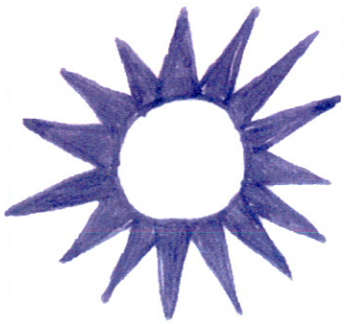
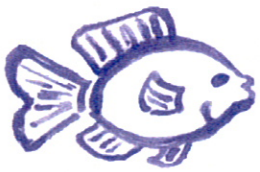
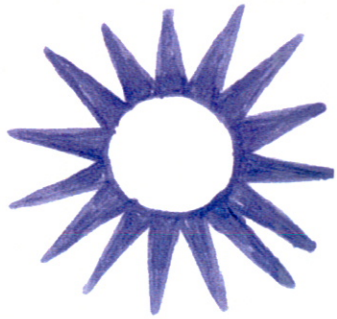



California Aquatic WILD

Early Childhood Education Supplement





California Aquatic WILD Early Childhood Education Supplement

Table of Contents

Supplement Cover designed by Bobbie Winn
Edited by Angela Barlow and Alisha Jurick

Introduction

As an educator and a counselor, for the past six years, I have experienced the value of involving students in active learning and using tools to enhance their cognitive development. I have had the opportunity to work with a very diverse student population in an inner city environment. As an educator, my approach is to work with the "whole" child, to encompass the student's cultural, social, personal and academic background and needs. In revising these lessons I based the changes made on this premise. For me it is important to remember that when I am educating a child I am not only expanding their present knowledge, but am enhancing their past and future experiences.

Krista L. Depenbrok, M.S. PPS, MFTT

This Early Childhood Education Supplement of Project WILD Aquatic activities was made possible through a Whale Tail Grant from the California Coastal Commission with matching funds provided by the Sports Fish Restoration Act Fund and the California Department of Fish and Game.

Each year the Project WILD Aquatic Coordinator receives numerous requests for educational materials appropriate for preschool and primary students, 4-8 years old. The early learning years are a fundamental period for the formation of attitudes and thus of great importance in developing a generation that is conscious of the need to respect the aquatic environment. Young children throughout California need to learn that they have an impact on the natural world and their impact can be positive or negative. Once young children explore and feel their connections with the natural world they will understand that impact. This understanding will lead to behavior and attitudes that can help keep inland watersheds as well as coastal and marine life healthy.

Project WILD Aquatic activities have been adapted using teaching strategies, which are literature-based, hands-on, multi-curricular and theme-based. An Early Childhood Education teacher and counselor in collaboration with the Project WILD Aquatic Coordinator adapted the curriculum. However, we need to thank Audrey Walker who lead the way with her Utah Early Childhood program, she really demonstrated the need and the possibilities. The Colorado and Minnesota Early Childhood guides provided a rich source of references and stimulated lots of ideas. We appreciate the efforts of these state coordinators and the writers for providing such valuable assets.

Bobbie Winn
California Project WILD Aquatic Coordinator

Supported by the
California COAST 4U
California Coastal Commission's
Whale Tail License Plate Grants Program

Project WILD

SPORT FISH RESTORATION
Your purchase of fishing equipment and motor boat fuel supports boating access and Sport Fish Restoration.

Unit 1 - General Awareness

Water Cycle
Water is important for people, animals and plants
Water provides food

Alice in Waterland

Objective

Students will: 1) identify the parts of the water cycle, 2) generalize how water is used by people, animals and plants, and 3) how to be a water saver.

Curricular Areas

Math (patterns); Language Arts (water cycle vocabulary and brain storming); Science (the water cycle); Health (people's need for water); Art and Social Science (how cultures educate using art and story telling)

California Content Standards

Science: **K**–Physical 1, Earth 3, Investigation 4; **1st**–Physical 1, Life 2, Earth 3, Investigation 4; **2nd**–Physical 1, Life 2, Investigation 4
Math: **K**–Algebra 1.0, Measurement & Geometry 1.0, 2.0; **1st**–Statistics 2.0, Measurement 2.0, 1.0 in extension; Reasoning 1.0 in extension; **2nd**–Measurement 2.0, 1.0 in extension, Statistics 1.0
Social Science: **K**–1 & 3; **1st**–1.1, 1.2, 1.5; **2nd**–2.4
Language Arts: **K**–Writing 1.0 in extension, Written/Oral 1.1, Listening 1.0, 2.0; **1st**–Reading 1.0, 2.0, Written/Oral 1.0, Listen 1.0, 2.0; **2nd**–Writing 1.0, 2.0, Written/Oral 1.0, Listening & Speaking 1.0, 2.0

Method

Students use guided imagery to help them understand the water cycle. They are introduced to water vocabulary and explore ideas about water use. A water bracelet is made to enhance, reinforce and review the concept and vocabulary. NOTE: For ESL and ELL learners use pictures coupled with the vocabulary words and water cycle concepts throughout the lesson.

Materials

- The "Water Cycle" guided imagery page

The Water Cycle Bracelet

- Pony beads; gray, light blue, brown, blue, green, yellow and clear
- Satin or leather cording

Background

The water cycle is a model that traces the cyclical journey of water. This path involves 1) precipitation–such as rain or snow–on a watershed; 2) runoff that flows into streams, groundwater systems, lakes, reservoirs, estuaries and oceans; 3) evaporation and evapo-transpiration, which returns water to the atmosphere; 4) cloud formation; and 5) condensation as water falls again in the form of precipitation on a watershed.

Life depends upon and is affected by the continuous process of the water cycle. In between the watershed and the ocean, humans divert the water from its natural course to be used in a variety of ways. The most obvious use of water is for domestic purposes. Conservation of both groundwater and surface waters protects the continued availability of water for humans, wildlife and the environment. Conserving water is one way to make a difference.

Procedure

1. Ask students what they know about water and to share some ways they used water today. Discuss how common water is in our lives. Have students think about where water comes from. Write on the board or large tablet the students' ideas on water origin, and how they see water being used.
2. Discuss being a water saver. Define conservation (the wise and intelligent use of a resource, the use of a natural resource in a way that assures it will be available to future generations). Have students explain what they can do to be a water saver.
3. Read the water cycle guided imagery. The imagery will help students better understand the water cycle concept.
4. After the guided imagery review the brainstorm activity. Ask students if they would like to add to it or change anything on the list.
5. Reinforce the vocabulary with the water bracelet (see instruction page). Show the bracelet. Explain that the bracelet forms a circle like the water cycle. All the beads can move around the circle. Like the beads, water is always moving. The water cycle begins and ends and then begins again. Use the bracelet as a visual.

Continued

6. Throughout time people of all cultures have used art to tell stories and to teach. People use art to teach others about their world or community. The water bracelet, which is a form of art, tells a story about water. Discuss types of storytelling from other cultures. Ask if anyone knows of a culture that uses storytelling and art to teach. Write down different ideas. Examples: Native Americans totems, buffalo skin paintings, and cave drawings.
7. Make the bracelet, group students (3 to 5 in a group), allow them to share beads and help one another. Have one bracelet already made as an example for students.

Extensions

1 Create a water cycle puzzle. Provide each student with a copy of a large circle. Have students divide the circle into six equal parts (like slicing a pie). In each section have them write the word for one part of the water cycle. For this exercise explain that the sun will represent both energy and evaporation. Only one cloud section is needed in this circle illustration. Now have students draw a picture to represent each word. When drawing is completed, the circle can be cut out and the sections cut apart. Students can then assemble and reassemble this circle as a puzzle.

2 "Be a Water Saver" experiment. How much water comes from a dripping faucet? This experiment can be done in the classroom or have students do it at home, reporting the findings to the class. Use a large container (bucket), a sink and a measuring cup. Set the large container under a faucet. Open the tap just enough to let the faucet drip slowly. Leave the bucket overnight. In the morning, shut the tap and measure with the measuring cup how much water was lost with the drippy faucet. Also, have students use paper cups to catch excess water as drinking fountain is used. Collect excess water in a jar. See how much is wasted at every recess.

3 Have 3 to 5 students brainstorm (write or draw) ways water is used in their own home or community and how they might be able to save water.

Evaluations

- Ask students to explain and/or draw a picture showing where water comes from and where it goes after it is used.
- Have students name 5 different uses of water.
- Have students tell a story about how an animal, plant or person uses water.
- Have students name 3 ways they can conserve water.

The Water Cycle: a guided imagery

To begin lesson have the lights off in the classroom and have students either sit in a circle or stay at their tables or desks. Have them close their eyes and breathe in and out. After every question pause and allow the student to think about the question and not to answer out loud.

The instructor can begin with;

"Water is everywhere around us. It is in our oceans, in our ground. You can see it coming out of faucets in your house or in a pool. It is in lakes, rivers and streams. It falls from the sky and is on the roads, ponds and puddles. I want you to imagine that you are standing next to water. Look around, what do you see? What do you hear? What do you smell? Still using your imagination, bend down and touch the water. What do you feel? Is it cold or warm? What color is it? Can you see animals or bugs swimming in it? Now think, where did this water come from? How did it get here?"

"Now open your eyes. Where were you? (Allow the students to share.) How do you think the water got to the place where you were? (Refer to the original list of ideas concerning the origin of water) No matter where your imagination took you somehow the water got to that spot. It got there through a cycle of events. A cycle is something that repeats over and over again. That means that a cycle is something that starts and ends and then starts again, like the seasons. Think about a tree losing it leaves, the leaves drop off the tree but then others grow back. The water cycle starts with the rain or snow that falls to the ground. How many of you have seen it rain or snow? This is called precipitation. Some of the rain runs off, the snow melts and runs off. Some of the rain water or water from the melted snow is absorbed into the ground. This is called ground water. Plants, trees,

Continued

flowers and grass absorb some of the water. In the city, water goes into the storm drains. The drains bring the water to streams, rivers or lakes and then into the ocean. When the sun comes out some of that rain dries up. That is called evaporation. Where does the dried up (evaporated) water go? It goes back up into the sky to help form more clouds and so it can rain again. That is the water cycle. It begins with rain water and ends with some of that water drying up (evaporating) back into the air to form more clouds to make more rain."

"So now let's go back to our imaginary water place. Shut your eyes and imagine that you are back at your water spot. What do you see? (Pause) What do you hear? (Pause) What do you smell? (Pause) Now bend down again and touch the water. Can you drink it? Is it cold or warm? (Pause) Take a deep breath in and out and think where did this water come from? Imagine that you are there in the rain or in the melting snow. Can you see the ground getting muddy? Are the lakes and rivers filling with water? Think about the plants, the grass, the trees, the flowers. Why would they need the rain? Now the sun is coming out. What happens to the water? (Pause) Where does it go?"

Allow time for the students to process and then have them open their eyes and share what they saw.

SUGGESTION: For pre-kindergarten, the teacher creates the water puzzle (see activity extension) and uses it with the guided imagery during water cycle explanation.

ADAPTION: Draw large drop of water on easel pad paper using blue pen, fill the drop with the students ideas on water origin. Outside the drop using black ink write students ideas on water waste.

The Water Cycle Bracelet

Materials

- Satin or leather cording (cut approximately 12" per student)
- Medium size pony beads: for each student - 2 white or light gray, 1 each - light blue, brown, blue, green, yellow and clear

Procedure

Place the beads, representing stages of the water cycle, on the bracelet in the following order.

1. White (or light gray)	Cloud
2. Light blue	Rain (precipitation)
3. Brown	Ground (absorption and surface run-off)
4. Blue	Water in lakes, rivers, ocean (accumulation)
5. Green	Plants (transpiration)
6. Yellow	Sun (source of energy that keeps cycle moving)
7. Clear	Water vapor (evaporation)
8. White (or light gray)	Back to cloud (condensation)

* Suggestion for pre-kindergarten, kindergarten, ESL and ELL: make a color chart of color names and order.

Aqua Words

Objective

Students will explore the importance of water for people, animals and plants.

Curricular Areas

Language Arts (brainstorming, new vocabulary and ideas, writing words); Art (collage & rain stick creation, singing and visualization); Social Science (oral presentations, discussion of community water areas)

California Content Standards

Science: **K**–Physical 1, Earth 3, Investigative 4; **1st**–Physical 1, Life 2, Earth 3, Investigation; **2nd**–Life 2, Earth 3
Social Science: **K**–3 & 6; **1st**–1.4; **2nd**–2.4
Language Arts: **K**–Writing 1.0, 1.1, Listening/Speaking 1.0, 2.0; **1st**–Reading 1.0, Writing 1.0, 2.0, Written/Oral 1.0, Listening/Speaking 1.0, 2.0; **2nd**–Literary Response 3.4, Writing 1.0, Listening/Speaking 1.0, 2.0

Method

Students brainstorm water words and create water words pictures. Students make a rain stick and use vocabulary words in a song or chant.

Materials

- Writing materials
- Magazines
- Paper towel rolls
- Toothpicks
- "Fill" for rainstick
- Coloring materials

Background

Water is necessary to all life and life activities. Plants and animals must have water to survive. Humans need about one liter (about one quart) of water each day. Water is important in transporting oxygen and nutrients and removing waste through our circulatory systems. Water represents about 75 percent of a person's body weight. Some animals and plants contain even more water. A jellyfish is made up of 95 percent water and a watermelon is 97 percent water. Most fish and other aquatic animals can only live when they are completely covered with water.

Water covers nearly 75 percent of the earth's surface. Nearly everything on earth has a direct or indirect connection with water. Rocks channel water into streams, and streams and rivers carry water across the land. Ponds, lakes, marshes and swamps often hold water in place. Trees draw water from the soil and transport it into the leaves and out again into the air. Clouds are airborne carriers of water across the sky.

Humans use water for many purposes other than drinking. Water is used for generating power, for industry, for irrigating crops and lawns, for growing food, and cooling cars. Water provides beauty and recreation. It is the basis of a massive planetary transportation system. Even the driest desert has water—and there are about 320,000,000 cubic miles of water in the oceans.

Procedure

1. Ask students to think of words they know of that have to do with water. Help the process by asking questions like: how do we use water? What is something fun to do in the water? Formulate questions using the senses. How does water feel? What are water sounds? Where do you see water? What can you do with water? Write all the words that come from the students on a large piece of paper for everyone to see.
2. Have the students create water picture collages. Students working in groups of 2 or 3 cut out pictures from magazines related to the discussion words. Have the students write the words under the picture. NOTE: Words may be added to the list as students think of new water words. One large class collage may be created on the paper used to write all the words. Space must be left around the words to allow for picture placement.
3. After collages are done, have students share their work. This can be done with either group oral presentations or group rotation for visual presentations.

Continued

4. Review the water words. Ask: Do these words help you know how important water is in your life? What about water for animals and plants, do they need water?
5. Have students make and decorate a rain stick (see instructions).
   NOTE: People have long recognized the importance of water. Many cultures have used music and dance to celebrate rain and water. South American Native peoples make rain sticks. Native Americans perform rain dances and create rhythm with strings of shells.
6. Use the water words as a chant or song. Have the students chant the water words and use the rhythm instruments. Encourage students to each create a water dance.

Extensions

1 Use water word search (see information at activity conclusion).
2 Have students draw how people, plants and animals use water. Discuss the differences.

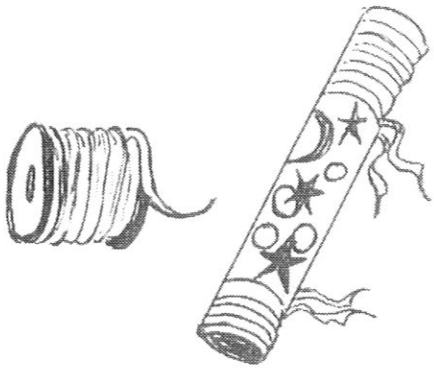
Evaluation

- Students create waterbooks with magazine pictures or drawings to show and explain several ways people, plants and animals use water.
- Students explain why water is important.

Notes

Create a Rainstick

The rainstick is a type of rattle, an instrument used by the earliest cultures. It is a hollow tube filled with pebbles, seeds, tiny shells, sand or beans. People create rainsticks from material found in the environment in which they live. A student's rainstick should be created from things that are a part of their life.



