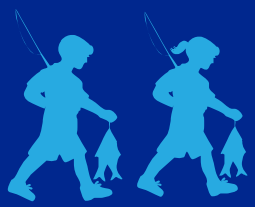
Learning to Fish, Fishing to Learn



A Fishing in the City Unit

California Department of Fish and Wildlife

"Learning to Fish – Fishing to Learn" was created for use with the Fishing in the City Program in the San Francisco Bay Area. The content is appropriate for use in other geographic areas and the material will work well with many programs that teach about fish, fishing, or aquatic biology.

Mike Roa, Author
Meredith Fleener, Design and Layout
Sarah Darbee, Original Artwork
Ethan Rotman, Project Manager

The mission of the Department of Fish and Wildlife is to manage California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public.

This project was funded by the Sportfish Restoration Fund (SFR) – an excise tax on the sale of fishing tackle and motor boat fuel. SFR works through partnerships to conserve and manage fish and wildlife and their habitats for the use and enjoyment of current and future generations.

First edition – 2013

California Department of Fish & Wildlife
Bay Delta Region
7329 Silverado Trail, Napa CA 94945
(707) 944-5500
For information on Fishing in the City
www.fishinginthecity.org or www.dfg.ca.gov/fishinginthecity/

CONTENTS

INTRODUCTION: FISHING IN THE CITY

Although fishing is as old as human culture, it is being re-discovered for its value as a tool to teach environmental topics and give students a healthy activity to continue outside the classroom. The act of fishing and attempting to catch a fish demonstrates the importance of understanding basic biological concepts including habitat, food chains, the interdependence of structure and function in anatomy, and relationships among organisms in the environment, including people. Most importantly, it provides a real-world model for how our actions affect the quality of water in our local waterways and how we can be good stewards of the environment.

The California Department of Fish and Wildlife's Community Fishing and Watershed Education Programs provide opportunities for citizens to enjoy aquatic resources while they gain an understanding of the role that they play in maintaining clean and healthy waterways. The Fishing in the City program is part of the DFW's education program.

Community Fishing programs can include any or all of the following components:

- school-based education such as this unit and the Fishing 101 program
- school and community fishing events at local sites, possibly utilizing rod lending programs
- service learning and habitat improvement projects

Community Fishing programs are supported by the California Department of Fish and Wildlife (DFW), schools, service clubs, local governmental agencies, park agencies, water districts, tackle retailers, and others. These "Partners" each have a role in the success of the Fishing in the City program. (See Parameters for Partners in Appendix V.)

Fishing in the City (FIC) is a partnership with each partner contributing a piece of the overall project. As the classroom teacher, your role is to introduce your students to the concepts of watershed, fish biology, and aquatic ecology before they're taught to fish. We encourage you to include math, literature, social studies, art and any other subject area in your unit. You do not necessarily need to do any of the activities in this unit, but what is important is that you implement a systematic approach that incorporates these topics in the classroom, preferably prior to the Fishing 101 experience.

WHAT IS FISHING 101?

Fishing 101 is a free program in which volunteers from community service clubs such as Rotary International come to classrooms to teach the students the basics of fishing such as knot tying, casting, and ethics. Materials such as fishing rods and tackle are provided, and the students are given some basic tackle to keep. The Fishing 101 classroom experience is followed by a trip to a local lake where the students can try out their skills. The lake is generally stocked with trout and/or catfish specifically for the students, greatly increasing their chance of catching a fish.

Lessons 1 – 6 in this *Learning to Fish, Fishing to Learn* Unit should be done prior to the Fishing 101 class visit, with Lessons 7 – 9 following the Fishing 101 visit. (See page 51.)

Participating schools are expected to provide an Event Coordinator to work with the other partners, secure commitment from all teachers at the selected grade level, develop and implement watershed study and fish ecology lessons prior to and following the fishing event, and meet other simple requirements. See Parameters for Partners in Appendix V.

Ethical fishing and watershed stewardship are emphasized in both the classroom and lake portions of Fishing 101.

In conjunction with the other partners, the Community Fishing program will provide instructors to come into the classroom to teach Fishing 101 and provide a tackle box for each student to keep. We will also provide a day of fishing at a local lake. To help make this a part of the community at large and a part of the students' lives, in most areas we will offer a free community fishing clinic shortly after the school event, and we have established a rod lending system in conjunction with local retailers in your community.

The more you put into the classroom portion, the more your students will gain. We encourage you to be creative and use fishing as a catalyst for getting your students excited and involved in projects related to your local watershed. We hope the materials in this packet will help you bring fishing – and watershed stewardship – alive for your students.

It is important to enlist the support of parents for this unit. You will probably need their help with transportation for the fishing event. Lesson 6 (*Fish Fry!*) involves cooking and eating fish at school. You may want to have parents help with this lesson. A sample Parent Letter is provided in Appendix I. We recommend that you send it to parents at least two weeks prior to starting the unit so that they can plan to help.

For information on how to bring Fishing 101 to your classroom, contact Ethan Rotman, Fishing in the City Coordinator…see below.

CDFW also supports a program in which students start with trout eggs in the classroom and then release the young fish. Contact Ethan Rotman (see below) for information about the Trout in the Classroom program.

If we can be of any assistance at all, please do not hesitate to contact:

Ethan Rotman, San Francisco Bay Area Fishing in the City Coordinator

ethan.rotman@wildlife.ca.gov

Additional information is available from the California Department of Fish and Wildlife at: www.wildlife.ca.gov .

WELCOME TO LEARNING TO FISH, FISHING TO LEARN!

Learning to Fish, Fishing to Learn is a Fishing in the City unit designed for use by classroom teachers. While the activities can be used without participating in a Fishing in the City program, we highly recommend that this unit and the Fishing 101 program be used together to maximize the learning and enjoyment. This unit is intended to complement a Fishing 101 experience.

Learning to Fish, Fishing to Learn is a unit of study that can help third grade students advance towards mastery of standards in a several content areas. It also aligns nicely with third grade units from California's Education and the Environment Initiative (EEI).

LESSON SEQUENCE

Teachers participating in the Fishing in the City program are expected to provide relevant instruction before and after the Fishing 101 classroom visit and the fishing event. The lessons in this Unit can be presented in varying sequences, but the sequence below is recommended.

Prior to Fishing 101 and the fishing event:

Lesson 1: *Goin' Fishin'!* Introduces students to fish and the idea of going fishing; it provides the teacher with information about what students already know.

Lesson 2: *Home Sweet Lake* Introduces students to freshwater habitats and ecosystems.

Lesson 3: *Worms for Lunch!* Introduces students to freshwater food chains and food webs.

Lesson 4: *What's a Fish?* Introduces students to basic fish anatomy.

Lesson 5: *Fishing: Playing Fair and Safe* Students discuss some ethical situations that they might encounter while fishing.

Lesson 6: *Fish Fry!* Students sample fish cooked at school.

We strongly recommend that Lessons 1 – 6 be done before the Fishing 101 workshop.

Recommended for after the Fishing 101 workshop and the fishing event:

Lesson 7: *Thank You!* Students write letters of appreciation.

Lesson 8: *What's a Watershed?* Introduces students to the concept of a watershed.

Lesson 9: *A Fish Story* Students summarize their learning by writing and illustrating a fish story

FISHING 101 INTEGRATION

1. Obtain the contact information for the Community Partner that will be presenting the Fishing 101 workshop so that you can confirm the presentation a couple of days before it is scheduled.
2. Be sure that the Partner knows where to park and that they need to check in at the office when they arrive.
3. Let the Partner know that the students will be writing letters of appreciation. Ask for names and where the letters should be sent.

4. Find out from the Partner whether he or she is comfortable with having parents participate in the classroom workshop. If so, invite some parents. (One of the goals of the Fishing in the City program is to get families to go fishing. Parental involvement can greatly increase the chances that they will take their children fishing.) This may also facilitate finding transportation for the fishing event.

CALIFORNIA STATE CONTENT STANDARDS:

Learning to Fish, Fishing to Learn primarily addresses content standards in the area of science, but it can also help students achieve standards in other areas of study. Each lesson includes a section that indicates some of the standards that the lesson can help teach. Generally, the standards are listed by a number and described by a short phrase. The complete Next Generation Science Standards are listed in Appendix III. Common Core English/Language Arts and Mathematics Standards are listed in Appendix III, but not in their entirety in order to save space.

Learning to Fish, Fishing to Learn is correlated with California Common Core Standards in English and Mathematics, and with the Next Generation Science Standards, which were adopted by California in 2013.

EDUCATION AND THE ENVIRONMENT INITIATIVE:

In 2003, the California legislature passed the Education and the Environment Initiative (EEI). The EEI resulted in the development of Environmental Principles and Concepts (EP&C) that are important for people to understand if they are to be environmentally literate. Along with the development of the EP&C, 85 units of study were developed in the areas of science and history/social studies. These units support the teaching of existing science and history/social studies content standards from an environmental perspective and include teaching of the EP&C. The third grade EEI units with which Learning to Fish, Fishing to Learn align are indicated in the lessons. Information about the Environmental Principles and Concepts is included in Appendix IV.

To find out more about the EEI go to: www.calepa.ca.gov/education/eei

The EEI units of study can be downloaded at: www.calepa.ca.gov/education/eei/curriculum

RESOURCES:

A list of useful resources is included in the Appendices. Classroom teachers will find these three resources especially useful as they teach about fish, aquatic ecology, and stewardship:

F.I.S.H. – Fishing is Simple Handbook is a small booklet that includes basic information about fishing and being a responsible angler. It is available from the Future Fisherman Foundation (FFF) and to participants in the FIC program. See the resources section of the FCC Web site at: www.futurefisherman.org

Project WILD Aquatic and ***Project WET*** are curriculum resources for grades K-12. Each guide provides activities that have been developed and used for years by many teachers. To obtain these guides, teachers participate in a six hour workshop. Correlations with California content standards have been developed. To find out more, do an internet search or contact:

Project WILD Aquatic: CA. Department of Fish and Wildlife at: www.DFW.ca.gov/projectwild

Project WET: the Water Education Foundation at: www.watereducation.org

Trout in the Classroom (also a DFW-affiliated program) has a variety of educational materials, including lesson plans and videos, wet sites, and a library list, available at the DFW and Trout in the Classroom websites:

www.classroomaquarium.org & www.troutintheclassroom.org/teachers

LESSON 1 *GOIN' FISHIN'!*

LESSON SUMMARY:

In this introductory lesson, students play a game of "20 questions" and work with other students to draw a picture of a fish's habitat. They then discuss some reasons why people might enjoy fishing.

CONTENT STANDARDS AND EEI CORRELATIONS:

- Common Core Standards in English/Language Arts (Grade 3)
  - Speaking and Listening: 3-SL 1 (Engage…in…discussions with diverse partners…)
  - Speaking and Listening: 3-SL 2 (Determine the main ideas…of information presented in diverse formats, including…orally)
  - Speaking and Listening: 3-SL 3 (Ask and answer questions about information…)
- Visual and Performing Arts: 2.1 (Explore ideas for art in a personal sketchbook)

LINKS TO THE PREVIOUS LESSON: None.

LINKS TO THE NEXT LESSON:

In *Home Sweet Lake*, students will find out more about freshwater habitats.

BACKGROUND INFORMATION FOR THE TEACHER:

While students may not have much direct experience with aquatic habitats, or know much about the lives of fish, they do have some knowledge and ideas about fish and where they live. This lesson might help make the teacher aware of students' misconceptions. It should also help set the stage for the following lessons and for the field trip to the fishing site. A "KWL Chart" is created.

A KWL Chart has 3 columns. The first is what the students "know" (Or think they know. It should include any misconceptions that the students put forth so that they can be corrected during or at the end of the unit.) The second column is for things that the students want to learn…questions that they have at the start of the unit. The third column is for things that they have learned during the course of the unit. You will post the KWL Chart and add to it as you teach the lessons.

ETHICAL CONSIDERATIONS AND CONSERVATION:

While Fishing in the City is a program that enables students to go fishing and, hopefully, catch fish to eat, the real agenda is to help students (and their families) become better stewards of our waterways and watersheds. Throughout the unit, teachers should look for ways to encourage students to protect and improve the environment.

VOCABULARY (SEE APPENDIX II FOR DEFINITIONS):

environment freshwater habitat

LESSON GOALS:

1. The students will begin to think about fish and aquatic environments.
2. The aquatic habitat drawing by the students and the KWL chart can provide a baseline to show the students' knowledge at the start of the unit and to identify student learning needs.

TIME CONSIDERATIONS:

Approximately 45 minutes

GROUPING SUGGESTIONS:

whole class and groups of 3-5 students

MATERIALS (FOR A CLASS OF 30):

chart paper (1 sheet per group plus one for KWL Chart)

drawing materials (crayons, colored pencils, markers)

copies of the Fishing in the City Letter to Parents (Appendix I) (1 per student)

PROCEDURES:

1. If the students don't know how to play "20 Questions," explain the rules:
   a. the teacher will think of something and students will try to figure out what it is
   b. students can raise their hands and ask a yes/no question
   c. the teacher will answer the question
   d. the goal is to try to figure out what you are thinking of in 20 questions or less
   e. give or elicit examples of the types of questions that they might ask…
      i. Is it alive?
      ii. Is it bigger than a basketball? (Most won't know what a breadbox is!)
      iii. Does it move?
      iv. Is it a food?
      etc.
2. Play a game of 20 questions…you are thinking of a fish.
3. After the students figure out that you were thinking of a fish, ask them to tell you what they know about fish. Use their responses to start a KWL chart.

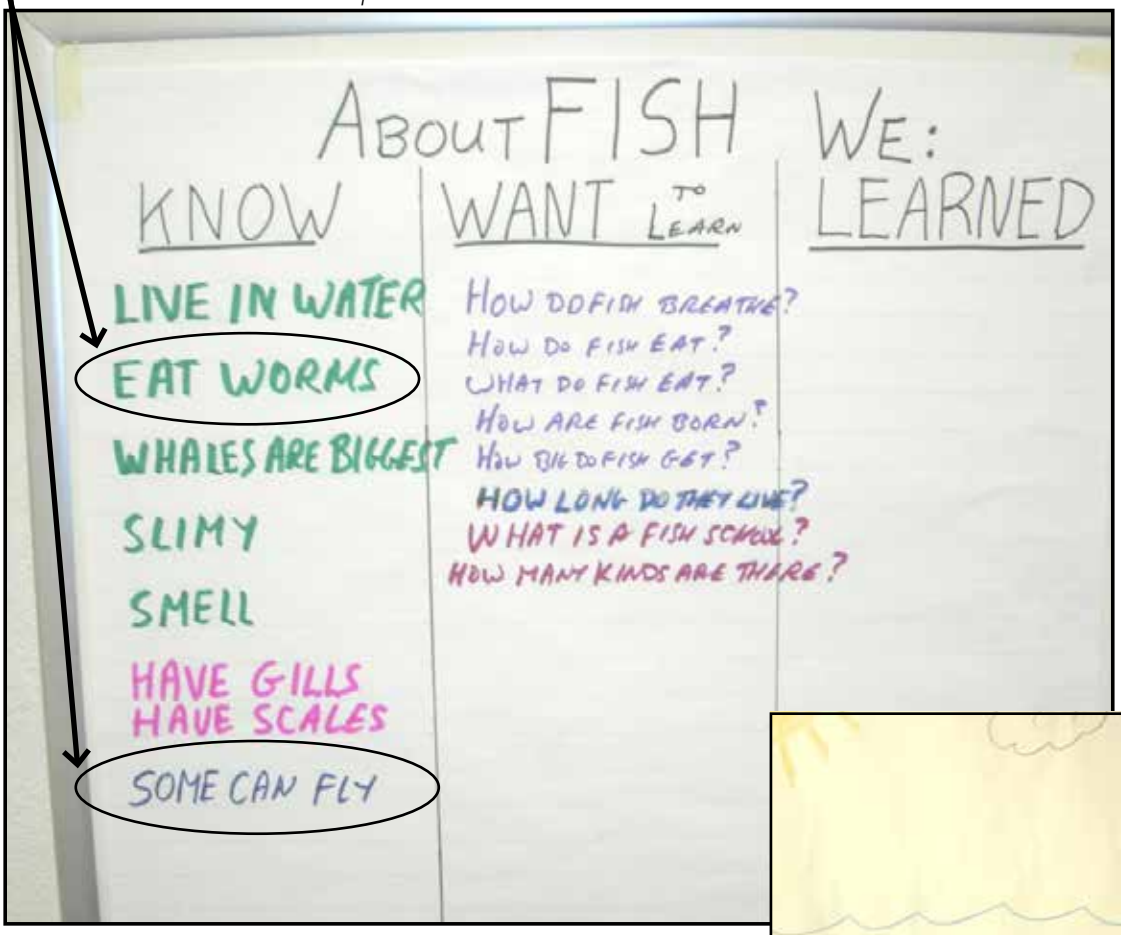
Maybe start with a sample game with something relatively easy…the sun, a dog, a tree or the school, for example. When you play the game, you don't have to strictly abide by the yes/no rule. For example, technically, trees are food to some organisms. If the answer is "tree," and the students ask if it is food, you could say "to some kinds of animals" rather than just "yes," which they would probably interpret as "Yes, it is food for people."

