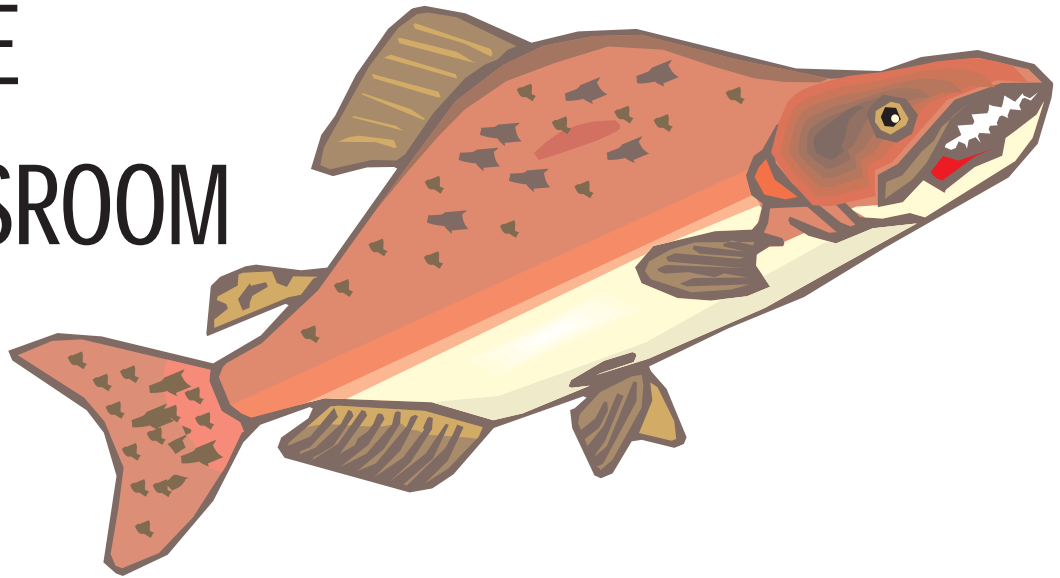


SALMON

IN THE CLASSROOM



-
- **The Salmon Life Cycle**
 - **Funky Fish Morphology**
 - **Salmon Stream Design**
 - **Salmon Release Field Trip**
-



Rural Science Education Program
A partnership between Oregon State University
and rural K-12 schools



OSU
Oregon State
UNIVERSITY
Extension Service

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Rural Science Education Program

The Rural Science Education Program is a partnership between Oregon State University and local rural K–12 schools for enrichment of the science curriculum with hands-on science activities. The curricula include simple, innovative inquiry- and site-based experiments that encourage critical thinking in K–12 students about the impacts of agriculture on the environment and the implications of advanced scientific research on human lives.

For more information

For more information about the Rural Science Education Program, to order copies of *Salmon in the Classroom*, or to request a loaner kit that includes limited supplies for each activity, contact Sujaya Rao (phone: 541-737-9038; e-mail: sujaya@oregonstate.edu; fax: 541-737-5725).

Also available: *Insects: Taking a Deeper Look at the World of Bugs*, EM 8896-E, three lesson plans for grades 3 through 8.

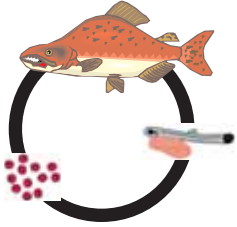
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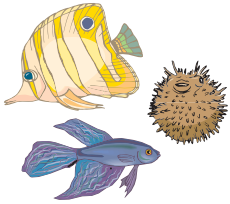
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Sample Completed Stream Design



Salmon Release Field Trip

Lesson Plan
Student Worksheet—Salmon Release Field Trip

Look for
these
symbols



Lesson plan



Student worksheet

SALMON IN THE CLASSROOM



DESCRIPTION

The lessons in this unit are designed to be used during and after salmon have been raised in the classroom. Most of the lessons can be adapted, however, if salmon eggs and incubator equipment are not available.

Local hatchery programs can help you set up an incubator in your class. Most offices of the Oregon Department of Fish and Wildlife (ODFW) have recovery and education programs to facilitate these activities. Please consult your local ODFW office for more information about raising salmon in your classroom. (See “Extensions/Resources” on page 3.)

This unit is designed to begin in the early fall, but the exact start date may vary. We recommend that you spread the four lessons throughout the month required for incubation so that your students get steady exposure to salmon biology leading up to the salmon release field trip. The first three lessons can be completed in any order.