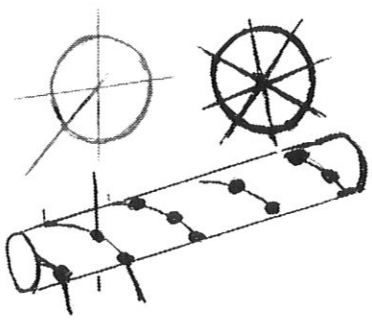
Materials

- Cardboard tube –use a variety; toilet paper, paper towel, gift wrapping
- A tool to punch holes in the tube, as a drill or awl or nail inserted into a dowel
- Toothpicks (see note below)
- Glue
- Masking tape
- Pruning shears, wire cutters or sturdy scissors
- "Fill" – seeds, rice, dried beans, beads, shells and so forth
- Funnel (optional)
- Materials to decorate outside of tube: paper, crayons, paint, markers, yarn, etc.

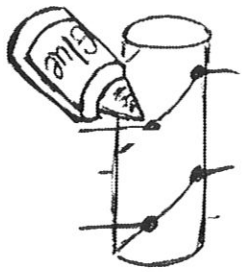
SUGGESTION: The teacher should do drilling or poking holes in the tube. For younger students, it would be best for the teacher to do steps 1 through 4, using toilet paper tubes. Younger student can then fill and decorate tubes.

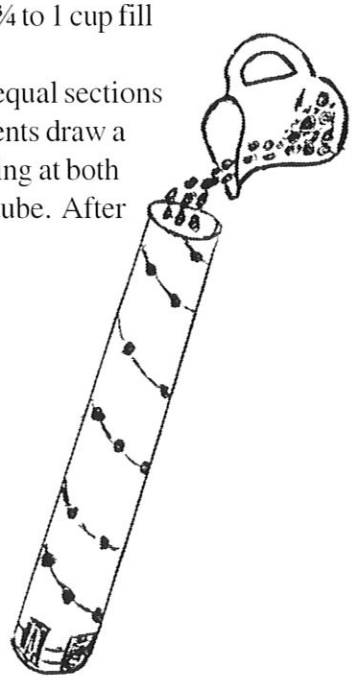
Procedure

1. Drill or poke holes in the cardboard tube. Make the hole all the way through both sides of the tube. See illustration for placement of tube holes.
2. Put toothpick through the holes. The toothpick will extend to the outside on both sides of the tube.
3. Apply glue to the surface of the tube. Make sure the toothpick holes are sealed with glue. Allow to dry and then cut off extra toothpick length.
4. Wrap the tube and one end with masking tape.
5. Use funnel to fill tube. Approximately ¼ to ½ cup fill material for small tube, ¾ to 1 cup fill material for large tube. Cover the end with masking tape.
6. Decorate the tube. For toilet tube, an 8 ½ x 11 sheet of paper divided into 4 equal sections will cover 4 tubes. For larger tubes use legal or ledger size paper. Have students draw a picture or design and color, then glue paper to tube. Wrap yarn or colored string at both ends. Paper mache, or newspaper with watered glue, may be used to cover tube. After overnight drying, tube may be painted and decorated.
7. Students now have a simple percussion instrument to use.



*Instead of toothpicks, use small guaged fowl plastic netting





Water Word Search

Find and Circle the water words in the puzzle

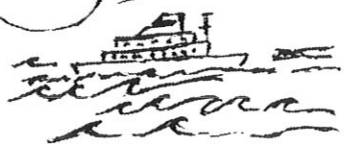
I	C	E	N	L	S	P	Q
Z	D	R	O	P	N	W	X
Y	K	X	C	L	O	U	D
L	A	K	E	L	W	L	R
S	T	W	A	T	E	R	W
V	W	E	N	R	A	I	N
X	Y	T	P	Q	Z	B	B

SNOW

ICE

DROP

OCEAN



RAIN

CLOUD

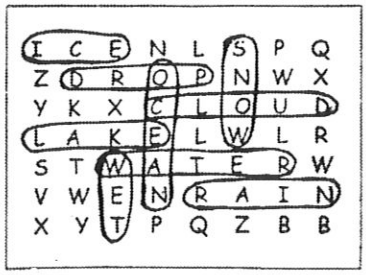
LAKE

WET

WATER

(*Cover before copying)

**** To create a word search puzzle, first choose the search words. Place the words on a grid (either graph fadeout paper or using a computer), and then fill extra letters in the spaces around the words. Cut out and glue pictures next to the list of words in the search.



Water We Eating

Objective

Students will identify the basic importance of aquatic environments that provide foods for humans and animals.

Curricular Areas

Language Arts (reading, creating and using the three column chart); Social Science (types of food students know and eat); Science (where foods come from, salt water and fresh water foods); Math (sorting); Art (puppet making); Health (what we eat and its origin)

California Content Standards

Science: **K**–Life 2, Earth 3, Investigation 4; **1st**–Life 2, Investigation 4; **2nd**–Earth 3, Investigation 4
Math: **K**–Number Sense 1.0, Algebra 1.0; **1st**–Number Sense 1.0, Data Analysis 1.0; **2nd**–Statistics 1.0
Social Science: **K**–6; **1st**–1.5; **2nd**–2.1, 2.4
Language Arts: **K**–Written/Oral 1.0, Listening/Speaking 1.0, 2.0; **1st**–Reading 1.0, Written/Oral 1.0, Listen/Speak 1.0; **2nd**–Writing 1.0, Listen/Speak 1.0, 2.0

Method

Students will be read a story about the ocean and the food it provides. Students will compile a list of products that originate in aquatic habitats. Students will do a sorting activity to categorize foods.

Materials

- Book: *The Sea That Feeds Us*
- Magazines
- Materials for sorting include empty product containers, photos, and advertisements
- Ollie Otter puppet, scissors, crayons, lunch bags and glue sticks
- Writing utensils

Background

Aquatic ecosystems (oceans, estuaries, marshes, lakes, rivers, etc.) provide humans with a variety of products, including fish, shellfish and wild and domestic rice. Other products, such as fertilizer, soup stock, watercress, water chestnuts and ingredients for vitamins, are not as well known. Seaweed is a source of algin, carrageenin and agar, which are used as stabilizers, thickeners and emulsifiers in hundreds of food products. These seaweed derivatives are used to smooth the texture of things like ice cream and to make them creamy, and help to keep ingredients like the chocolate in suspension in chocolate milk. Certain types of seaweed, which are actually forms of algae, are consumed directly by humans. For example, nori is used in sushi, and irish moss, lauer and dulce (dulse) are used in other dishes. In another example, the meat in oysters are eaten directly by humans, while the shells are ground up for use as calcium supplements for humans and poultry.

Procedures

1. Ask students how many of them have eaten something from the ocean. Read the book *The Sea That Feeds Us* (or one of the other books listed in the resource section) to students. Discuss the vocabulary used and what students learned from the story.
2. Draw a three-column chart on a large sheet of paper or on a chalkboard. Use headings, "I know," "I wonder," "I have learned". Ask students what foods they know come from the ocean, lake, river, swamp or wetland area. Which foods may be eaten by people or animals? What foods are students uncertain come from water? At the conclusion of the following sorting activity the "I learned" column will be completed.
3. Gather the students into a circle, share with them foods they may not have included in the chart. Rice, cranberries and blueberries are grown in wetlands. Also include pet foods. Review the foods list.
4. Do a sorting activity to review the chart. Use two large brown bags (one labeled–"From Water," one labeled–"Other") in the center of the circle. Using empty food product packages or photos, have students sort items into two groups–those which have a water origin and those that do not. For older students, ask them to divide the items by Fresh Water or Salt Water origin. At the conclusion of the sorting activity complete the last column of the chart.
5. Aquatic habitats also provide food for animals. Have students make the Ollie Otter puppet and discuss Ollie's meal. Have students share their

Continued

puppet and ask them if they can think of other animals that eat aquatic foods.

Extensions

1 Have students work in pairs or in groups to create make up and perform a play about Ollie the Otter.

2 Have students share information about foods eaten by their culture (or family) that originate from the water (different fish, sea weed etc.). Create a "food" book with drawings or paintings of foods and table settings culturally traditonal to each child.

3 Discuss the nutritional food groups, place aquatic products into the food groups.

Evaluation

- Name 3 different foods that come from an aquatic source.
- Identify 2 different aquatic habitats.
- Name 2 animals that eat aquatic foods.

Notes

Ollie Otter Lunch Bag Puppet

Materials

paper lunch bags, copies of the otter's body parts sheet, scissors, glue, crayons. Optional - pipe cleaners or yarn

Procedure

1. Cut out the otter's body parts.
2. Glue the head to the bottom of the lunch bag. Optional – yarn or pipe cleaners to replace the drawn whiskers.
3. Glue the tail to the inside edge of the bag and the rest of the parts on the outside.
4. Color Ollie Otter with crayons. Sea otters are brown-colored, clams are yellow or tan.

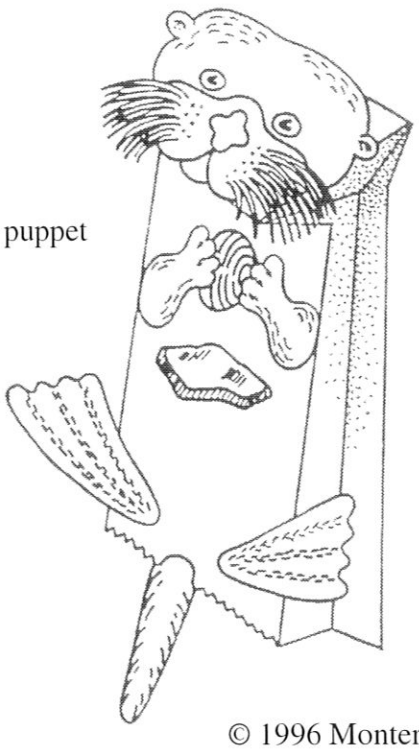
Story – A Sea Otter's Meal
(Students can use their puppets to act out this story as you read it to them.)

Sea otters eat animals like clams, snails, crabs, abalones, sea stars and sea urchins that live on the sea floor. Webbed rear flippers and a tail help the otter swim to the ocean's bottom to catch food.

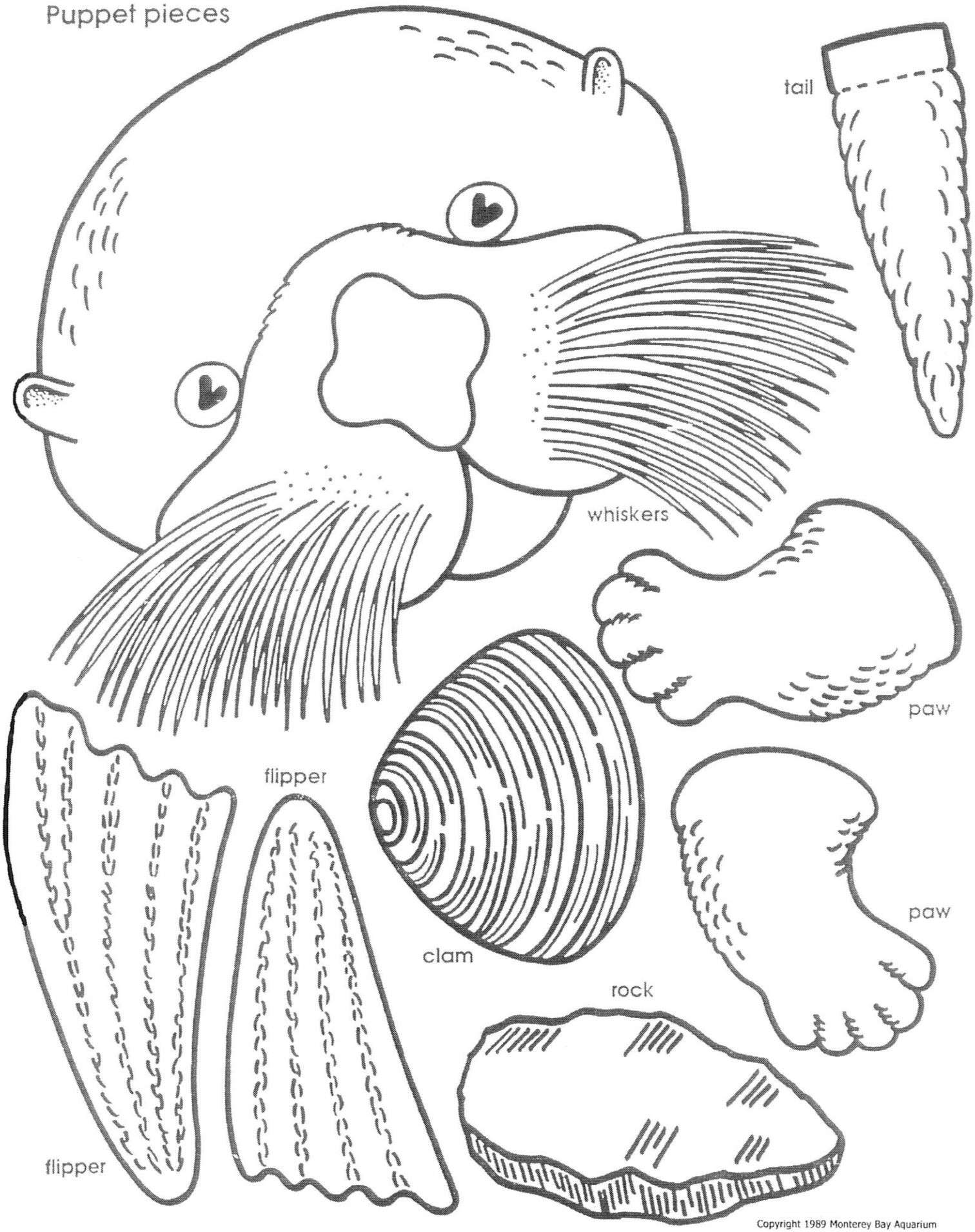
An otter finds food using its eyes and whiskers. It gathers the prey and sometimes a rock with its padded paws and carries them in a fold of skin under its arm.

Back at the surface, the otter floats on its back and eats, using its chest like a table. Its strong jaw muscles and flat teeth crush hard shells. If the prey's too hard, the otter bangs the shell against a rock to crack it open.

Finished puppet



*Puppet pieces maybe enlarged by 25% for use with younger children.



Unit 2 - Aquatic Habitats

Habitat characteristics
Why a fish can live in water
Plants in an aquatic habitat

Designing a Habitat

Objective

Students will identify the different parts of an aquatic habitat that most aquatic animals need to survive.

Curricular Areas

Social Science (importance of the students' homes and neighborhoods); Language Arts (creation of a class list); Science (components of a habitat)

California Content Standards

Science: **K**–Life 2, Earth 3, Investigation 4; **1st**–Life 2, Investigation 4; **2nd**–Life 2, Earth 3, Investigation 4
Social Science: **K**–4; **1st**–1.2, 1.5; **2nd**–2.2, 2.4
Language Arts: **K**–Written/Oral 1.0, Listening 1.0, 2.0; **1st**–Writing 1.0, Written/Oral 1.0, Listening 1.0, 2.0; **2nd**–Written/Oral 1.0, Listening 1.0, 2.0

Method

Students will design and build an aquatic habitat either as a two-dimensional display or in the form of a simple aquarium.

Materials

For a display:

- Use felt board with components (gravel, plants, fish) drawn by students
- White construction paper, crayons, scissors, glue, and felt pieces
- Or students may draw and color an aquarium

For a simple Aquarium:

- A large glass or see-through plastic container or fish bowl
- Gravel, small plants (may be replicas), water, fish, and fish food

NOTE: Project WILD Aquatic Guide, page 229 provides a simple guide for educators keeping a classroom aquarium.

Background

An aquarium is an artificial habitat. However it provides the life-giving conditions of food, water, shelter, air, and space in a suitable arrangement for animals to survive. In the aquarium, water is a uniquely sensitive part of the habitat. A simple aquarium is an effective way for students to learn that animals need food, space, shelter and water in order to survive. For animals this environment is called a "habitat."