4. Introduce the terms "environment" and "habitat" and explain what they mean…a place where something lives.

5. Divide the class into groups of 3 – 5 students and issue chart paper and drawing materials to each group.

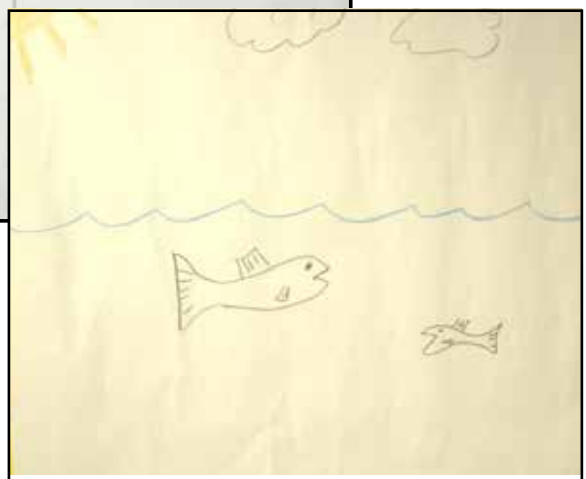
6. Assign the groups to discuss what they know about where fish live – their habitat – and to draw a fish in its habitat. Tell them to think about fish that live in freshwater – lakes, ponds, and streams – as opposed to the ocean.

Include misconceptions…Be sure to address them later.



You may not get to all of the students' "Wants." Possible independent research projects for students or teams of students?

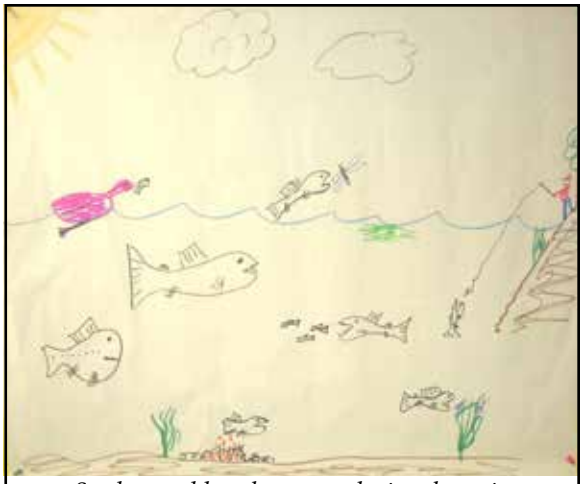
7. After the students have completed their drawings, have representatives of two or three of the groups bring their posters to the front of the room, hold them up, and explain what the drawings show about fish and fishes' habitat. After one or two groups have shown their posters, ask the groups to only explain what their poster shows that is different from the previous posters.



Beginning of the unit

8. Tell the students that they are beginning a unit about fish and aquatic habitats, and that later in the unit there will be guests coming in to help them learn to fish and that there will be a field trip to a lake where they will have a chance to try to catch a fish.

9. Ask students why people go fishing. List their responses on the board. Elicit or suggest the following reasons:
   a. to catch fish to eat
   b. to make a living…professional fishermen and fisher-women
   c. it's fun!
   d. to spend time in the out-of-doors
   e. to spend time with friends and family
   f. to spend time alone
   g. to experience nature
   h. to experience a quiet and beautiful environment/place
10. Wrap up the lesson by explaining and giving the students the Letter to Parents to take home.



Students add to the poster during the unit.

11. Post the KWL Chart at the front of the room and the student posters on bulletin boards.

NOTE: As your students proceed through the lessons in the unit, you should:
   a. Update the KWL Chart by addressing misconceptions, adding new things that they want to know, and listing things learned.
   b. Periodically (after each lesson or two), give the students time to add new learning to their posters.

Duplication or Transparency Masters:

- Letter to Parents (A sample is provided in Appendix I.)

ASSESSMENT SUGGESTIONS:

1. The KWL Chart can be used to assess the students' prior knowledge about fish and aquatic habitats.
2. At the end of the unit the poster might be useful in assessment.

POINTS FOR WHICH TO ASSESS:

1. Formative Assessment:
   a. Use the student posters and the KWL chart to reveal misconceptions and also what they already know about fish.
   b. Use the student posters and the KWL chart to determine whether you want to add lessons to address their interests and needs, including the "W" (Want to learn) column.
2. Summative Assessment:
   a. none at this point

VARIATIONS, ALTERNATIVES AND EXTENSIONS:

1. Your science text book probably has a section on ecosystems and habitats or biomes. Use this lesson in conjunction with that chapter or unit.

REFERENCES AND RESOURCES:

Council for Environmental Education. *Project WILD Aquatic K-12 Curriculum and Activity Guide*
Minnesota Department of Natural Resources. Fishing: *Get in the Habitat! – MinnAqua Leader's Guide*

LESSON 2 *HOME SWEET LAKE*

LESSON SUMMARY:

First students learn about habitats and the requirements for a healthy environment. They then learn some of the requirements for a healthy freshwater environment and about threats to freshwater ecosystems. Through demonstrations and hands-on activities, students see that silt and warming of water can harm trout habitat. Finally, they discuss how to protect freshwater habitats and do an art activity to promote protecting lakes and streams.

Part 1 of this activity is based on the activity "Silt: A Dirty Word" from the *Project WILD Aquatic K-12 Curriculum and Activity Guide.*

CONTENT STANDARDS AND EEI CORRELATIONS:

Next Generation Science Standards:

- 2-LS4-1 (diversity of life in different habitats)
- 2-ESS1-1 (Use evidence from several sources to provide evidence that Earth events can occur quickly or slowly.)
- 2-ESS2-1: Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.
- 3-LS4-3 (…in a …habitat, some organisms can survive well, some survive less well, and some cannot survive at all.)
- 3-LS4-4 (…solution to a problem caused when the environment changes…)

History-Social Science: 3.3 (how the community has changed over time)

Common Core Standards in English/Language Arts (Grade 3)

- Reading Standards for Informational Text: 3-RI 1 (Ask and answer questions…)
- Reading Standards for Informational Text: 3-RI 2 (Determine…main idea…details)
- Reading Standards for Informational Text: 3-RI 4 (Determine…meaning of…words)
- Reading Standards for Informational Text: 3-RI 7 (Use information…from illustrations…and words…)
- Reading Standards for Informational Text: 3-RI 10 (…read and comprehend…texts…)

Visual and Performing Arts: 2.4 (Create a work of art.)

Health Education: 8.2P (Encourage others to promote a healthy environment.)

EEI Units: *Living Things in Changing Environments* and *The Geography of Where We Live*

LINKS TO THE PREVIOUS LESSON

In *Goin' Fishin'!* students began to discuss and think about fish and freshwater habitats. In this lesson, students learn more of the specifics of a freshwater ecosystem and how some changes can degrade or improve a lake's quality as fish habitat.

After completing this lesson, students should add their new learning to the posters created in Lesson 1.

LINKS TO THE NEXT LESSON:

In *Home Sweet Lake*, students learn about a variety of factors that are important in any ecosystem. One of those factors is food for the organisms living there. In the next lesson, *Worms for Lunch!*, they learn about food chains and food webs.

BACKGROUND INFORMATION FOR THE TEACHER:

Your science text book includes lessons on a variety of habitats and biomes, but most likely does not go into depth on any particular habitat type, or, if it does, it may not focus on freshwater habitats. This lesson focuses on freshwater habitats such as lakes that provide habitat for trout.

All organisms depend on their habitats for a variety of resources such as food, oxygen/air, water, shelter, light, absence of toxins and pollution, and an appropriate temperature. Different species of fish have different requirements. Some eat algae, while others eat insects, frogs, or other fish. Some, such as trout, require cool, well-oxygenated water; others, such as catfish, can tolerate warmer water. Trout and salmon also need clean gravelly areas in which to lay their eggs.

In fourth grade, students will study about the California Gold Rush, but many third graders will have heard of it. Hydraulic mining during the gold rush era resulted in many tons of soil entering streams and burying spawning grounds under sand and silt. Mercury was also used in gold mining operations and released into the environment. Mercury is a highly toxic metal that still contaminates many streams and San Francisco Bay.

Early logging practices, especially road building and clear-cutting, resulted in damage to streams from erosion. Streamside building, grazing, fires, plowing of fields, and other factors have also resulted in erosion of soil and the addition of sand and silt to streams and lakes.

Cold water can dissolve or hold more gas (such as oxygen) than warm water. Dams and removal of streamside vegetation have resulted in the warming of water in many streams. Trout and salmon require cool, well-oxygenated water, and warming of water has further degraded many trout streams.

Lakes and rivers are affected by events upstream and also by events on the land adjacent to the water body, which is called the riparian zone. Streamside restoration projects can help improve and protect streams, and there may be opportunities for students to become involved with restoration projects.

ETHICAL CONSIDERATIONS AND CONSERVATION:

Understanding the requirements of a healthy freshwater ecosystem should enable students to understand ways that they can help protect not only freshwater ecosystems but others as well. Once they understand some of the threats to freshwater ecosystems, students can encourage others to protect and improve or restore them.

VOCABULARY (SEE APPENDIX II FOR DEFINITIONS):

❑biome ❑freshwater gravel habitat oxygen pollution restore/restoration sand sediment/sedimentation silt/siltation temperature

LESSON GOALS:

1. Students will understand that ecosystems are complex, with many factors that can be healthy or unhealthy for fish.
2. Students will understand that trout need cool, well oxygenated water.
3. Students will encourage others to take steps to protect habitats such as lakes.

TIME CONSIDERATIONS:

Part 1 *Teacher preparation:* gathering materials: 30-60 minutes the first time you do the activity; subsequently, 15 minutes to set up.
Class activity: 30-45 minutes

Part 2 *Teacher preparation:* varies according to what pictures you already have
Class activity: 30-60 minutes

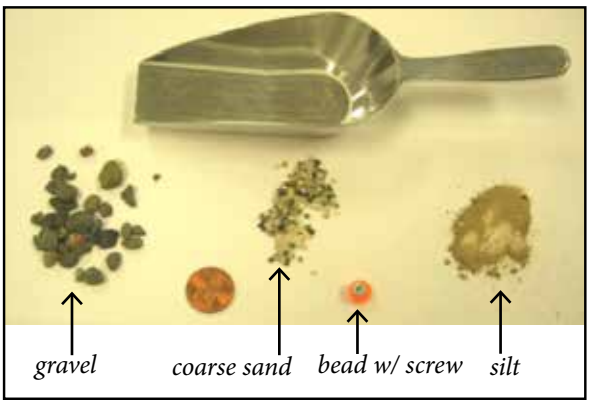
GROUPING SUGGESTIONS:

Part 1: whole class and groups of 2-4 students

Part 2: individual or groups of 2

MATERIALS (FOR A CLASS OF 30):

Part 1-a: For each group:



1 clear plastic cup or other clear container, 8-12 oz., per group

1 straw per student

pea gravel or other gravel from 1/4 inch to 1 inch in diameter: enough to fill approximately 1/4 of the cup

coarse sand: enough to fill approximately 1/8 of the cup

(Sand and gravel are available from landscape supply companies.)

silt (very fine soil): enough to fill approximately 1/8 of the cup

(Silt might be collected from lakes or along slow moving streams and then dried.)

1 orange bead, approximately 1/4 inch diameter (available at crafts stores)

1 scoop or measuring cup (for adding sand and silt to cups)

Part 1-b: For the teacher/class:

1 electric hot plate

1 glass pot such as a Pyrex coffee pot that can be put onto the hot plate (possibly purchased at a thrift store if you don't have one)

1 thermometer

Part 2:

art supplies

pictures of streams, lakes, fish

PROCEDURES:

Part 1-a

1. Prior to the lesson, test the beads to see if they float. If so, you might glue a small screw into the hole; use "model airplane cement."

2. Prepare the cups by placing about ¼ cup of pea gravel into each. Add water until ½ full.

3. After studying habitats and biomes, review the definition of "habitat" with your students. Depending on what science text you use, it will probably be something like "The environment where an organism (or a plant or animal) lives."

4. Ask the students what kinds of things fish would need to have in their habitat. List them on the board.

   a. The list *should* include:

      i. water

      ii. air or oxygen

      iii. food

      iv. shelter

   b. The list *might* also include such things as:

      i. light (which is necessary for plants, which provide food)

      ii. an appropriate temperature (or heat)

      iii. clean water (or absence of pollution, harmful chemicals, etc.)

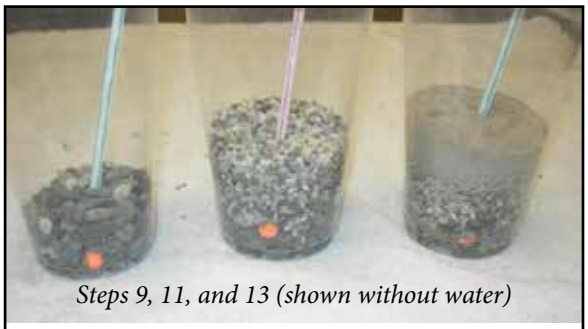
5. Point out that, for a fish, "shelter" usually means a place where they can get away from predators such as larger fish and people, and also a place where they can lay their eggs. We will look at food in the next lesson. In this lesson, we will consider oxygen/air.

6. Divide the students into working groups of 2-4 students each. Each group should be issued or pick up: 1 cup with pea gravel and water, one straw per person

7. Explain that the gravel represents gravel in a stream.

8. Give each group one orange colored bead. Explain that the bead represents a trout egg. Have the students press the "egg" into the gravel in the cup. (If it floats because of air trapped in the hole in the bead, have the students gently swish it around until the bubble pops and the bead sinks. See Variation #2.)

9. Give each student a straw and ask them to push the end of the straw through the gravel to the bottom of the cup and gently blow. Ask them to tell how difficult it is to blow air into the gravel. (It should be easy.)



Steps 9, 11, and 13 (shown without water)

10. Point out to the students that the fish egg needs air in order to survive. Ask how air might get into the water. (It can enter from the air above the water, but it is also added as water splashes over rocks and waterfalls. Water with lots of air is said to be well "oxygenated.")

11. Add a layer of coarse sand to the cup…about a ½ - 1 inch thick layer.

12. Have the students again push their straws through the sand and gravel and blow again. Ask them how difficult it is to blow air into the gravel. (If the sand is coarse, it will still be easy. Sand of a medium coarseness will be a little more difficult to blow through.)

13. Add a layer of silt (very fine soil) to the cup…about a ½ - 1 inch thick layer.

14. Have the students again push their straws through the silt/sand/gravel and blow again. Ask them how difficult it is to blow air into the gravel. It should be very difficult.

15. Ask the students what will happen to the fish egg if it can't get air because of a layer of silt. (The egg will die.)

16. Discuss with the students how silt might get into a stream or lake. Discuss causes of erosion such as fires burning off plants that hold soil, improperly built roads and building sites, plowing of fields, deforestation, and animals such as cattle killing streamside vegetation.

17. Discuss and list on the board or overhead ways that people can prevent soil erosion, including staying on trails when in parks.

Part 1-b (teacher demonstration)

1. With the class watching, add water to the Pyrex pot and place it on the hot plate.
2. Measure the water temperature and record it on the board.
3. Turn on the hot plate.
4. While the water heats, ask the students what "boiling" means. Elicit that boiling water is very hot and would hurt you if you put your hand into it. Ask how one can tell that water is boiling. Elicit that boiling water forms bubbles.
5. As the water heats, bubbles will begin to form long before the water reaches its boiling temperature. This is because warm water cannot "hold" or dissolve as much gas (air/oxygen) as cold water can.
6. When the students observe bubbles forming, measure the temperature and record it on the board. It should be well below the boiling point.
7. Continue to heat the water until it boils…show the students that boiling temperature of water is 212 F° or 100 C°.
8. Turn off the hot plate.
9. Discuss the implications of this demonstration…that fish, especially active fish like trout, need cold water that can hold a lot of oxygen. Cold, well-oxygenated water is an important part of the habitat for a trout. Discuss that different fish can tolerate different temperatures of water, but all need to have oxygen in the water.
10. Discuss how water might become warmer and, therefore, harm fish. Examples include removing streamside vegetation that provides shade, filling in of lakes and ponds by erosion (The shallow water heats up more readily than deep water), and adding warm water to the lake or river, as electric power plants do.
11. Discuss how we can help prevent streams and lakes from becoming too warm.

Part 2

(You might wait to do this part until after completing Lesson 5: *Fishing – Playing Fair*)

1. When discussing threats to aquatic habitats, be sure to discuss ways that people can protect them. Then have students make posters illustrating threats and ways to reduce or eliminate the threats. Have pictures of streams, lakes, and fish available for them to observe.

2. Contact stores that sell fishing tackle (including tackle stores, general sporting goods stores, and stores such as large drug store chains) and arrange to have the students' posters displayed. Also contact agencies such as parks and recreation agencies and water agencies about posting the students' work.

After completing this lesson, students should add their new learning to the posters created in Lesson 1.