Benefits of raising salmon

- Generates higher levels of interest in the lessons.
- Fosters a sense of environmental stewardship and responsibility.
- Provides in-class reference for the subject material.
- Encourages community involvement.
- Introduces a policy-relevant topic: Salmon management is controversial.
- Engages students with a sense of place: Salmon are an icon species in the Northwest.



STUDENT OUTCOMES/OBJECTIVES

- Students will be able to list the salmon life cycle stages in order.
- Students will be able to draw a stream showing vegetation, animals, and water quality parameters that are necessary for salmon survival.
- Students will be able to identify salmon habitat characteristics in the field.
- Students will be able to explain the connection between animal morphology and habitat.



STANDARDS

Benchmark 1

- Describe a habitat and the organisms that live there.

Benchmark 2

- Describe basic plant and animal structures and their functions.
- Describe the living and nonliving resources in a specific habitat and the adaptations of organisms to that habitat.
- Describe the life cycle of an organism.
- Describe how adaptations help a species survive.
- Identify conditions that might cause a species to become extinct.



TIME ESTIMATE

- One month for the entire unit (the time it takes to incubate the salmon)
- One 50-minute class period for each lesson



MATERIALS

For the lessons

- Salmon life cycle video (see “Resources” on page 2 of the Salmon Life Cycle lesson plan for suggestions)
- Salmon life cycle story (included in this package)
- Salmon life stage cards (included in this package)
- Preserved fish or photos/illustrations of fish and other animals
- Scissors
- Stapler
- Crayons/markers
- Colored clay
- Fish habitat cards (included in this package)
- Rite in the Rain paper
- Thermometer (for taking stream temperatures)
- Turbidity meter (if available)
- Paper or plastic cups

To raise salmon

- Refrigerating unit or lots of ice
- 10- to 20-gallon tank
- Under-gravel or power filter
- Aquarium rocks
- Thermometer
- Eggs provided by a local hatchery or fish and wildlife program



WORKSHEETS

- Salmon Release Field Trip



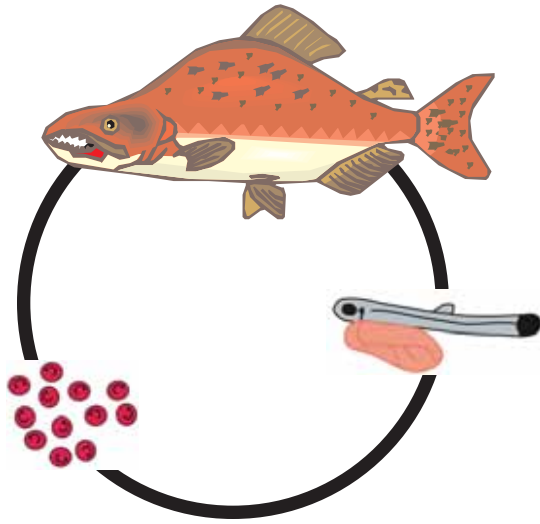
LESSON PLANS

- The Salmon Life Cycle
- Funky Fish Morphology
- Salmon Stream Design
- Salmon Release Field Trip



EXTENSIONS/RESOURCES

- Oregon Department of Fish and Wildlife Salmon Trout Enhancement Program
<http://www.dfw.state.or.us/STEP/>
- Oregon Department of Fish and Wildlife local offices
http://www.dfw.state.or.us/agency/directory/local_offices.asp
- Oregon Department of Fish and Wildlife
3406 Cherry Avenue NE
Salem, OR 97303
Phone 503-947-6000 or 1-800-720-ODFW
- Life cycle videos are available at most libraries. Suggested videos are listed under “Resources” on page 2 of the Salmon Life Cycle lesson plan.



The Salmon Life Cycle

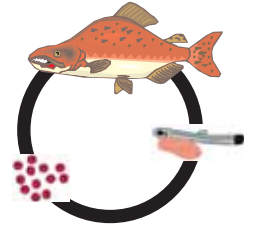
Lesson Plan

Salmon Life Cycle Story

Salmon Life Stage Cards

LESSON PLAN

THE SALMON LIFE CYCLE



Objectives

- Students will be able to list the salmon life cycle stages in order.

Note: Italicized words are potential script for the teacher.