A habitat is more than a house, it is like a neighborhood. People live in many different types of houses and neighborhoods. Animals live in many different types of habitats. Some animals live in a grove of trees, in backyard bushes, underground tunnels or in the water. There are also different types of water habitats. Some aquatic animals need fresh water as in lakes, streams or rivers. Others need salt water that is found in oceans.

Procedure

1. To begin, have students close their eyes and picture the houses in their neighborhood. Ask students to picture their own home. Ask them questions, such as: "How does your home help you? What do you have in your house that helps keep your food cold? How do you stay cool in the summer and warm in the winter? How and where do you get water?"
2. Have students open their eyes and share what they saw.
   *For ESL and ELL learners it is important to have pictures of appliances and different types of homes. Write the words from the sharing on the board or a piece of paper.
3. Define habitat and start a discussion about habitats.
   *For the ESL and ELL learners provide pictures of different types of habitat. Focus on different water habitats such as rivers, streams, lakes, ponds, and oceans.
4. Explain that the class is going to make an aquatic habitat. Ask the students what a fish needs in order to live.
   For a class aquarium: show students the different elements for the aquarium and ask what they provide for the fish.
   For a class felt board display: have students draw the elements; color, cut and glue felt on the backside.
   *The container provides space; the plant provides shelter (gravel anchors the plant).
5. Have the students help assemble the class aquarium or the felt board.

Continued

6. When the aquarium is completed, review the terms habitat, shelter, space, food, air and water. Create a list of the aquarium components and designate if it provides shelter, food, water, or space for the fish. Ask the type of water in the aquarium: fresh or salt.

Extensions

1 Have the class visit a large aquarium.
2 Discuss what types of animals live in salt water and fresh water.
3 Have students keep a daily journal on the activities in the aquarium (either by drawing pictures or writing one or two sentences depending on the age group).

Evaluation

- Have the students name the five elements needed to sustain life.
- Ask the students to choose an aquatic animal and tell or draw where it lives (fresh water or salt) and what it needs to survive.
- Have students draw pictures of the sequence of steps in making the aquarium habitat.

Notes

Keeping Classroom Aquaria: A Simple Guide for Educators

There are many resource books available on the topic of keeping aquaria. These books provide a great deal of detailed information on aquaria of many different types including tropical freshwater, temperate freshwater and marine aquaria. Many specialized aquaria require equally specialized equipment and a lot of care and attention to keep the animals and plants in them healthy. Most educators have neither the time nor the resources to do this but may want to maintain a simple aquarium. Some will want to use an aquarium as an object of interest and as a catalyst for classroom activities.

The following procedures are a very simple way to start a freshwater aquarium. It is suitable for the many species of hardy fish that are widely sold in pet shops. If educators or students are bitten by the "aquarium bug," a more detailed book will be necessary for additional guidance.

Some people will have ethical objections to keeping a classroom aquarium. Whether it is, or is not appropriate to keep plants and animals in a classroom aquarium for instructional purposes will be left to individual educators and students to decide. If educators do decide that a classroom aquarium is appropriate, these procedures will help ensure that it is a healthy medium within which the plants and animals can live.

Equipment

The following items will be needed to start an aquarium.

A glass fish tank: The size will depend upon the number of fish you want to keep. A five- to 10-gallon tank (19 to 38 liters) is recommended as a beginning size; however, this size will only hold a few fish. An aquarium can safely support about one inch of fish per gallon of water (10 inches of fish in a 10 gallon aquarium).

Aquarium sand and/or gravel: This item can be purchased in a pet shop. Natural sand, especially from a seashore or lakeside beach, will have to be carefully washed before use in your tank. It is easier to buy pre-washed sand or gravel. Natural sand may also introduce unwanted organisms. A ratio of one pound of gravel for every gallon of water is recommended.

An air pump with plastic tubing: Tygon is a high-quality plastic tubing.

An air stone: This device is a porous, stone-like block of material that attaches to the end of the tubing and forces the air from the pump to spread into many small streams of bubbles.

A water-filter system: Many pumps are attached to a filter of some kind. Some filters hang outside the tank. Others are built into a plastic grid that is placed below the sand and gravel in the bottom of the tank. Sub-sand filters are often cheaper and are suitable for a general-purpose tank with a small number of fish or small animals.

Nylon wool (glass wool) and charcoal granules

Foil wrap (aluminum cooking foil)

Reagent grade salt: This is non-iodized or natural sea salt.

A few crystals of potassium permanganate: This chemical is available in many drug stores and is often found in school science storerooms.

An aquarium hood or cover: This item is necessary to keep fish from jumping out. Many hoods have built-in lights. Check standard hood sizes before constructing your own aquarium.

Dried fish food

An aquarium heater: This equipment is optional for certain conditions.

Continued

Constructing a Glass tank

The funds to buy even a small, professionally made fish tank simply may not be available. You can make your own tanks if you want to save money. If so, you will need the following:

Five pieces of glass: One piece is needed for the bottom and four pieces are needed for the sides (see Diagram A). You can get these at a hardware store or glass shop. Staff will cut them from glass of the weight (thickness) you desire. Bigger tanks should be made from heavier glass, but normal window-grade glass is

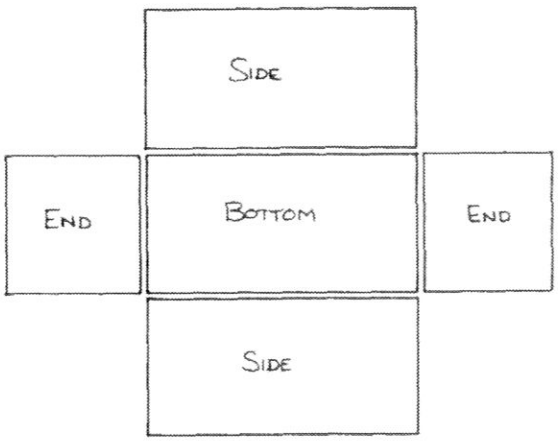


Diagram A

suitable for five-gallon tanks. Have the glass shop polish all the edges of the glass pieces on their machines so that they are smooth and square. Ask them not to bevel the polished edges. Once you have the glass pieces, you are ready for the next step.

Aquarium sealant: Aquarium sealant is a glue for sticking pieces of glass together. It is usually a high-quality silicone sealant. Do not use ordinary silicone sealant for the aquarium because it contains a compound that is toxic to fish and other animals. The tube will say "aquarium sealant" on it. Most aquarium supply shops sell this material. Squeeze a wide line of the sealant out of the tube around the perimeter of the piece you are going to use for the bottom of your tank. Squeeze a line of the sealant around three sides of two of the other side pieces. Stand them up on top of the bottom piece so that their edges overlap at the corners. Repeat the process with the two other side pieces. The tank will now be formed from the bottom and the four sides. Make sure the sides are square at the corners and perpendicular to the bottom. Leave the tank where it was assembled until the sealant dries. Note that the sealant always stays somewhat

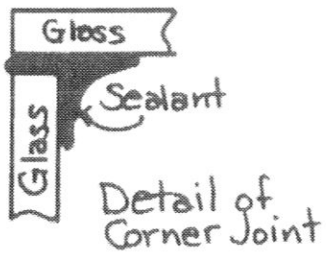


Diagram B

soft or rubbery. This drying process will take 12 to 24 hours. Following the first drying period, go around the inside corners and the entire bottom inside where the sides join the bottom piece with another good line of sealant. Let it dry for an additional 24 to 48 hours. Fill your new tank with water and let it stand to test that it is leak proof and that the sealant is secure.

NOTE: Diagram B is a detail of the corners, showing the fit of the glass and sealant. The end pieces will have to be shorter by two times the thickness of the side pieces of glass so that they will all fit inside the perimeter of the bottom.

CAUTION: Water is heavy! It is never a good idea to try to carry even a small aquarium while it is filled with water.

Preparation of Tank for Animals

Once you have a tank and the other items mentioned above follow these steps to get it ready for the fish or other animals.

Step 1. Set up the tank where it is not in direct sunlight. You may use a 25-watt bulb in a normal lamp for light if your room has little natural light.

Step 2. Put your aquarium sand in a bucket and wash it with hot tap water. Swirl the water with the sand and pour off the water and any fine debris. Repeat this process until the wash water is clear. New sand is usually dusty, and this process removes the dust.

Continued

Step 3. If you are using a sub-sand filter, you should place it on the tank bottom before you add the sand. Pour the sand into the bottom of the tank and smooth it until it covers the bottom.

Step 4. Cover the sand with a sheet of the aluminum foil wrap. Slowly add hot tap water. The foil prevents the sand from being stirred up as you pour in the water, but pour quite slowly and gently. Once the water cools, remove the aluminum foil wrap.

Step 5. Add a teaspoon of the plain salt (noniodized). Add a few crystals of potassium permanganate. This step helps to maintain the chemical balance of the tank water. Instead of potassium permanganate, you can use some dechlorinator available from pet stores; use according to instructions provided at time of purchase.

Step 6. Set up your air pump, tubing and air stone. If you are using a filter that hangs outside the tank or that is attached to the air pump, set it up now as well. (The charcoal and glass wool are for the pump.) If you are using a sub-sand filter, attach the tubing from the pump to the tube coming up from the sub-sand filter. (The booklets that come with the filters or pumps usually will explain this arrangement.) Once your pump and filter are working and air is bubbling, let the system "age" for at least two days. Five days is better. Aging means letting the equipment operate with no fish or plants in the water.

Step 7. Add plants that are floating or the type that are planted in the sand. Make sure your hands are clean before you plant the bottom plants. Rinse your hands well to get rid of any traces of hand soap, hand lotion, etc. Be sure the plants are healthy before adding any animals.

Step 8. You are now almost ready to add the fish or other animals. Before adding the fish to the tank, float the bags containing the fish or other animals and the water from the pond or shop where you obtained them on the surface of your tank for one to two hours before opening them. This process allows the water from the pond or shop to come to the same temperature as that in your tank and reduces any stress to the animals. Add one-half cup of aquarium water to the bag of fish every 15 minutes for 45 minutes to an hour before adding any fish to the aquarium water. Begin by adding no more than two fish to the aquarium or else some poisons may develop, killing the fish.Wait from three to five days before adding any more fish.

Step 9. You may need a tank heater if you want to keep tropical freshwater fish, or if your tank gets cold because your school heat is turned off on weekends or overnight. Heaters for small tanks are fairly inexpensive and have built-in thermostats to maintain the temperature. They come with instructions. You may want to set up the thermostat during Step 6 above. Install an aquarium thermometer to monitor and maintain recommended water temperature.

Step 10. Once the fish are in the tank and the aquarium is balanced, you should never have to change all the water. Every month, remove and replace 25 percent of the water. Remember that the water you use to replace the aquarium water should be "aged". Keep a supply of water that has been taken from the tap hot and then allowed to stand for two days in a clean bottle, with salt and permanganate crystals or dechlorinator added. If aquarium water is heated, add replacement water slowly to avoid shocking fish with cold water.

Feeding

Feed the fish lightly once each day. Do not feed more than the fish can eat in two or three minutes. Feeding on weekends may not be necessary. Never leave quantities of decaying food or any vegetable matter (dead plants, etc.) in the tank. Make or purchase a siphon and "vacuum" your tank with it. If you are away for a long time, you can buy slow feeding tablets from pet supply shops. Make friends with the school custodians because they will often look after your tank on holidays. Some animals such as frogs, salamanders, dragonfly nymphs and diving beetles require live food. Brine shrimp are good sources. You can set up and keep a brine shrimp colony in the classroom. You can also buy live brine shrimp in many aquarium-supply shops.

Disease

There are many diseases that afflict aquarium fish but the two most common are fungus and ich. Fungus occurs after an injury or loss of the fish's protective mucous coating and appears on the fish as white, cotton-like patches. Ich usually occurs after a period of stress and looks like small grains of salt on the fish. Consult a pet shop for proper medications.

Continued

Special Purpose Tanks and Aquaria

Aquaria can take many forms and shapes. You can make small aquaria from gallon jugs if they have clear glass. You can use a two-hole stopper on top so that the tube from an air pump can be let into the neck of the bottle. You will have to use a small air stone so that it can be slipped through the narrow neck into the bottle. If you have a special jar cutter (a tool for scribing around glass jars so that they can be cut to remove the neck), you can make a number of cylindrical tanks from scrap bottle jugs. Be careful to avoid cutting yourself. Some local glass shops will do this job for you. Always have the newly cut surfaces polished because a freshly cut glass surface is very sharp.

You can use aquarium sealant and small pieces of glass to make mini-aquaria of special shapes so that you or the students can photograph fish and pond animals in a thin "sandwich" of water. Otherwise, the thickness of water in a normal tank allows the animal to turn away from the camera or to swim out of view, especially in close-ups. You can also adjust the lights on small tanks to get well-lighted photos. If you are studying special behaviors (e.g., egg laying or predation), then small, narrow tanks are often best.

Often small aquaria and small animals are more useful for examination and observation than are big tanks, but big tanks can serve as long-term classroom learning centers by providing the focus for many instructional activities, including creative writing, drawing, painting, poetry, reading and research, as well as science and mathematics activities.

Notes

Fashion a Fish

Objective

Students will identify of the basic parts of a fish and how those parts help a fish live.

Curricular Areas

Science (fish and the parts of a fish); Math (puzzle making and geometric figures); Social Science (group work and class presentations); Art (creating a fish); Language Arts (reading names for the parts of a fish)

California Content Standards

Science: **K**–Life 2, Earth 3, Investigation 4; **1st** & **2nd**–Life 2, Investigation 4
Math: **K** & **1st**–Measure & Geometry 2.0, Reasoning 1.0
Social Science: **K**–1 & 3; **1st** & **2nd**–1 & 4
Language Arts: **K**–Written/Oral 1.0, Listening 1.0, 2.0; **1st**–Reading 1.0, Writing 1.0, Written/Oral 1.0, Listening 1.0, 2.0; **2nd** – Written/Oral 1.0, Listening 1.0, 2.0

Method

Students work in groups to create a fish using cards of various fish parts. They will color the fish in its habitat. Cards will have fish parts written in both English and Spanish.

Materials

- Coloring utensils
- Copies of the fish puzzle, one per student (use cardstock or heavy gauged paper)
- Paper
- Glue

***Note:** If possible bring in a model of a fish

Background

Fish are aquatic animals that have special adaptations in order to be able to live in the water. Their body, gills, eyes, nostrils and fins allow them to live under water and survive in their habitats. Adaptations, allow the fish to be better suited to the habitat in which it lives. Because of the variety of conditions within each habitat, many different fish can live together and flourish.

Procedure

1. Ask students how many have ever seen a real fish? What do students like about fish? Why is a fish different from other animals?
2. Read *Swimmy*, the *Rainbow Fish* or *El Pez Arco Iris* to the students or show them many pictures of different fish. Ask: How do fish breathe? What do fish eat? How do they swim? Where do fish live?
3. Divide class into 3 to 4 groups. Show students the cards and model how to create a fish and glue it together. Explain that it is a puzzle which they will color after the pieces are in place.
4. Pass out cards and discuss the body parts and the function of each part.
5. Students create their fish, glue it to a sheet of paper and color the fish and its habitat (home).
6. Have students share their projects and explain the various parts of their fish.

Extensions

1 Observe actual fish. Have students discuss what they see–the body parts and elements of the habitat.

2 Have students do a fish print. Use a rubber fish replica available from classroom suppliers. This activity allows students to experience a Japanese cultural artistic expression called Gyotaku, the art of Japanese fish printing. The activity is similar to the way Japanese fishermen recorded their day's catch. The art of gyataku (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.

3 Have students make a 3-dimensional "stuffed" fish, and identify the different parts of that fish. Pattern for fish follows activity. Enlarge the pattern with a copier to desired size.

4 Dissect a fish for observation.

Evaluation

- Name parts of a fish and how each help the fish survive.
- Where do fish live and what does their habitat provide?