Duplication or Transparency Masters: none

ASSESSMENT SUGGESTIONS:

1. Evaluate the students' posters: Do they show factors that could harm a freshwater ecosystem and also ways that people can protect freshwater ecosystems?
2. Ask students to explain, orally or in writing, how the following actions help or harm fish and fish habitat:
   - littering
   - picking up litter
   - allowing cattle or sheep to overgraze plants along streams
   - protecting plants near streams
   - fires that kill trees and other plants near streams
   - building roads that allow soil to enter streams
   - trampling plants near lakes and streams
   - designing and using trails that don't cause soil erosion
   - dumping harmful chemicals such as oil and pesticides into streams and lakes
3. Can students explain how silt and warm water can be harmful to trout?
4. While on a field trip to a natural area, do students stay on trails, pick up litter, and protect plants?

POINTS FOR WHICH TO ASSESS:

1. Formative Assessment:
   a. As the students make their posters, be aware of whether the posters show both threats to aquatic habitats and ways that people can do to reduce or eliminate the threats.
2. Summative Assessment:
   a. Bullet points 1 and 2 (littering): Students should know that litter can harm fish in a variety of ways such as adding pollutants to the water, introducing materials such as fishing line that can entangle fish, and introducing harmful things that fish might eat, as well as the visual impact of litter.
   b. Bullet points 3 - 8 (plant damage): Students should know that silt harms fish in a variety of ways, including covering spawning grounds, and that plants help hold soil in place, reducing silt. They should also know that streamside plants provide shade, thus keeping the water cooler.

VARIATIONS, ALTERNATIVES AND EXTENSIONS:

1. Introduce this lesson by reading the excellent book *Web of Water: Life in Redwood Creek*, by Maya Khosia.
2. Plastic cups are inexpensive, safe if they break, and save storage space because they "nest." To reduce waste, you might also use glass jars or other durable clear containers.
3. Rather than buy straws for Part 1, have students save straws from their lunches, or get wax paper straws from the school lunch program. If you buy plastic straws, consider using alcohol to sterilize them so that you can save them for other activities or to do this activity again.
4. Give each group of students 4 plastic cups. Have them fill two of them ¼ full of water and label them #1 and #2. Fill two of them ¾ full of water and label them #3 and #4. Measure and record the temperatures of each. (The temperatures should be the same.)
   a. Place #1 and #3 in a low cabinet.
   b. Place #2 and #4 on a window sill in the sun for several hours.
   c. Ask the students to predict what will happen to the temperatures of the water in each cup. Record their

answers…or have the students make a data table and record their own predictions. (If you wish, you might introduce the term "hypothesis" at this point.)

d. After several hours, check the temperatures of the water. (Probably the temperature of the water in the ¼ full cup in the sun went up the most and the ¾ full cup in the sun went up the next most.)

e. Discuss the implications of this simple experiment: Removing shade from a stream or lake and/or adding sediments making it shallower are likely to result in warmer water, which can be detrimental to trout.

f. Discuss ways to prevent the warming of the water…maintaining or restoring streamside vegetation, protecting streams and lakes from siltation.

REFERENCES AND RESOURCES:

California Environmental Protection Agency. Education and the Environment Initiative unit titled *The Geography of Where We Live*

California Environmental Protection Agency. Education and the Environment Initiative unit titled *Living Things in a Changing Environment*

Council for Environmental Education. *Project WILD Aquatic K-12 Curriculum and Activity Guide*

Khosia, Maya. *Web of Water: Life in Redwood Creek*

LESSON 3 *WORMS FOR LUNCH!*

LESSON SUMMARY:

Using pictures, students first learn about simple food chains and then learn that food chains are parts of food webs. Once they understand the interconnectedness of organisms in a freshwater food web, they create short presentations telling why various organisms, abiotic factors, and human activities are important in a freshwater ecosystem.

CONTENT STANDARDS AND EEI CORRELATIONS:

Next Generation Science Standards:

- 2-LS4-1 (Compare the diversity of life in different habitats.)
- 3-LS4-3 (Construct an argument with evidence that in a particular habitat, some organisms can survive well, some survive less well, and some cannot survive at all.)
- 3-LS4-4 (…solution to a problem caused when the environment changes…)

History-Social Science: 3.4 (the role of rules)

Common Core Standards in English/Language Arts (Grade 3)

- Speaking and Listening: 3-SL 1 (Engage…in…discussions with diverse partners…)
- Speaking and Listening:3- SL 2 (Determine the main ideas…orally)
- Speaking and Listening: 3-SL 3 (Ask and answer questions about information…)

Health: 8.2P (Encourage others to promote a healthy environment)

EEI Unit: *Living Things in Changing Environments*

LINKS TO THE PREVIOUS LESSON

In *Home Sweet Lake*, students learned about various factors that affect a freshwater ecosystem such as a lake, especially how sediments and heat affect trout. In *Worms for Lunch!*, students see how various organisms are dependent on each other, and also how non-living or abiotic factors affect the living or biotic parts of an ecosystem.

After completing this lesson, students should add their new learning to the posters created in Lesson 1.

LINKS TO THE NEXT LESSON:

In *Home Sweet Lake* and *Worms for Lunch!*, students learned about some of the requirements for life, such as food, water, and oxygen. Different organisms meet those requirements in various ways, and have a variety of structures that enable them to do so. In Lesson 4, *What's a Fish?*, students learn basic fish anatomy and how the anatomical structures enable fish to survive in their aquatic habitat.

BACKGROUND INFORMATION FOR THE TEACHER:

Food chains are studied more thoroughly in grades five and seven, but the topic of interdependence is comprehensible for younger students and they are able to understand the basic concept.

When teaching about food chains and food webs, most curricula focus exclusively on the biotic or living part of the environment. *Worms for Lunch!* reinforces the concept that the organisms in a food chain ultimately depend on the non-living or abiotic part of the environment. The sun provides light for photosynthesis, and also affects

the water temperature, as seen in *Home Sweet Lake*. Water is essential to life, and water quality can be degraded by both natural pollutants like silt or chemicals leaching from the soil and by man-made pesticides and fertilizers. Plants need carbon dioxide for photosynthesis and produce oxygen, which is needed by animals.

Another point made in this activity is the interaction between the freshwater environment of a lake and the adjacent land area. *Worms for Lunch!* helps students understand that a stream or lake is influenced by the plants and animals along its shore, the riparian zone.

ETHICAL CONSIDERATIONS AND CONSERVATION:

- Since species are interdependent, we need to care for not only species such as trout that are of direct benefit to us, but also for the other organisms in the ecosystem.
- Not only must we pay attention to the living parts of the ecosystem, but we also must take care of the non-living parts.
- Many laws and regulations are directed at maintaining a healthy ecosystem. Examples include limits on number of fish that may be caught, laws intended to protect water quality, litter laws, and the enforcement of fishing seasons.

VOCABULARY (SEE APPENDIX II FOR DEFINITIONS):

aquatic	bacteria	carnivore	decomposer	herbivore
omnivore	regulation	riparian	scavenger	

LESSON GOALS:

1. Students will understand the concept of a food chain.
2. Students will understand the concept of a food web.
3. Students will understand the dependence of animals on plants and on the non-living parts of the environment.
4. Students will understand the importance of caring for the environment, including both the living and non-living parts of the environment.
5. Students will understand that a body of water such as a lake or stream is influenced by and influences the nearby land, or riparian zone.

TIME CONSIDERATIONS:

Part 1 Teacher preparation: first time doing the activity: 30-45 minutes; subsequently: little

Class work time: 45-60 minutes

Part 2 Teacher preparation: 10-15 minutes

Class work and presentations: 15-45 minutes

Part 2 Class work and discussion: 45-60 minutes

GROUPING SUGGESTIONS:

Part 1 3 groups of nine students each

Part 2 Teams of two students each

Part 3 Teams of two students each

MATERIALS (FOR A CLASS OF 30):

Part 1

Pictures of living and non-living parts of the environment. The pictures might be from magazines and calendars, or downloaded from the Internet, or use the Organism Drawings, (Set 1) below. (Three blank "cards" are provided for you to modify the list of organisms if you wish to do so.) Laminate for future use. Divide into three sets. Different outline patterns help distinguish the sets.

Lake	***Stream***	***Streamside (Riparian)***
sun	sun	sun
soil	soil	soil
water	water	water
algae	aquatic grass plant	aquatic grass plant
aquatic snail	amphipod (scud)	worm
small fish	dragonfly adult	newt
trout	frog	trout
egret	trout	kingfisher
human	human	human

Others to use if you have a larger class

cattail	duck	mayfly adult
river otter	catfish	stonefly larva
bluegill	raccoon	water strider
crayfish	dragonflynaiad	mosquito adult

30 arrows (see Duplication Masters below)

Push pins (at least 60)

Bulletin board space that is accessible to students

Signs or letters spelling out the following:

- Lake Food Chain
- Stream Food Chain
- Riparian Food Chain

Part 2

Age-appropriate encyclopedia or other books, Internet access

Picture Set 2

yarn

push pins

arrows (from Duplication Masters)

sign or letters spelling out Aquatic Food Chain

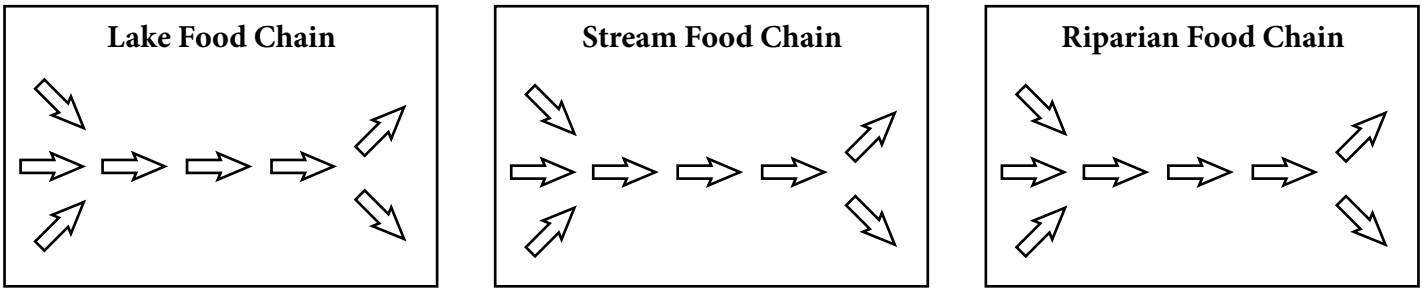
Part 3

optional: age-appropriate encyclopedia or other books, Internet access

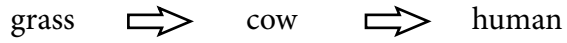
PROCEDURES:

Part 1

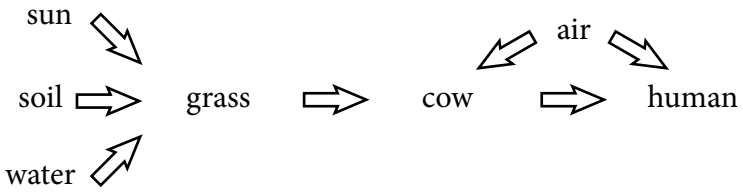
1. If using the drawings below, color them before cutting them apart and laminating.
2. Laminate the pictures.
3. Attach the food chain signs (lake, stream, riparian) to the bulletin board, leaving about 8-12 inch below each title. Attach the arrows as shown, leaving space between the arrows for the pictures.
4. Place push pins in the spaces between the arrows. These will be used to attach pictures later.



5. Ask the students if they have ever eaten hamburger or chicken.
6. Then ask the students what the cow or chicken ate. Elicit that the cow ate grass and the chicken ate grain, which is grass seed.
7. Draw a simple food chain on the board or overhead and identify it as a food chain. Tell the students that the arrow means "was used or eaten by.":



8. Have the students "read" the above diagram:
"Grass was used (or eaten) by the cow. The cow was eaten by a human."
9. Ask the students what the grass needed in order to survive. Elicit soil, water, and sunlight. Point out that cows and people need air. (Plants need air/carbon dioxide too, but you needn't get into that here.) Add those items to the food chain diagram:



10. Have the students "read" the above diagram: Sunlight, soil, and water are used by the grass. The grass is used (or eaten) by the cow. The cow is used (or eaten) by the human. People and cows both use air. (Plants need carbon dioxide, but you needn't get into that here.) Tell them that this is called a "food chain." Ask why it might be called a food chain. Point out that each part is connected to other parts, just like links in a chain.

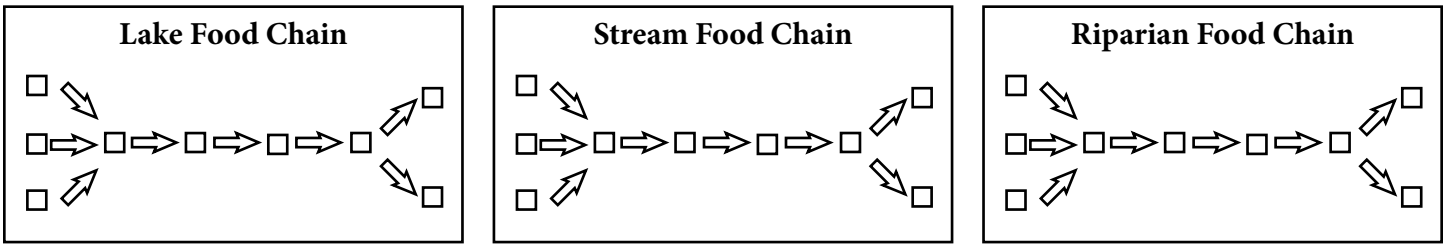
11. The students' job is to figure out what eats or is used by what in their group's food chain. Decide whether they should just use prior knowledge, or if they can do research or ask you or another adult or older child. Explain to the students that they are going to work in three teams. One team will be given pictures of parts of a lake food chain, one will be given parts of a stream (river or creek) food chain, and the other will be given the parts of a food chain from the shore of a lake or stream…the riparian area.

12. Tell the students which food chain they are assigned, and issue each group their nine* pictures (from Picture Set 1). Also show the areas of the bulletin board labeled "Lake Food Chain," "Stream Food Chain," and "Riparian Food Chain" and the arrows that are already in place.
*27 pictures are provided.

    - If you have more than 27 students present, you might either (a) create some extra cards or (b) have one or two students assigned to be the card- pinner-uppers.
    - If you have less than 27 students present, have one student explain and pin up more than one of the sun/water/soil cards.

13. Tell them that, for this activity, they will ignore "air," but that both plants and animals need air.

14. Once they have figured out the order of the food chain parts, they should place their pictures on the bulletin board in order, like the diagram that you drew on the board. (Explain how to use push pins safely to attach the pictures, or have an adult or older student attach the pictures.)



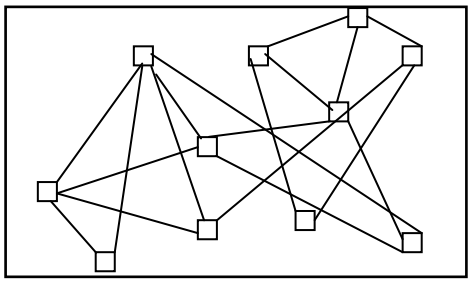
15. Have a representative of each group "read" the group's food chain.

16. Point out that all of the food chains are based on the sun, earth, and water, and that all contain bacteria (decomposers) as well as plants and animals.

Part 2

1. Have research materials available.
2. Assign each team of two students a part of a food web by giving out the pictures from Set 2. (Consider the students' existing knowledge and research ability when assigning pictures. Some pictures may be easier to find out about and understand than others.)
3. Allow 15-30 minutes for the students to research their food web part and make notes about it.
4. Either use a different area of a bulletin board or finish Part 2 on a different day after removing the Food Chains done in Part 1. If you leave Part 1 up, you will need to make additional arrows.
5. Have the sun, soil, and water pictures already in place.

6. After the students have completed their research, have each team come to the bulletin board and tell a bit about their part of the food web, including what it eats and what eats it. (In the case of plants, it would be what it uses, *i.e.*, soil, sun, and water.)
7. After the team has told about their part, use a push-pin attach the pictures to the bulletin board in a random way, spreading them out.
8. After attaching each picture, use yarn to connect the organism to things that it might eat (or use) and things that might eat it. Be sure to connect all plants back to the sun, soil, and water, and also be sure to connect animals to water.
9. When finished, the yarn should look like a web. Identify this as a Food Web and point out that it is more realistic than a Food Chain. Point out that the cow or chicken discussed at the start of this lesson didn't just eat grass, but it would eat other types of plant material. Point out that in the wild, the cow might be eaten by a mountain lion or a coyote, and that the chicken might also be eaten by a fox, bobcat, or eagle.



Part 3

1. Approach the food web bulletin board and ask the students what might happen if one of the organisms were removed. Select one and show how, because it is linked to other organisms, many other organisms are affected by the removal of any one of them. Remove the yarn connecting the organisms that are affected.
2. Repeat for two more organisms.
3. Ask what would happen if the water were to be polluted. Show how something that affects the water affects all organisms.
4. Form 12 groups. Assign each group one of the parts of the food web listed below. Their assignment is to prepare a short presentation telling why their part of the freshwater food web is important to the entire food web, including people.

Picture Set 2: Food web parts

sun soil water aquatic plants aquatic insect larvae adult insects
frogs fish people egrets and herons bacteria/decomposers tadpoles

5. Allow the groups about 10 - 30 minutes to prepare their presentation, and then have them tell the class why their topic is important.

After completing this lesson, students should add their new learning to the posters created in Lesson 1.

