshwater to become part of the fish ladder.
6. Next the remaining salmon travels through the fish ladder by stepping over the backs of each student. In the fish ladder, predators may not harm the salmon. This enforced trip through the full fish ladder gives the students a hint of how restricting and tedious the upstream journey can be.
7. Next the remaining salmon faces the broad jump waterfall. Be sure jumping distance is challenging but realistic. The two former turbine students monitor the jump. If a student does not complete the jump then they must return to the bottom of the fish ladder and come through again.
8. Above the waterfall, student predators formerly below the turbines are now the last set of limiting factors faced by the salmon. They represent bears and must catch the salmon with two hands. If caught, the bears escort the salmon to be part of the structure of the fish ladder.

9. The activity ends when all the salmon have been killed before the spawning ground is reached-or when all surviving salmon reach the spawning ground.

FACT: An average female salmon lays 3,000 eggs. Only 2 will survive to spawn.

Discussion Topics:

- the apparent survival-mortality ratio of salmon
- the role of barriers
- the students' feelings throughout the activity

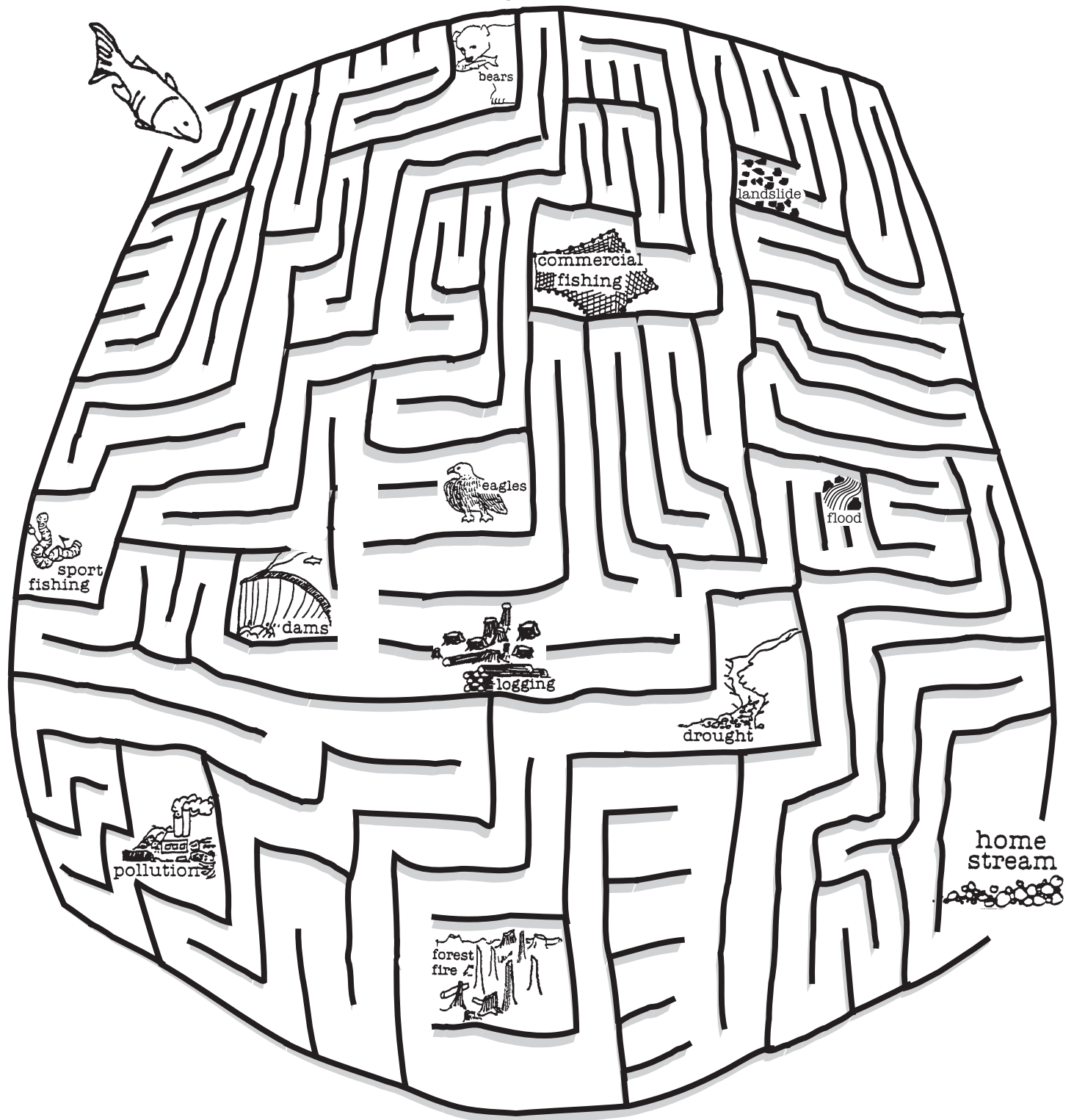
Activity adapted with permission from Aquatic Project WILD.

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# AMAZING SALMON



“Imagination is more important  
than knowledge.”

Albert Einstein

“Nobody makes a greater mistake than  
he who did nothing because he could  
only do a little.”

Edmund Burke

## SALMON TENT: A BIG FISH STORY

Your students will be swallowed whole by a magical salmon. In the depths of the salmon, students will be captivated by stories of environment role models.

Environmental Education Objective: The activity will help students to understand that role models encourage the positive participation of others. (Goal III, Objective B)

## CLASSROOM PRE-WORK: TALL TALES

Creating your own legend

Concept:

Legends and stories

Objective:

1. Students will learn that environmental messages can be transmitted through storytelling media.

Skills:

creative expression public speaking

Materials:

paper pencil sample legends.

Procedure:

1. Read "Coyote Takes Water From the Frog People," and/or "The Legend of Coyote."
2. Lead a discussion so that students understand what a legend is and the main elements of a legend.

A legend is a special type of story. It is based partly on fact and told as if it were true. Legends center around an actual person or place or event. These stories were told to explain the origins of mountains, volcanoes, rivers, and local geography. These stories had messages of how to take care of the earth. Characters get in trouble for not respecting people or abusing nature. Native Americans did not write their legends down, but passed them on in several ways. They told their legends as stories around the fire, sang them, and acted them out in dances. They also painted or carved their legends on rocks.

3. Tell students that they will now write a legend based on an environmental ethic. Students should make sure that their stories have a message.

Examples:

I make Mother Nature smile by...  
The day everyone's water faucet dried up...  
How the children helped the river run clean...  
The day the Garbage Demon got mad...  
Why Raven loves a clean shower...  
The day the salmon came back...  
Coyote tells a secret to Jimmy...

4. Have students share their story through: reciting, acting, drawing, or a combination of these.

## Coyote Takes Water From the Frog People

Coyote was out hunting when he found a dead deer. One of the deer's rib bones looked just like a big shell. Coyote picked it up and took it with him to see the Frog People. The Frog People had all the water. When anyone wanted any water to drink, to cook with, or to wash with, he or she had to get it from the Frog People.

Coyote said, "hey, Frog People, I have a big shell. I want a big drink of water, and I want to drink it for a long time." "Give us that shell," said the Frog People, "and you can drink all you want." Coyote gave them the shell and began drinking. The water that Coyote drank was behind a large dam.

Coyote began drinking. He drank for a long time. Finally, one of the Frog People said, "Hey Coyote, you sure are drinking a lot of water there. What are you doing that for?" Coyote brought his head up out of the water. "I'm thirsty."

After a while one of the Frog People said, "Coyote, you sure are drinking a lot of water. Maybe you had better give us another shell." "Just let me finish this drink," said Coyote, putting his head back under the water. The Frog People wondered how Coyote could drink so much water. They thought Coyote might be trying to trick them.

All the time he had his head underwater, Coyote was digging. He was making a hole under the dam. When he was finished, he stood up and said, "That was a good drink just what I needed." Then the dam collapsed and the water went out into the valley and made the creeks and rivers and waterfalls. The Frog People were very angry. "You have taken all the water, Coyote!" they cried. Coyote said, "It is not right that one group of people has all the water. Now it is where everyone can have it."

Now, anyone can go down to the river and swim or get water to drink or to cook with.

Legend from Columbia River: It's Future and You.

## The Legend of Coyote

After Old-One, the Great Spirit and Creator, had made the earth and the ancient Indian people, he sent Coyote among them, because they were very much in need and were having a hard time. Coyote was told to kill the evil beings who preyed upon them and to teach them the best way of doing things. It was because of Coyote that the salmon were first brought to the Wenatchee River. First, he broke down the dam which five Beaver women had built in the lower Columbia. "It is not right" he said to them, "for you to keep the salmon penned up here. The people farther up the river are hungry."

Then he changed the Beaver women into sandpipers. "You shall forevermore be sandpipers," he said. "You shall always run by the water's edge. You shall never again have control over salmon."

By this time so many salmon had come up from the mouth of Big River that the water was dark with them. Coyote walked along the bank of the river, and the salmon followed him in the water. At all the villages, the Indian people were glad to see him and the fish he brought. Their hunger was over.

When he came to the Little White Salmon River, he stopped and taught the people how to make a fish trap. He twisted young twigs of hazel brush and hung the trap in the river. Then he showed the people how to dry fish and how to store it for winter use.

When he came to the bigger White Salmon River, he showed the people how to spear salmon. He made a spear from a young white fir tree and tipped the point with a sharp flint rock found along the Big River bank and caught the salmon with the pointed end of the spear. "This is how you should do it," said Coyote.

Wherever he stopped, he showed the people how to cook fish. They had always eaten it raw. He showed them how to broil salmon by holding it over the fire on sticks. Coyote put salmon in a hole, poured a little water over it, dropped hot stones into the pothole, and covered everything with green grass to hold the steam. Thus the salmon was steamed until it was tender. "This is how you should do it, Coyote told the people.

Then Coyote traveled farther up the river, and the salmon followed him. Often he came to a smaller stream flowing into Big River. Because the people along the Yakima and Wenatchee Rivers treated him kindly, Coyote sent the fish up their rivers and promised them that every spring the salmon would return. Where he was treated very kindly he made the river narrow in one spot. He made the two banks of the river almost meet, so that there would be a good place for catching salmon. This Salmon Place where we are gathered today in the place where he has always given us fish to meet all of our needs.

Legend as told by Moses George, Colville Confederated Tribes.

## SALMON FESTIVAL ACTIVITY: SALMON TENT

### **\*\*SPECIAL NOTE\*\***

Teachers must make reservations for a specific time, due to the popularity of this event.

### Concept:

Native American storytelling

### Objectives:

1. Students will hear a Native American legend.
2. Students will experience salmon as an art subject.
3. Students will realize that stories can communicate specific messages or morals.

### Skills:

listening art appreciation

### Materials:

none

### Procedure:

Salmon Festival Staff will lead your students into the Salmon Tent, entering through the salmon's mouth. Students sit inside a colorful nylon tent and listen to Native American stories told by Salmon Festival staff.

## CLASSROOM FOLLOW-UP ACTIVITY: WE'RE ON A ROLE

### Concept:

Role models

### Objectives:

1. Students will understand what a role model is and be able to name at least one.
2. Students will understand why role models are important to the environment.

### Skills:

discussion

### Materials:

optional, based on extensions

### Procedure:

1. Teacher leads a discussion, using some of the following questions. Students may expand on any of these ideas.

Do you know any people who you admire and respect for something they have done to help protect the environment? Explain.

Have you ever read something about the life of a person who has done something for the environment? What did the person do?

Can you name one person in your community who has done something to improve the local environment? Explain.