Continued

Fish Adapted to Life in the Water

Fish vary greatly in size and color. There are tiny fish, giant fish, flat fish, skinny fish, flying fish, electric fish, and fish that live in schools. Fish represent more then half of all vertebrate animals. All fish are adapted to life under water. Their streamline body is good for moving through the water. Fish can be found wherever there's water; salt water (like the ocean) and fresh water (like lakes, streams and rivers).

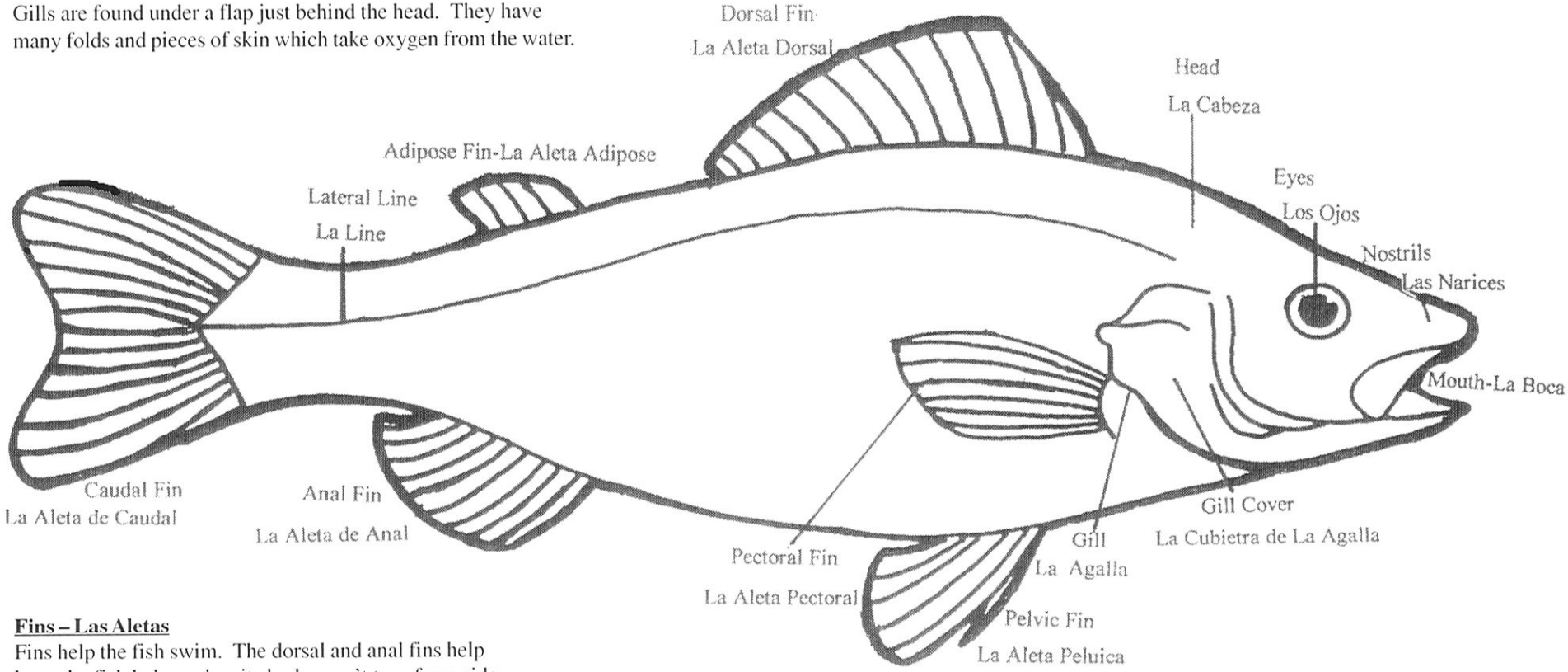
Gills – Las Agallas

Fish, like people, need to breathe oxygen in order to live. People get oxygen from the air they breathe. Fish get oxygen from the water which flows through their mouths and passes by their gills.

Gills are found under a flap just behind the head. They have many folds and pieces of skin which take oxygen from the water.

Eyes – Los Ojos

The fish has eyes that work independently. They can see in all directions. They can see in front and back at the same time.



Fins – Las Aletas

Fins help the fish swim. The dorsal and anal fins help keep the fish balanced so its body won't turn from side to side. Pectoral and pelvic fins are like arms and legs in animals. These fins are used for turning, backing up and stopping, in addition to balancing. The caudal or tail fin sweeps from side to side and moves the fish forward. The adipose fin is small and fleshy and has no special use.

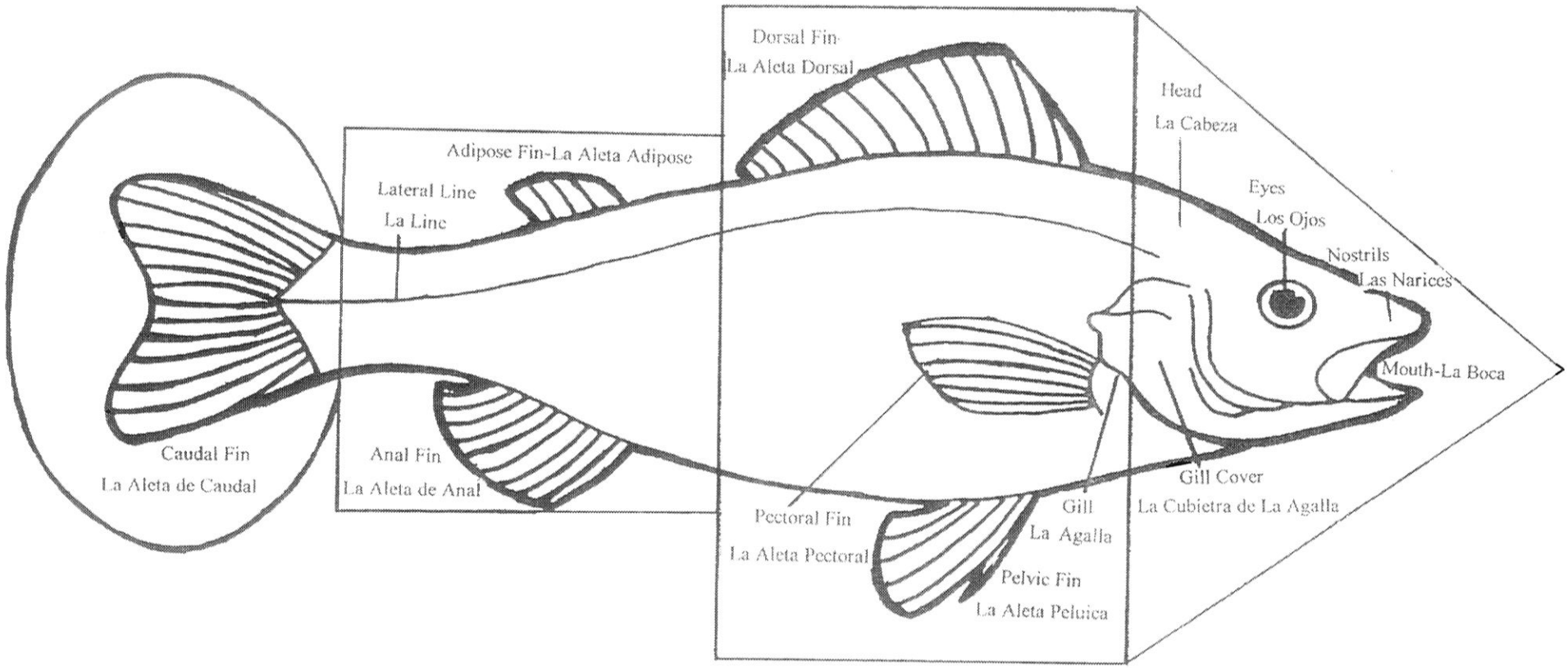
Lateral Line – La Linea

Most fish have a line running along each side of their body. The little holes in the line help the fish sense movements of other animals and objects in the water.

Nostrils – Las Narices

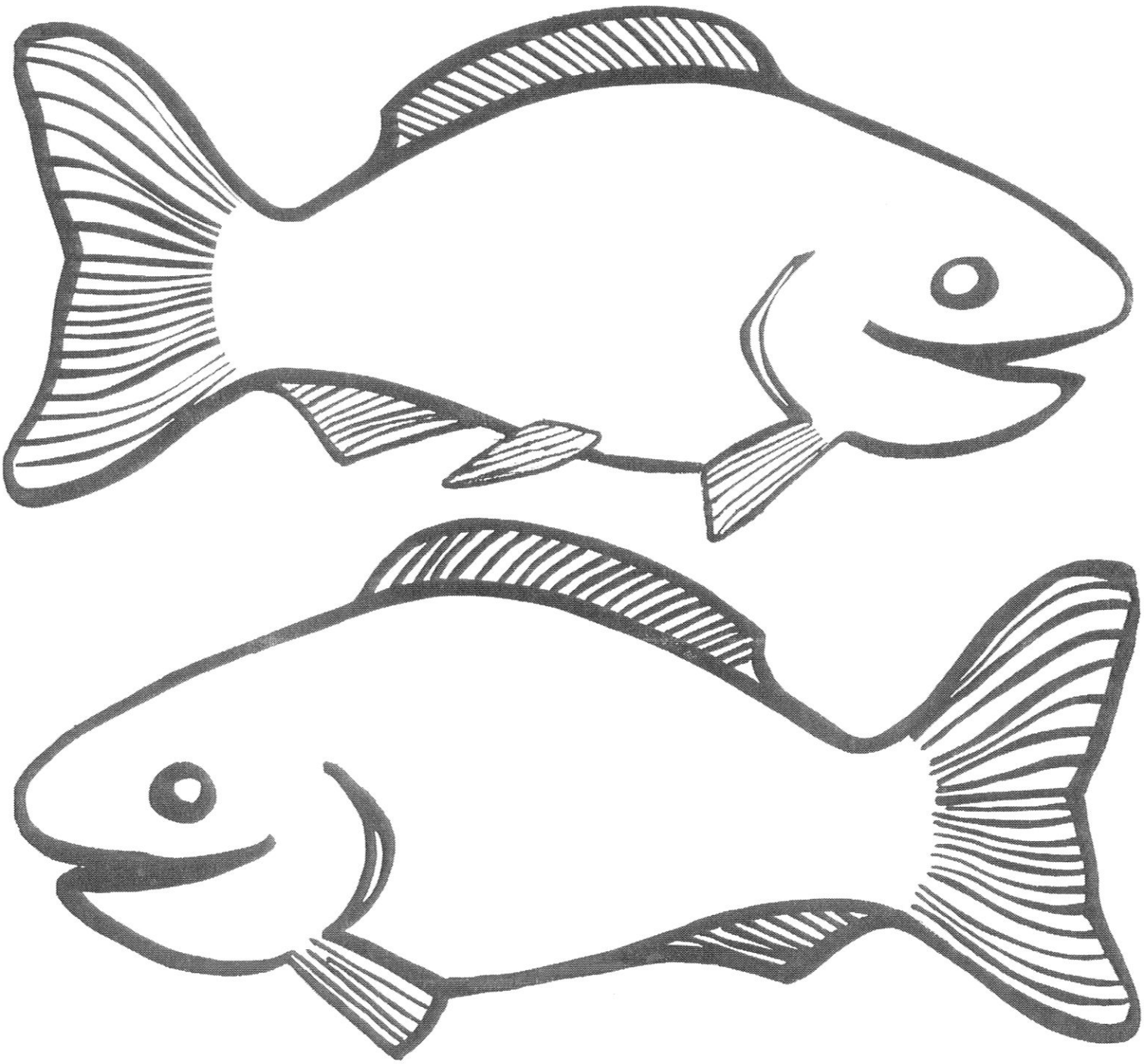
Fish use their nostrils for smelling but not for breathing. A sense of smell is used to find food. Some fish (like salmon) use smell for finding their way back to their home stream.

Cut puzzle creating geometric shapes



Extension: For Centers, color several puzzles to represent flashy tropical fish. Cut them and have students mix and match to create their own new species. Have students decide the habitat, food, name, etc. for their fish. Older students can write a mini report on their new fish. Use these reports to create a class fish book.

Stuff a Fish



Water Plant Art

Objective

Students will recognize the importance of plants to an aquatic habitat.

Curricular Areas

Social Science (waterways); Science (types of water and the vegetation); Art (plant printing); Language Arts (creative writing in the extension)

California Content Standards

Science: **K**–Life 2, Earth 3, Investigation 4; **1st**–Life 2, Investigation 4; **2nd**–Life 2, Earth 3, Investigation 4
Social Science: **K**–1 & 4; **1st**–1 & 2; **2nd**–4
Language Arts: **K**–Written/Oral 1.0, Listening 1.0, 2.0; **1st**–Writing 1.0, Written/Oral 1.0, Listening 1.0, 2.0; **2nd**–Writing 1.0, Written/Oral 1.0, Listening 1.0, 2.0

Method

Students can use aquatic plants (both fresh and salt water) to create artwork showing different aquatic habitats.

Materials

- Both fresh and salt water aquatic plants (real or replica).
- Tempera paint; browns, greens and blues. Thin with water.
- Coloring utensils (crayons, markers or colored pencils)
- Paper for the coloring and painting (white or blue).
- Newspaper
- Pie tins for the thinned tempera paint

Background

Aquatic plants are a necessary part of the web of life in any aquatic habitat. They grow in a variety of sizes, shapes and colors. The benefits of aquatic plants include: releasing oxygen into the water, absorbing excess nutrients, providing food, and breaking down into detritus during decomposition. Detritus feeds many small aquatic insects, shellfish and small fish, which are eaten by larger predators. Emergent plants, such as cattails, grow in swallow water or at the waters edge. Floating plants like water lilies are rooted underwater and their stems extend to or above the waterline. The roots and leaves of both emergent and floating plants provide food, shade, cover, and a place for aquatic animals to lay their eggs and the young to hide. Along the shorelines plants reduce erosion by stabilizing the soil. Aquatic plants also attract insects, which in turn attract insect-eating birds; birds may also use the plants for nesting. In addition, many wildlife species feed on the seeds produced by some of these plants.

Procedure

NOTES: Plants for students to study may be collected from outdoors, or purchased from pet/aquarium stores and some plant nurseries and science supply catalogs. If you plan to collect plants from the wild, be sure to follow local laws and ordinances for collecting plants. Do not dispose of purchased plants in a local ecosystem! Place them in plastic bags, freeze them, then place them in the trash. For plant prints, plastic or silk aquarium plants work well. Additional adult help would be beneficial.

1. Discuss with students plants they may have seen growing in or near a river, pond or the ocean. Let them share their experiences.
   NOTE: For ESL and ELL students, pictures of aquatic habitat and different types of aquatic plants are important.
2. Show students a picture of a fresh water habitat (a lake, stream, river, and pond). Review that this is a fresh water habitat. If you have fresh water plants, allow students to see, touch and smell the plants. Show a picture of the ocean, explaining that this is a salt water habitat. If you have salt water plants, allow the students to touch, see and smell the plants.
3. Share with the students the role plants play in the aquatic habitat. Use the information in the background section.
4. Explain that each student will use an aquatic plant (or plant replica) to create artwork. Discuss the plant's habitat (fresh water and salt water).

Continued

5. Model for the students how the artwork will be created. Place plant in the thinned tempera paint and then press onto paper.
6. Help the students cover their tables or desk with newspaper and pass out paint and supplies. NOTE: It may be easier to have the students sitting in groups so that each group can share paint and other supplies.
7. Encourage students to arrange plant prints in the way plants might grow. Assist students that need help making the print. When students finish their plant prints have them draw and color an aquatic environment around their plant.
8. After students have finished their art have them share whether they have created a fresh water or salt water habitat. Have them explain how plants help the habitat sustain life.

Extensions

1. Have the students tell or write a creative story about their picture including the animals and the life that lives in their picture.
2. Talk about local water habitats and the life that they sustain (visit one of those sites).
3. Draw a picture of a pond or seashore area as it would look in the spring, summer, fall and winter.

Evaluation

- Have the students talk about the habitat they made and what is needed for life to flourish.
- Have students explain why plants are important in the aquatic habitat.

Notes

Unit 3 - Animals that live in an Aquatic Habitat

Stages and characteristics of aquatic creatures
Different aquatic habitats for different fish
Fish that live in two different habitats

Are You Me?