Duplication or Transparency Masters (found at the end of the lesson):

Arrows (11 arrows per page, so duplicate, cut, color, and laminate at least 3 pages)

Picture Set 1

Picture Set 2

ASSESSMENT SUGGESTIONS:

1. Can the students explain, orally or in writing, how the various parts of a food web influence and depend on each other? [Answers should indicate an understanding that carnivores depend on herbivores, herbivores depend on plants, and plants depend on the soil, water, and sun, (and air). They should know (and state) that anything that affects one part of a food chain or food web will affect other parts.]
2. Give the students pictures from this lesson and ask them to form a food web and to explain what a food web is. (Answers should indicate that students understand that plants and animals are interdependent, and that the various pictures have multiple connections.)
3. Give the students pictures of familiar organisms from a different ecosystem and ask them to form and explain a food chain. (Note: Be sure that the organisms are organisms that are familiar to the students, especially if you have students from other areas of the world.) An example might be: soil, sun, water, air, grass, grasshopper, lizard, coyote.
4. Have the student explain, orally or in writing, how a human eating a trout for supper is connected to algae in a lake.

POINTS FOR WHICH TO ASSESS:

1. Formative Assessment:
   a. The food chains formed by the students should be in the right order, i.e., the sun, soil and water should be at the left, followed by the plants/algae, then herbivores, then carnivores, then people.
2. Summative Assessment:
   a. The food webs formed by the students should show an understanding of the above, and also that most organisms are eaten by and eat more than one other organism.
   b. See the assessment suggestions above.

VARIATIONS, ALTERNATIVES AND EXTENSIONS:

1. Prior to posting the pictures on the bulletin board, students can line up holding their food chain pictures in order and explain why they put them in that order.
2. Consider printing (or mounting) the pictures of the three food chains (lake, river, riparian) on three different colored paper, with the food web pictures on a fourth color.
3. Students can form a circle with their food web pictures. Then connect the parts of the web to each other using string or yarn (Have the students take hold of the string.) Ask what would happen if the string were cut…show how each part of the web would be affected. (Versions of this are shown in Roa's *A Guide to the Side of the Sea, Redwood Ed*, and *The Conifer Connection.*)
4. If you didn't read it in Lesson 2, read Maya Kosia's *Web of Water: Life in Redwood Creek.*
5. Several activities from the Council for Environmental Education's P*roject WILD Aquatic K-12 Curriculum and Activity Guide* are useful in teaching about food chains and food webs, including: "Blue Ribbon Niche," "Marsh Munchers," "Micro Odyssey," "Water We Eating?," "What's in the Water?," and others.
6. This activity can be done for any ecosystem/biome type. The Council for Environmental Education also publishes a more general curriculum guide called *Project WILD K-12 Curriculum & Activity Guide. The Project WILD Guide* includes several food chain/food web activities such as "Energy Pipeline," "Hazardous Links," and "Owl Pellets."
7. The Project WET Foundation publishes the *Project WET Curriculum and Activity Guide, Generation 2.0*, which includes several food chain/food web activities such as "Invaders!!," and "Macroinvertebrate Mayhem."

REFERENCES AND RESOURCES:

California Environmental Protection Agency. Education and the Environment Initiative unit titled *Living Things in a Changing Environment*

Council for Environmental Education. *Project WILD Aquatic K-12 Curriculum & Activity Guide*

Council for Environmental Education. *Project WILD K-12 Curriculum & Activity Guide*

Khosia, Maya. *Web of Water: Life in Redwood Creek*

Project WET Foundation. *Project WET Curriculum and Activity Guide, Generation 2.0*

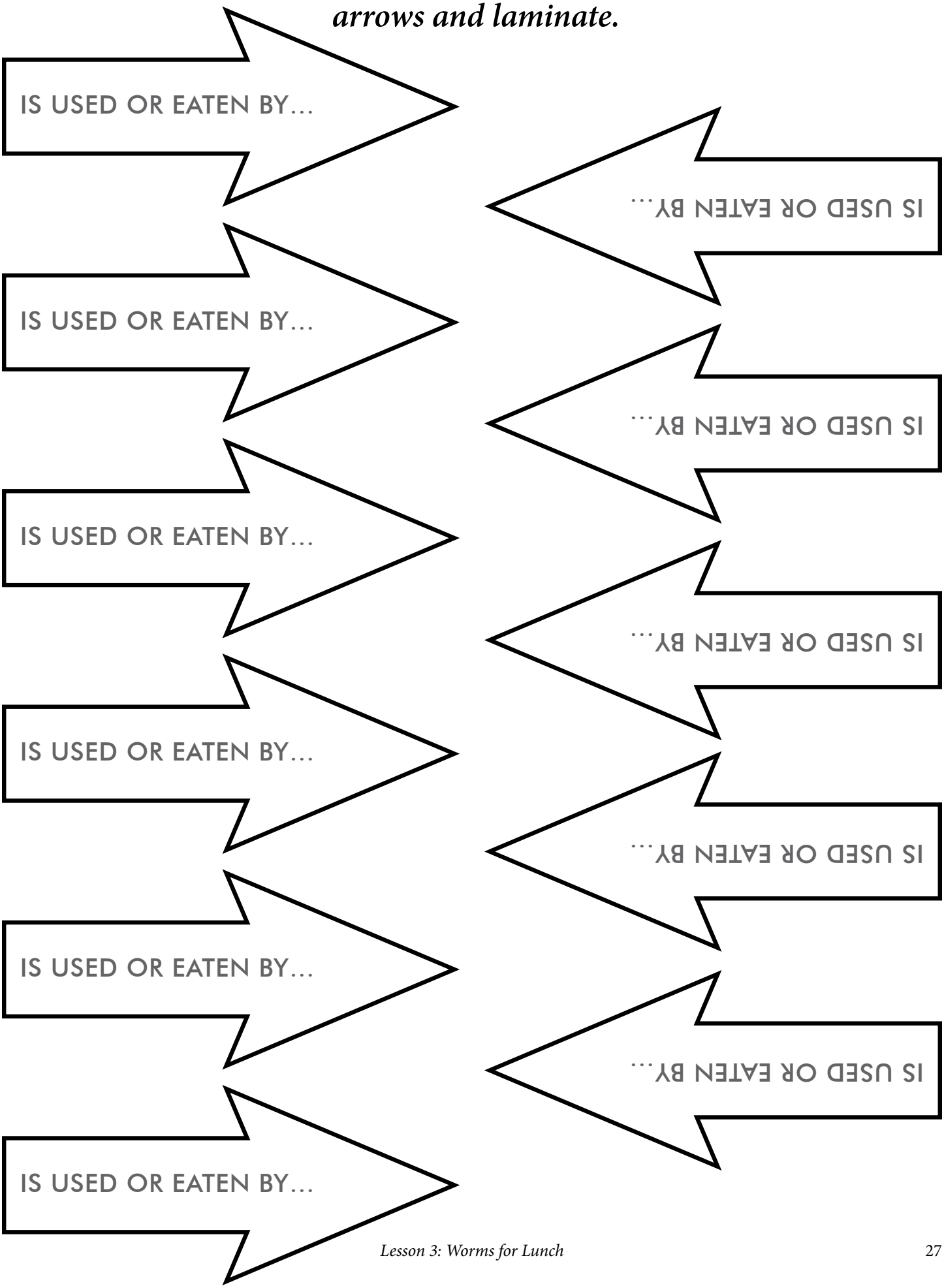
Roa, Michael. *A Guide to the Side of the Sea*

Roa, Michael. *Redwood Ed*

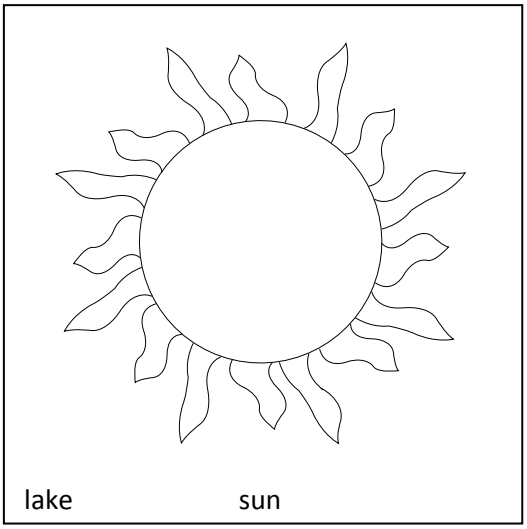
Roa, Michael. *The Conifer Connection*

Schmidt, Bob. *Sport Fishing and Aquatic Resources Handbook*

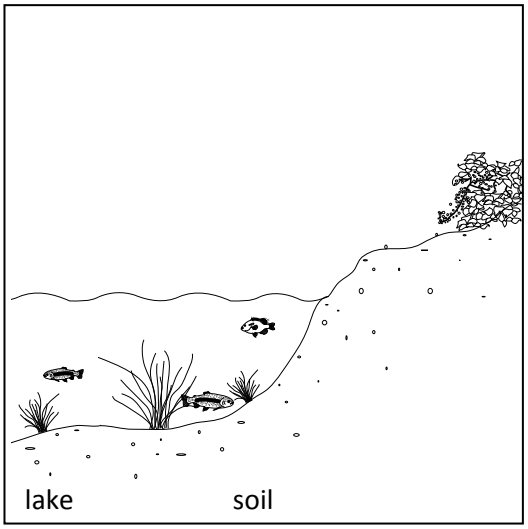
Make 3 or more copies of this page. AFTER copying, cut out the arrows and laminate.



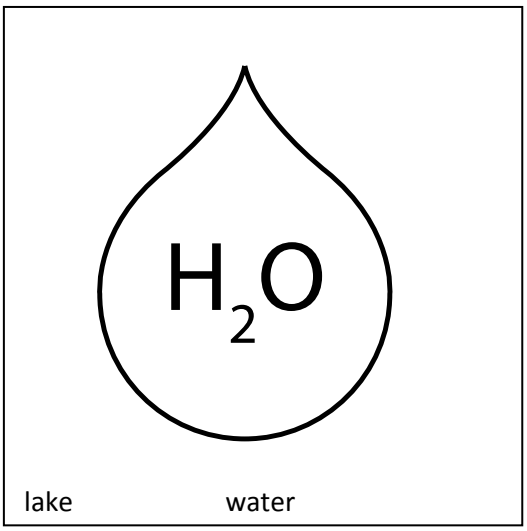
PICTURE SET 1
COLOR, CUT & LAMINATE



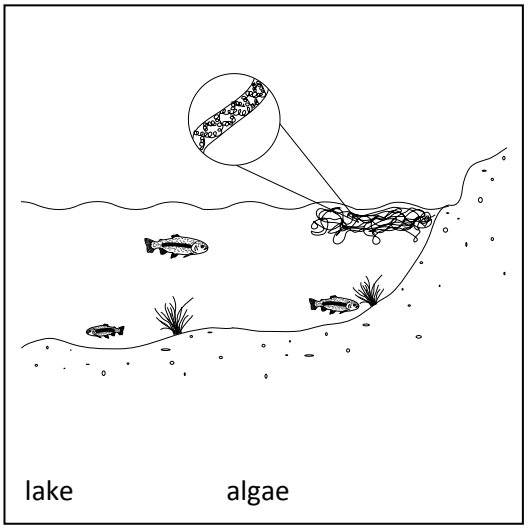
lake sun



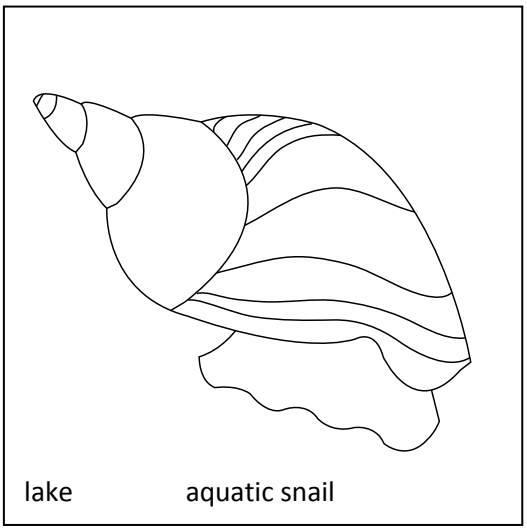
lake soil



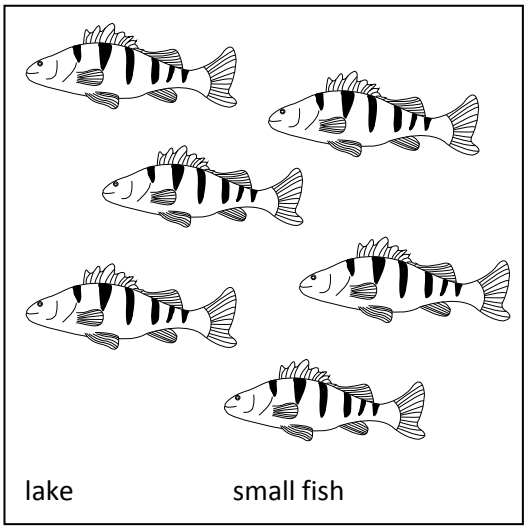
lake water



lake algae

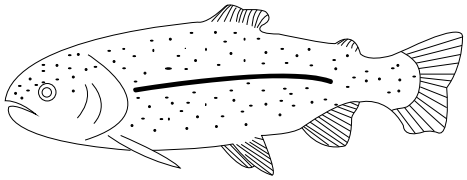


lake aquatic snail

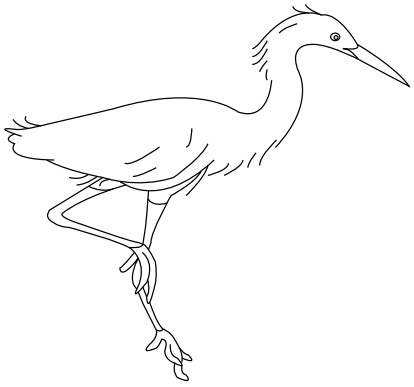


lake small fish

PICTURE SET 1
COLOR, CUT & LAMINATE

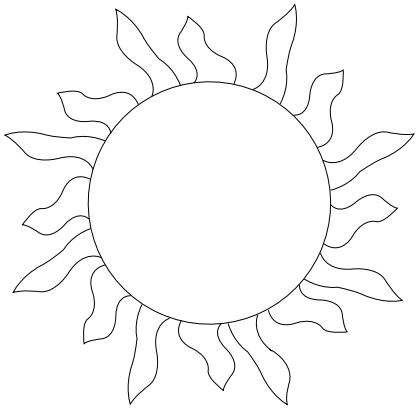


lake trout

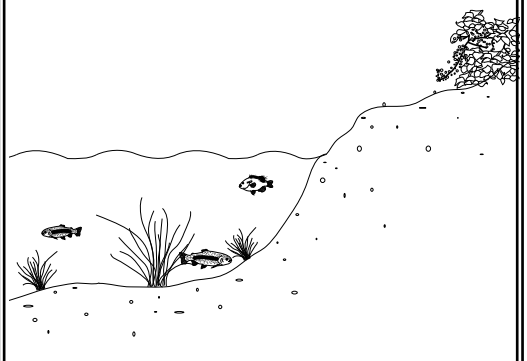


lake egret

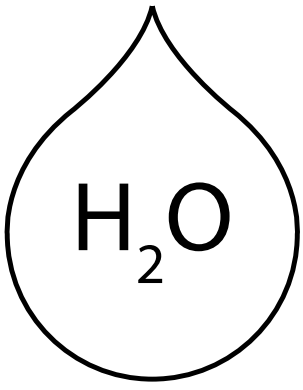
lake human



stream sun

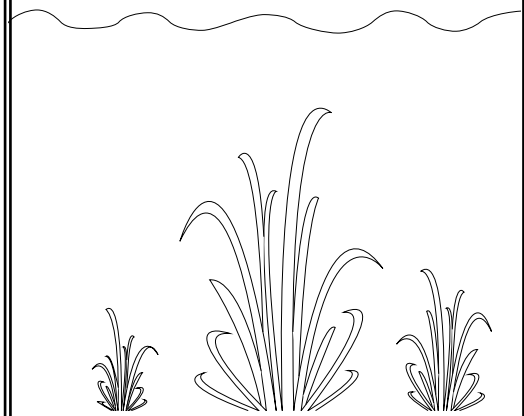


stream soil

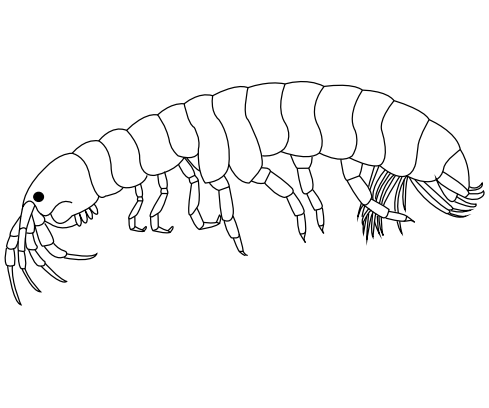


stream water

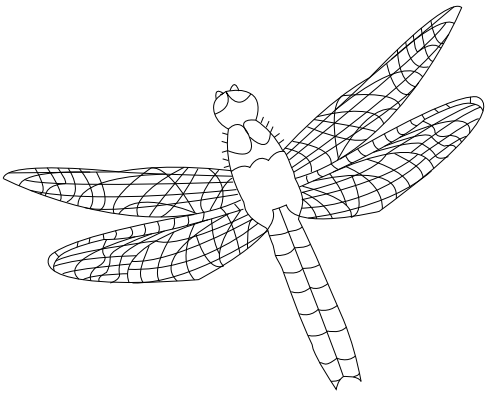
PICTURE SET 1
COLOR, CUT & LAMINATE



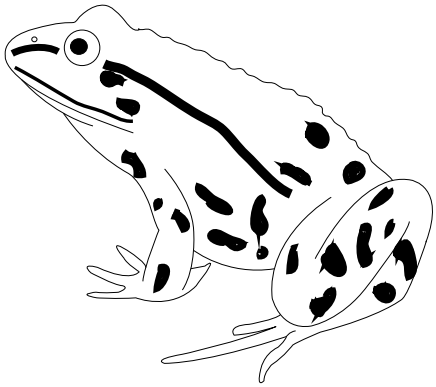
stream aquatic grass plant



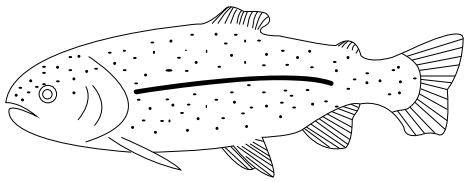
stream amphipod (scud)