Materials

- Salmon life cycle video (see suggestions under “Resources,” page 2 of this lesson plan)
- Salmon life cycle story (following this lesson plan)—photocopy one story for each student
- Salmon life stage cards (following the salmon life cycle story)—photocopy one sheet for each student
- Scissors
- Crayons/markers
- Stapler

Introduction (10 minutes)

The salmon life cycle is famous in the fish world, and justifiably so. The odds against a fish surviving from egg to spawning are huge. The epic journey from the spawning grounds to the sea and the return to spawn in the same spot years later is also a remarkable feat.

Activity (30 minutes)

- Watch a video about the salmon life cycle.
- Cut out the 8-page story and staple it together to make a booklet. Cut out the six life stage cards. Ask the students to read the story and match the picture with the appropriate page in the life cycle booklet.
- Allow students to illustrate their booklets with crayons or markers.

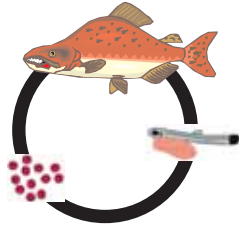
Closing activity/Assessment (10 minutes)

- Read the life cycle story together and ask students to tell which life stage picture goes with each page.



Resources

- *Life Cycle of the Salmon* (VHS video). Produced by Oregon Sea Grant in cooperation with the U.S. Army Corps of Engineers (Corvallis, OR: Oregon Sea Grant Communications, Oregon State University, 1999).
- *Journey of the Kings* (VHS video). Northwest Power Planning Council. Produced by Echo Film Productions, Inc. (Doug Copsey, producer, screenwriter; Norman Nelson, director).
- *To Restore a Legacy: The Struggle for the Snake River's Salmon and Steelhead Trout* (VHS video). Presented by the U.S. Department of the Interior, Fish and Wildlife Service in cooperation with the National Fish and Wildlife Foundation. Produced by Stefan Dobert Productions, Inc. (Edouard Croteau, executive producer).



The Life of

(Your first name)

the Salmon

1

During spawning, my parents were careful to make sure I had plenty of cool water flowing over me. Then they gently covered me with gravel to keep me from washing away.

2

After hatching, I had to work my way up through the gravel nest by following the light of the moon. I emerged from the nest at night to avoid predators. Once I was out, I swam for shelter right away. I don't need to worry about food for awhile because I can survive on my yolk sack for several weeks.

3

Oh no, my yolk sack has run out! I'd better find some food quickly or I'll starve. It's a good thing I have this camouflage pattern on my skin so that predators won't see me while I look for food. I'm able to eat insects that feed on bits of flesh left behind by the rotting adult salmon. Disgusting!

4

I've become larger and less vulnerable to predators. I can eat bigger insects and small fish. My skin has started to become brighter and more suited for ocean life, so I start to make my journey downstream.

5

Once I reach the ocean, I find a lot of food. I follow other salmon to feeding grounds way out in the Pacific Ocean. I spend the next several years hogging out on all different kinds of food. I'll eat just about anything I can fit in my mouth.

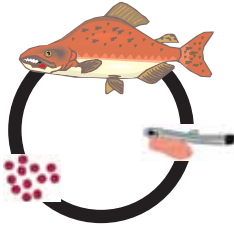
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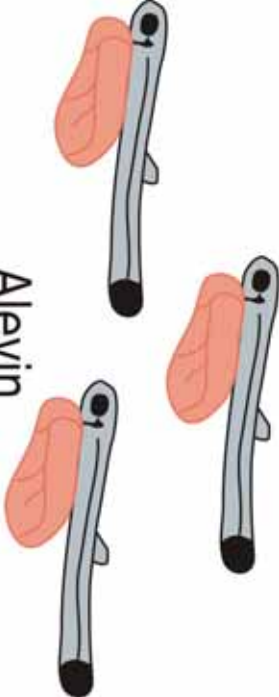


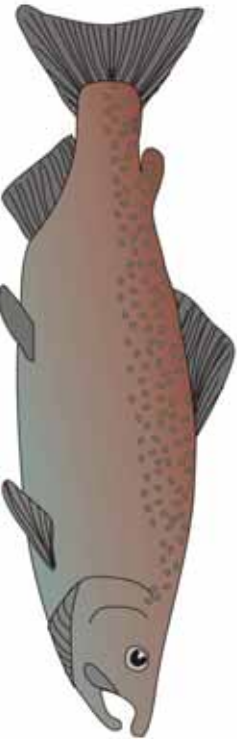

After I've grown very large, I use my nose to find my way back to the stream where I was born. My body begins to change shape, and my snout becomes long and hooked. Eventually, I make it back to the same part of the stream where I hatched, and I spawn. The journey was very difficult, and I have worn myself out dodging fishing nets, jumping waterfalls, and sliding over rocks. I have become so tired out that I die. However, my body is not wasted. It becomes food for future generations of salmon and other river creatures.