Objective

Students will recognize stages of aquatic animals and identify characteristics of each stage.

Curricular Areas

Science (stages of growth in aquatic animals), Language Arts (write characteristics or create a story and discussion), Math (matching), Art (in extension and evaluation sections–drawing, coloring or pantomime)

California Content Standards

Science: **K**–Life 2, Earth 3, Investigation 4; **1st**–Life 2, Investigation 4; **2nd**–Life 2, Investigation 4
Math: **K**–Algebra 1.0, Geometry 2.0, Data 1.0; **1st**–Measurement 2.0, Statistics 1.0
Language Arts: **K**–Written/Oral 1.0, Listen 1.0, 2.0; **1st**–Writing 1.0, 2.0, Written/Oral 1.0, Listening 1.0, 2.0; **2nd**–Reading 2.0, Listening 1.0

Method

Using picture cards students will sort and match the animals at different stages and discuss characteristics of each stage of the aquatic development.

Materials

- Copy cards of aquatic animals.
- Cardboard or tag board for stage cards
- *The Very Hungery Caterpillar* book
- Photos of a person as a child and as an adult (may use multiple sets)

Background

Many animals, including aquatic insects, look significantly different in their earliest stages of development when compared to adulthood. Insects (like some other animals) undergo a change during growth called metamorphosis. Insects experience either a simple or a complete metamorphosis. In simple metamorphosis, the insect egg develops into a nymph, which resembles the adult. In complete metamorphosis, the egg changes into a larvae, which is usually encased in a protective cover. The larva changes into a pupae, which changes into a soft-bodied, often pale-colored, adult. Adults differ remarkably in appearance from their earlier forms and are not yet completely formed. Gradually the soft, pale bodies develop firmness and color. Many marine animals have a larval stage that is quite different from the adult stage. Most float and drift as zooplankton before transforming into an adult. The aquatic animal cards include a jellyfish and a crab. Aquatic mammals often do not change as dramatically during their growth.

The major purpose of this activity is for students to recognize that there are differences in the life stages of aquatic animals. The students will increase their appreciation of the diversity of wildlife as well as their understanding of growth and change in animals.

Procedure

1. Make card pairs of aquatic creatures.
2. Glue reproduced cards on tagboard or cardboard.
3. Show students a group of photos of individuals as children. Then show them the photos of the children as adults. What changes have happened? Allow students to exchange ideas.
4. Explain that animals also change as they grow; many animals look very different as adults. Read the book *The Very Hungery Caterpillar*. Explain that the process of the caterpillar changing into a butterfly is called metamorphosis.
5. Have the students view aquatic animal cards as sets and brainstorm about the characteristics of each stage and its differences. The teacher should be prepared to help students with examples like: a tadpole has a tail and swims in the water, but as a frog it has legs and lives out of the water. Record ideas on board or large sheet of paper.
   Jellyfish and crab information–
   - Jellyfish: young do not float, but grow anchored to a rock. The body of young look like a stack of dishes. Each dish separates from the others and floats away to become an adult jellyfish.
   - Crab: during larval stage it floats with other zooplankton. The long spines on the head help the young stay afloat. Young crabs do not have claws or a hard exoskeleton.
6. After the card sets have been discussed, divide

Continued

students into pairs or small groups. Provide each group with a set of cards. They are to pair the young with the adult stage for each animal.

7. When the group has completed matching young to adult:
   a. Have older students write the characteristics of each stage on the back of each card. They can either use the recorded brainstorm ideas or think of new ones.
   b. For younger students have them choose one set of cards and verbally create a story about the animal.
   c. Have each group share their work; the older students can either verbally discuss or walk around and view others' work, the younger students can share the story they created with the class.

Extensions

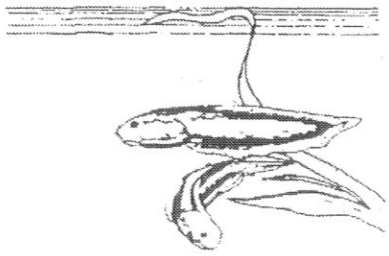
1. Have students talk about and draw the habitat of the aquatic animal.
2. Have students do a charade or pantomime of the concept of metamorphosis.
3. Have students pick an animal from the cards and learn more about that animal.

Evaluation

Choose an aquatic animal, draw a picture of the animal young and as an adult. Verbally identify the characteristics of each stage.

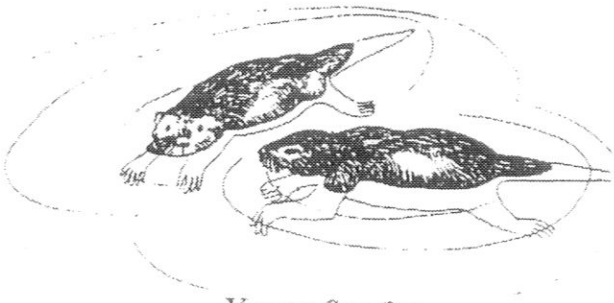
Notes

Frog

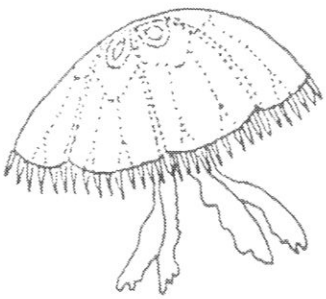


Tadpoles

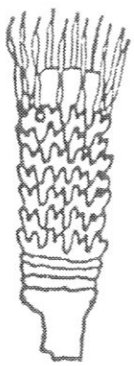
Sea Otter



Young Sea Otters



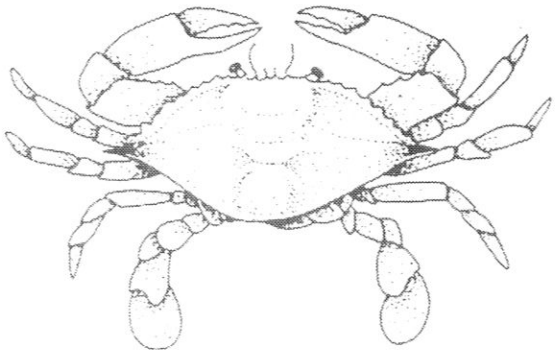
Jellyfish



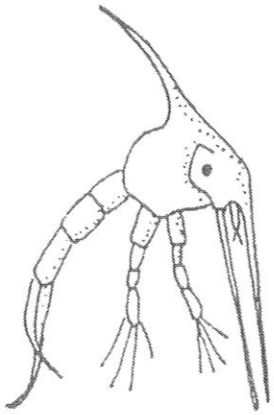
Jellyfish Larvae

Osprey

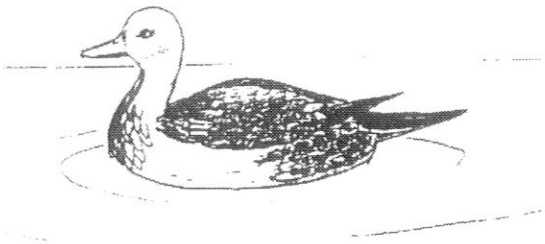
Osprey Hatchlings



Crab

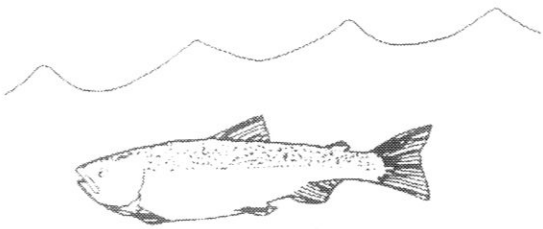


Crab Larva

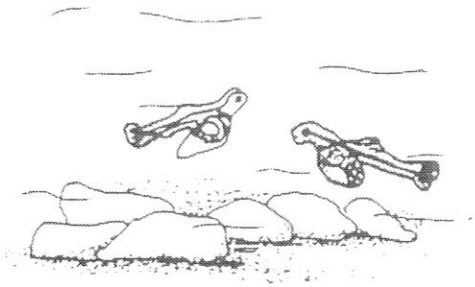


Duck

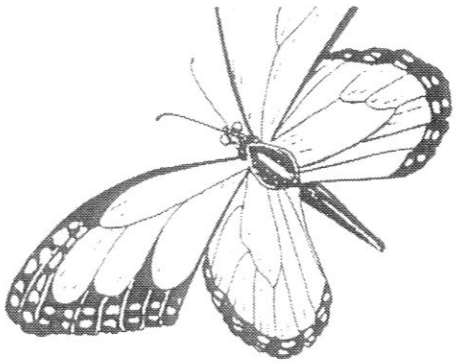
Ducklings



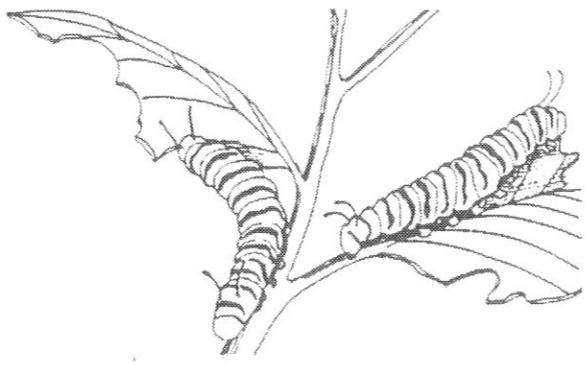
Salmon



Alevins (newly hatched salmon)



Butterfly



Butterfly Larvae (caterpillars)

Fishy Who's Who

Objective

Students identify fish which live in fresh and salt water habitats.

Curricular Areas

Math (geometric figures), Social Science (water environments), Language Arts (class vocabulary list, writing and reading fish names), Art (coloring fish), Science (types of fish, where they live, and what they look like)

California Content Standards

Science: **K**–Life 2, Earth 3, Investigation 4; **1st**–Life 2, Investigation 4; **2nd**–Life 2, Earth 3, Investigation 4
Math: **K**–Number 1.0, Algebra 1.0, Geometry 2.0, Data 1.0, Reasoning 1.0, 2.0; **1st**–Measurements & Geometry 2.0, Statistics 1.0
Social Science: **K**–2 & 4; **1st**–2 & 6; **2nd**–2 & 4
Language Arts: **K**–Written/Oral 1.0, Listening 1.0, 2.0; **1st** –Reading 1.0, Written/Oral 1.0, Listening 1.0, 2.0; **2nd** –Reading 2.0, Listening 1.0

Method

Students will use a fishing game to learn about various fish species and their different types of habitats.

Materials

- Copies of fish from following pages
- Cardboard, tag board or old file folders
- Pencil or dowel (used for fishing pole)
- Cardboard box or large plastic container
- Paper clips
- String and strong small magnet (to be tied on to string)
- Crayons or colored pencils, scissors, and glue

Background

Fish are aquatic animals, but not all fish can live in the same kind of water. Fish can tolerate different environmental conditions, including different: amounts of salt and oxygen, types and amounts of food, water temperature, hiding areas (cover and the bottom), and breeding areas. Salt concentration is one major factor that determins if a fish can live in an area. Some fish cannot live in areas where there is much salt and others need salt in the water to live. However, there are fish that can live in both saltwater and freshwater. Freshwater areas include most lakes, reservoirs, and rivers. Some common freshwater fish are bluegills, catfish, bass, perch, trout, and crappie. The kidneys of saltwater fish keep a proper balance of salt in the fish's body. Popular saltwater fish are flounder, striped bass (also found in fresh water), tuna, halibut, rockfish, and yellowtail. Some fish live in saltwater but swim up streams and rivers to spawn (lay their eggs). These fish are called anadromous fish. They include shad, salmon and steelhead trout.

Procedure

1. Before starting this lesson the teacher will need to:
    a. Reproduce the pictures of the fish and glue them onto tag board, then cut the board into geometric shapes.
    b. Slip a paper clip onto each geometric shape.
    c. Prepare a fishing pole by tying a 12 to 18 inch length of string onto the wooden dowel or pencil and attaching a magnet onto the other end of the string.
    d. Use a cardboard box or plastic container as the water (pond, ocean etc.).
    e. Reproduce ID keys for each student.
2. Ask students if they know the difference between the water in rivers, streams and lakes and the water found in the ocean.
3. Ask students if they can name fish that live in freshwater and saltwater. Consider making a list of the class' ideas for use later. Ask students if they know about fish that use both fresh and salt water. Explain that salmon and a few other species of fish start life in freshwater, spend adult life in saltwater, and then return to freshwater to spawn (lay eggs). A map or large poster showing rivers, lakes and the ocean might be helpful. Students ideas about what fish live where may be written on the map or poster.
4. Have each student use the fishing pole to catch a fish. They then use their ID Key to identify the fish and its habitat.
5. Have students write the name of the fish on their fish card and using the color key, color their fish

Continued

its natural colors. Students may trade their caught tagboard fish for an enlarged copy to color and keep. A worksheet on habitat maybe added to the back side of the enlarged copy.

Extensions

1. Have each student learn more about their fish; what it eats and how color provides protection.
2. Visit an ocean, lake, river, pond, or stream.
3. Have students brainstorm about the different waterways in their community and the fish they support.

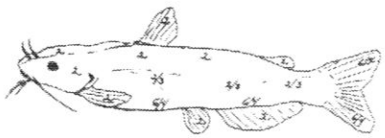
Evaluation

- Name a freshwater fish and a saltwater fish.
- Have students explain how an anadromous fish uses both freshwater and saltwater during their life.
- Name one or two reasons why fish are important.

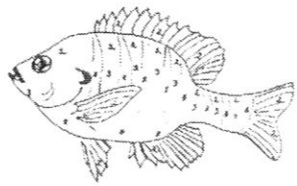
Notes

Fresh Water Fish

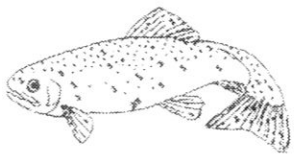
Channel Catfish
Olive-green to bluish body with light underside



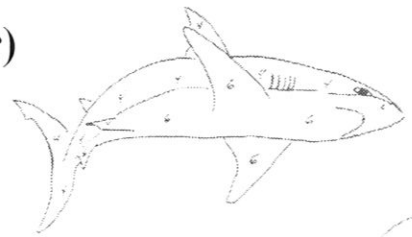
Bluegill
Olive with blue and orange sides, underside is orange



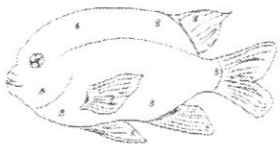
Rainbow Trout
Black spots on top and sides, olive and blue body and pink side stripe



Ocean Fish (Salt water)



Great White Shark
Gray body with white underside

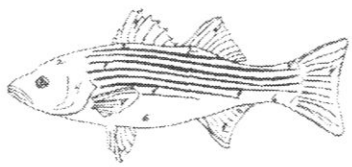


Garibaldi
California State Marine (Salt Water) Fish, is bright orange

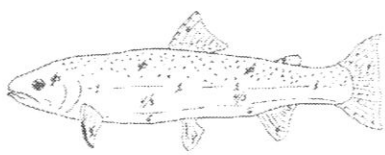
Brown Rockfish
Dark brown top with lighter brown sides and white underside