What could you do everyday to help the environment?

What environmental problem are you willing to make sacrifices for to help make the planet a better place?

Can you share something that you did to improve the environment? Explain.

### Extensions:

- A. Students write letters to express how much they admire a particular person for something that person did for the environment.
- B. Students write stories about a particular environmental role model.
- C. Students cut out newspaper or magazine articles or photos of their favorite role model and share it with the class.
- D. Explain to the students that they are environmental role models for younger students. Have the class generate a list of things that make them good role models for younger students. Examples: not littering during recess, showing younger students how to behave on the bus, cleaning up after themselves in the cafeteria, etc.

## The Place Where the Sidewalk Ends

There is a place where the sidewalk ends  
And before the street begins,  
And there the grass grows soft and whim  
And there the sun burns crimson bright  
And there the moon-bird rests from his flight  
To cool in the peppermint wind.

Let us leave this place where the smoke blows black  
And the dark street winds and bends.  
Past the pits where the asphalt flowers grow  
We shall walk with a walk that is measured and slow,  
and watch where the chalk-white arrows go  
To the place where the sidewalk ends.

Yes we'll walk with a walk that is measured and slow,  
And we'll go where the chalk-white arrows go,  
For the children, they mark, and the children, they know  
The place where the sidewalk ends.

Shel Silverstein



## NATURE TRAIL

Through a multi-sensory safari your students will explore creature clues, the riparian ribbon, the forest flora and the wild wetland along our interpretive trail.

### Environmental Education Objective:

The activity will foster the concept that appreciation of nature's intricacy and beauty promotes tranquility and creative expression. (Goal 11, Objective C)

The activities will demonstrate that respect for the earth and all its living things encourages people to maintain a quality environment. (Goal 11, Objective D)

## CLASSROOM PRE-WORK: SENSATION!

### Concept:

Sensory awareness

### Objective:

1. Students will use their senses to experience the aesthetic value of nature.

## PART 1: MICRO-HIKE

### Skills:

observation recording and sharing data

### Materials:

5 foot piece of string for each student magnifying glass (optional)

### Location:

natural area (field site, grassy area, park or nature trail nearby)

### Procedure:

1. Each student receives 3-5 feet of string.
2. Have students span their string over the most interesting ground they can find.
3. Students should anchor the string with a rock at one end.
4. If available, give each student a magnifying glass. Have students imagine shrinking themselves down to the size of an ant.
5. Students go on a micro hike, a very short expedition guided by their string, towards the anchored rock. The "hikers" cover the trail inch by inch on their bellies, viewing such natural wonders as grass blades, ants, dewdrops, and colorful beetles.

Have students keep their eyes no higher than one foot above the ground. Have students share what natural wonders they found on their hike. What wonders are living and non-living? Did they observe anything that was human made? How long a list can you generate?

6. Further questioning to stimulate their imaginations might be:  
What kind of world are you travelling through right now?  
Who are your nearest neighbors?  
What would it be like to be that metallic green beetle?  
How does he spend his day?  
What is that spider going to do, eat you, or take you for a ride?

## PART 11: SOUNDS AND COLORS EVERYWHERE!

### Skills:

auditory awareness

### Location:

Grassy/Natural Area

### Procedure:

1. Have students lie on backs with both fists in the air.
2. Have students lift one finger every time anyone hears a bird song. Who has the best hearing?
3. See if you can count to ten without hearing a bird song.
4. Vary the game by listening for general animal sounds, or any natural sounds at all, like wind in the grass, falling leaves, or rushing water.
5. To get children to concentrate more deeply on any natural setting, ask them how many different colors and shades of colors they can see in front of them without moving from where they are sitting.

## SALMON FESTIVAL ACTIVITY: INTERPRETIVE TRAIL

**Concept:**

Nature appreciation

**Objective:**

1. Students, during a walk on the island trail, will observe and learn to interpret their natural surroundings.

**Skills:**

wildlife observation  
sensory awareness

**Materials:**

sturdy shoes appropriate clothing for weather binoculars optional

**Procedure:**

Teacher will lead your students on our interpretive trail. Along the trail students will use their sensory skills developed in the pre-work activities to observe the natural world around them.

## CLASSROOM FOLLOW-UP ACTIVITY

**Concept:**

Patterns in nature

**Objectives:**

1. Students, through a group process, will explore patterns in nature.
2. Students will devise a plan for a functioning ecosystem.

## PART 1: A NATURAL SCAVENGING HUNT

**Concept:**

Nature appreciation

**Skills:**

collecting and classifying open ended learning

**Materials:**

Student Activity Sheet #8, "Scavenger Hunt" one for each group of 4-6 students a box or bag to for collected items

**Procedure:**

1. Divide your class into groups of 4 to 6 students.
2. Provide each group with a copy of the scavenger hunt.

3. Have groups hunt for their items on the school grounds or else a natural area near your school. Remind students to only collect things that they can return safely and without damage.
4. Have students share their findings with the rest of the class. Generate further discussion based on "Scavenger Hunt" items number:
  - 11) Beauty is in the eye of the beholder--it's all beautiful!
  - 13) Are there many things in nature that are perfectly straight?
  - 14) Everything in nature has a function.
  - 17) Everything in nature is important.
  - 18) A sun trap is anything that captures the sun's heat (water, rocks, plants, animals)
5. Return items to their original location.

## PART II: RECIPE FOR A FAVORITE PLACE

### Skills:

making models controlling variables synthesizing

### Materials:

Student Activity Sheet #9, "Dream Deed"-one per student

### Procedure:

1. Distribute Student Activity Sheet "Dream Deed," an imaginary deed to one square mile of land.
2. Tell students that they are to create their own dream-place on their untouched plot of land. They can have as many trees, animals, rivers, and mountains as they like.
3. Encourage their imaginations to run wild. To foster creativity the teacher can give the student some suggestions: "to make your place beautiful and radiant, you might want to add things like waterfalls and windstorms, or perpetual rainbows..."
4. On the back of the deed, have students list the ingredients of their dream place, then have them draw a picture of it.
5. Are their places able to maintain themselves year after year? For instance, see if they have chosen representatives of the food cycle: plant-eaters, plants, and decomposers (example: ants, mushrooms, bacteria). Suggest they include subtle factors like soil and climate.

+ Activities adapted from Joseph Cornell Sharing Nature with Children.

SCAVENGER HUNT

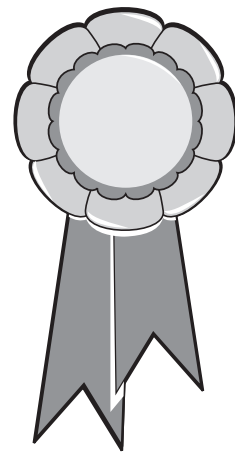
Work together. Don't take anything that is alive.

- 1) A feather
- 2) One seed
- 3) Exactly 10 of something
- 4) A needle from a pine tree
- 5) A bone
- 6) Something round
- 7) Something fuzzy
- 8) Something white
- 9) Five pieces of litter
- 10) A chewed leaf (not by you!)
- 11) Something beautiful
- 12) Something that makes a noise
- 13) Something perfectly straight
- 14) Something that is of no use in nature
- 15) Something that eventually becomes soil
- 16) Something that reminds you of yourself
- 17) Something important in nature
- 18) A sun trap (anything that captures the sun's energy)
- 19) A smile

DREAM DEED

**Certificate  
OF DEED**

1 Square Mile  
Your Own  
Special Place



# RECIPE FOR A FAVORITE PLACE

List of ingredients

Draw your favorite place

“... our religion we were taught that our salmon and our meat and our roots and berries are gifts from the creator. . . it’s our religion that we have to take care of them....”

Margaret Palmer, Yakama



## NATIVE AMERICANS

The smell of smoked salmon will lure your students to the tribal village. Students will observe the Native American life-style, and develop a better understanding of salmon's spiritual significance to these people.

Environmental Education Objective: These activities will communicate that respect for the earth and all its living things encourages people to maintain a quality environment. (Goal II, Objective D).

### CLASSROOM PRE-WORK: CEREMONIES

**Concept:**

Cultural significance of natural resources

**Objectives:**

1. These activities will have the students investigate ways in which cultures respond to the environment through shelter, food, clothing and the type and amount of energy used. (Part I)
2. Students will investigate the origin of local place names. (Part II)

**Skills:**

listening/reading open-ended learning

**Materials:**

none

### PART I: NOT THE SAME NAME

**Concept:**

Philosophy of naming

**Skills:**

description imagination

**Materials:**

paper, yarn, pencils, crayons, markers, etc

**Procedure:**

1. Remind students people have two names: a name that shows what family they belong to, and a name that is meant just for an individual. Both names are given to us when we are babies.

2. Mention that other cultures use names differently. Suggest that the students create new names for themselves to use for the day. Tell students to think about a name that describes something about themselves or something important that happened in their lives, or maybe one of their favorite things.
3. After a student has selected a new name, have them create a name tag to wear for the day. Everyone should try to use their new name for the day.

**Extension:**

- A. The new name helped to enforce the idea of individual identity. If some students finish early, ask them to create a flag or banner to represent their family or heritage.

## PART II: SALMON PEOPLE DRAWING

**Concept:**

Cultural significance of salmon to Native Americans

**Skills:**

drawing imagination

**Materials:**

paper, colored pencils, crayons, markers, etc.

**Procedure:**

Salmon have always been an important food for Indians of the Pacific Coast. The salmon are often used in art work and legends. One Indian legend tells about the Salmon People. Salmon People lived in large Indian houses under the sea. In their undersea houses, the salmon had bodies which looked like people. Each year, the Salmon People put on robes of salmon skin and became fish for Indians to catch. After being caught and eaten, the bones were returned to the ocean. The bones came back to life as more Salmon People.

1. Have students imagine and draw what the Salmon People looked like.
2. Students share drawings with the class.

+ Activity adapted from *Discovering Salmon*, Dog-eared Publications.

## Background Information to share with students before arriving at the Salmon Festival.

Native Americans lived off the land. Everything they ate grew in nature. Everything they wore was made from things found in nature. They did not use watches or calendars to tell time. Instead, they watched the plants and animals, they watched the passing seasons to tell time. Because nature provided everything in their lives they knew many things about nature. Native Americans had great respect for nature and gave thanks to nature when food was plentiful. The most important food in our area was salmon.

The Native Americans here had an important ceremony to show respect for the first salmon to arrive in the river each year. The person who catches the first salmon cuts it down the back, lengthwise. The meat is cut from the bones and cooked. The head, bones, and tail are placed on leaves. The fisherman then carries the bones back to the river, followed by a procession of people. They all sing songs which tell how grateful they are for the return of the salmon and pledge that they will always show them the proper respect. When the procession reaches the river, the fisherman takes the bones to the middle of the river and carefully returns them to the water. The spirit of the salmon can then go back to the Salmon People and tell them that it is all right for the rest of the salmon to swim upstream, because the people on the shore still remember the right way to treat them. After the singing and the prayers are finished, the people return from the river and eat the salmon meat from the first salmon. The elders are served first and every person has a small bit of this sacred food.

The Native American gathering at the Salmon Festival shows their respect and celebration for the salmon's return. Please encourage your students to show respect for the Native American traditions.

adapted from Native American Curriculum Series.

## SALMON FESTIVAL ACTIVITY: NATIVE AMERICANS

### Concept:

Native American studies

### Objective:

1. Students will learn about Native American culture through their observation of performances and a tribal village.

### Skills:

questioning, observing

### Materials:

Student Activity Sheet #1, "Festival Fun", one per student found in EXHIBITS section  
pencils

**\*\*BRING THESE MATERIALS TO THE SALMON FESTIVAL**

**Procedure:**

By observing Native American crafts, dwellings, and performances, students will be able to complete the "Native American" section of Student Activity Sheet #1, "Festival Fun."