stream dragon fly adult



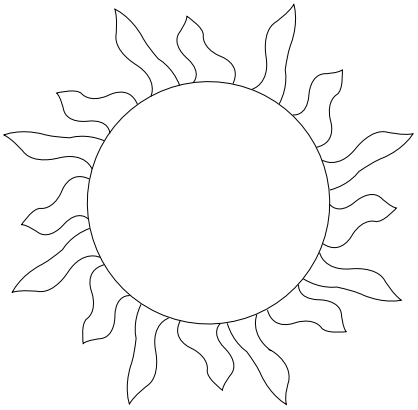
stream frog



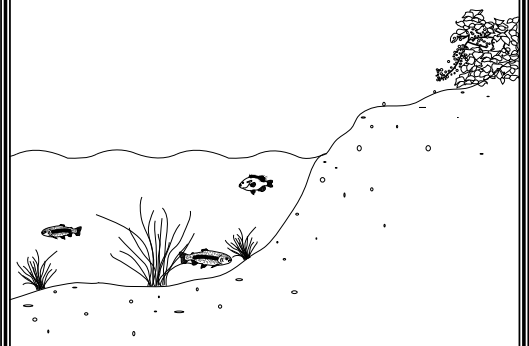
stream trout

stream human

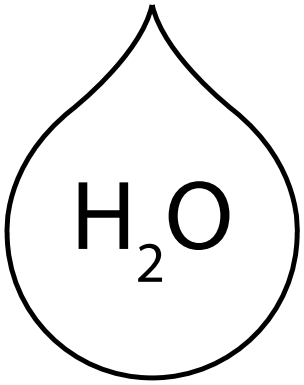
PICTURE SET 1
COLOR, CUT & LAMINATE



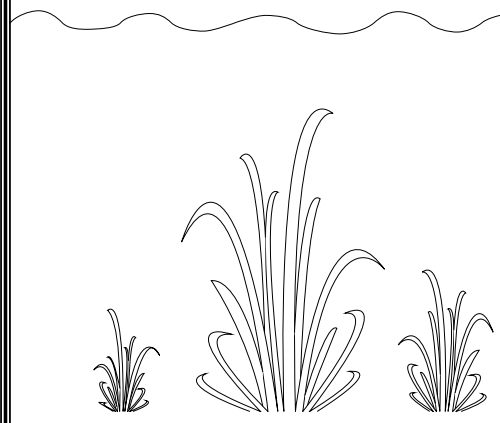
riparian sun



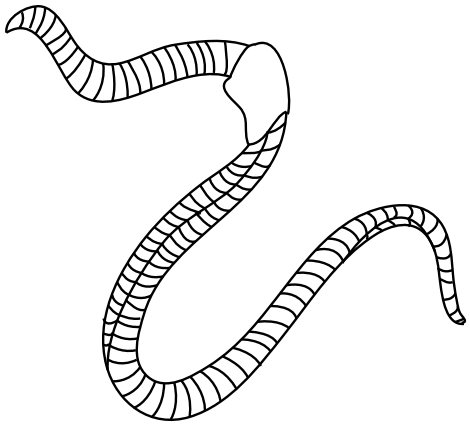
riparian soil



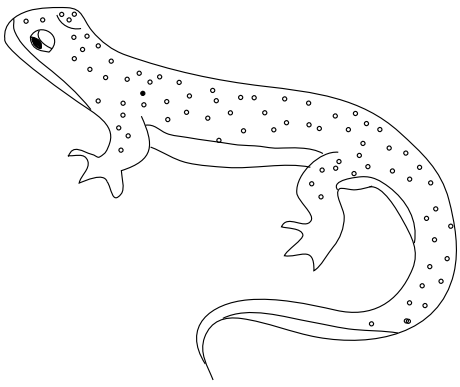
riparian water



riparian grass plant

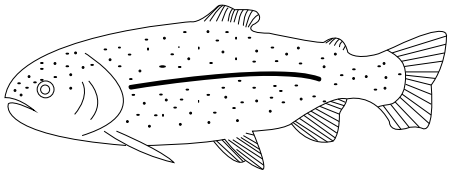


riparian worm

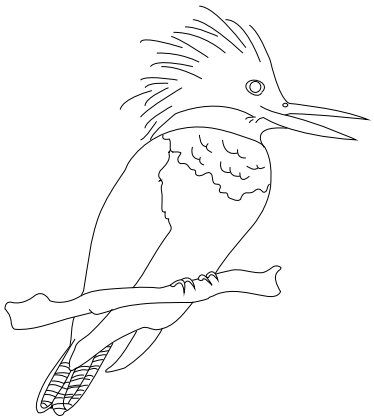


riparian newt

PICTURE SET 1
COLOR, CUT & LAMINATE



riparian trout

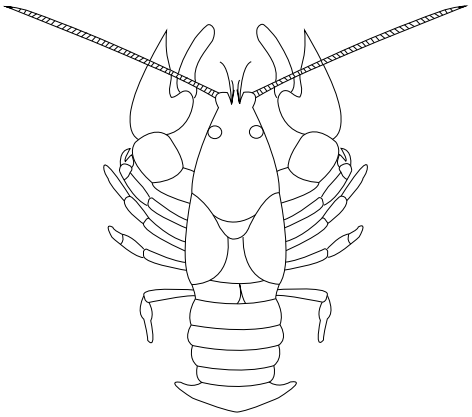


riparian kingfisher

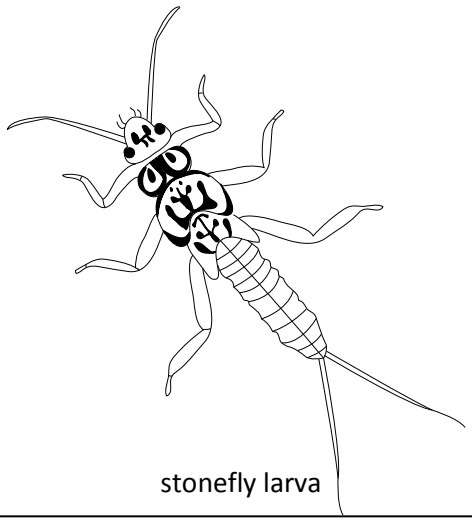
riparian human

PICTURE SET 1
COLOR, CUT & LAMINATE

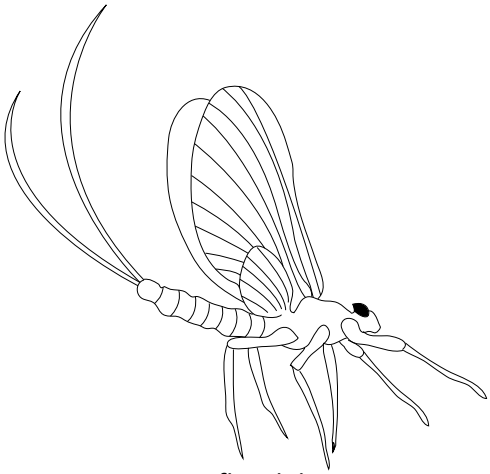
raccoon



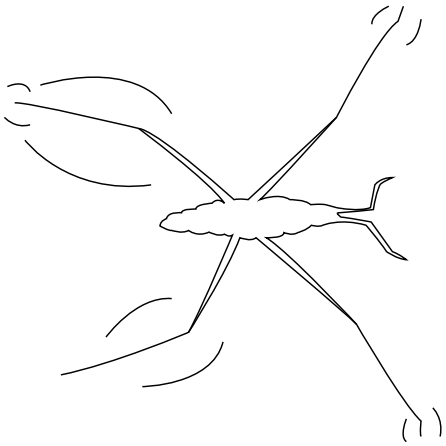
crayfish



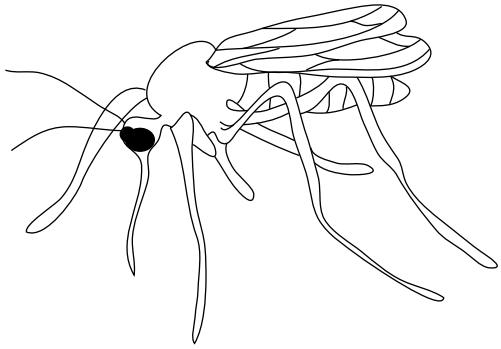
stonefly larva



mayfly adult

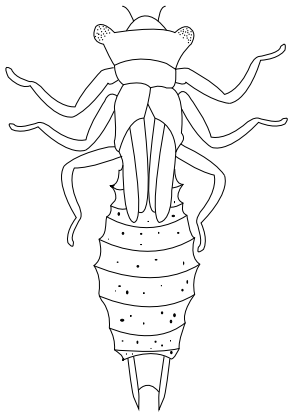


water strider

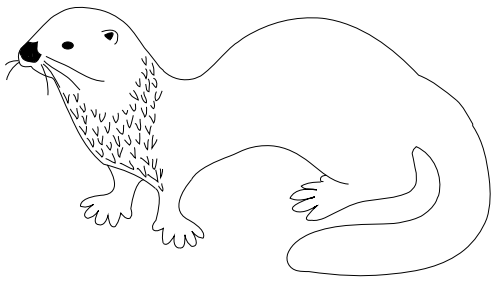


mosquito adult

PICTURE SET 1
COLOR, CUT & LAMINATE

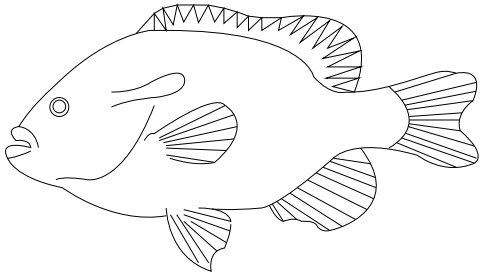


dragonfly naiad

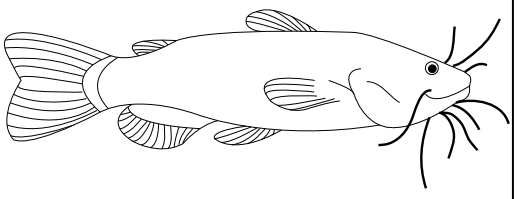


river otter

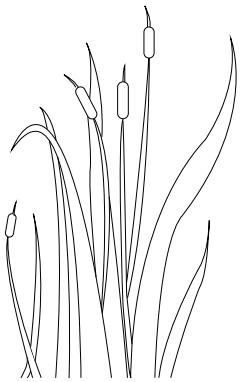
duck



bluegill

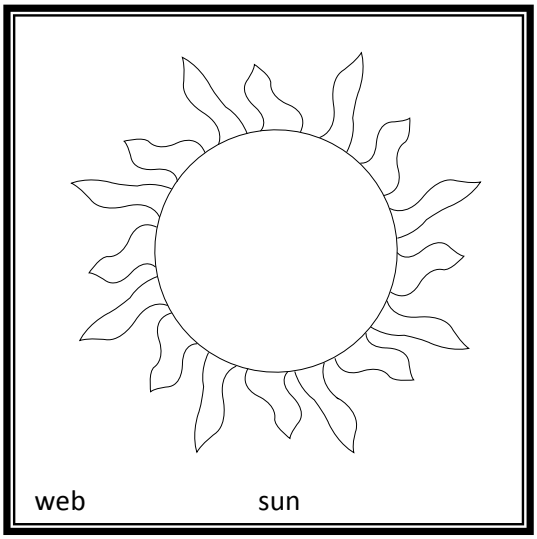


catfish

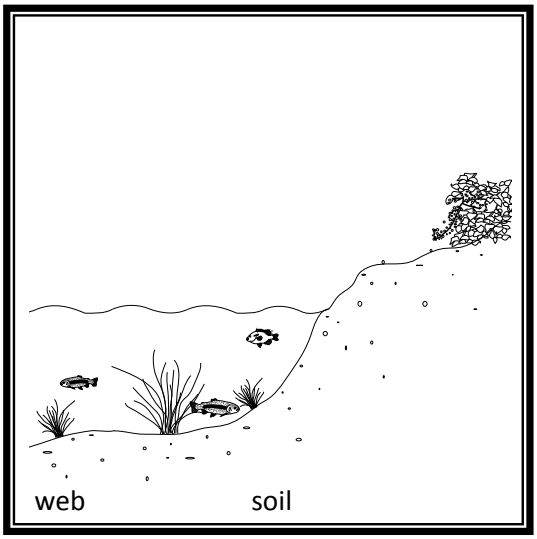


cattail

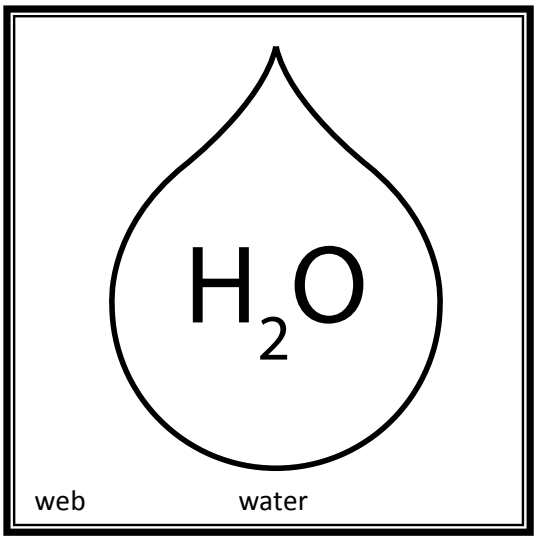
PICTURE SET 2
COLOR, CUT & LAMINATE



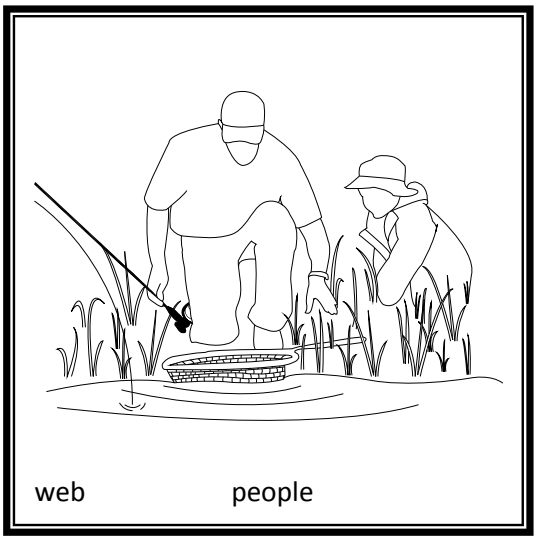
web sun



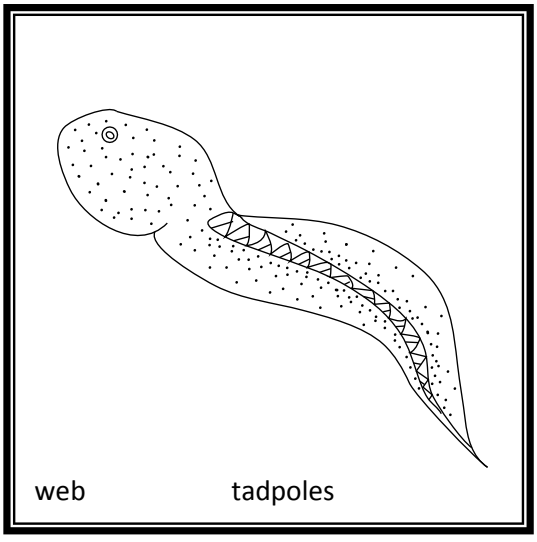
web soil



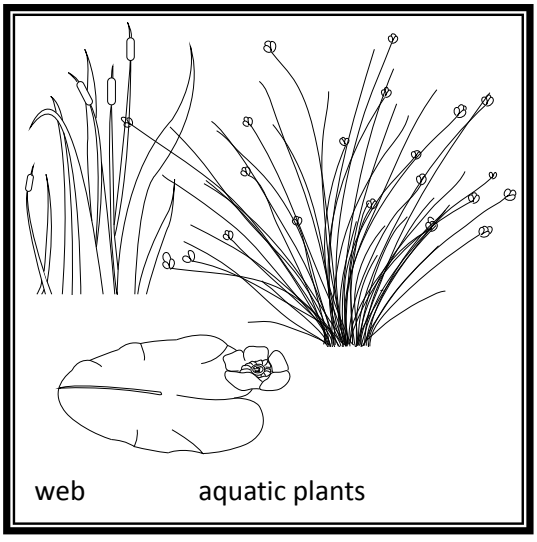
web water



web people

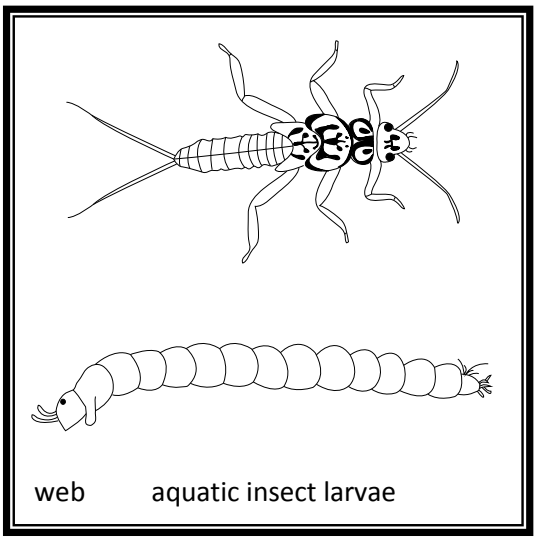


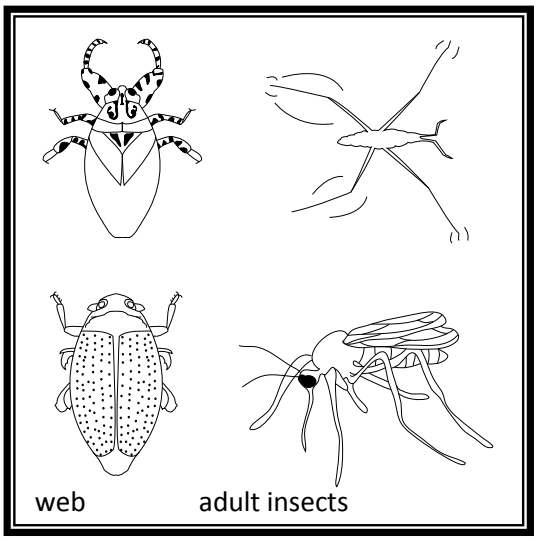
web tadpoles

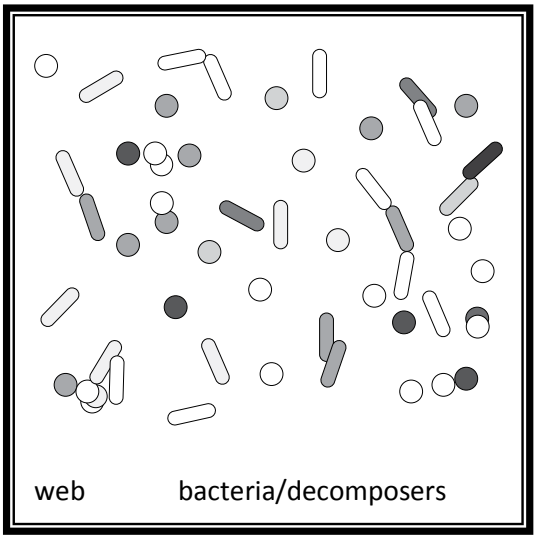


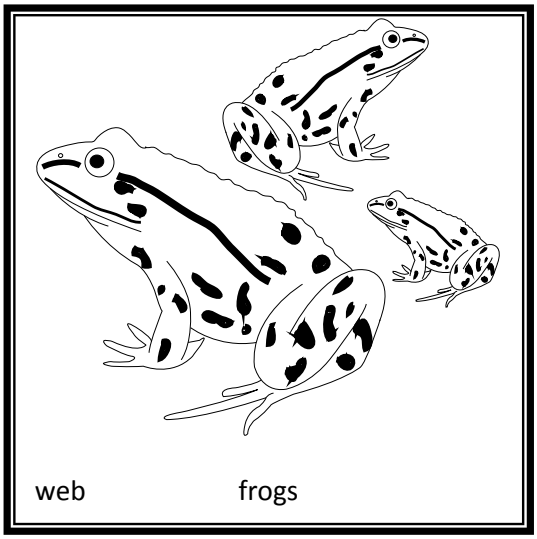
web aquatic plants

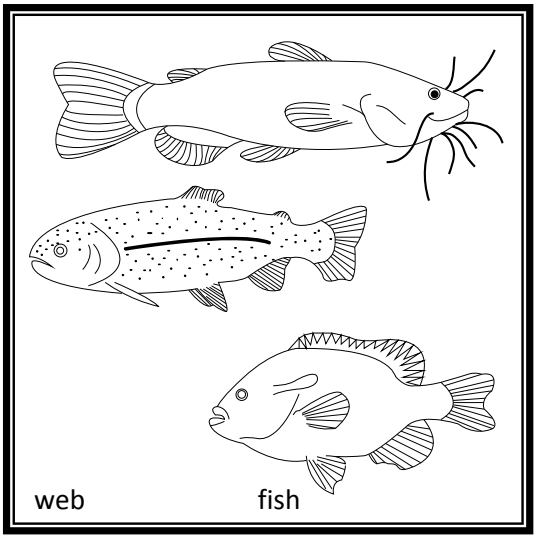
PICTURE SET 2
COLOR, CUT & LAMINATE

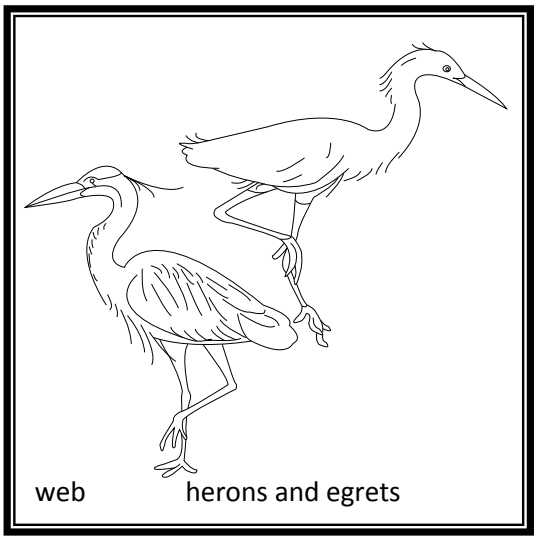












LESSON 4 *WHAT'S A FISH?*

LESSON SUMMARY:

Students use a drawing, or a drawing coupled with a real fish, to learn the names of some important parts of a fish. They also learn the functions of those parts and their analogous parts in people.

CONTENT STANDARDS AND EEI CORRELATIONS:

- Next Generation Science Standards:
  - K-2-ETS1-2: (...illustrate how the shape of an object helps it function…)
  - 4-LS1-1: (…animals have…structures that function to support survival…)
- Visual and Performing Arts: 2.1 (sketchbook), 2.4 (create a work of art)
- Health Education: 1.3G (identify major body parts)
- EEI unit: *Structures for Survival in a Healthy Ecosystem*

LINKS TO THE PREVIOUS LESSON

In Lesson 3, *Worms for Lunch!*, students learned about food chains and food webs. Part of that was consideration of what animals need to live, including food and oxygen/air. Another requirement is shelter or protection. In this lesson students see that fish and people both have structures or body parts that enable them to meet their needs.

After completing this lesson, students should add their new learning to the posters created in Lesson 1.

LINKS TO THE NEXT LESSON:

In *What's a Fish?*, students learn some external fish anatomy. In Lesson 5, *Fishing: Playing Fair and Safe*, students learn some ways that people can have an impact on fish and fish populations. They learn about both positive and negative impacts. Students' understanding of how some human activities affect fish is enhanced by understanding fish anatomy.

BACKGROUND INFORMATION FOR THE TEACHER:

It would be helpful to do this lesson after studying basic human anatomy so that students know the functions of the human body parts that are analogous to the fish body parts studied in this lesson. Scales are similar to mammals' hair in that they help protect the skin. The gill cover protects the gills much like the rib cage protects our lungs.

Students are asked to learn the names and functions of the following fish body parts and their analogous parts in humans:

eye fin gill gill cover mouth scale skin

ETHICAL CONSIDERATIONS AND CONSERVATION:

It is recommended that you have a live fish (preferably several) for students to observe. Consider what to do with the fish after the lesson; you might want to keep it as a classroom pet. In that case, learn how to care for it. (If you don't want to maintain an aquarium in your classroom, it may be possible to arrange for a local pet store or fish/aquarium store to loan you some fish and aquaria.)

VOCABULARY (SEE APPENDIX II FOR DEFINITIONS):

camouflage coloration fin gill gill cover scale tail fin (or caudal fin)

LESSON GOALS:

1. The students will be able to identify the indicated structures of a fish on a diagram and on a real fish.
2. The students will be able to tell, orally or in writing, the function of the indicated structures.
3. The students will be able to tell the human body parts that are analogous to the indicated fish structures.

TIME CONSIDERATIONS:

30-45 minutes

GROUPING SUGGESTIONS:

groups of 2-4 students

MATERIALS (FOR A CLASS OF 30):