7

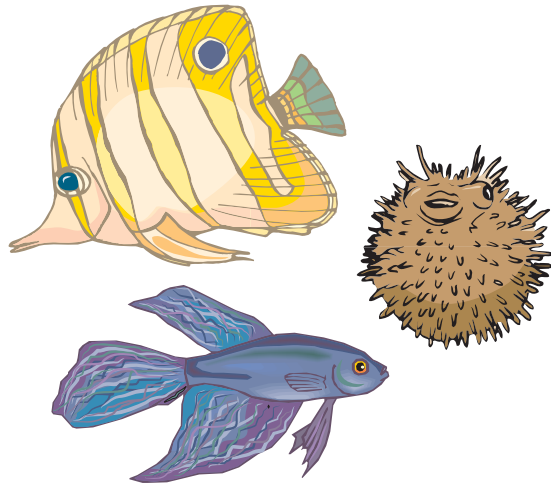
8

SALMON LIFE STAGE CARDS



<p>Salmon Fry</p> 	<p>Alevin</p> 	<p>Adult Fish</p> 
<p>Eggs</p> 	<p>Spawning Adult</p> 	<p>Smolt</p> 

Artwork by Caryn Ackerman

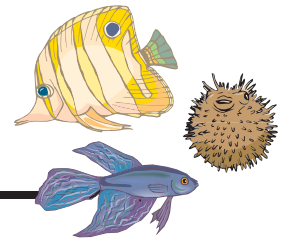


Funky Fish Morphology

Lesson Plan
Habitat Cards

LESSON PLAN

FUNKY FISH MORPHOLOGY



Note: Italicized words are potential script for the teacher.

Objectives

- Students will be able to explain the connection between animal morphology and habitat.

Materials

- Colored clay
- Fish habitat cards (following this lesson plan)
- Examples of fish morphology (preserved fish, photos, illustrations, etc.) and other animals

Introduction (10 minutes)

- While showing examples of salmon morphology, briefly explain why certain morphologies are advantageous given the fish's native habitat and predator-prey relationships. Leading question: What effect might habitat, potential predators, and prey types have on fish morphology?
Examples: A sea horse's unique shape allows it to live in seagrass or on reefs. A flounder hides from prey by burying itself in the sand. A puffer fish avoids predators by becoming too big to eat.
- Make sure each student understands the relationship between form and function in the animal world.

Activity (30 minutes)

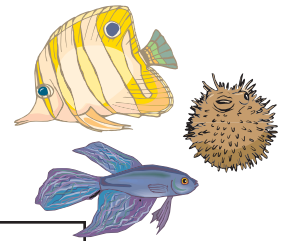
- Explain that the goal of this activity is to design the best adapted fish possible.
- Give each student or group a large glob of clay.
- Give one habitat card to each student or group.
- Instruct students to use the clay to shape their fish, giving special attention to mouth morphology. Mouth morphology should be clearly represented in detail.
- Show more examples of animal morphologies. This time include nonaquatic animals as well. Help the class compare and contrast several of their fish designs with other creatures that inhabit similar habitats.

Closing activity/Assessment (10 minutes)

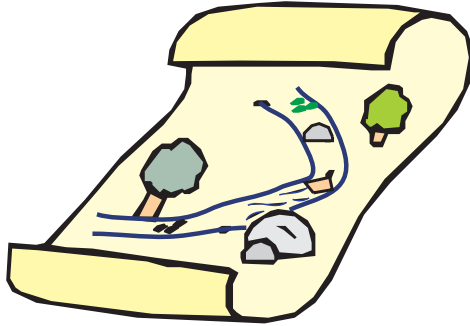
- Ask students or groups to show their models in front of the class, indicating how certain features will benefit and/or inhibit the fish's survival in its habitat.