## CLASSROOM FOLLOW-UP: WHAT'S IN A NAME?

**Concept:** Cultural significance of Pacific Northwest Native Americans

**Objective:**

1. Students will understand that Indian place names have been retained in Pacific Northwest geographical nomenclature.

**Skills:**

cooperative learning/brainstorming communicating listing

**Materials:**

map of Washington state

**Procedure:**

1. Help the students make a list of regional names with Native American origins. Include local, regional and Washington state names of rivers, lakes, canyons, cities and towns, plants or animals.
2. After generating the list on a blackboard, review each name and its Native American origin. As each Native American origin is reviewed, show students where the place name is located on a Washington state map and the geographical features associated with the names.

**Examples:**

Chelan - a modification of "Tsill-anne" the original name for the lake meaning "deep water."

Chikamin Creek - derived from a word in Chinook trade language that means "money" or "metal." Fur traders came to an Indian village at the creek's mouth to buy pelts. The bargaining phrase was "conchs chikamin?" or "How much?"

Chinook - A trade language made up of Indian, English, and French words, used chiefly for trade. Also a tribe on the Washington side of the mouth of the Columbia River.

Chiwaukum Creek - Wenatchee Indian word, meaning "many little creeks running into one big one."

Chumstick - Camp site on Chumstick Creek 7 miles north of Leavenworth. The name is a chinook jargon word, meaning "marked tree."

Cle Elum - Northern Pacific Railway officials named the station Cle Elum after the Indian name of Tle-el-lm, which means "swift water" and which refers to the Cle Elum River.

Entiat - Name is a version of the Indian En-ti-at-kwa meaning “rapid water.”

Enumclaw- thunder

Icicle - The name is a distortion of the Wenatchee Indian word Na-sik-elt meaning “narrow-bottom canyon”.

Kittitas - Indian word K-tatus, meaning “gray gravel bank,” it refers to an extensive gravel bank on a river shoal near Ellensburg.

Okanagon - Salish word translated as “meeting place of water” because the Okanogan and Salmon Creek meet here at this townsite. It has also been translated as “rendizous” - because Indians meet for their annual potlatches here.

Peshastin - “Broad-bottom canyon” - Indian pronunciation of the name was Pish-pish-astin.

Skykomish - A Salishan tribe formerly living at the mouth of the Skoolmish River, which flows into the northern end of Hood Canal. The name means “river people”.

Snoqualmie - A Salishan tribe along the upper branches of the Snoqualmie River, western Washington. The name means “people who came from the moon”.

Spokane - The name appears to be from the Indian tribal designation, Spohk-nne, meaning “children of the sun” or “sun people”. It evidently derives from Indians who formerly lived in a village at the foot of Spokane Falls. When they fished at the falls, they stood in a rainbow or halo of light formed by sunlight striking a cloud of mist.

Stehekin - The Indian name means “the pass” or “the way through”.

Tumwater - Rough water

Wenatchee - Name from the original Indian designation, which was We-natcha or We-natchi meaning, “river issuing from a canyon”.

Yakima - Several authorities have claimed divergent meanings of the Indian term E-Yak-Kah-Ma or Yah-Ah-Ka-ma. A plausible translation is “black bear” from Yah-Kah, meaning black bear, and the plural ending ma. The Bureau of American Ethnology has interpreted the term as meaning “run-away” which tends to support an Indian legend of an Indian chief’s erring daughter, who lived at Moxee. When the girl became pregnant out of wedlock, she moved to the Yakima River near Union Gap, either as a runaway or as a deportee.

Seattle (named after Chief Sealth)

Name information from Robert Hitchman, Place Names of Washington.

Quotes from Clearing magazine, Number 76, November/December 1992.

“We have our religion that was preserved for us by our elders... our religion we were taught that our salmon and our meat and our roots and berries are gifts from the Creator...it’s...our religion that we have to take care of them, let Him know how much they mean to us...”

Margaret Palmer, Yakima

“We have to carry on our traditions, our religion, in worshipping and protecting and praying for those Salmon...so that the salmon will come back. That’s our responsibility to these salmon. In order for them to come back, we have to maintain our culture, and remember where we came from.”

Don Sampson, Umatilla

“The Salmon is the giver of life to the Indian people...gives us strength...and it gives us strength to get to the other world. That’s how important Salmon is.”

Louis Dick, Umatilla

“For generations we have carried (these) teachings, for thousands of years, a way of life and a livelihood. We are those descendants, have lived those teachings and we still hear the words of our forefathers, their voices clear in our minds.”

Johnson Meninick, grandson of Chief Meninick, Yakima

“Habitat’s the place to be;  
A place to go and stretch your fins,  
A place to stay out-ta trouble in.  
Habitats the place for me;  
A place to eat, a place to rest,  
A place where I can do my best!”

Rhona Baron





4. Bring a copy of the lyrics and song title to Salmon Sing-Along where Ms. Alevin and Mr. Smolt will lead your class in song. Students will leave the festival with a live recording, documenting their participation in this musical event.

## SALMON FESTIVAL ACTIVITY: SALMON SING-ALONG

### \*\* SPECIAL NOTE\*\*

Teachers must make reservations for a specific time, due to the popularity of this event.

#### Concepts:

Food webs  
Salmon habitat  
Salmon life cycle

#### Objectives:

Students will sing about natural resource value and concepts.  
Students will perform simple gestures to emphasize lyrics.  
Students who have completed the pre-work will share songs with presenters.

#### Skills:

creative expression motor cooperation

#### Materials:

None needed unless a song is given to presenters.

#### Procedure:

1. Go to the designated Salmon Sing-Along area where students will be directed to sit on the grass.
2. Ms. Alevin and Mr. Smolt warm up with the class using voice/listening exercises.
3. Students share original composition with presenters (if they do pre-work).
4. Presenters teach original songs encouraging students' active participation.
5. Each class receives a recording of the session and sheet music of songs sung.

## CLASSROOM FOLLOW-UP ACTIVITY: KEEP SINGIN ON!

#### Concept:

Singing, choreography, and instruments as an education method.

#### Objectives:

1. Students will create musical instruments.
2. Students will share Salmon Sing-Along experience with others.

## Skills:

creative expression cooperation information/song sharing motor

## Materials:

May vary depending on type of instruments made.

### IDEAS:

- \* rattlers: orange juice containers and/or film canisters popcorn, pebbles, rice, beans, etc.
- \* rain sticks: poster cardboard tubing same fillers as above nails ribbons, sand, decoration materials glue masking/duct tape
- \* audio cassettes/CDS with natural sounds
- \* sticks
- \* dry leaves for rustling
- \* transparencies for overhead projector or copies of songs shared

## Procedure:

1. Discuss with students how they want to accompany specific songs from the Salmon Sing-Along session. Refresh their memories by playing the tape received from Ms. Alevin and Mr. Smolt.
  
2. Musical instruments: make your own from suggestions listed below or from your bag of tricks
  - \* Rattlers: use empty orange juice containers or film canisters and fill with noisemakers.
  - \* Rainstick:
    - Punch broad headed nails through cardboard, spiraling to the tube's other side. The more nails added, the slower the filler will fall. Nails should be long enough to extend through the tube's middle but not puncture the other side.
    - Close off one end of cardboard tubing with duct/masking tape and fill with materials listed for rattlers.
    - Close off the other end.
    - Decorate with colored paper, ribbon, leather pieces, natural objects found on forest floor, or even cover with glue and roll in sand.
  - \* Use body parts to make sound through clapping, stomping, making animal or wind sounds, clicking fingers, or striking knees with palms.
  
3. Purchase audio tapes with bird, cricket, rain, whale, dolphin, or other sounds. Use in concert with student made instruments or alone.
  
4. Choreograph movements with students imitating animals, or plants that exemplify the song's lyrics.
  
5. Share with other classes and do peer teaching.
  
6. Write another verse to a song learned at the festival.



Small salmon need to hide they like rocks and logs and shade. There's places they can rest where they will not be afraid. There's bugs they love to crunch and cold water flowing by, Some get caught and munched Just because they can't find...

(Chorus)

When salmon take a trip from the river to the sea, they look for motels Just like you and me. The current leads them on from one spot to the next, but dams slow them down-- they don't provide the best...

(Chorus)

In the salty sea the habitat's divine. The water's like a soup where the salmon dine. There's lot's of room to swim and grow big and strong and fat. The ocean's home sweet home. Now how do you spell that?...

(Chorus)

Although the ocean's sweet, the salmon need to spawn. So they cruise back upstream. They keep movie' on-Until they find clean gravel where they can make a nest and lay their eggs and hope their babies find the best...

(Chorus)

I've wanted to take the measure of this turn in the river, grasp it for private reasons. I feel closer to it now. I know which deer drink at which spots on this bank. I know of the small screech owl nesting opposite. I am familiar with the raccoon and fisher whose tracks appear here, can even tell them apart in the dark by delicately fingering the rim of their prints in the soil. I can hear the preparations of muskrats. On cold, damp nights I am aware of the fog of birds' breath that rolls oceanic through the trees above. Out there, I know which rocks are gripped by slumbering water striders, and where beneath the water lie the slipcase homes of caddie fly larvae.

I feel I am coming closer to it.

River Notes: Dance of the Herons

## KIDS IN THE CREEK: A STREAM STUDY

Your students slip on waders to take a closer look at the Icicle River. With a resource specialist, they explore the life of a stream and the macroinvertebrates living there.

### Environmental Education Objectives:

These activities will demonstrate that human health responds to the quality of our environment. (Goal 2, Objective A) These activities will communicate that respect for the earth and all its living things encourages people to maintain a quality environment. (Goal 2, Objective D)

## CLASSROOM PRE-WORK: ARE YOU ME?

### Concept:

Metamorphosis

### Objectives:

1. Students will recognize various stages of aquatic animals.
2. Students will determine the life cycles stages of various macroinvertebrates.

### Skills:

comparing similarities and differences matching classify

### Materials:

crayons or marking pens  
Student activity sheet "aquatic animal cards"  
Student activity sheet "color me"  
Student activity sheet "immature aquatic insect key"  
Student activity sheet "aquatic insect life cycle stages"

### Background:

Many animals look significantly different in their early stages of development when compared to adulthood. This is obviously true for some aquatic insects. Many aquatic insects undergo simple metamorphosis while others undergo complete metamorphosis. In simple metamorphosis, the insect egg hatches to produce a nymph. Metamorphosis means change during growth. Nymphs may begin to resemble adults but they still may vary considerably from their adult form.

Insects that experience complete metamorphosis are characterized by eggs that hatch into larvae. The larva grows through several stages and then changes into a pupa. Pupae are usually encased in a protective cover for their next stage of growth. From the pupae emerge the soft-bodied, often pale-colored, adults. They differ remarkably in appearance from their earlier forms but are not yet completely formed. Gradually the soft pale body develops firmness and color. In complete metamorphosis's, there is little resemblance between the adult and earlier forms. Please refer to the "Aquatic Insect Life Cycle Stages" which demonstrates the aquatic insect life cycle.