recommended: live fish (goldfish?) in aquarium, or, preferably, several fish and aquaria

copies of worksheet (2 pages): one per student

either transparency of worksheet or document camera for projection

PROCEDURES:

1. Refer to the food chains from Lesson 3. Remind the students that organisms need not only food but also oxygen in order to survive. On the board or overhead, write: "Survival Needs," "What Animals Need to Live," or something like that. Then list food and oxygen. Water may be added.
2. Ask the students what else animals need. Elicit "shelter" or "protection" and add that to the list.
3. Ask how people meet those needs…What parts of our bodies enable us to get food, oxygen, and protection? List those things under the heading "People" or "Humans".
4. Issue the worksheet. Project the drawing of the fish. Ask the students if they can name the parts with lines by them. Help the students identify and label the body parts on the diagram.
5. If you have several living fish, have the students observe the fish for 5 – 10 minutes. Ask them if they can tell how fish

   a. move

   b. get air/oxygen

   c. see

   After several minutes, while the students are still observing the fish, ask the students how the fish do those things. Point out that:

   i. the tail or caudal fin provides most of the swimming motion

   ii. they bring oxygen in through their mouth and pass it over their gills, with the water leaving as the gill cover opens

   iii. fish have eyes…but no eyelids. (One of the main functions of human eyelids is to blink and thus spread water over the eyes so that they don't dry out. Fish don't have that problem.)

5a. If you have only one live fish, have groups of students observe it while the others work on the worksheet.

5b. If you have no live fish, tell the students how fish move and obtain oxygen. There are many videos/dvds about fish…Showing one of those can be helpful.

6. Refer to page 2 of the worksheet. Go over the questions (but not the answers). Either working individually, in teams of two, or in small groups, have the students work out the answers and write them on their worksheets.
7. Go over the answers to the worksheet questions. Allow the students to correct their worksheets.

After completing this lesson, students should add their new learning to the posters created in Lesson 1.

Duplication or Transparency Masters (found at the end of the lesson):

What's a Fish? worksheet (two pages)

ASSESSMENT SUGGESTIONS:

1. Use the worksheet to test the students' knowledge of fish anatomy.
2. Provide the students with a simple outline drawing of a fish and ask the students to label the parts that have been taught in class. Also ask them to explain the functions of the parts.
3. Provide a blank piece of paper and ask the students to draw a fish, label the parts taught in class, and explain the functions of the parts.
4. Ask the students to explain, orally or in writing, how a fish moves, gets oxygen, and sees. Also ask how fish protect themselves…look for a variety of methods including swimming away from danger, protective coloration, spines in fins, teeth.

POINTS FOR WHICH TO ASSESS:

1. Formative Assessment:
   a. As the students complete their worksheets, circulate and ask them to identify the parts and tell their functions orally.
2. Summative Assessment:
   a. The two worksheets should be correctly labeled. See pages 40 and 41.
   b. Refer to the KWL Chart and poster started in Lesson 1. Have you
      i. addressed the students' misconceptions?
      ii. addressed the "Want to learn" column – or at least as much of it as you plan to address?

VARIATIONS, ALTERNATIVES AND EXTENSIONS:

1. Visit an aquarium or fish store and help students notice various fish adaptations.
2. If the students participate in a fishing event at a lake, have the students observe any sample fish that may be on display. Have them identify the anatomical features from this lesson.
3. Have students create their own fish from a variety of materials such as clay, *papier maiche*, construction paper and recycled materials. Have students design fish with adaptations for living:

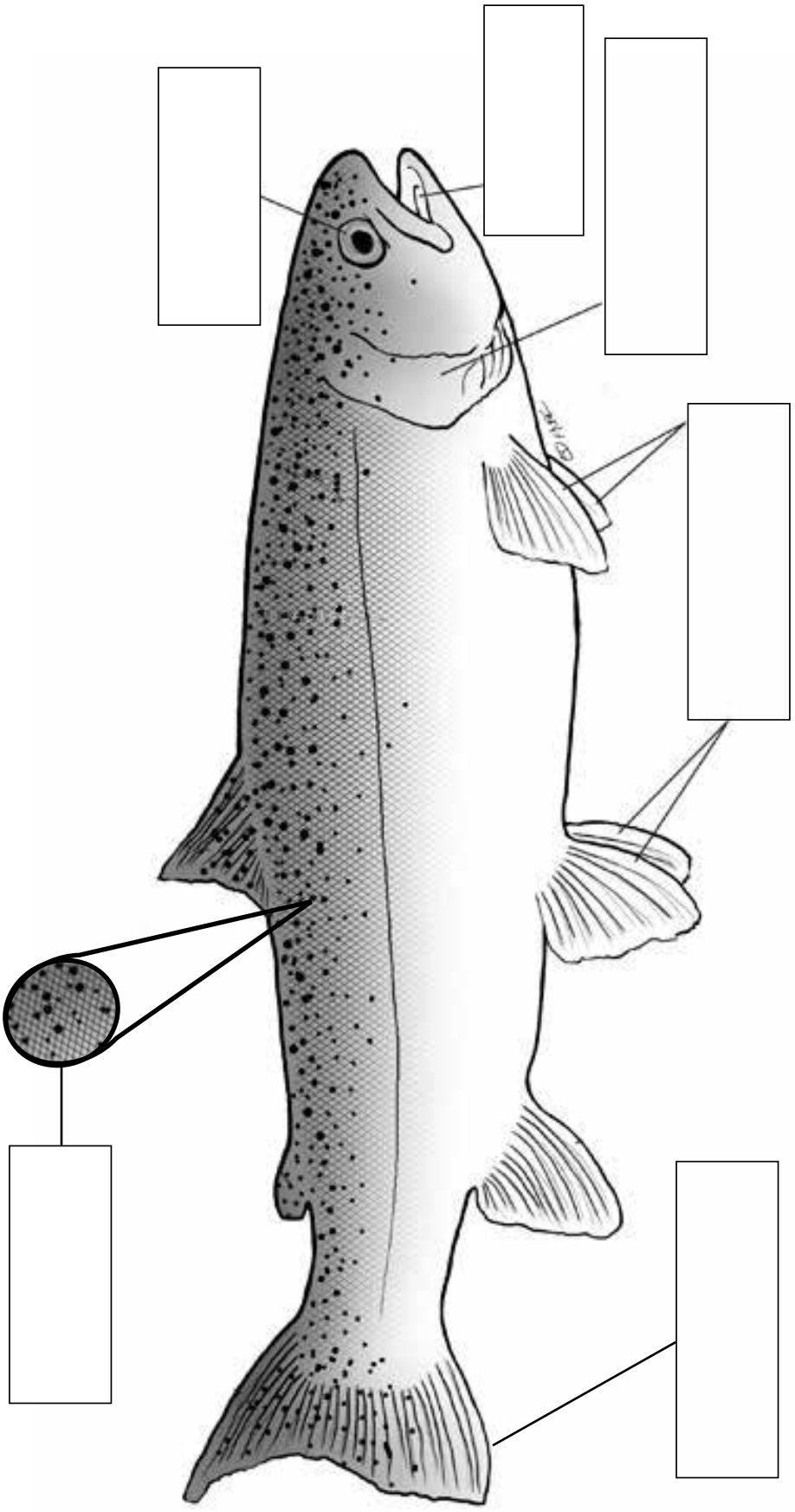
   a. in a place with white sand
   b. in a place with dark brown sand
   c. among grasses, reeds, etc.
   d. in holes among rocks or in coral
4. Local libraries or video rental stores may have age-appropriate videos or dvds about fish.

REFERENCES AND RESOURCES:

Project WILD Aquatic has several activities that could be used in conjunction with this lesson, including one called "Fashion a Fish" in which students design fish adapted for various habitats.

Trout In The Classroom has a number of print and online resources that might be of use.
Go to: www.troutintheclassroom.org

WHAT'S A FISH? WORKSHEET #1



WHAT'S A FISH? WORKSHEET #2

Tell how each of the following helps the fish to live or survive:

Camouflage patterns of color help fish survive by _____

A fish's eyes help it survive by _____

A fish's fins help it _____

A fish's gills help it get _____ from the water.