Anadromous Fish: Live in both Fresh and Salt Water

Salmon (Chinook)
Silver-brown body with dark spots on back and tail



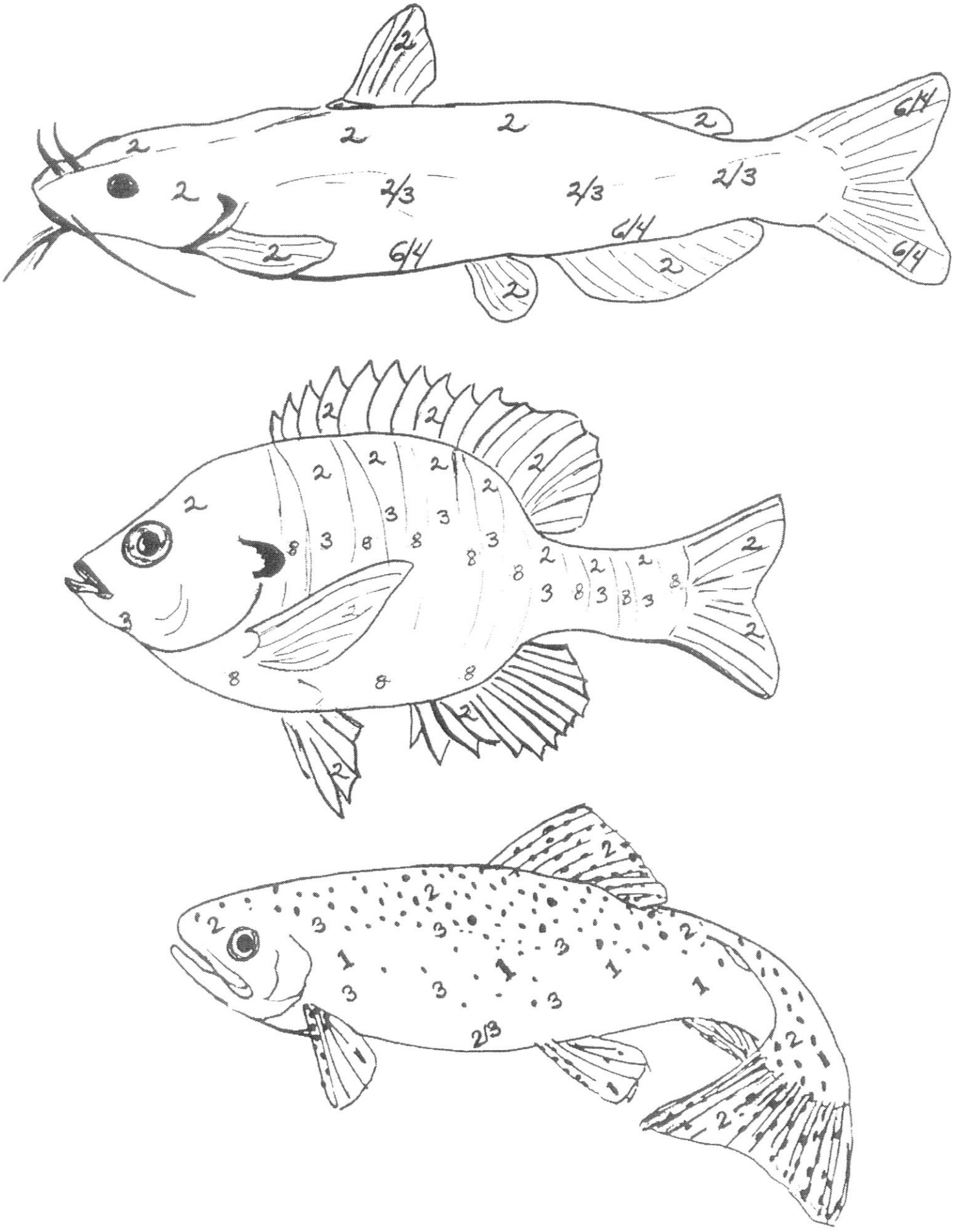
Striped Bass
Body has olive colored top with silver sides and white underside

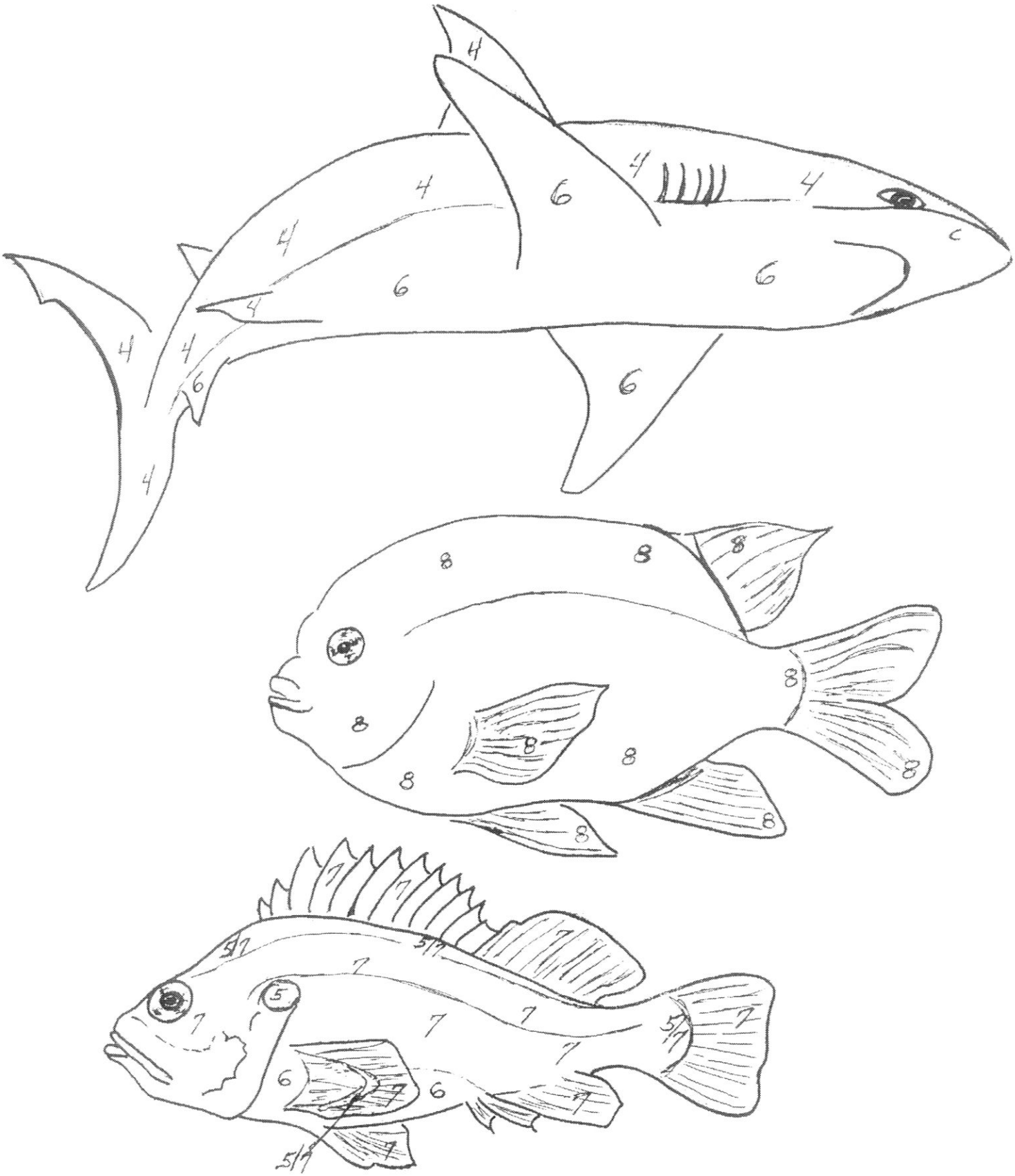


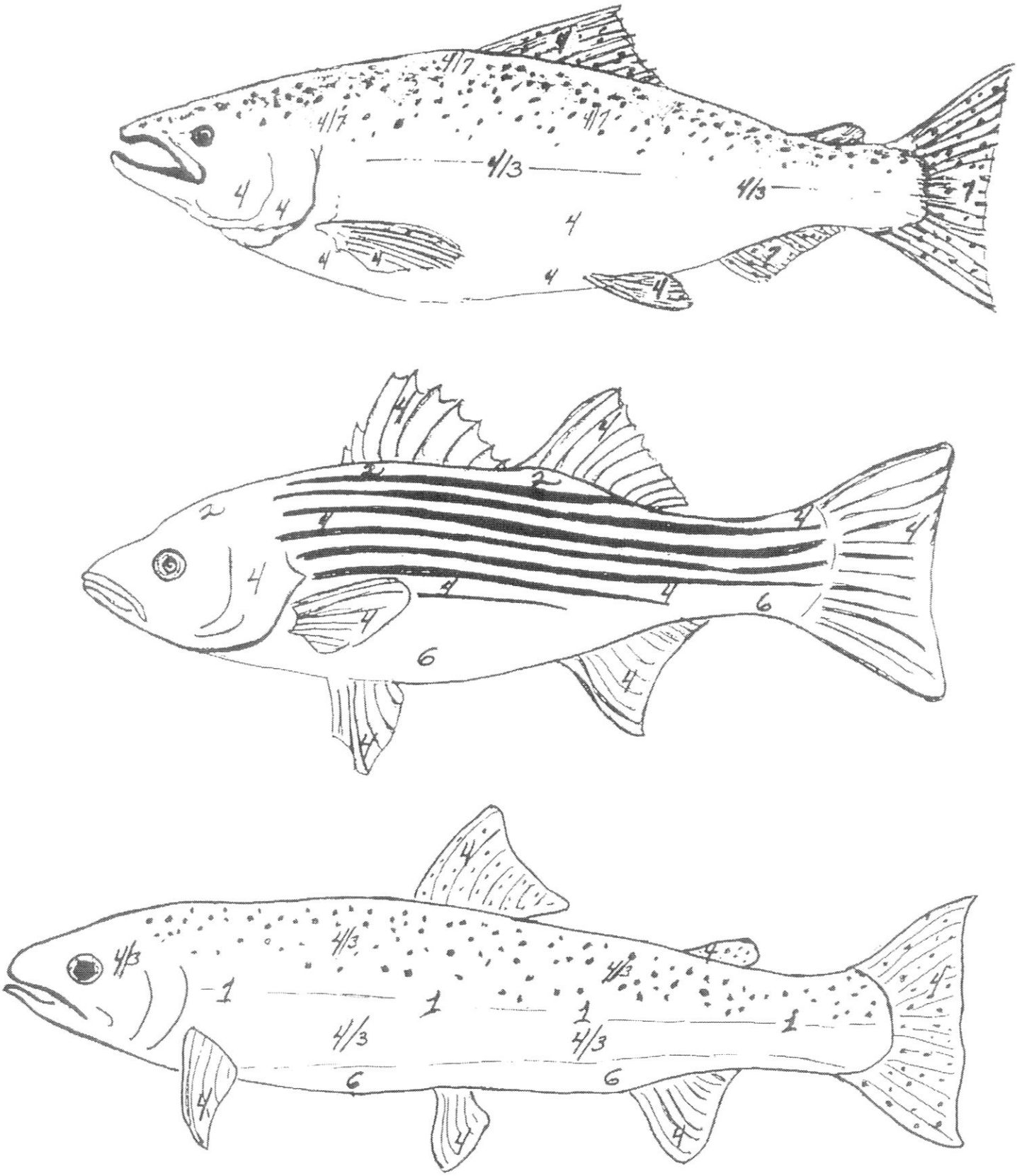
Steelhead Trout
Body is silver and blue with light pink side stripe and white underside. The top and side of the body and tail have dark spots

Color Key:

1 Salmon Pink	4 Silver/Gray	7 Brown
2 Olive Green	5 Black	8 Orange
3 Turquoise Blue	6 White	







Hooks and Ladders

Objective

Students will explore the concept of migration. They will identify hardships and obstacles that salmon encounter during the migration cycle.

Curricular Areas

Physical Education (moving through a simulated migration), Language Arts (discussion of vocabulary), Social Science (aquatic jobs), Science (migration), Math (counting)

California Content Standards

Science: **K**–Life 2, Earth 3, Investigation 4; **1st**–Life 2, Investigation 4; **2nd**–Physical 1, Life 2, Earth 3, Investigation 4
Math: **K**–Number 1.0, Geometry 1.0, Data 1.0, Reasoning 1.0, 2.0; **1st**–Number 2.0, Algebra 1.0, Measurement 1.0, 2.0, Statistics 1.0, Reasoning 1.0, 2.0
Social Science: **K**–3, 4, 5; **1st**–1, 2, 6; **2nd**–2 & 4
Language Arts: **K**–Written/Oral 1.0, Listening 1.0, 2.0; **1st**–Written/Oral 1.0, Listening 1.0, 2.0; **2nd**–Reading 2.0, Listening 1.0, 2.0

Method

Students will simulate the migration of the Pacific salmon and the hazards faced by salmon in a kinesthetic activity.

Materials

- Storybook *Salmon Stream*
- Large play area (100 feet x 50 feet)
- Chalk, 500 ft rope or yellow plastic hazard tape (available at hardware or lumber stores) to make boundaries
- 18 cones
- Cardboard boxes or plastic dishpans (needed for fishing boats)
- 2 containers & 100 tokens (3"x5" cards, poker chips, macaroni, etc.)

Background

Many fish migrate from one habitat to another during their lives. Pacific salmon are examples of fish that endure a spectacular migration. The life cycle for Pacific salmon begins when the female deposits eggs in a shallow gravel depression. Once deposited, the male fertilizes the eggs.

Newly hatched salmon, called "alevins," live in the gravel and survive by absorbing proteins from their yolk sacs. After a few weeks the yolk sacs are gone and the small fish, known as "fry," move into deeper water to find food on their own. Salmon remain in freshwater streams feeding and growing for many months or even years before migrating downstream to the ocean. These small ocean-bound salmon are now called "smolts." In the ocean the salmon grow rapidly by feeding on a rich food supply that includes other fish, shrimp and crustaceans. Young salmon may encounter many dangers, including sharks, killer whales and other marine mammals, along with humans who are fishing for salmon. After two to five years, in the ocean, the Pacific salmon begin the journey that guides them to their own hatching sites. Pacific salmon spawn only once in their lives. Salmon have an inherent ability to return to their original streams. Juvenile salmon imprint or memorize the unique odors of their home streams. As returning adults they use their senses of smell to detect these odors and guide them upstream to where they were hatched. Once there, the salmon spawn and then die.

Salmon face a variety of limiting factors in the completion of their life cycle. A limiting factor is a reason or cause that reduces the population of an organism. Some limiting factors are natural, and some result from human intervention with natural systems. Dams are a limiting factor that block or slow migration to and from the ocean. Fish ladders can be installed to help salmon through the dams. Fish ladders can be water-filled staircases that allow migrating fish to swim around the dam.

Procedure

This lesson can span over two days. The first day read the book *Salmon Stream*, introduce the concept of migration and vocabulary. On the second day have students play the Hooks and Ladders game. Parent assistance during the outside activity is helpful.