\*bolded words indicate new vocabulary terms

Procedure:

1. Make pairs of aquatic animal cards You may use the masters provided Make sets for each student or groups of students.
2. Ask your students to bring two pictures from home. One should be of an adult, the other should be a picture of a child. The pictures would be pictures of the same person as an adult and as a child. For example, the pair may be of the student's parents as an adult and in a childhood picture, or it may be a school picture of the student and a picture of the students as an infant.
3. Divide the class into small groups of three or four students each Have them hold their own set of paired pictures in their hands. Assign each group a single table or station. Ask them to stand in a circle around that station.
4. Have the students at each station place their pairs of pictures on the table and mix them \_ randomly. Once the adult-child pictures are mixed at each table, have the entire group shift to another table so there will not be anyone at the tables where their own pictures are placed.
5. At the new table, have the groups attempt to match pairs of adult/child or student and infant photos.
6. When the students at each table have completed their efforts to match the pairs, ask all of the groups to return to their original tables-the places they left their own pairs of pictures. Are the matches correct? Ask the students to change any pairs that are not correctly matched. Talk about how difficult or easy it was to correctly match pairs. Introduce the idea that many animals look remarkably different as adults than they appeared in younger forms. Tell the students that they are about to learn how to match young and adult forms of many different kinds of aquatic animals.
7. Introduce the aquatic animal cards and divide the class in two. Designate one half of the students "adults" and the other half "young animals." Give each student in the "adult group" and "adult" animal. image. Give each student in the "young animal" group a "young animal" image. Make sure there is a corresponding match, adult or juvenile, for each card given. [instruct the students to look for their "match"- pairing the appropriate adult and juvenile forms. Note- You can attach each animal card to a string loop so the pictures can be hung around the students' necks as they try to match the pictures.
8. When all the students have made their choices and think they have a match, let everyone help to see if the matches are correct. Some are more difficult than others and may be confusing.
9. Have all of the students look at all of the correctly matched pairs Look at similarities and differences in how different kinds of aquatic animals grow and change You may want to reshuffle the cards and distribute new "animals" to each student.

adapted with permission from Project WILD Aquatic "Are You Me?" p. 14.

10. Distribute student activity sheets “color me” aquatic insects to groups of four.
11. Have students color each insect
12. Have students study each page and then cut out each insect.
13. Ask students to decide which is the adult form and which is the juvenile form of each insect. Separate them into two piles
14. Have students try to identify the juvenile insects by using the “immature aquatic insect key”.
15. If students understand the concept of metamorphosis easily, photocopy and cut up the “aquatic insect life cycle stages” sheet and distribute to groups of students. Have each group arrange in order the insect’s life cycle from juvenile to adult.

“Immature aquatic insect key” and “color me” reference sheets adapted with permission from the Klamath River Education Program, 1989. “Aquatic insect life cycle stages” reference sheet adapted with permission from Wa Dept. Of Ecology

**Extensions:**

1. Find out as much as possible about some of the habitats in which these animals live
2. Pick a pair of images and find out more about the life cycles of the animals shown.
3. Discuss and /or pantomime the concept of metamorphosis.
4. Students pick two other animals that haven’t been discussed and draw their life cycle.
5. Cut the “color me” aquatic insects, distribute them, and ask students to find their parent or child.



## SALMON FESTIVAL ACTIVITY: KIDS IN THE CREEK

### **\*\*SPECIAL NOTE\*\***

Teachers must make reservations for a specific time, due to the popularity of this event.

Teachers should make copies of the key “immature aquatic insect key” provided.. It would be ideal if the keys are laminated so that they are protected from the water.

#### Concept:

Macroinvertebrates  
Stream Habitat  
Indicator Species

#### Objectives:

1. Students will explore the stream habitat.
2. Students will identify and classify macroinvertebrates.

#### Skills:

classify identify observation

#### Procedure:

From the banks of the creek, and in its calmer reaches, students explore the parameters of a healthy fish habitat. With a resource specialist they will determine where fish like to live, what they prefer to eat, and what insects are indicator species.

## CLASSROOM FOLLOW-UP: MACOINVERTEBRATE MAYHEM

#### Concept:

Macroinvertebrates  
indicator Species

#### Objectives:

1. Students will illustrate how tolerance to water quality conditions varies among macroinvertebrate organisms.
2. Students will explain how population diversity provides insight into the health of an ecosystem.

#### Skills:

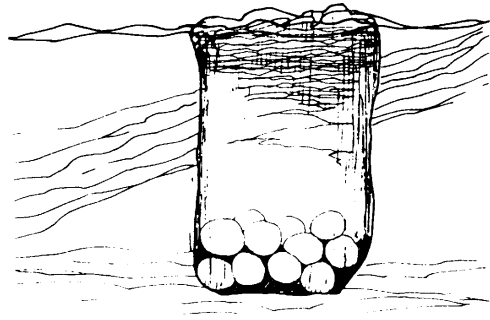
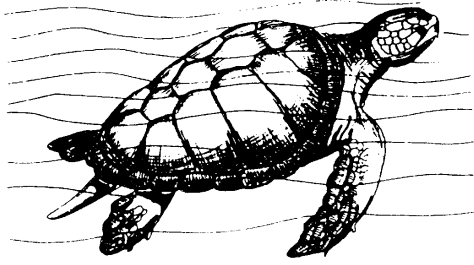
gathering information  
Organizing, interpreting

#### Procedure:

see next page used with permission from Project WET (Water Education for Teachers)

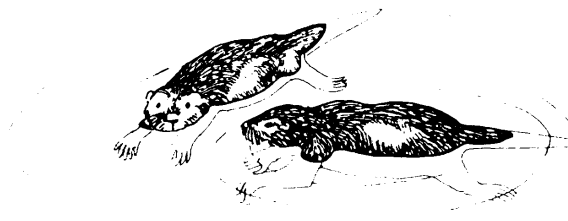
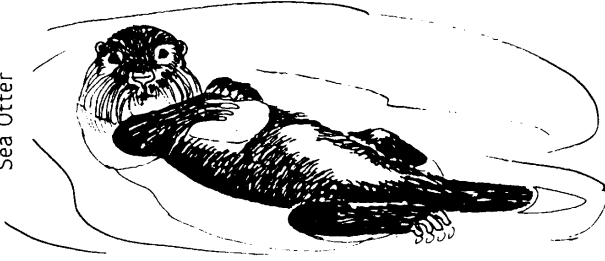
# AQUATIC ANIMAL CARDS

Sea Turtle



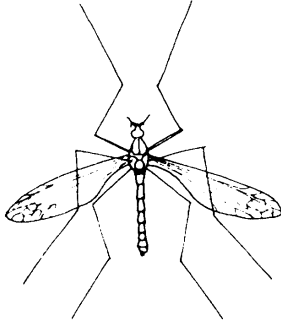
Sea Turtle Eggs

Sea Otter



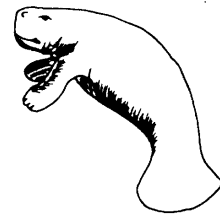
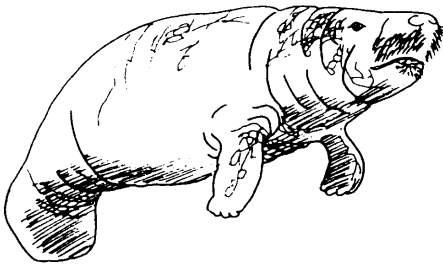
Young Sea Otters

Cranefly



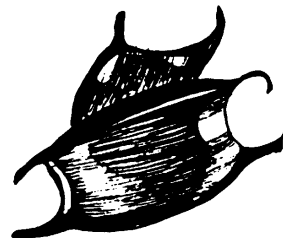
Cranefly Larva

Manatee



Young Manatee

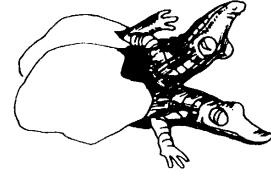
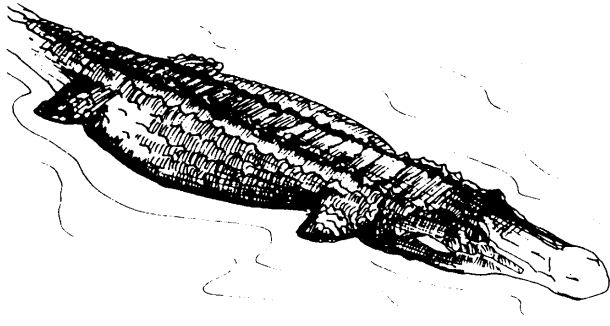
Skate



Skate Egg Cases

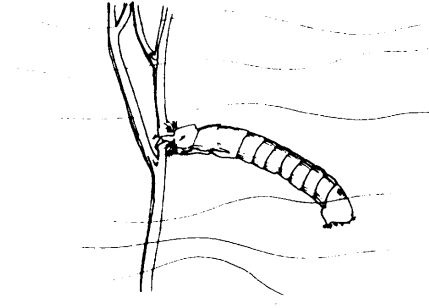
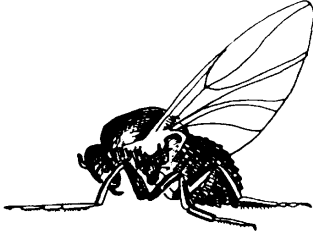
# AQUATIC ANIMAL CARDS

Alligator



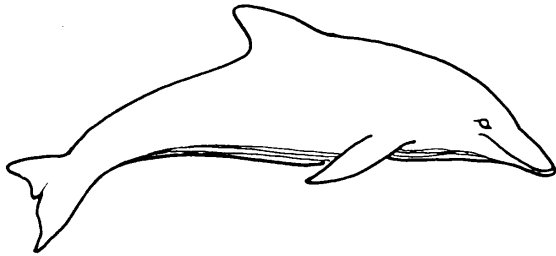
Alligator Hatchlings

Black Fly



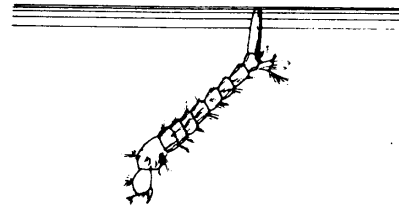
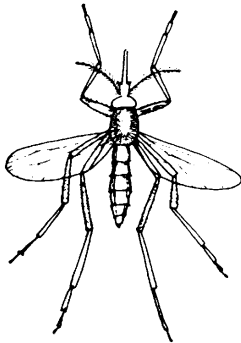
Black Fly Larva

Porpoise



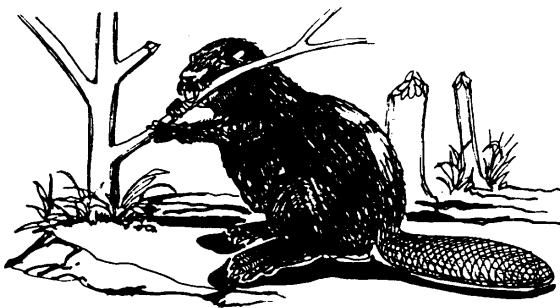
Young Porpoise

Mosquito



Mosquito Larva

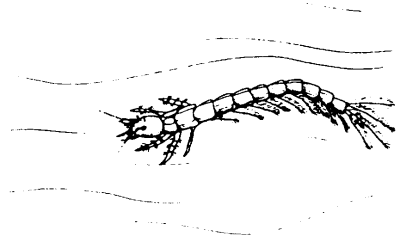
Adult Beaver



Young Beavers

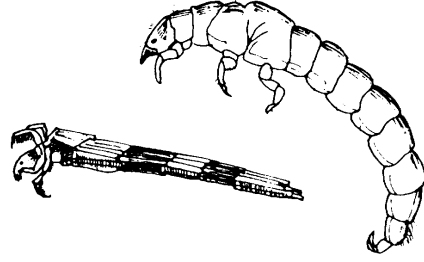
# AQUATIC ANIMAL CARDS

Whirligig Beetle



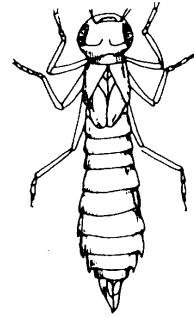
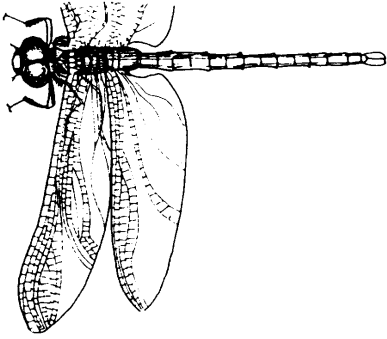
Whirligig Larva