The gill covers help a fish survive by _____

A fish's mouth helps it survive by _____

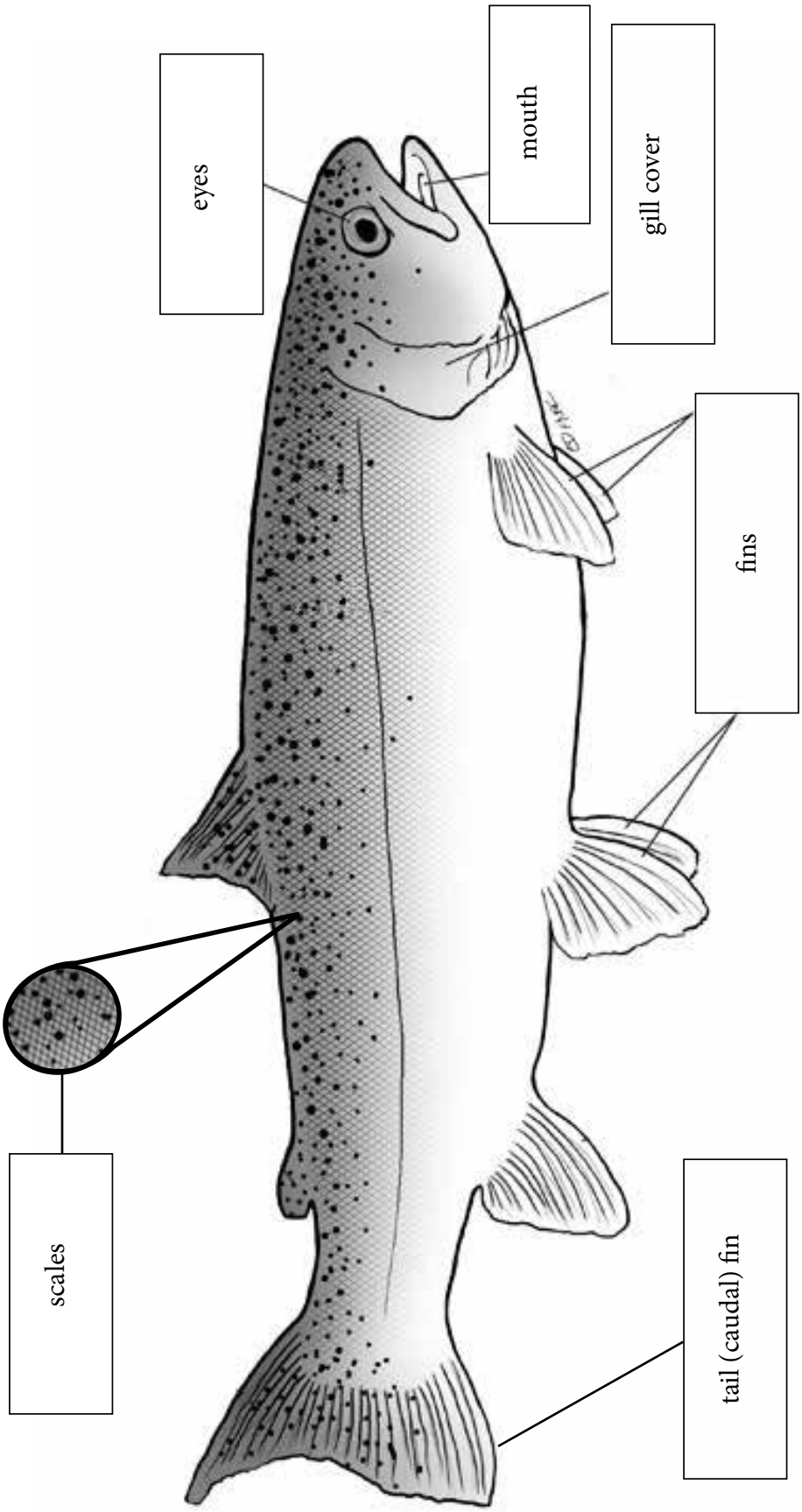
A fish's scales help it survive by _____

A fish's caudal fin or tail fin helps it _____

Matching: Draw a line from the fish part to the human part that does the same job:

FISH PARTS:	HUMAN PARTS:
gills	mouth
mouth	lungs
skin and scales	feet and legs
tail fin (or caudal fin)	skin and hair

WHAT'S A FISH? ANSWER SHEET #1



WHAT'S A FISH? ANSWER SHEET #2

Tell how each of the following helps the fish to live or survive:

Camouflage patterns of color help fish survive by *helping it avoid being eaten by other animals such as larger fish or birds, and by helping it sneak up on its prey.*

A fish's eyes help it survive by *enabling a fish to see its food and also to see other animals that might want to eat it.*

A fish's fins help it *swim so that it can catch its food or get away from predators.*

A fish's gills help it *get oxygen (or air) into the bloodstream* from the water.

The gill covers help a fish survive by *protecting the gills from damage.*

A fish's mouth helps it survive by *enabling the fish to get food. It also allows water to enter the fish so that it can pass over the gills.*

A fish's scales help it survive by *protecting the fish, and also providing camouflage.*

A fish's caudal fin or tail fin helps it *move through the water.*

Matching: Draw a line from the fish part to the human part that does the same job:

FISH PARTS:	HUMAN PARTS:
gills	mouth
mouth	lungs
skin and scales	feet and legs
tail fin (or caudal fin)	skin and hair

LESSON 5: *FISHING: PLAYING FAIR AND SAFE*

LESSON SUMMARY:

Students learn about some basic fishing regulations and etiquette and the reasons for the regulations.

CONTENT STANDARDS AND EEI CORRELATIONS:

- Next Generation Science Standards:
  - 3-LS4-3 (Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.)
  - 3-LS4-4 (…solution to a problem caused when the environment changes…)
  - 3-5-ETS1-2 (Generate and compare multiple possible solutions to a problem…)
- Common Core Standards in English/Language Arts (Grade 3)
  - Speaking and Listening: 3-SL 1 (Engage…in …discussions with diverse partners…)
  - Speaking and Listening: 3-SL 2 (Determine the main ideas…of information presented in diverse formats, including…orally)
  - Speaking and Listening: 3-SL 3 (Ask and answer questions about information…)
- History-Social Science 3.4 (the role of rules)
- Health Education 8.2P (encourage others to promote a healthy environment)
- EEI Units: *Living Things in Changing Environments* and *California's Economy – Natural Choices*

LINKS TO THE PREVIOUS LESSON:

This unit is not linked to Lesson 4 (*What's a Fish?*) in a very direct way, but an understanding of the concepts taught in lessons 1-3 about watersheds and ecology provides the basis for understanding the need for fishing regulations.

LINKS TO THE NEXT LESSON:

The Fishing in the City program gives children the opportunity to catch fish that they can take home and eat. An understanding of the rationale for regulations includes understanding that resources such as fish should not be wasted. If fish are not released after being caught, they should be eaten. Lesson 6 (*Fish Fry!*) is intended to help children appreciate fish as a healthy food.

This lesson is also closely linked to Lesson 8 (*What's a Watershed?*). Many written and unwritten regulations and rules are intended to protect the watersheds that are critical to fish.

Background information for the teacher:

If children (or adults) understand the "why" of fishing (or any other) regulations they are generally more likely to follow the regulations. Conversely, if people don't know why a given regulation is in place, they may be less likely to obey the law.

Beyond laws, though, is the question of ethics and etiquette. Some children are raised in environments in which behaviors that many of us would consider rude or unethical are tolerated. Children may not have good adult role models in the home. Fishing in the City provides an opportunity for children to develop some ethical behavior and consideration for other people and the environment.

Teachers should be aware of the possibility of a conflict between the ethical behaviors promoted by Fishing in the City and what the student sees parents or others do in the home or community. Friends or family may litter, dam-

age vegetation, exceed limits, behave rudely, or trespass when fishing. While students may not be able to change other peoples' behavior, they can try, and understanding the reasoning behind regulations and ethical behavior will encourage them to behave ethically themselves.

ETHICAL CONSIDERATIONS AND CONSERVATION:

This lesson focuses on ethical considerations and conservation. It is important to recognize that not everyone shares the same values. Some say that teachers should not be promoting any particular "values." However, that is part of our job as adults and teachers. If we encourage students to do well, to be on time, to be kind to others, to be polite, or to be honest, we are promoting values that we have that not everyone supports. Encouraging students to protect the environment and obey fishing regulations is appropriate for us as adults and teachers.

VOCABULARY (SEE APPENDIX II FOR DEFINITIONS):

regulation limit

LESSON GOALS:

1. The students will understand the need for fishing regulations and ethical fishing behavior.
2. The students will follow fishing regulations and develop ethical fishing behavior.
3. The students will encourage others to follow fishing regulations and behave ethically.

TIME CONSIDERATIONS:

One or two 45 – 60 minute time blocks

GROUPING SUGGESTIONS:

small group and whole class

MATERIALS (FOR A CLASS OF 30):

one set of Discussion Cards (see below)

PROCEDURES:

1. Photocopy the Discussion Cards below. Consider laminating them for repeated use.
2. Introduce the lesson by asking the students why games have rules. Elicit that rules make games more fun for everyone. They also help make games safe. Ask for examples of rules that help make games safe and what might happen if the rules aren't followed.

   Explain that fishing also has rules and that the rules are made to protect people, fish, and the environment.
3. Select one of the Discussion Cards to discuss as a class. Encourage students to try to understand both sides of the issue and to present reasonable solutions.
4. Divide the class into 6 teams. Issue each team one of the other Discussion Cards to discuss among themselves for 5 – 10 minutes. Tell the teams that after their discussion they will share their discussion with the class.
5. After 5 – 10 minutes, read the scenario presented on one of the cards to the class.
6. Ask the group that has already discussed it to share their thoughts.
7. Then ask the class to share any other thoughts.

As you discuss the issues, be sure to discuss the "why" of the ethical or safe behavior…

- Why are there rules or regulations about such things as how many fish one may catch?
- What is wrong with littering or discarding tangled fishing line? (Not only is litter unsightly, but it can be hazardous to animals.)
- What are the rights of other people at a fishing site?
- Why are people supposed to buy fishing licenses? (Fishing licenses provide a large proportion of the funds for programs that protect fish and wildlife.)
- What could happen if you aren't careful when casting?

8. Repeat steps 5-7 for the other cards

Duplication or Transparency Masters (found at the end of the lesson):

Discussion Cards to duplicate and, preferably, laminate

ASSESSMENT SUGGESTIONS:

1. Twelve Discussion Cards are supplied. Including the introductory Card, seven are used in the lesson. At the end of the lesson, use the other cards as whole-class discussion starters. Do the students show an understanding of the importance of taking care of the environment and individual responsibility and stewardship?
2. Students can respond to a situation/discussion card in writing.
3. Ask students to list three things to remember with regards to safety and fairness when fishing.

POINTS FOR WHICH TO ASSESS:

1. Formative Assessment:
   a. Use the students' answers to the questions to assess whether they understand the problems presented by the behaviors on the cards. If the students' comments in the discussions don't show it, elicit it in discussion. Points to look for in discussion:

CARD 1: Litter is unsightly. Fish and other animals can become entangled in fishing line. Fish and other animals may ingest wrappers. Sharp edges on cans can cut fish or other animals.
CARD 2: The other party was there first today, so they should get to fish at that spot. You should try some of the other spots because crowding not only is unpleasant but can also be hazardous. Of course, you could keep an eye on your favorite spot in case the other party leaves.
CARD 3: Probably depends on the size of the lake. If it is a large lake, you might find an area away from fishermen to swim. But the card says small lake, and your swimming would probably scare the fish and ruin the other people's fishing experience. You might also ask the other people if they would mind your swimming, or tell them that you would like to swim when they are finished fishing.
CARD 4: Breaking branches harms the plants, and the plants protect the soil and provide shade. Also, rough play near a lake can be especially dangerous.
CARD 5: Tossing back a smaller fish to replace it with a larger one is illegal! It is also a waste of the fish that you caught and tossed back.
CARD 6: Even if people don't see the line in the bushes, it can be dangerous to animals. Wind or rain may also remove the line from the bushes.
CARD 7: To say that your brother is 15 is lying! You shouldn't do that. He should not be fishing without a license. Licenses help pay for programs such as Fishing in the City, and everyone should be willing to pay their fair share.
CARD 8: In this situation, you should not give one of your fish to your brother. The limit is two fish per angler, and you have caught your share. You and your brother both need to understand that sometimes people don't catch fish… That's why it is called "fishing" rather than "catching"!

CARD 9: Taking a break is fine, but the fish were put there for kids to catch. Your mother should not be fishing until after 11:30 a.m.
CARD 10: You should point out to your cousin that he almost caught you and ask him to be sure to look around before casting.
CARD 11: You (or your dad) should get the line out of the bushes because the line and hook can be dangerous to animals and people and because it is litter.
CARD 12: You should suggest that your brother turn down his music so that it doesn't bother others. He can move the boom box so that he can hear it at a low volume.

2. Summative Assessment:
    a. see above

VARIATIONS, ALTERNATIVES AND EXTENSIONS:

1. If the reading level of the cards is too difficult, either:
    (a) have an adult or older student read the cards to the group
    (b) read and discuss all of the cards as a whole class
    (c) create other cards as appropriate for your class
2. Invite a California Department of Fish and Wildlife representative to visit your class to discuss the need for rules and regulations.
3. Have the students role-play the situations described in the cards.
4. Make up other Discussion Cards to initiate discussions of ethical situations. Review the California Freshwater Sport Fishing Regulations booklet for ideas.

REFERENCES AND RESOURCES:

Current editions of *California Freshwater Sport Fishing Regulations* and *Freshwater & Ocean Supplemental Fishing Regulations* (available at fishing supply stores, from the California Department of Fish and Wildlife, or online).

PLAYING FAIR AND SAFE: CARD 1

You are walking along the edge of a lake.

You find some tangled fishing line, a torn corn chip bag, and an empty can.

Your friend says that because you didn't drop them, you should just leave them there. It's a long way back to the car, and it is hot!

What do you think?

PLAYING FAIR AND SAFE: CARD 2

You and your mom go to your favorite fishing lake. You find that someone else is fishing at your favorite spot. Just last week you caught 3 trout in that spot!

There are several other spots around the lake, but you don't think they are as good as your favorite spot.

What should you do?

PLAYING FAIR AND SAFE: CARD 3

You and your dad have been fishing all day at a small lake and haven't caught anything.

It's really hot, and you have your swim trunks. You would like to jump in for a swim.

There are other people fishing nearby, and they haven't caught anything either.

Nobody is catching anything anyway… Should you swim there?

What do you think?

PLAYING FAIR AND SAFE: CARD 4

You and three friends are fishing at your favorite lake. The fish aren't biting.

Your friends stop fishing and start breaking branches from some trees to use as play swords.

What should you do?

PLAYING FAIR AND SAFE: CARD 5

You and your brother are fishing at a place where the limit is five fish per day.

The fishing has been great! You and your brother have each caught your limits of five fish. Some of them are pretty small.

Your brother suggests that you keep fishing and if you catch a larger fish, keep it and toss back one of the small ones.

What do you do?

PLAYING FAIR AND SAFE: CARD 6

You and your cousin are fishing.

Her line gets so tangled that you can't get it untangled. You cut the line and now have a huge wad of tangled fishing line.

She suggests just tossing it into the bushes. Nobody will see it.

What should you do?

PLAYING FAIR AND SAFE: CARD 7

People 16 years or older are supposed to have fishing licenses.

Your brother is 16 years old. He does not have a fishing license.

You and he are going to go fishing.

He tells you that you should say that he is only 15 if anybody asks.

What do you do?

PLAYING FAIR AND SAFE: CARD 8

You, your brother, and your dad have just taken part in a Fishing in the City program at a local lake.

The Fishing in the City people have loaned you some fishing tackle, and you have been fishing for about an hour.

You have caught your limit of 2 fish, but your brother hasn't caught any. Your dad suggests that you give your brother one of your fish and that you keep fishing.

What do you do?

PLAYING FAIR AND SAFE: CARD 9

You and your mother have just taken part in a Fishing in the City program at a local lake.

The Department of Fish and Wildlife has put some fish into the lake just for the kids in the program. Only kids are supposed to fish until 11:30 in the morning.

You haven't caught anything, and it is getting boring. You want to take a break.

Should your mother hold your fishing rod just while you take a break?

PLAYING FAIR AND SAFE: CARD 10

Your cousin has come to visit you and you. You and he are going fishing. He says that he is an expert at fishing.

You notice that when he casts he doesn't look around to see if people are nearby. In fact, he almost caught you on one of his casts.

What do you do?

PLAYING FAIR AND SAFE: CARD 11

You and your dad are fishing at a nearby lake.

Your line got badly tangled and your dad cut it off.

He tossed the tangled line, including the hook, into the bushes.

What do you do?

PLAYING FAIR AND SAFE: CARD 12

Your brother got a new "boom box" and some CDs for his birthday.

He brings it when you and he go fishing, and he turns up the music quite loud so that he can hear it as he moves around the lake to fish.

There are many other people fishing at the lake.

You wonder if others are bothered by the music of if they enjoy it.

What do you do?