HABITAT CARDS



<p>Your fish lives in cold, fresh water. It is a carnivore, but relies on camouflage rather than speed to catch its prey.</p>	<p>Your fish lives in cold, fresh water. It is a carnivore, but relies on camouflage rather than speed to catch its prey.</p>
<p>Your fish must travel long distances from its spawning grounds to its feeding grounds. It prefers to eat meat, but will also eat plants when they are available. Your fish is a very fast swimmer and lives in salt water.</p>	<p>Your fish must travel long distances from its spawning grounds to its feeding grounds. It prefers to eat meat, but will also eat plants when they are available. Your fish is a very fast swimmer and lives in salt water.</p>
<p>Your fish is very large, but eats very tiny animals called krill. Krill are found in large groups in the ocean, numbering in the millions.</p>	<p>Your fish is very large, but eats very tiny animals called krill. Krill are found in large groups in the ocean, numbering in the millions.</p>
<p>Your fish lives in freshwater lakes. It has no natural predators and spends most of its time munching on plants found at the bottom of lakes.</p>	<p>Your fish lives in freshwater lakes. It has no natural predators and spends most of its time munching on plants found at the bottom of lakes.</p>
<p>Your fish is an aggressive carnivore that lives in fresh water. It eats other fish, amphibians, mammals, and even its own kind.</p>	<p>Your fish is an aggressive carnivore that lives in fresh water. It eats other fish, amphibians, mammals, and even its own kind.</p>

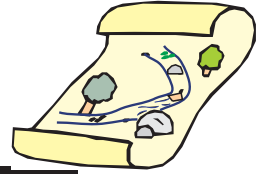


Salmon Stream Design

Lesson Plan
Sample Completed
Stream Design

LESSON PLAN

SALMON STREAM DESIGN



Objectives

- Students will be able to draw a stream with the vegetation, animals, and water quality parameters that are necessary for salmon survival.

Materials

- Rite in the Rain paper—Prior to class, make photocopies of two curved lines on Rite in the Rain paper (to represent a river). Make one copy for each pair of students.

Introduction (10 minutes)

This lesson will help students learn about freshwater salmon habitat while tying the previous lessons together. It should be done in preparation for the salmon release field trip. The activity is intended to be a transition from in-class activities to the salmon release field trip.

Activity (30 minutes)

- Group students in pairs.
- Briefly discuss the parameters that are necessary for salmon survival. After each topic, allow the pairs to add that parameter to their drawings. Make sure students understand the role each parameter plays in supporting or inhibiting salmon survival. An example of a finished stream design follows this lesson plan.

Parameters to cover

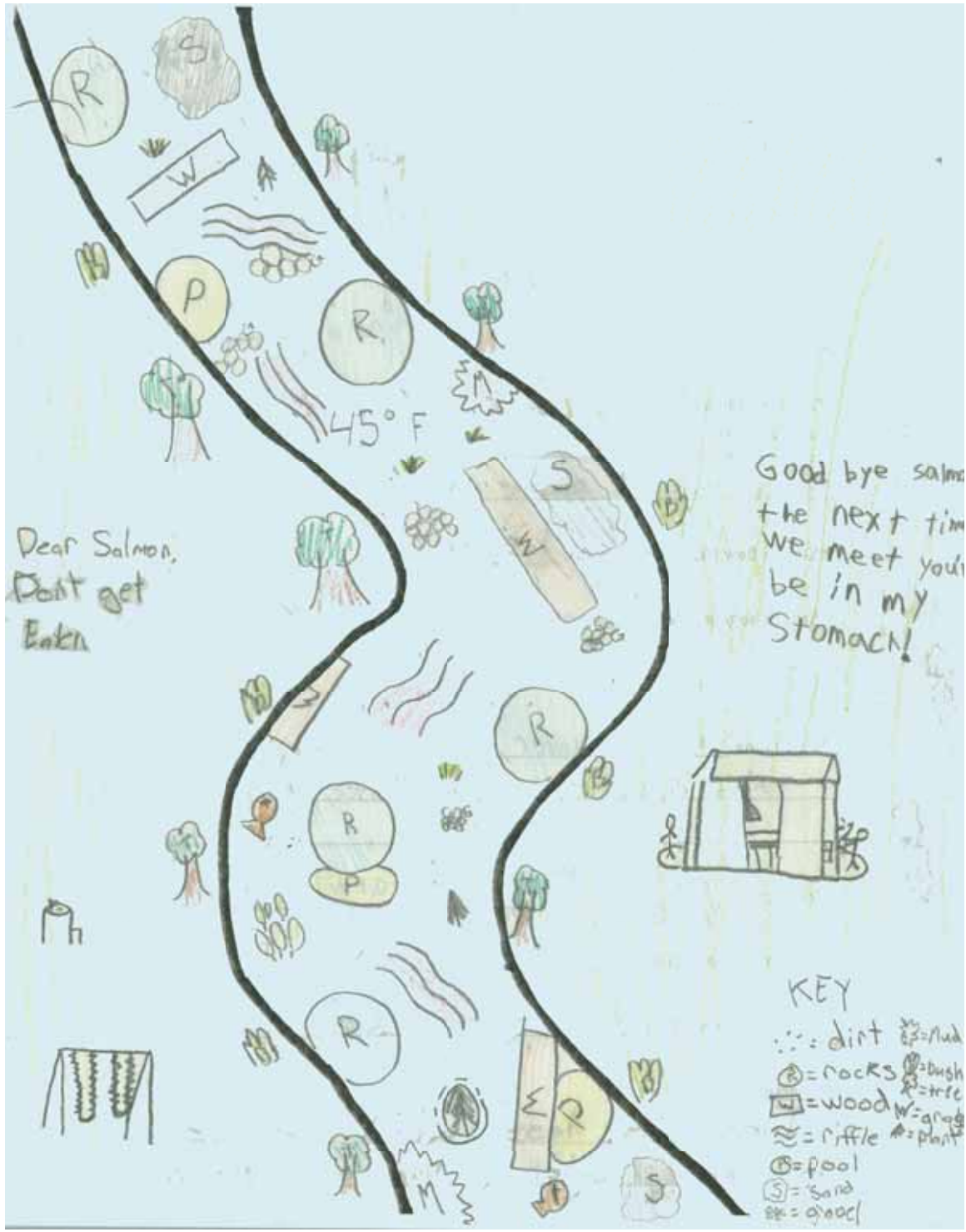
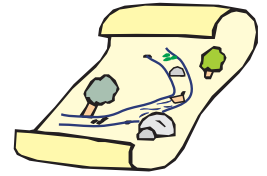
- **Water quality:** Temperature, dissolved oxygen, turbidity/sedimentation
- **Physical parameters:** Shelter (debris, boulders, trees, etc.), stream flow, substrate (gravel, mud, etc.)
- **Other living things:** Vegetation, insects, amphibians, predators (birds, other fish)