Caddisfly



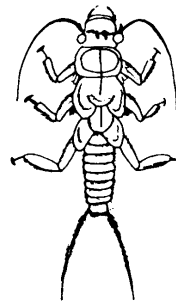
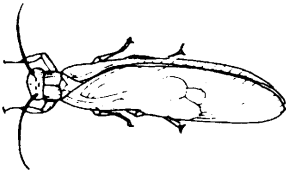
Caddisfly Larvae

Dragonfly



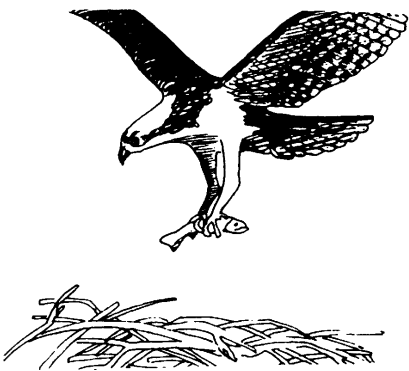
Dragonfly Nymph

Stonefly



Stonefly Nymph

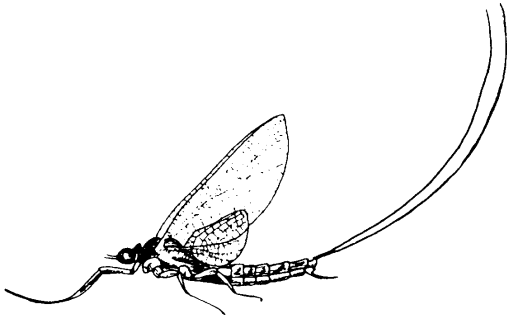
Osprey



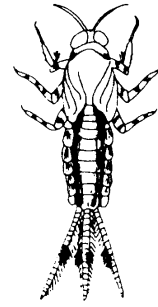
Osprey Hatchlings

# AQUATIC ANIMAL CARDS

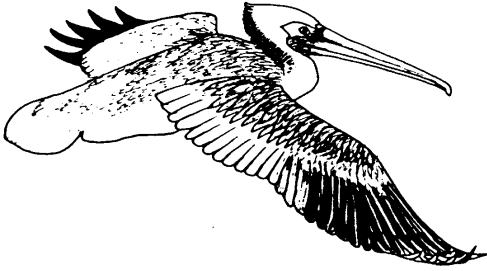
Mayfly



Mayfly Nymph



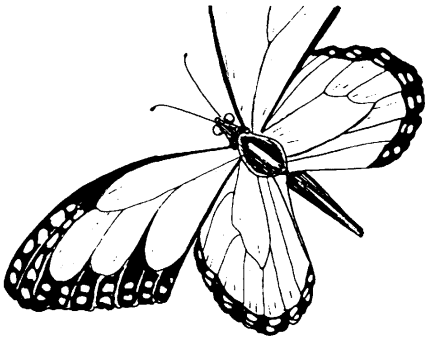
Pelican



Pelican Nest and Eggs



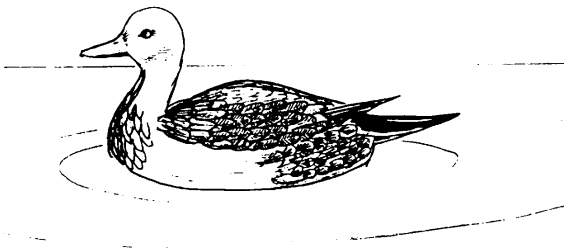
Butterfly



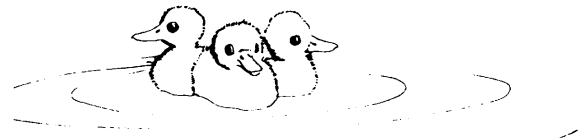
Butterfly Larvae



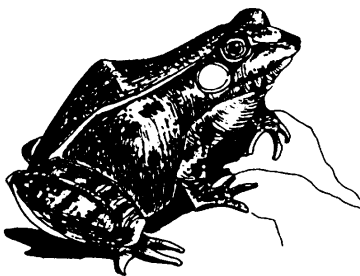
Duck



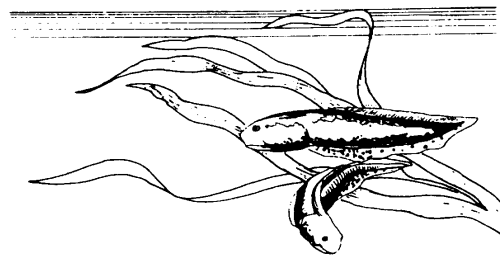
Ducklings



Frog



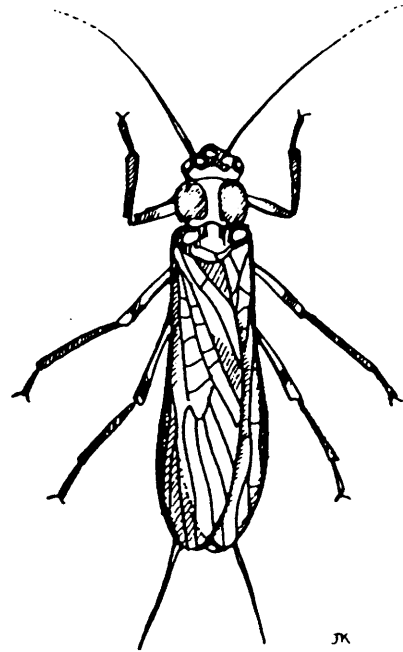
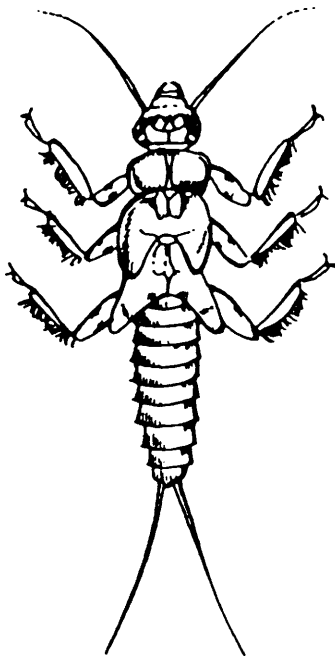
Tadpoles



“Color Me”

ORDER PLECOPTERA: STONEFLIES

FAMILY PERLIDAE



### ~ WHAT TO LOOK FOR

Two tails (cerci), two grasping claws at end of each leg, wings of adult are held parallel along top of body  
light brown or yellowish color with dark patterns  
gills are hairy projections  
wing plates clearly visible on back- point toward rear of insect not divergent  
projections from mouth used for manipulating prey (they are predators)

### FUN FACTS

nymph molts 6-7 times (6-7 instars) various sizes show that hatch is staggered  
·live 1-3 years as nymph - 1-4 weeks as adult  
·may require longer time for life cycle due to cold temperatures starts as egg (adhesive sticky covering or anchoring devices)

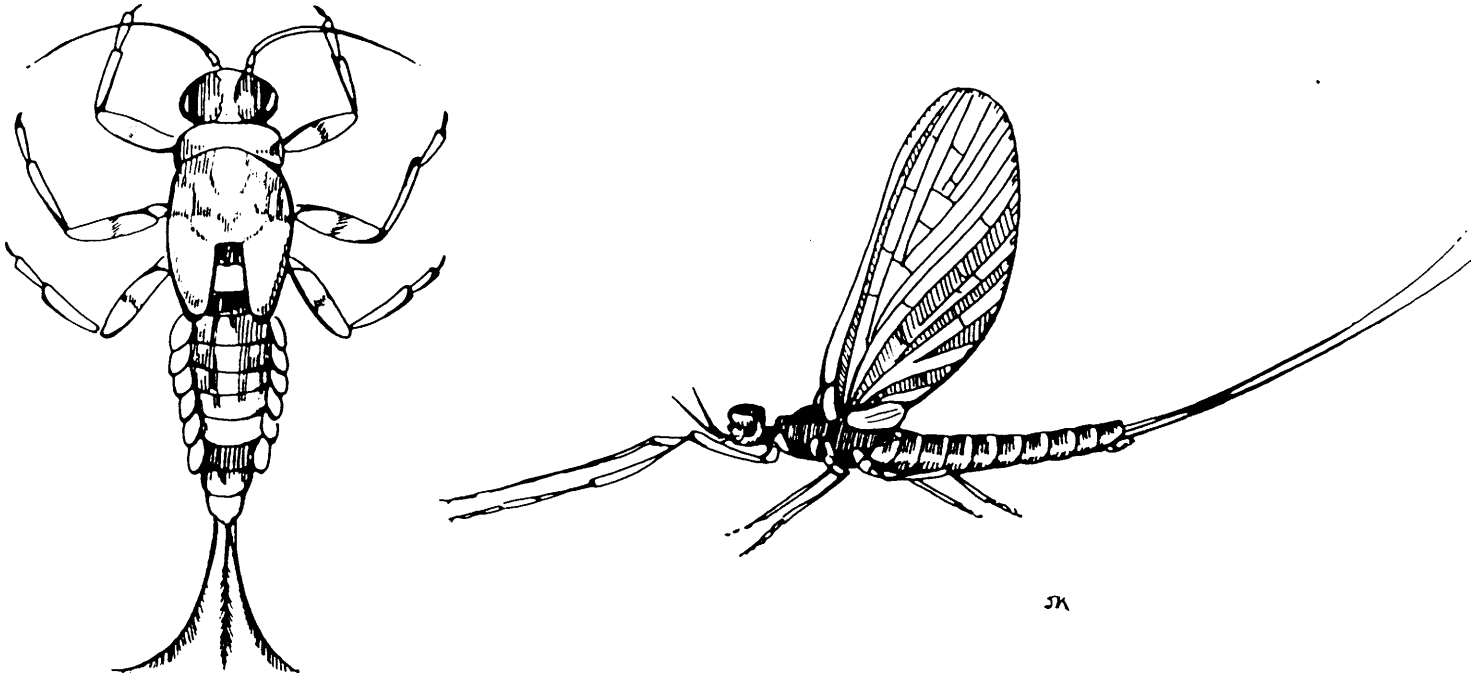
Klamath River Education Program  
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Drawing By John King

“Color Me”

## ORDER EPHEMEROPTERA: MAYFLIES

One claw at end of each leg, three tails on abdomen of most families. Adults have large front wings and smaller back wings, often swarm in large numbers for mating, may spend less than one day as adult! Can have several broods during the year, so they can colonize habitats that are uninhabitable a certain times of the year

### SWIMMING MAYFLIES: Family Baetes



### WHAT TO LOOK FOR

light colored elongate body oval plate-like gills on abdomen large eyes

### FUN FACTS

may shed skin as many as 27 times! gather detritus or scrape algae off rocks adults may live only 2 hrs and no longer than 3 days