Continued

1. Ask the students if they have heard the term migration. Define the term and provide an example (ducks migrate each year). Ask if students can think of any animals that migrate. Write these animals down on a class list. Introduce the fact that some fish migrate. Talk about the Pacific salmon and how it is one of the types of fish that migrate. If possible show pictures of animals that migrate and the habitats they move to and from. This will help the students visualize the process.
2. Read the book *Salmon Stream* to the class. The story follows the life cycle of the Pacific Salmon. After the story, have students discuss each stage of the salmon's life.
3. Set up the playing field as shown in Diagram A. The area needs to be at least 100 feet by 50 feet. Use the chalk, rope or hazard tape to mark the boundaries. 10 cones will be used to represent the curves and natural hazards within the river. Set up the cones in two rows of five allowing space in between for the students to run in a zig-zag motion to the end of the row. Assign the students roles as follows.
   - Choose two students to be predators. Predators are stationed just past the river hazards. They catch the salmon fry as they head down stream on the way to the ocean. Later in the activity, when all the salmon are in the sea, these same two predators will be patrolling the broad jump area, which represents the waterfall.
   - Choose two students to be humans in fishing boats catching salmon in the open sea. The students need to keep one foot in the cardboard box or plastic dishpan at all times; this will help to reduce their speed as they try to tag the salmon.
   - All remaining students are salmon.
4. Begin the activity with all the salmon in the spawning ground (see diagram). *SUGGESTION: do a walk through of the activity to help orientate students to its features.* The salmon fry first move into deeper water from the gravel area of their birth. They stay in this deeper stream area to the count of 20. This pause simulates a time of growth and the imprinting of the river area on the salmon fry before they begin their journey. During this time the predators may try to catch the salmon by tagging them. When a student is tagged, they are to be escorted by the predator to the fish ladder area. The predator then returns to catch more salmon fry. After the count of 20, the salmon can then move downstream. As they move downstream they will zigzag through the cones, if a cone is hit or knocked over the student must join the fish ladder. (This represents a natural hazard encountered by the salmon fry.) NOTE: during the entire activity any salmon that "dies" (gets out) become part of the human-made physical structure called the fish ladder. Students, who are part of the fish ladder, kneel down with one body space between them (see illustration).
5. Next the salmon must pass some predatory wildlife. The predators moved from the deeper water area to the area below the cones (river hazards). Predators must tag the salmon with both hands. Caught salmon are dead and must go to the fish ladder.
   NOTE: both the predatory wildlife students and the people fishing must escort the dead salmon to the fish ladder area. This allows for a more realistic survival ratio.
6. Once in the ocean, the fishing boat can catch the salmon. The salmon must move back and forth across the ocean area four times. Each time the student successfully crosses the ocean they gather a token. Students must gather four tokens. Each token represents one year's growth. Once the student has four tokens (crossed the ocean four times) they can then move to the fish ladder.
7. As the salmon start upstream each salmon must walk through the entire pattern of the fish ladder. Have someone at the beginning of the fish ladder to collect the tokens. This activity will provide the students with the idea of how restricting and tedious the upstream journey can be. While in the fish ladder, predators cannot harm the fish.
8. Once through the ladder, the salmon face the broad-jump waterfall. The waterfall represents one of the natural barriers salmon faces going upstream. Be sure the jumping distance is challenging but realistic for the age group participating. Have two parents or students (depending on the age of the participants) monitor the jump. The salmon must

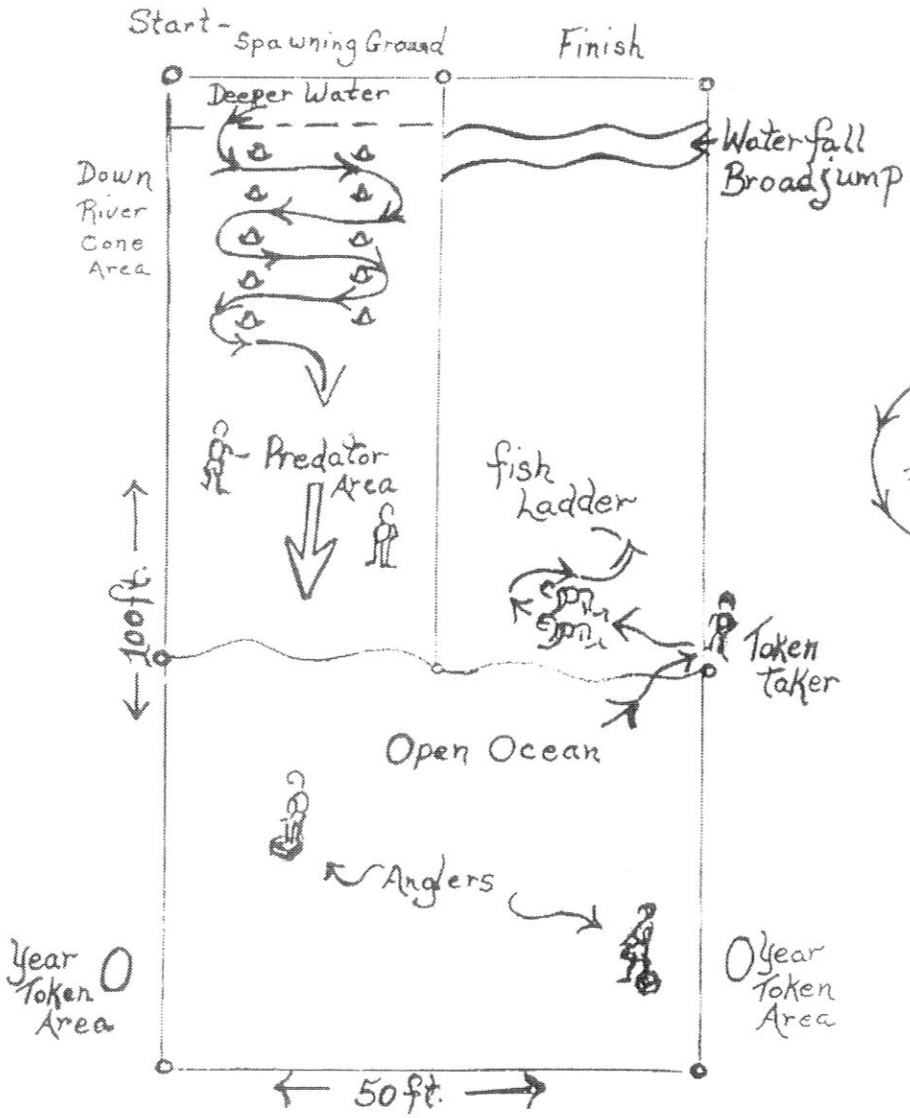
Continued

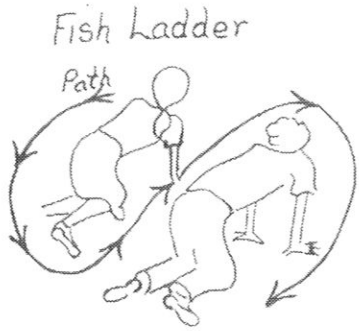
jump the entire breadth of the waterfall in order to continue. If a salmon fails to make the jump then they must return to the bottom of the fish ladder and come through again.
NOTE: the waterfall may be changed into a stepping-stone jump defined by masking tape squares.

9. Above the falls, the two predators that started the simulation as predators now become the last danger faced by the salmon. Again the predators must tag the salmon with both hands.
10. The activity ends when all the salmon are either dead or in the spawning ground.
11. After the activity ask the students to discuss:
    - In what areas did most of the fish die?
    - What was the hardest part?
    - What other types of predators do the salmon face?
    - How hard is it for the salmon to survive?
    - Why is it so hard?
12. Have the students draw or write about their experience after the discussion. Invite students to share their work with the rest of the class.

Extensions

1. Create a storybook about an aquatic animal that migrates; older students can write and illustrate their book; younger students can do a picture story.
2. Illustrate, with a simple map, how the salmon travel from the freshwater lakes and rivers into the saltwater of the ocean and return.
3. Visit a fish hatchery.





Evaluation

- Have the students write or draw the migration of a Pacific salmon.
- Identify two hazards the salmon encounter during their life cycle.
- Draw or write the life cycle stages of the salmon.

Unit 4 - Aquatic Habitats and Humans

Characteristics of a Riparian Area
Animals and change in the Riparian Area
Human responsibilities for all Aquatic Habitats

Riparian Retreat

Objectives

Students will generalize the importance of riparian areas, and identify the characteristics of those areas.

Curricular Areas

Science (the riparian area and its function), Social Science (landforms, waterways, and that community), Language Arts (journal writing and story), Art (creating a flannel board display of a riparian area)

California Content Standards

Science: **K**–Life 2, Earth 3, Investigation 4; **1st**–Life 2, Investigation 4; **2nd**–Life 2, Earth 3, Investigation 4
Social Science: **K**–4; **1st**–2; **2nd**–4
Language Arts: **K**–Written/Oral 1.0, Listening 1.0, 2.0; **1st**–Written/Oral 1.0, Listening 1.0, 2.0; **2nd**–Writing 1.0, 2.0, Written/Oral 1.0, Listening 1.0, 2.0

Method

Awareness is created through a simulated field trip. Students create a riparian area artwork.

Materials

- Flannel board, or large size construction paper.
- Different colors of construction paper and small flannel pieces.
- Art supplies, crayons, scissors, pencils, etc.

Background

Riparian zones are the green ribbons of life found on the edges of watercourses (streams, lakes, ponds, etc.). Riparian areas have rich, moist soil that supports a variety of plants–grasses, flowers, shrubs and trees, that grow best when their root systems are near the level of high ground water. Riparian areas provide space, shelter and food for the plant and animal communities with which they are associated. The shade trees cool the water, providing habitat for fish. Shrubs and trees protect deer as they travel from one feeding ground to another. The trees and grasses provide homes for song- and ground-nesting birds. Raccoons, beavers and numerous other animals also find homes in riparian areas. The moist soil in a riparian areas filters pollutants out of the water–cleaning it. The soil's ability to store water reduces flooding during spring snowmelts. In the dry season, the stored water is released into the stream. Riparian vegetation strengthens the stream banks. This tends to prevent erosion and maintain the stream channel, keeping the water clear. Riparian areas also have aesthetic and recreational value for humans. They are used for fishing, hiking, camping, picnicking and resting.

Procedure

1. Show students pictures of land areas bordering streams, rivers, and lakes. Ask if they have visited a place like those pictured. Maybe they enjoyed a picnic, fished or hiked near a lake or stream. Have them share their experiences. Ask them sensory questions. What did it smell like? What did you hear? What did you see? Write their responses on a class recording sheet. With each child's experience, put his or her first and last initial next to it. Explain that this area has a special name–*riparian*. Write the word on the board.
2. Tell students they will be taking an imaginary field trip to a riparian area. You will read a description to them and invite them to close their eyes and picture what they hear.

   "It is a hot summer day. You are walking in a meadow of knee-high grasses and lots of tiny flowers that are blue, yellow and white. Slowly you walk toward a grove of trees. As you near the trees, you notice the different colors of green... first a shiny green, and then darker green leaves. It feels cooler in the grove of trees. You feel the protection as the trees surround you. Suddenly you hear a tap-tap-tapping sound. Looking above into the rough-barked tree trunks, your eyes see a bird, black and white with a touch of red on its head. The bird taps into the tree trunk with its beak making a rhythmic tapping. With your eyes you see the beauty of this place. Your skin feels the cool air and you can smell the earth, the plants, and here and there the perfume of the flowers. As you explore further, you notice that the trees are not as crowded and close as before. The grass is disappearing and

Continued

suddenly bushes are everywhere. They snag your clothing and scratch your arms. Several of the bushes are covered with small berries, pink and pale green, ripening into red in the warm sun. There are also thick, tangled willows taller than your head. Suddenly, you notice the slope of the land is steeper...you pause, listening... listening. You can hear the sounds of insects and, lower in pitch and volume, is the sound of water gently spilling over rocks. Above the place where the water must be, you see thousands of tiny swarming insects in a thick cloud. A dragonfly flashes by with its iridescent color of pink and green, darting here, pausing, darting there, pausing, and snatching dozens of the insects for dinner. Now, your eyes can see the splashing waters of the stream below. You notice a hip-high rock ahead of you. As you proceed, it is gray and warm. You pause before reaching the rock and bend toward the water, gathering a handful of pebbles from the streambed. With the pebbles in your hand, you sit on the rock. You look at pebbles...gray, pink, tan and cool in your warm hand. You toss the stones one at a time into the stream, listening to the pleasing plop of stones on water. You glance into the water and notice a fish. It is unblinking and still, only the faint wave of a gill, a tail fin, showing any evidence of life at all. You notice all kinds of small insects dancing above the water. There is a small ripple in the water, then several more, and you realize that fish are rising up from below and feeding on the surface insects. Birds seem to be everywhere. Downstream frogs begins to croak; you wish there was time to search for the frogs. But then it is time to leave. You take one last look all around this beautiful setting. You slowly get up from the rock along the streamside and head back home."

Before the students open their eyes ask them to think about their favorite part of the field trip. Tell them they are going to be asked to share their favorite part with the class. Invite them to open their eyes.

3. Ask students to share their favorite part of the riparian area. Make a class list of favorite images. This list can be used to divide the class into groups for the artwork creation.
4. Explain that the class will be making an illustration of a riparian area. Review the list of favorite images and the first class list created. Add to the list any characteristic areas that need to be included in the illustration.
5. Group students (2 to 3) and have them work together drawing or cutting from magazines the different characteristics of a riparian area. For younger students, have them color reproduced color book images. It is helpful to have a riparian picture gallery in the classroom. Remind students that this illustration is to show the characteristics of the area and not necessarily the animals.
6. When all groups have finished their work, the class will work together to create the complete riparian area on either a flannel board or on a large sheet of construction paper. Each group will arrange and attach their artwork.
7. When the work is complete have the students write or draw about their experience in a journal. Have the class discuss the types of animals that might live in a riparian area. Have they been to a place that looks like the illustration? Is there a place like this in their community? How is the environment different close to the water and fatherer away? What is the importance of a place like this? NOTE: Not all of these questions need to be answered; questions will vary with the age group.

Extensions

1. Visit a riparian habitat. Look for things that were in the simulated field trip and in their pictures.
2. Talk about ways people can visit those habitats without damaging them.
3. Have the class create a story about what happens in one day in a riparian area. Develop this story into a play with each student participating in the play. Perform the play for the parents.

Evaluation

- Have students describe three characteristics of a riparian area
- Identify two animals that live in a riparian area.
- Explain why a riparian zone is important.

Blue Ribbon Niche

Objective

Students will identify different animals that live in a riparian area.

Curricular Areas

Science (wildlife in the riparian zone), Language Arts (a class recording sheet, oral report about animal), Art (drawing, pasting and coloring), Social Studies (changes in the riparian area and effects on wildlife and community)

California Content Standards

Science: **K**–Life 2, Earth 3, Investigation 4; **1st**–Life 2, Investigation 4; **2nd**–Life 2, Investigation 4
Social Science: **K**–4; **1st**–1; **2nd**–2, 4, 5
Language Arts: **K**–Written/Oral 1.0, Listening 1.0, 2.0; **1st**–Written/Oral 1.0 Listening 1.0, 2.0; **2nd**–Writing 1.0, 2.0, Written/Oral 1.0, Listening 1.0, 2.0

Method

Students will create a representation of wildlife that lives in riparian areas. They will add these animals to the riparian habitat previously created in the "Riparian Retreat" lesson.

Materials

- Art materials: crayons, scissors, paints, pencils and glue
- Paper for drawing
- Nature magazines or reproduced coloring book pictures

Background

Riparian areas are found wherever streams or rivers at least occasionally cause flooding beyond their channels. These areas are an important and valuable habitat that supports a variety of plant and animal life. Each plant and animal has an important role in the riparian area. Some are predators, some prey. Some are producers, some consumers, and some decomposers. Some are herbivores, some carnivores, and some omnivores. The plants and animals in the riparian area are interdependent, with each species contributing to the well-being of the overall system. Riparian areas often provide a wide variety and great abundance of vegetation, along with a high-percentage of shade, humidity and diversity of animals and plants. Riparian areas are both aquatic and terrestrial and are characterized by a diversity of life forms. For example, frogs are commonly found in areas of calm waters in riparian areas. Frogs are predators, once they mature beyond their algae-eating tadpole stages. They need moisture, sunlight and grasses or other vegetative shelter. Their eggs must be deposited in water that is permanent enough to allow a lengthy gestation period, growth into gilled tadpoles, and finally transformation into predatory, air-breathing frogs. Riparian areas are easily affected by natural and non-natural changes. For example, spring flooding and flash floods dramatically affect vegetation and wildlife. Excessive use of riparian areas by humans, livestock and wildlife can greatly modify riparian vegetation and destabilize the stream or riverbanks, causing increased rates of erosion. Development and recreational pressures also jeopardize these unique habitats. Riparian areas have aesthetic, ecological, scientific, social, economic, recreational and intrinsic value.

Procedure

1. Review the concept of habitat and what a habitat provides: food, water, shelter and space in the proper arrangement to insure an animals survival.
2. Discuss that animals found in a riparian habitat are animals that need to live in or close to a body of water. Have the students pantomime the following poem.

This is a Plant
This is a plant so tiny and small
It dances in the river's current spring, summer and fall
But...
This is an insect flying in haste
Smelling the plant, she (he) stops for a taste
But...
Here comes a fish and with its keen eye
She (he) sees the insect and silently swims close by
But...

Continued

Here sits a duck, a very patient squatter
She (he) gets ready to dive for the fish in the water
But...
Here comes an angler just looking things over
She (he) gives a whistle to her (his) big dog Rover
So...
The duck flies away
The fish swims low
The insect flies on
And the plant just grows.

Explain that this poem talks about some of the animals in a riparian area.