Closing activity/Assessment (10 minutes)

- At the end of class, have each student write a one-sentence farewell to the salmon fry. The students will bring their drawings on the field trip so that they can compare the habitat they drew with the habitat at the release site.



SAMPLE COMPLETED STREAM DESIGN





Salmon Release Field Trip

Introduction

**Student Worksheet—Salmon
Release Field Trip**



LESSON PLAN

SALMON RELEASE FIELD TRIP



Objectives

- Students will be able to measure qualitative and quantitative stream parameters.
- Students will be able to identify salmon habitat characteristics in the field.

Materials

- Thermometer
- Turbidity meter (if unavailable, have the students make a qualitative measurement)
- Unfed salmon fry
- Paper or plastic cups
- Students' stream design maps from the Salmon Stream Design lesson

Worksheets

- Salmon Release Field Trip

Introduction (10 minutes)

Remind the students about the six salmon life cycle stages and answer any questions before you begin the day's activities.

Activity (40 minutes)

- Divide the students into three groups. The three groups correspond to the first three sections on the Salmon Release Field Trip worksheet. Designate one adult to each of three stations:
 - Station 1: Water quality
 - Station 2: Physical stream characteristics
 - Station 3: Stream organisms
- The three groups of students will rotate among the stations to receive assistance with each section of the worksheet.
- When the worksheet is completed, place the unfed salmon fry in cups and give every two or three students a cup.
- Locate a suitable, safe release area and instruct the students to release the salmon after they read their farewells aloud. (The farewells should have been written during the Salmon Stream Design lesson.)



Closing activity/Assessment (5–15 minutes)

- Instruct the students to fill out the final section of their worksheet, “Conclusions.” Ask them to compare what they observed at the release site with their drawings from the Stream Design lesson. Does the habitat seem suitable for survival? What’s present? What’s missing?



Name: _____ Date: _____



STUDENT WORKSHEET SALMON RELEASE FIELD TRIP



Data collection and observations

Water quality

Temperature _____

Turbidity _____

Physical stream characteristics

Types of shelter for salmon _____

Stream flow (fast, slow, or both) _____

Stream bottom type (gravel, boulders, or mud) _____

Stream organisms

Vegetation _____

Insects _____

Possible salmon predators _____

Amphibians or reptiles _____

Conclusions