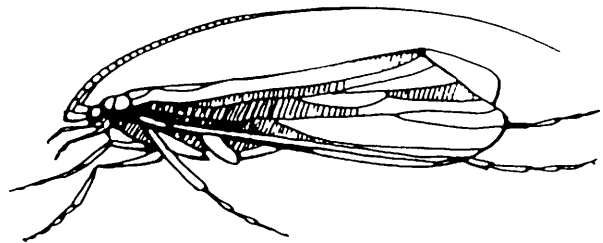
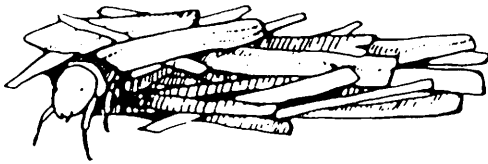
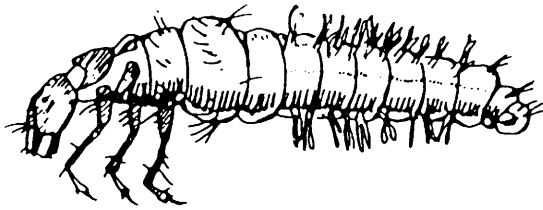
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## ORDER TRICHOPTERA: CADDIS FLIES

Many nymphs build cases, worm like body often with gills on abdomen, hard shell like parts on top of thorax, adult is moth like and hold wings over body like tent

TUBE CASE BUILDING CADDIS Family Limnophilidae- largest family of case makers but not all case building caddie are in this family



### WHAT TO LOOK FOR

build cases of rock in swift water but of leaves in still water areas

·gills on abdomen (like soft white hairs)

·horn under thorax between front legs (need microscope) stiff hair like objects on top of first abdominal segment (need microscope)

### FUN FACTS

eats dead leaves but fungi on leaves may be source of nutrition (like peanut butter on bread)

may feed on dead fish

eggs do not hatch until days are long (signals food availability)

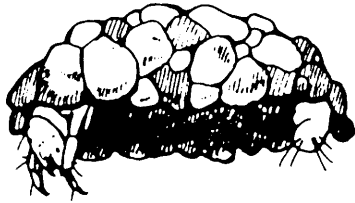
constantly adds on to case as larvae grows

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· SADDLE CASE CADDIS Family Glossomatidae



## WHAT TO LOOK FOR

shell like turtle (half rounded case looking from top) lives on rocky surface only first section of thorax has hard covering on top no gills on abdomen

## FUN FACTS

scrapes algae and detritus off rocks  
builds new cases as it grows-discards case and drifts downstream if water conditions get bad  
has many holes to allow water flow- helps get oxygen

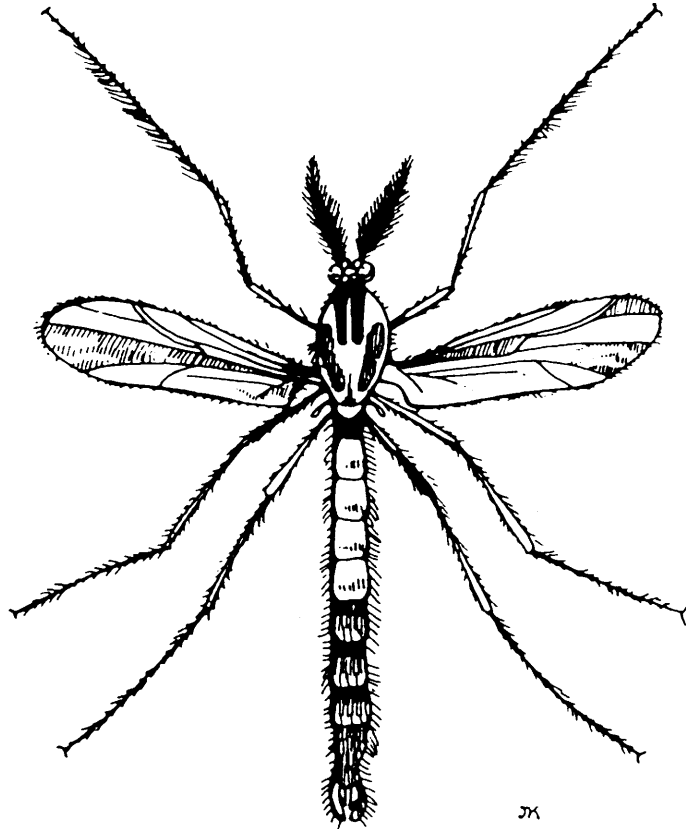
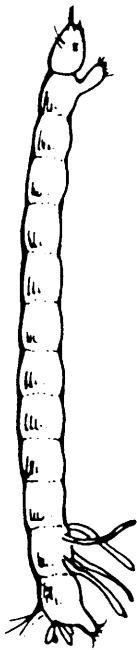
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## ORDER DIPTERA: TRUE FLIES

larvae have no legs, often white and worm like, difficult to tell head from tail. Adults with two wings.

MIDGES: Family Chironomidae No



### WHAT TO LOOK FOR:

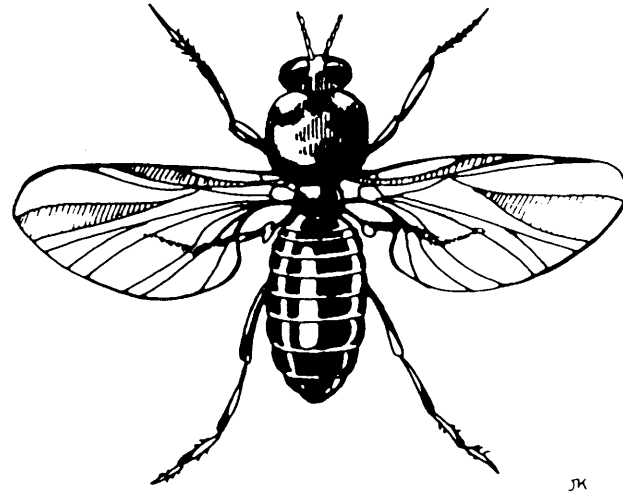
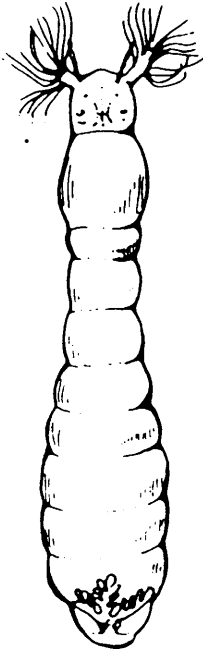
small white worm like larvae with segmented body and hardened head capsula sometimes small proleg near head and cases of built of detritus adult has plumous antena

### FUN FACTS:

some found in healthy streams but numbers increase greatly in polluted environments

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“Color Me”  
BLACK FLIES Family Simuliidae



WHAT TO LOOK FOR

larvae have white worm like body with hard head capsule  
comb-like mouth parts

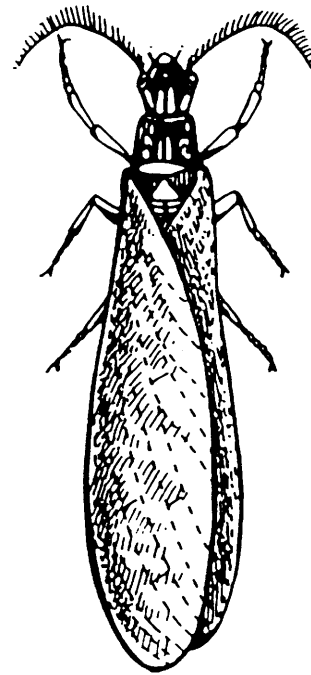
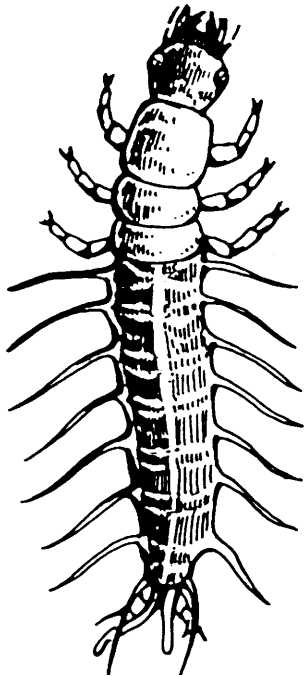
FUN FACTS

attach to bottom with glue and strain food from passing water

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“Color Me”

· ORDER MEGALOPTERA ALDERFLIES



JK

WHAT TO LOOK FOR

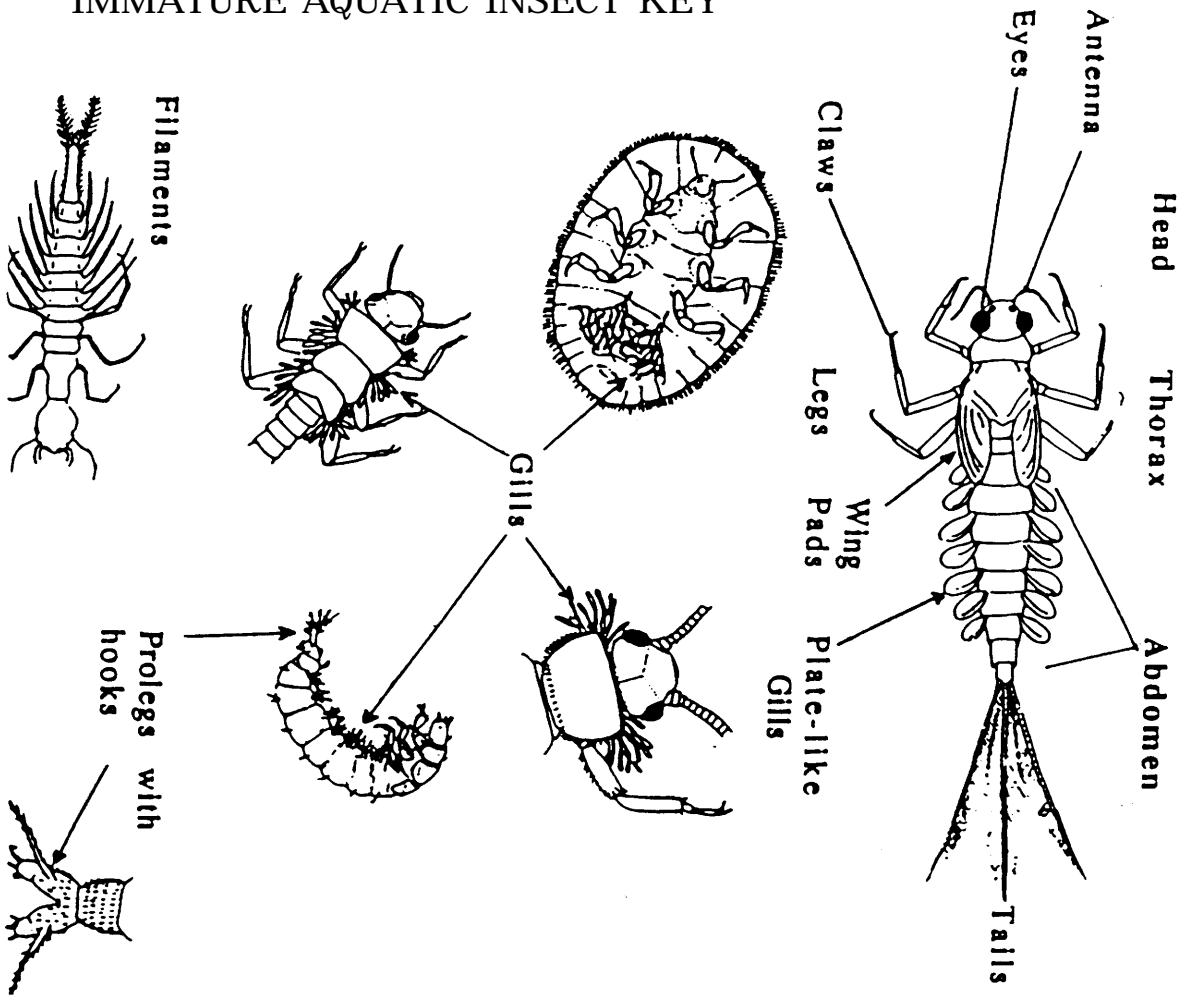
spine like filaments on nymphs and very large mandibles (jaws) adults large with lacey wings held over back