3. Ask student to think of other animals that would live in a riparian habitat. Write the animals names on a class-recording sheet. This sheet will help when students are writing the name of their animal on its picture.
4. Talk about the riparian habitat that was made previously. Will it provide for the needs of the animals that live in the area? Is there anything that needs to be added?
5. Using the animal list made earlier, have students find magazine pictures, draw and color animals, or color and cut out reproduced coloring book pictures.
6. Allow time for all students to complete their animal representations. Have students place their animal in the riparian area and tell the name of the animal. Have older students share some of the characteristics of the animal.
7. After every student has placed their animal, have students discuss what would cause changes to take place in a riparian area. Consider how the change might affect the animals that live in the area. Change may be natural or created by humans. Examples of events that could cause change:
   - removing trees that produces shade along the bank
   - flooding caused by a winter storm
   - discarded trash along the waterway
   - planting grasses and shrubs along river bank that was bare
   - draining to expand acres for building or farming
   - moving livestock, people swimming, fishing or hiking
   - planting trees to replace trees that have been cut down
8. Read the book *Once There Was a Wood*. Have the students discuss some things that humans can do to preserve the riparian areas and help wildlife survive.

Extensions

1. Have students choose an animal found in a riparian area. They are to find out as much as they can about the characteristics of the animal and do an oral report to the class.
2. Consider ways that cities, a distance from a riparian area, may have a negative affect on the area through storm drain run off.
3. Identify animals that are predator and prey in a riparian area.

Evaluation

- Have the students identify and talk about an animal that is found in a riparian area.
- Identify two ways that riparian zones could be affected in a negative way.
- Identify two ways that riparian zones could be affected in a positive way.

Plastic Jellyfish

Objective

Students will identify the potential harm pollution from plastic waste will cause wildlife and generalize human responsibilities for keeping the habitat clean and safe.

Curricular Areas

Math (graphing and tallying), Language Arts (journal writing), Social Science (waste and its effects on the community and environment), Science (the effects of pollution on aquatic animals), Art (creating an art form), Health (how the environment affects people and animals)

California Contend Standards

Science: **K**–Physical 1, Life 2, Earth 3, Investigation 4; **1st**–Life 2, Investigation 4; **2nd**–Life 2, Earth 2, Investigation 4
Math: **K**–Number 1.0, 2.0, Algebra 1.0, Measure 2.0, Statistic 1.0, Reasoning 1.0, 2.0; **1st**–Number 1.0, 2.0, Measure 2.0, Statistic 1.0, Reasoning 1.0, 2.0; **2nd**–Algebra 1.0, Statistics 1.0, 2.0, Reasoning 1.0, 2.0
Social Science: **K**–1, 4, 5; **1st**–1, 2, 5; **2nd**–2, 4, 5
Language Arts: **K**–Written/Oral 1.0, Listening 1.0, 2.0; **1st**–Written/Oral 1.0, Listening 1.0, 2.0; **2nd**–Writing 1.0, 2.0, Written/Oral 1.0, Listening 1.0, 2.0

Method

Students will: monitor their home waste production, sort and classify according to potential wildlife harm, create artwork from plastic trash, and develop an action plan to reduce plastic pollution.

Materials

- Have students collect plastic garbage from their home for a two or three day period
- Journals for each child, may be made by students
- Masking tape, glue, tempera paint, paint brushes
- Tarp (needed if teacher brings items for sorting and if the students paint their artwork).
- Teacher collect and provide class with plastic trash items for sorting and art projects

Background

Much of the pollution that reduces the quality of water is trash discarded by thoughtless people. People who dispose of their trash along waterways not only create an ugly mess but can also harm wildlife. Plastics are particularly hazardous. Plastic products have made our lives easier and safer. But two characteristics of plastics make them a threat to wildlife. They are lightweight and almost indestructible. Since they are light weight, they can blow in the wind and float on the water. Because they are indestructible they stay in the environment forever. Many fish, birds and other animals die every year from entanglement in plastic six-pack rings that come from canned drinks. The nylon fishing line discarded by anglers can also kill wildlife by entanglement. Animals can mistake some plastics for food; sea turtles have mistaken plastic bags for jellyfish (their favorite food) and choked to death trying to eat the bag.

Procedure

1. Have each student make a journal. The journal will be used to keep a record of amount of plastic trash collected, to record the classifications of the trash, and actions to reduce the harmful effects on wildlife. This can be done in a variety of ways; tallying, graphing, drawing, counting etc. Have younger students cut out pictures illustrating the type of trash, glue the pictures, then write the name and number in the journal. Have students collect every piece of plastic waste used in their home for two or three days. Tell them to notice how much plastic they use daily and record the type of trash in their journal.
2. Daily have students share items they have recorded in their journal. Keep a classroom graph on types of plastic waste. Discuss how plastic products can be harmful to animals.
3. Using their journal, have students sort the materials from their home collection list into two main groups. (The teacher may collect trash and bring the collected items to class for sorting.)
   a) A group for those items students think could

Continued

be harmful to wildlife if discarded improperly into the environment. b) A second group for those items that probably wouldn't be harmful to wildlife. Have students record the number of items of each group in their journal.

4. Now have students sort the potentially harmful items into three smaller groups. Younger students may need help with this process. Some items will fit into more than one group.
    a. Create a group for items in which animals may become entangled. Call it group **E** = entanglement hazard
    b. A second group for materials that might be mistakenly eaten by animals as food. Call it group **F** = mistaken as food
    c. The third group for items that might cut an animal that steps on it or attempts to eat it. Call it group **C** = cutting hazard

    An example of a trash sort and group coding: six-pack holders – E; plastic bags – F&E; Strapping packaging bands – E&C; Plastic utensils, cups, Styrofoam coolers – F&C; fishing line – E&C; plastic containers – E&C; balloons – F; fishing nets – E&C.

    Have student record the number of items in each group in their journal. Older student can use this information to create a graph.
5. Discuss how the students can make something good out of the waste they have collected. Explain to the students that they will create an artwork using collected trash. The artwork can be either a sculpture or a collage. Provide an example of both forms of art. Have students first sketch their ideas in their journal and then begin to make it. It is important to explain to the students that sculptures do not have to look like anything in particular. This work represents their ideas about trash and pollution.
6. Students may paint their creation. Have a class art show for the student's work. Allow students to discuss their creation and what they learned throughout the week. Examine the class graph to find out the most common type of garbage.
7. Have a discussion about actions that can lessen the potential hazard of plastic (and other waste materials) to wildlife. Develop a Student Recycle, Reduce and Reuse Action Plan. It should include:
    - Always dispose of trash properly.
    - If you see trash, pick it up for recycling or place it in a garbage can.
    - Carry a litterbag.
    - If you see a friend littering, explain why they may be doing more harm than they realize.
    - Cut up large tangles of fishing line into short sections before you discard it in the trash can or recycle it. Cut up six-pack plastic rings.
8. Let students know that their extra little effort will keep the water clean and may also save a fish, bird or other animal.

Extensions

1. Establish a litter patrol for your school. Also take part in a creek or beach cleanup.
2. Find out what items can be made from recycled plastic. Collect plastic that are not recyclable and reuse in class craft projects.
3. Have the students draw posters which can be placed in the community. Posters can show the before and after effects of pollution on an aquatic habitat.

Evaluation

- Have the students explain one way in which waste can affect an aquatic habitat.
- Have the students describe two ways they can help prevent plastic pollution from harming animals and the environment.
- Describe two ways plastic waste can harm wildlife.

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Resources Section

The following section includes recommended books and sources for other educational materials.

Resources For Teachers

Books

Parker, Steve. ***Pond and River***. (Eyewitness Book) Alfred Knopf, 1988
Reid, George. ***Pond Life***. Golden Press, Western Publishing Company, 1967
Resnick, Jane. ***Eyes on Nature Fish.*** Kidsbooks, 1992
Stidworthy, John . ***Ponds and Streams.*** Troll Associates, 1990
Eyewitness Book Series. ***Fish, Pond and River***. Alfred A. Knopf, New York

Read to the class books

Hoolling, Holling C. ***Paddle-to-the-Sea.*** Houghton Mifflin Company, 1980
O'Brien, Theresa. ***The Little Fish in a Big Pond***. Child's Play International,1990

Stories about River Clean-up Projects done by student

Cherry, Lynne. ***A River Ran Wild***. Harcourt Brace & Company, 1992
Cone, Molly. ***Come Back Salmon.*** Sierra Club Books for Children, 1992

Dawn Publications may be purchased directly from the publisher- Dawn Publications, P.O. Box 2010, Nevada City, CA, 95950, www.dawnpub.com, phone: (800) 545-7475, fax: (530) 478-0112
Classroom supplies, books, videos, CDs, etc. are available from Acorn Naturalists, P.O. Box 2423, Tustin, CA, 92781-2423, www.acornnnaturalists.com, phone (800) 422-8886, fax: (800) 452-2802

Continued

Unit 1 Resources–General Water Awareness

Books:

Arnosky, Jim. ***Otters Under Water.*** The Putnam Publishing Group, 1992.
Baldwin, Robert F. ***This is the Sea That Feeds Us***. Dawn Publications, 1998.
Bartlett, M. ***Where Does All the Rain Go?.*** Coward, 1973.
Base, Graeme. ***The Water Hole***. Harry N. Abrams, Inc.: Publisher.
Brandt, Keith. ***What Makes It Rain? The Story of a Raindrop.*** Troll Associates, 1982.
Chappell, James. ***Little Johnny Raindrop.*** State House Press, 1991.
Hale, J.G. ***Down Comes the Rain***. Harper Collins, Children's Book 1997.
Hall, Howard, "The Kelp Forest." Blake Publishing, CA, 1990.
Hooper, Meredith. ***The Drop in My Drink: The Story of Water on Our Planet.*** Viking Press, New York, 1998.
Kerr, Kimberly. ***The Raindrops' Adventure: From Raindrops to Rainbows.*** Kimberly Kerr Press, Sewickley, PA.1999.
Locker, Thomas. ***Water Dance.*** Harcourt Brace and Company, New York, 1997.
Locker, Thomas. ***Where the River Begins.*** Puffin Books, New York, 1984.
Locker, Thomas. ***Cloud Dance.*** Silver Whistle/Harcourt Inc. New York, 2000.
McKinney, Barbara Shaw. ***A Drop Around the World!*** Dawn Publications 1998.
Michel, Francois. ***Water.*** Lothrup, Lee, and Shepard Books, New York,1993.
Pfister, Marcus. ***Rainbow Fish and the Big Blue Whale.*** North-South Books.
Rauzon, Mark J. and Cynthia Overbeck. ***Water, Water Everywhere***. Sierra Club, San Francisco.
Relf, Patricia. ***The Magic School Bus Wet All over: A Book About the Water Cycle.*** Scholastic Inc, New York,1996.
Schaefer, Lola M. ***This Is the Rain.*** Green Willow Books, New York, 2001
Schmid, Eleonore. ***The Water's Journey***. North-South Books, New York, 1989.
Spier, Peter. ***Peter Spier's Rain*** **(Reading Rainbow Book).** Picture Yearling Books, New York.
Ward, Elsie. ***Follow a Raindrop: The Water Cycle.*** Scholastic, Inc. Super Science Reader Books, New York

Videos:

Journey of the Blob – Bullfrog films, Box 149, Oly, PA 19547 - phone 610/ 779-8226, website: www.Bullfrogfilms.com
Video illustrates the water cycle as well as environmental responsibilities and consequences. Video is without dialogue, it uses only visual images.

Other Resources:

Bailey-Rowland, Ann. ***Excuse Me Sir, That's My Aquifer.*** The Groundwater Foundation. Cassette tape with songs, booklet of sing-along-lyrics, background notes, and student activities. GW@groundwater.org.

Continued

Unit 2 Resources – Aquatic Habitats

Books:

Appleton-Smith, Laura. ***Frank the Fish Gets His Wish***. Flyleaf Publications, 1998.
Clements, Andrew. ***Big Al.*** Aladdin Paperbacks, 1997.
Cristine, Ermanno & Luigi Puricelli. ***In the Pond.*** Picture Book Studio, 1984.
Ehlert. Lois. ***Fish Eyes***. Harcourt, Brace and Company, 1990.
Fleming, Denise. ***In the Small, Small Pond.*** Scholastic 1993.
Lionni, Leo. ***Swimmy***. Knopf Books 1973.
Plister, Marcus. ***The Rainbow Fish.*** North-South Books 1992.
Plister, Marcus.***El Pez Arco Iris.*** North-South Books 1995.
Schwartz, David. ***At the Pond.*** Garth Stevens, 1998.
Winner, Cherie. ***Trout.*** Carolrhoda Books, 1998.
Dr. Seuss. ***McElligot's Pool.*** Random House 1966.
Dr. Seuss. ***One Fish, Two Fish, Red Fish Blue Fish.*** Random House, 1987.

Videos:

Preserving California's Forest of the Sea – Sea Farer Productions; 5 minutes running time, may be borrowed by contacting California Department of Fish and Game/Project WILD, 1416 Ninth St. Room 1326, Sacramento, CA 95814, phone toll free 1-888-945-3334, e-mail: projectwild@dfg.ca.gov. Video has very good footage of ocean kelp forests and the animals which use this habitat.

Unit 3 Resources – Animals in Aquatic Habitats

Books:

Carle, Eric. ***The Very Hungry Caterpillar.*** Philime, 1987
Doubiler, Julie. ***Under the Sea From A to Z.***, Scholastic, Inc
Ehler, Lois. ***Waiting for Wings.*** Harcourt
Fredericks, Anthony D. ***In One Tide Pool.*** Dawn Publications, 2001
Hogan, Paula. ***The Salmon***. Raintree Steck-Vaughan Publishers, 1991.
Kovacs, Deborah. ***A Day Underwater.*** Scholastic, Inc. New York
Pratt, Kristin Joy. ***A Swim Through the Sea.*** Dawn Publications 1994
Reed-Jones, Carol. ***Salmon Stream.*** Dawn Publications 2000
Statson, Caroline. ***On the River ABC.*** Roberts Rinehart Publishers 1993

Videos:

California's Fish Hatcheries – Enriching Nature's Bounty – California Department of Fish and Game, 16 minutes running time. Video may be borrowed by contacting California Department of Fish and Game/Project WILD, 1416 Ninth Street, Room 1326, Sacramento, CA 95814, phone toll free 1-888-945-3334, email: projectwild@dfg.ca.gov. Video is very good showing salmon and trout life cycle and habitat. It provides a history of hatcheries and jobs related to sports and commercial fishing.

Continued

A Visit to the Feather River Hatchery – California Department of Fish and Game/Project Wild, 9 minute running time. Video may be borrowed by contacting California Department of Fish and Game/Project WILD, 1416 Ninth Street, Room 1326, Sacramento, CA 95814, phone toll free 1-888-945-3334, email: projectwild@dfg.ca.gov. Video is recommended for older students however, can help with an understanding of salmon migration and life cycle.

Unit 4 Resources – Aquatic Habitats and Humans

Books

Arnosky, Jim. ***All Night Near the Water***. Scholastic, Inc., 1994
Fleming, Denise. ***Where Once There was a Wood***. Henry Holt and Company Incorporated, 1996
George, Lindsay. ***Around the Pond: Who's Been Here?***. Harper Collins, 1996
George, Wm. ***Box Turtle at Long Pond***. Greenwillow, 1989
Halpen, Shair. ***My River***. Scholastic, Inc., New York, 1992
Hooper, Meredith. ***River Story.*** Candlewick Press, Massachusetts, 2000
Jeunesse, Gallimaid and Laura Bour . ***The River***. Scholastic, Inc., 1992
Locker, Thomas. ***Where the River Begins.*** Puffin Books, New York, 1984
Pratt-Serafine, Kristin Joy. ***Salamander Rain.*** Dawn Publications, 2000
Rand, Gloria. ***Prince William***. Henry Holt & Company Inc., 1995
Robertson, Kayo. ***Signs Along the River.*** The Court Wayne Press, 1986
Root, Phyllis and Jane Chapman. ***One Duck Stuck.*** Candlewick Press
Rosen, Michael. ***All Eyes on the Pond***. 1994 (preschool)
Wadsworth and Vojtech. ***Over in the Meadow***. North-South Books