FUN FACTS:

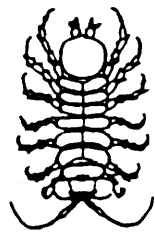
adults are secretive and short lived so they are not often seen nymphs use huge jaws to burrow through mud and to capture prey nymph crawls out and burrows before making pupae

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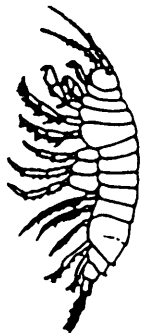
THINGS YOU SHOULD KNOW BEFORE USING THIS KEY



OTHER ANIMALS YOU MAY FIND



Isopods



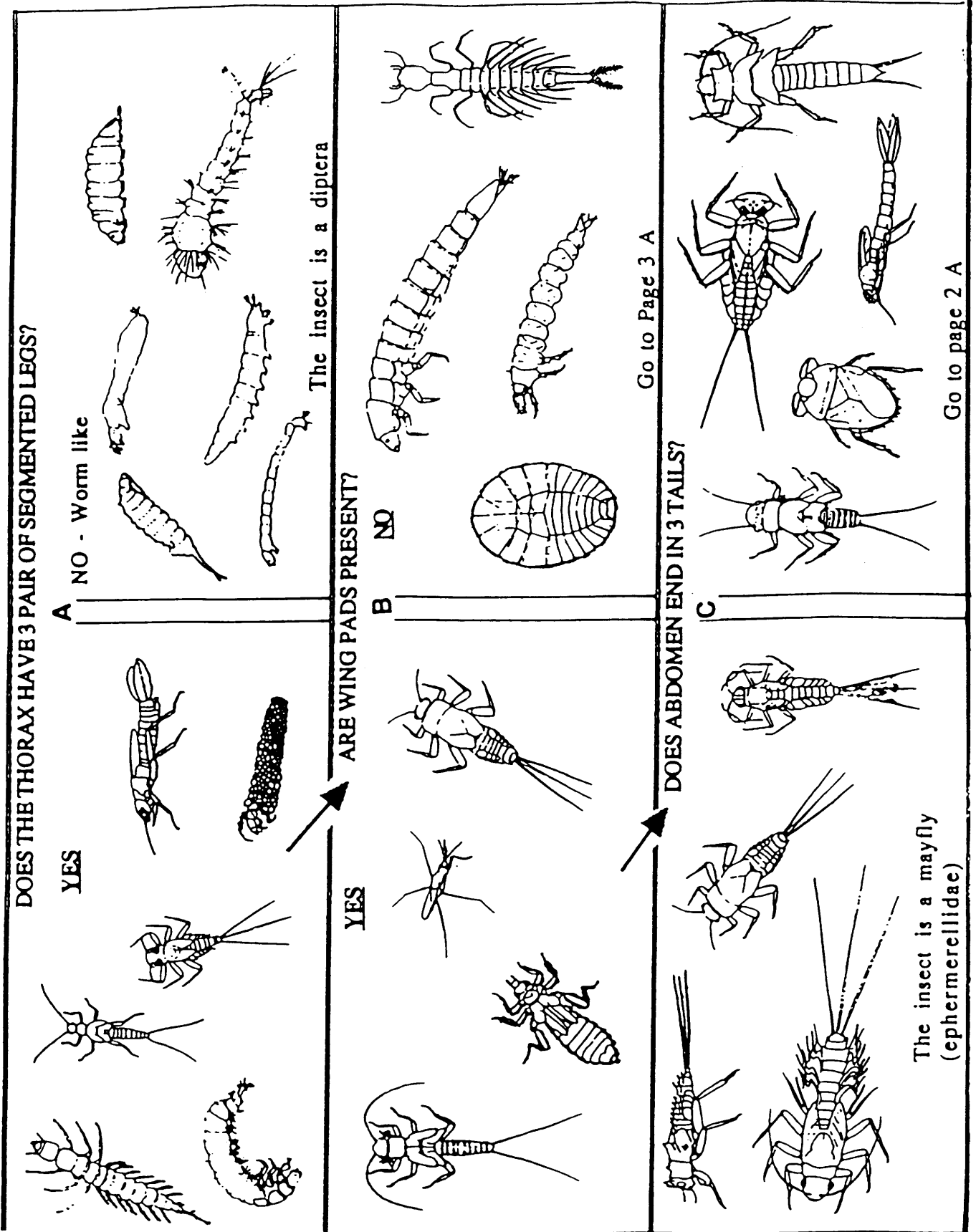
Amphipods



Snails

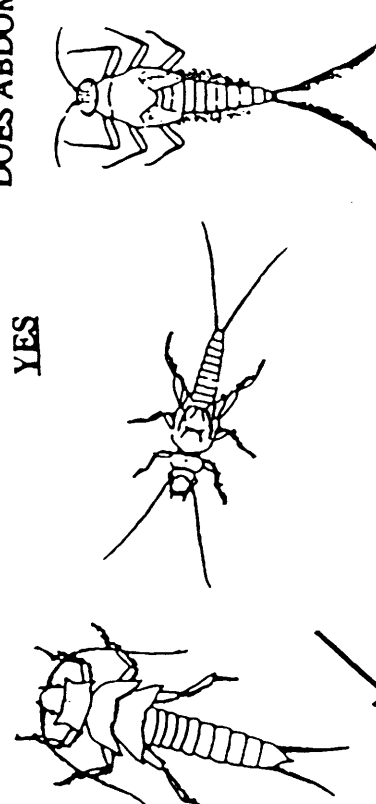
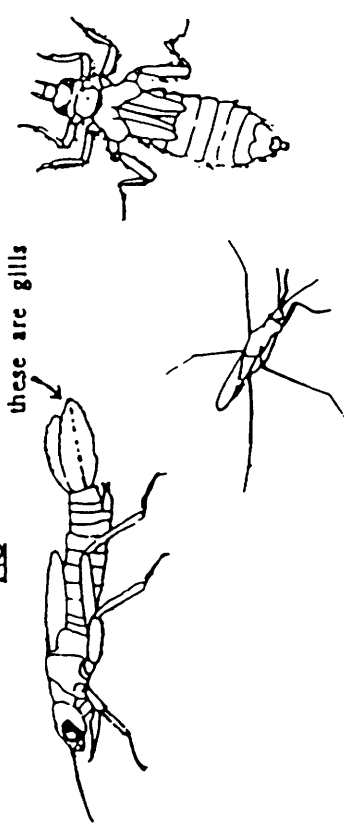

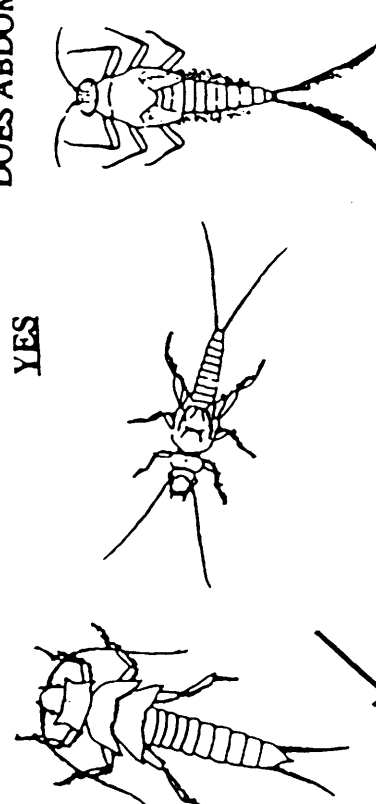
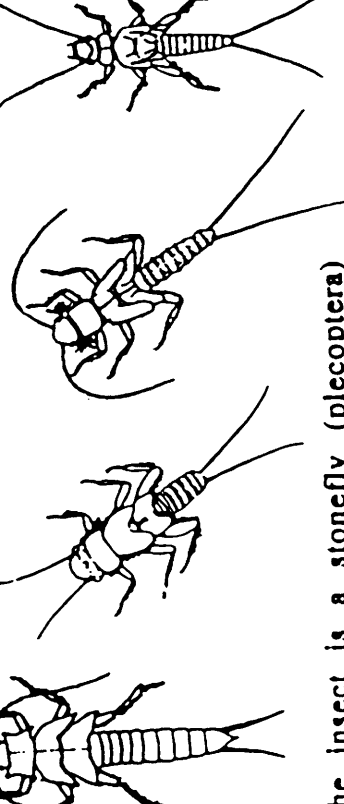
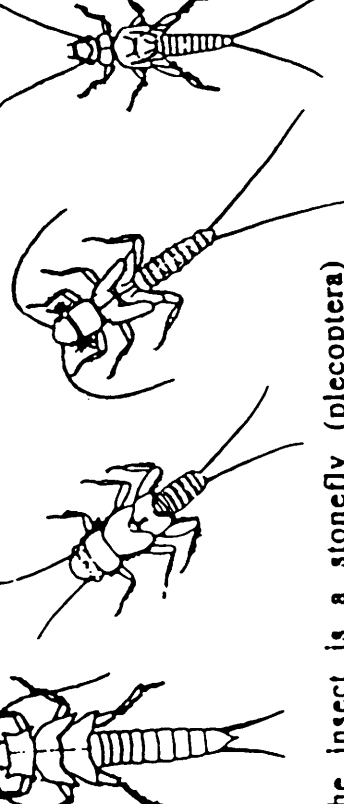
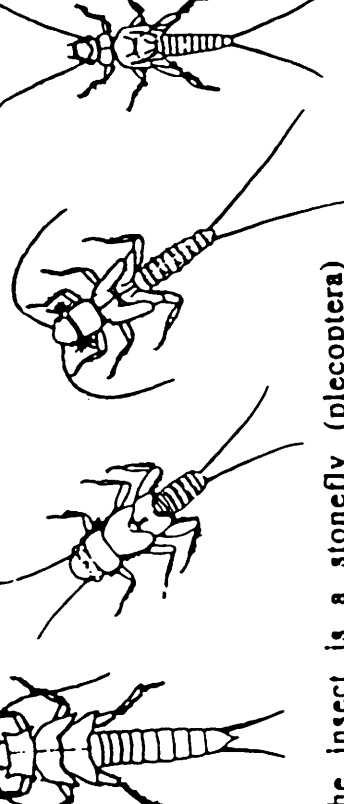
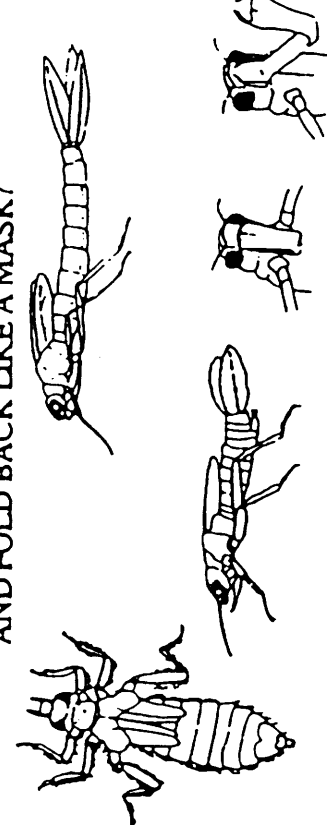
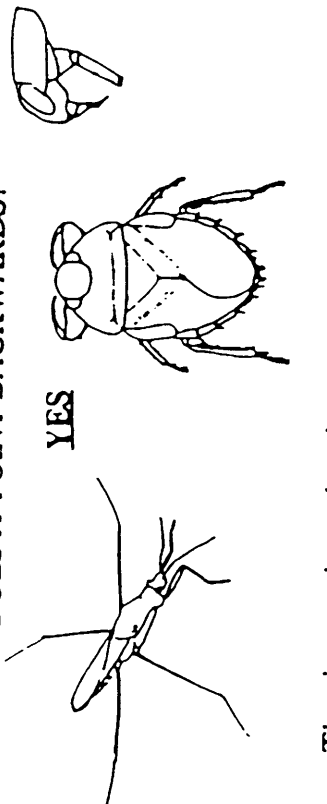
Adult Water Beetles





**AQUATIC INSECTS**

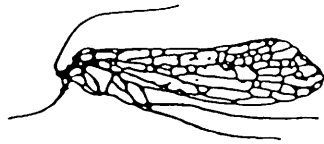
**A KEY TO IMMATURE**

<p><b>DOES ABDOMEN END IN 2 TAILS?</b></p> <p><b>YES</b></p>  <p><b>NO</b></p>  <p>these are gills</p>	<p><b>IS THERE ONE CLAW AT THE END OF LEGS and ARE THERE PLATELIKE GILLS ON ABDOMEN?</b></p> <p>Go to 2 C, below</p>  <p>The insect is a mayfly (ephemerellidae)</p>
<p><b>DOES ABDOMEN END IN 2 TAILS?</b></p> <p><b>YES</b></p>  <p><b>NO</b></p>  <p>OR</p>  <p>The insect is a stonefly (plecoptera)</p>	<p><b>IS THERE TWO CLAWS AT END OF LEGS and ARE THE GILLS NOT LIKE PLATES?</b></p> <p>OR</p>  <p>The insect is a stonefly (plecoptera)</p>
<p><b>DOES THE MOUTH EXTEND OUT LIKE A SHOVEL AND FOLD BACK LIKE A MASK?</b></p>  <p>The insect is odonata</p>	<p><b>IS THE MOUTH SHAPED LIKE A BEAK AND DOES IT POINT BACKWARDS?</b></p> <p><b>YES</b></p>  <p>The insect is a hemiptera</p>

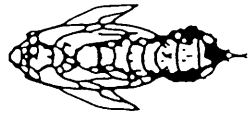
# Aquatic Insect Life Cycle Stages

Caddisflies (Trichoptera)

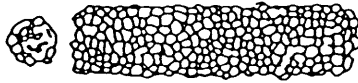
Stoneflies (Plecoptera)



adult



pupa



pupal sieve plate

case



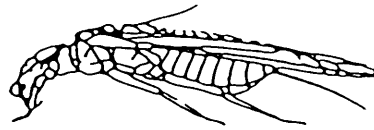
larva



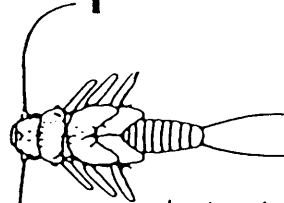
egg mass

A

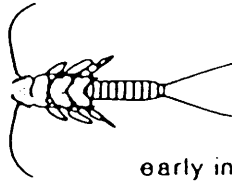
Complete Metamorphosis



adult



last instar



early instar



eggs

B

Incomplete Metamorphosis

Source: Rob Plotnikoff, Ambient Monitoring Section, Washington Dept. of Ecology



# Macroinvertebrate Mayhem

“For in the end, we will conserve only  
what we love, we will love only what we  
understand, we will understand only what  
we are taught.”

Baba Dioum  
Central African Conservationist

## SOME BASIC ECOLOGICAL CONCEPTS

### Everything has a home

We call these homes habitats, ranges and ecological niches. Ecology (from the Greek "oidus" which means house) is the study of the common home of all life-the earth.

### Everything is becoming something else

All plants and animals undergo evolutionary changes and adaptations. When things die, they are broken down, decomposed, recycled and used by other living things.

### Everything living thing eats and is eaten by something else

Three categories of life forms are in the basic food cycle of life: producers, consumers and decomposers.

### Everything depends on something else

Interaction and interdependence occur among living and non-living things and their environment. A change in one strand of the food cycle of life affects the entire web. Nothing exists in isolation.

### There are basic necessities for life: Food, water, shelter, space.

These necessities are found in the atmosphere (air), the hydrosphere (water) and the earth's crust (soil). The biosphere is the thin skin of the planet where these zones collectively support life on earth.

### Diversity is essential for life

Many similarities and differences occur among living and non-living things. This variation is essential for maintaining a healthy community and ensuring that plants and animals survive and reproduce in spite of changing situations.

### Hunans are capable of changing the balance of nature

We are rational, thinking beings that have changed and continue to alter the environment of the earth in many profound ways. As such, we have a responsibility to all living things.

from U.S. Fish & Wildlife Service Salt Marsh Manual: an Educator's Guide.

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# The Essential Learning Academic Requirements and The Salmon Festival Curriculum

## #2 FRANK AND FRANCES “WHAT’S MY LINE?”

### Communication

Essential Learning 1: The student uses listening and observation skills to gain understanding.

Component: Focuses Attention

Benchmark 1: listens without interrupting, sits quietly while others are talking

Essential Learning 2: The student communicates ideas clearly and effectively.

Component: Communicates to Range of Audiences for Variety of Purposes.

Benchmark 1: communicates to teacher, small groups and class uses narrative and descriptive forms of speech

## #3 EXHIBITS

### Writing

Essential Learning 1:

The students writes clearly and effectively.

Component: Sentence Fluency

Benchmark 1: uses variety of sentence beginnings and structures varies sentence length and type

Component: Applies Writing Conventions

Benchmark 1: writes complete sentences, uses capitalization and punctuation accurately, uses correct cursive letter formation and legible handwriting

Essential Learning 3: The student understands and uses the steps of the writing process.

Component: Pre-writing

Benchmark 1: generates ideas by recalling experiences, discovers, explores, and uses resources in schools, libraries, and community.

Component: Revising

Benchmark 1: shares writing with others. listens to response of audience

## #4 COSTUMES”THE WEB OF LIFE”

### Science

Essential Learning 1: The students understands and uses scientific concepts and principles.

Component: Recognize the components, structure, and organization of systems and the interconnections within and among them

Benchmark 1: describe the interdependence among animals, plants, and decomposers in their environments

Component: Recognize the components, structure, and organizations of systems and the interconnections within and among them.

Benchmark 1: identify the basic needs of plants and animals in their environment

Component: Understand that interactions within and among systems cause changes in matter and energy

Benchmark 1: recognize the sun provides the energy used and needed by the earth’s plants and animals

## #5 GYOTAKU

### Art

Essential Learning 1: The student acquires the knowledge and skills necessary to create, to perform, and to respond effectively to the arts.

Component: Create

Benchmark 1: Create artwork in all art forms

Component: Organize arts elements into a composition

Benchmark 1: arrange arts elements to create a composition

Essential Learning 4: The students understands how the arts connect to other subject areas, life, and work.

Component: Demonstrate how the arts connect to other subject areas

Benchmark 1: use art forms to reflect concepts learned in other subjects

### Science

Essential Learning 1: the student understands and uses scientific concepts and principles.

Component: Recognize the components, structure, and organization of systems and the interconnections within and among them

Benchmark 1: identify examples of the relationship between form and function in everyday life

Component: Construct and use models to predict test and understand scientific phenomena

Benchmark 1: interpret a physical model of a familiar object and/or system

## #6 HATCHERY

### Science

Essential Learning 1: The students understands and uses scientific concepts and principles.

Component: Recognize the components, structure, and organization of systems and the interconnections within and among them.

Benchmark 1: recognize that reproduction is essential to the continuation of the species

Benchmark 1: demonstrate how traits are passed from parent to offspring and recognize that those traits determine the species of an organism

Essential Learning 2: The student conducts scientific investigations.

Component: Conduct scientific investigations

Benchmark 1: make simple, accurate observations

ask questions, defining the problem, make predications based on experiences, and identify any conditions that should be considered.

Essential Learning 3: The students uses effective communication skills and tools to build and demonstrate understanding of science.

Component: Use listening, observing, and reading skills to obtain scientific information.

Benchmark 1: obtain science infonnation by listening to and attending a science presenta-tion

## #7 AQUARIUM

### Science

Essential Learning 1: The student understands and uses scientific concepts and principles.

Component: Identify, describe, and categorize living things based on their characteristics

Benchmark 1: use characteristics to distinguish among different kinds of living organisms

Component: Recognize the components, structure, and organization of systems and the interconnections within and among them.

Benchmark 1: describe the interdependence among animals, plants, and decomposers in their environment

## #8 MAZE

### Science

Essential Learning 3: The student uses effective communication skills and tools to build and demonstrate understanding of science.

Component: Use listening, observing, and reading skills to obtain scientific information.

Benchmark 1: read and comprehend developmentally appropriate science information

Essential Learning 4: The student understands how science knowledge and skills are connected to other subject areas and real-life situations.

Component: Describe the connection between science and society

Benchmark 1: describe how personal decisions can impact the environment

## #9 TENT

### Reading

Essential Learning 1: The student understands and uses different skills and strategies to read.

Component: Understands elements of literature --fiction.

Benchmark 1: reads, responds to, and discusses a variety of literature (folk tales, stories, rhymes, poems, plays)

Essential Learning 2: The student understands the meaning of what is read.

Component: Expands comprehension by analysis, interpretation, and synthesis

Benchmark 1: finds similarities and differences in stories; understands relationships between parts of text

Essential Learning 3: The student reads different materials for a variety of purposes

Component: Reads for literacy experience

Benchmark 1: reads to understand different views of family, friendship, culture and tradition from literature.

## #10 NATURE TRAIL

### Science

Essential Learning 1: The student understands and uses scientific concepts and principles.

Component: Identify, describe, and categorize living things based on their characteristics

Benchmark 1: use characteristics to distinguish among different kinds of living organisms.

Component: Recognize the components, structure, and organization of systems and the interconnections within and among them.

Benchmark 1: identify the basic needs of plants and animals in their environment

Benchmark 1: identify examples of the relationship between form and function in everyday life

## #11 NATIVE AMERICAN

### Social Studies-History

Essential Learning 1: The students understands and examines major ideas, eras, theses, developments, turning points, chronology, and the cause-and-effect relationships among them in Washington state, U.S. and world history.

Component: Historical time and chronology

Benchmark 1: explore cultural heritage of self and others

Essential Learning 2: The student understands that historical accounts and artifacts are subject to analysis and interpretation from multiple perspectives.

Component: Historical perspectives and interpretations

Benchmark 1: Use primary sources to reconstruct past events in his or her local community

### Social Studies-Geography

Essential Learning 3: The students observes and analyzes the interaction between people and their environment.

Component: the individual and the environment

Benchmark 1: identify a variety of perspectives individuals have regarding their relationship with the environment

Essential Learning 4: The student identifies, compares, and assesses the impact of cultures on individuals, groups and society.

Component: Elements of culture

Benchmark 1: recognize that people of different cultures have universal human needs which they satisfy in a variety of ways

# Field TRIP GUIDELINES