LESSON 6: *FISH FRY!*

LESSON SUMMARY:

Students observe trout and/or catfish being cooked and then get to taste the fish. They also receive a handout that tells how to clean a fish and provides several recipes.

CONTENT STANDARDS AND EEI CORRELATIONS:

- Next Generation Science Standards:
  - 4-LS1-1: (…animals have…structures that function to support survival…)
- Common Core Standards in English/Language Arts (Grade 3)
  - Speaking and Listening: 3-SL 3 (Ask and answer questions about information…)
  - Writing Standards: 3-W 4 (…produce writing…appropriate to task and purpose)
- Common Core Standards in Mathematics
  - Measurement and Data: 3.MD 2 (Measure…volumes and masses…)

LINKS TO THE PREVIOUS LESSON

In Lesson 5 (*Fishing: Playing Fair and Safe*), students discussed a variety of ethical situations. One ethical point that can be made with this lesson is to take only the fish that you will eat. Another is that if one is going to catch and then release a fish, one must be careful not to harm the fish.

In Lesson 4 (*What's a Fish?*), students learned some basic fish anatomy. They can review some of those fish body parts when preparing a fish for consumption (or watching an adult prepare a fish). They may also observe other body parts not studied in Lesson 4, which may lead to further investigation by the students.

LINKS TO THE NEXT LESSON:

Fish Fry! is intended to be the last lesson prior to the Fishing 101 workshop and the Fishing in the City fishing event. In Lesson 7 (*Thank You!*), students will write thank-you letters to the partners that provided those two events. (*Thank You!* can also be done immediately after the Fishing 101 workshop and before the fishing event.)

BACKGROUND INFORMATION FOR THE TEACHER:

Learning to Fish, Fishing to Learn is intended to be a unit of activities done in preparation for and follow-up to the Fishing 101 workshop, which is part of the Department of Fish and Wildlife's Fishing in the City program.

The intention is that, following the Fishing 101 workshop, the students will go to a local lake and fish for trout and/or catfish that are stocked by the DFW. The school fishing events are usually on the day before the "Learn to Fish" clinics sponsored by the Fishing in the City program. Since the lake is stocked just prior to the fishing event(s), the students have a pretty good chance of catching a fish.

For a schedule of the Learn to Fish clinics, refer to the "Events" menu for your area on the Fishing in the City Web site: www.DFW.ca.gov/fishinginthecity

ETHICAL CONSIDERATIONS AND CONSERVATION:

See Links to the Previous Lesson above.

Also, some students may be vegetarians or vegans for health or ethical reasons. You should consider how you can deal with this without embarrassing the students. One way is to have a discussion of vegetarianism prior to this unit (so that the students are familiar with the reasons that some people choose to be vegetarians). Some students might be excused from this lesson. You might have vegetarian or vegan alternatives for them to taste…and for the non-vegetarians to taste. Provide a classroom environment in which students can freely choose whether or not to partake of the cooked fish.

Some students will no doubt be concerned about killing or hurting fish. This valid concern can be used to emphasize the importance of catching only fish that will be eaten, i.e., not wasting fish. You might discuss being thankful for food.

Students living in cities and suburbs are often disconnected from their sources of food. Catching and eating a fish can help them understand that we are all dependent on the environment for our food. (Both wild and farm-raised plants and animals are dependent on nutrients, water, and air from the environment.)

Some students may have heard of "catch and release" fishing in which fish are caught and then released. Catch and release is most successful if the barbs on hooks are removed or bent down. Even when that is done, catching and handling the fish can harm them. Hatchery-raised trout, such as those released in the Fishing in the City program, have a low catch and release survival rate; catfish do better. Students catching fish as part of this program should plan to see that the fish that they catch are taken home to be eaten. They should not be put back into the lake.

VOCABULARY (SEE APPENDIX II FOR DEFINITIONS):

clean scale skin

LESSON GOALS:

1. Students will understand that fish or other resources should not be wasted.
2. Students will understand that fish can be a healthy food.

TIME CONSIDERATIONS:

30 – 60 minutes, depending on whether clean-up is done at school.

GROUPING SUGGESTIONS:

This is a demonstration and discussion for the whole class.

MATERIALS (FOR A CLASS OF 30):

electric frying pan(s)

cooking utensils

measuring spoons and cups…preferably several sets

reusable plates and forks

After the Catch/Cooking your Catch handout (pages 49 - 50)

trout or catfish and cooking ingredients…will vary depending on size of fish and recipe selected. Trout are recommended because (a) students may have the opportunity to catch trout after the lesson and (b) trout can be obtained with heads and fins intact and (c) they do not need to be skinned prior to eating.

optional: veggie burgers and other food

SAFETY CONSIDERATIONS:

1. Find out if any of your students are allergic to fish
2. Be sure to keep the students far enough away from the frying pan that they cannot be hit by spattering cooking oil.
3. Be sure that the person cooking the fish washes his/her hands and that the students have clean eating utensils. (Have water and hand soap available in the classroom. Pointing out where the sink and soap are is a subtle way to remind them to clean their hands.)
4. When using electric frying pans, avoid using multiple extension cords. Rather, use one cord and a power strip.

PROCEDURES:

1. Contact parents to see whether they would be willing to help with this lesson. It would be best to have at least 3 or 4 parents to help with distribution and clean-up. Parents are also a source for frying pans.

   Also determine how many students will be participating in the fish tasting, as this will determine how many fish you need to procure. Parents may decide to not have their child participate for health reasons or because they are vegetarians. Consider providing vegetarian options for those students.

   A sample parent letter is provided in Appendix I. We recommend that you send the letter a couple of weeks prior to starting the *Learning to Fish, Fishing to Learn* unit so that parents (and you!) can plan ahead. Modify it as you see fit.

   If parents are not available, the community volunteers that will be teaching the Fishing 101 lesson may be willing and able to help.

   Contact local markets to find one that will contribute fish. They may also contribute recipe ingredients such as lemons or tartar sauce. Fishing 101 partners are often members of service clubs such as Rotary Clubs, and those clubs may be willing to provide the fish. Your school's PTA may also be willing to provide volunteers and/or fish and ingredients.
2. Before doing the lesson with the class, use the same frying pans that you will use in the class to try out the recipe that you select. We recommend using a recipe from the "After the Catch/Cooking your Catch" handout. If not, prepare copies of whatever recipe is used for the students to take home.
3. Introduce the lesson by asking why we need food. Elicit that we need food for energy and also for materials for building our bodies.
   - Point out that if they hadn't eaten food, they wouldn't be alive.
   - Also point out that different kinds of food provide different nutrients. Sugars and starches provide energy, meat provides protein for building muscles, and fruits and vegetables provide lots of other nutrients. Point out that when a person eats fish, they are eating a type of meat.
4. Ask whether the students have ever eaten trout, catfish, or whatever type of fish you will be cooking. Ask if they liked the fish. If not, discuss the idea that how a fish is prepared for eating affects its taste. If they didn't like a fish prepared one way, they might like it if it is prepared a different way.
5. Tell the students that today they will have the chance to taste some fish that will be cooked in class. Tell them that you will be giving them the recipe to take home so that their parents can prepare fish in the same way.

Also tell them that they do not have to eat the fish if they do not want to.

6. Introduce the cooks.
7. After washing your hands, show the students the fish that will be cooked. Point out whatever anatomical features are identifiable. If you use trout, you can probably show the fins, gill covers, and eyes, as well as bones, muscle tissue, and skin. If you are using a filet, you will only be able to show muscle and bone. Call on students to identify the parts and tell their function.
8. Point out that the fish has been "cleaned." Tell the students that fish cleaning means removing parts that are not going to be eaten, such as the stomach. Some fish need to be skinned, or to have their scales removed. (Trout have small scales and thin skin that does not need to be removed prior to cooking.) Some people remove the fins and head when cleaning trout; some don't.
9. As the cooks prepare the fish, have them use measuring spoons to measure the ingredients…and show the students the spoons and quantities. (If possible, have several sets of measuring spoons/cups for the students to hold as the cooks do the measuring. If you can arrange that, have the cook hold up the measured amount and have the students look at their measuring spoons/cups and determine the amount that the cook is holding up.)
10. As the fish are being cooked, talk with the students about the nutritional value of fish as a good source of protein and also fish oil. (Also talk about other types of foods such as fruits and vegetables, dairy, etc.)
11. As the fish are being cooked, talk with the students about how you will manage the tasting.
    - How will the eating utensils and fish be distributed?
    - What if they don't like the fish…What should they do?
    - How will cleanup be handled?
12. After the tasting, have the students thank the cooks.
13. Have the students write thank-you notes to whomever helped…cooks, ingredient donors, or?

Duplication or Transparency Masters (found at the end of the lesson):

After the Catch/Cooking your Catch… handout for duplication

optional: copies of whatever recipe is used

ASSESSMENT SUGGESTIONS:

1. Can the students explain why people need food?
2. Can the students explain how fish are dependent on a healthy environment?

POINTS FOR WHICH TO ASSESS:

1. Formative Assessment:
   a. As you discuss the value of fish as a food (Step 10), do students understand that a healthy diet includes a variety of different food types, including protein?
2. Summative Assessment:
   a. Students should explain, orally or in writing, that fish provide a source of protein and oils.
   b. Ask students to recall the previous lessons and explain how fish depend on the environment. Look for such things as clean water (without too much silt or pollutants), water that isn't too warm and has plenty of oxygen. They should also know that fish need streamside vegetation for shade and also that vegetation attracts insects that trout eat.

VARIATIONS, ALTERNATIVES AND EXTENSIONS:

1. If your school has a cafeteria, you may be able to arrange to use it for this lesson.
2. Other kinds of aquatic foods, including crayfish and marine organisms such as squid, clams, crabs, and marine fish can be prepared. Be aware that some students may be allergic to crabs or crayfish.
3. Also cook vegetarian/vegan options (veggie burgers?) and have them available for all students to taste.
4. An entire meal, including vegetables and bread can be prepared.
5. Have students investigate the importance of salmon to Native Americans in California.
6. Encourage parents to let their children help prepare fish-based meals at home.
7. Find, or have students find, stories about how native peoples in various lands fish, use foods found in nature, or show their appreciation for their food.
8. Students can investigate the nutritional value of fish and fish oil.

REFERENCES AND RESOURCES:

Fishing in the City / California Department of Fish and Wildlife. *After the Catch/Cooking your Catch.* (See the following two pages.)

After the Catch...

Clean your fish to prepare it to eat or release it quick and unharmed.

Releasing a Fish

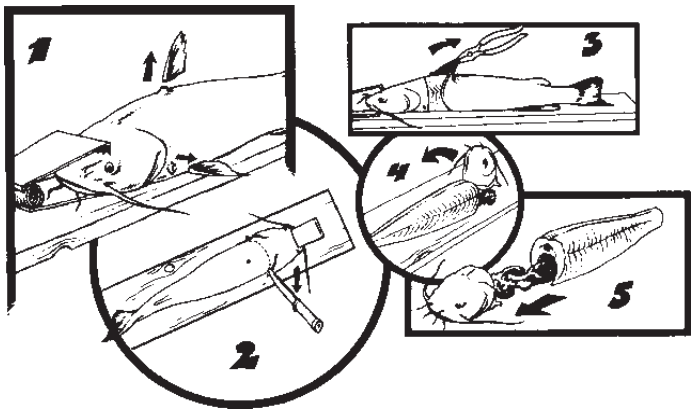
Handle the fish gently with a wet hand as you remove the hook. Grasp it carefully to avoid any spines on the back. If the hook is deep in the fish, you may not be able to remove it. Cut the line and release the fish. The hook will rust, dis-solve, or work its way loose. If a fish loses consciousness, try to revive it by gently moving it forward and backward so water moves through its gills. When the fish revives and begins to struggle, let it go. Fish do not always survive being caught.

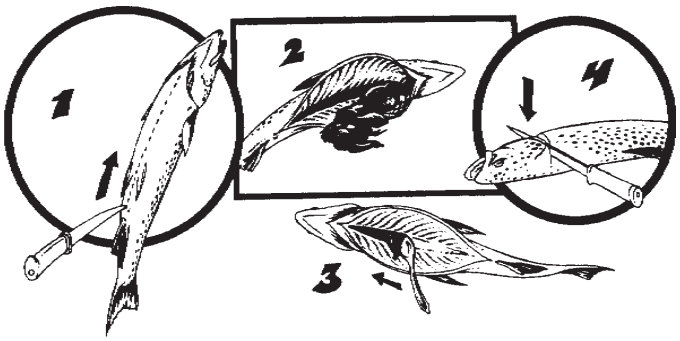
Skinning

Many people like to remove the skin from catfish and bullheads. To do this, hold the head firmly on a flat surface with a clamp. For safety, snip off a catfish's spines before skinning. Cut through the skin behind the head and the pectoral fins. Use pliers to remove the skin from the body, pulling from the head toward the tail. Grasp the head of the fish with one hand and the body with the other. Break the backbone at the head. Pull the head and guts away from the skinned body. Wash the fish in clean water and it is ready for cooking.

Cleaning a Fish

Fish are slippery and knives are sharp – be careful! Rinse the slime off the fish, lay it on a board, and insert the knife tip into the fish's anus. Cut upward along the belly to the head. Keep the knife blade shallow so you do not puncture the intestines. Spread the body open and remove all of the entrails. Some fish have a kidney by the backbone. You can remove it by scraping it out with a spoon or your thumbnail. Cut off the head and rinse the fish in clean water. Keep the fish cool.





Cooking your Catch

Campfire (or BBQ) Trout

Ingredients
trout - cleaned
1/4 cup (1/2 stick) butter
salt and pepper to taste
herbs such as parsley, sage or thyme

Make a long deep dish out of foil, with enough foil to fold over and seal on top. Butter the foil and place the fish in the dish. Add the remaining butter and herbs. Seal the top of the foil so that no liquid can escape. Bake on a grate over a hot bed of coals, turning frequently.

Pan Fried Trout

Ingredients
fresh trout - cleaned, scaled, and filleted
cooking oil
flour
lemon wedges (optional)

Dredge the trout filets through the flour. Heat the cooking oil in a frying pan. Fry the trout until golden brown on both sides. Use care when turning the filets over so they don't stick to the pan or break apart. Serve hot with lemon wedges.

Baked Trout or Catfish

Ingredients
fresh fish - cleaned, scaled and filleted
1/4 cup milk
seasoned bread crumbs or crushed corn flakes
2 tablespoons melted butter

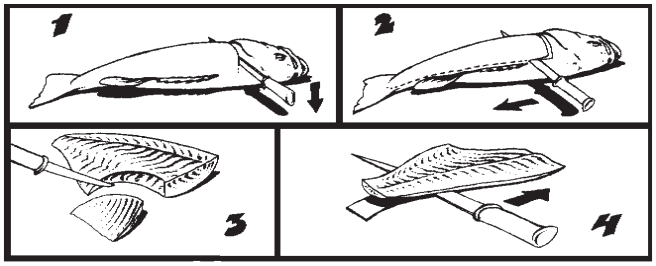
Preheat the oven to 350 degrees F. Dip the fillets in the milk, then in the bread crumbs or crushed corn flakes to coat. Place the fish in a baking pan. Bake until firm and golden basting with the butter several times.

Fried Catfish

Ingredients
fresh catfish - cleaned, skinned, and filleted
cooking oil
seasoned white cornmeal
lemon wedges (optional)

Cut the catfish filets into chunks and dredge them through the cornmeal. Heat the cooking oil in a frying pan. Deep fry the catfish until golden brown. Serve hot with lemon wedges.

Filleting Your Catch



Lay the fish on its side on a flat surface. Cut the fish behind its gills and pectoral fin down to, but not through, the backbone. Without removing the knife, turn the blade and cut through the ribs toward the tail. Use the fish's backbone to guide you. Turn the fish over and repeat the steps.

To skin the fish place it skin side down, insert the knife blade about a 1/2 inch from the tail. Gripping this tail part firmly, put the blade between the skin and the meat at an angle. Wash each fillet in cold water. Pat dry with a clean cloth or paper towel. The fillets are ready to cook or freeze.

FISHING 101 INTEGRATION

1. Obtain the contact information for the Community Partner that will be presenting the Fishing 101 workshop so that you can confirm the presentation a couple of days before it is scheduled.
2. Let the school office know that the Community Partners will be visiting.
3. Be sure that the Partner knows where to park and that they need to check in at the office when they arrive.
4. Let the Partner know that the students will be writing letters of appreciation. Ask for names and where they should be sent.
5. Find out from the Partner whether he or she is comfortable with having parents participate in the classroom workshop. If so, invite some parents. (One of the goals of the Fishing in the City program is to get families to go fishing. Parental involvement can greatly increase the chances that they will take their children fishing.) This may also facilitate finding transportation for the fishing event.

LESSON 7: *THANK YOU!*

LESSON SUMMARY:

Students write (and illustrate) letters of appreciation to the Community Partners that helped with the Fishing 101 and community fishing event. They also write thank-you notes to "Mother Nature."

CONTENT STANDARDS AND EEI CORRELATIONS:

- Common Core Standards in English/Language Arts (Grade 3)
  - Writing Standards: 3-W 4 (…produce writing…appropriate to task and purpose)
  - Writing Standards: 3-W 5 (…develop and strengthen writing…)
  - Writing Standards: 3-W 6 (…use technology to produce and publish writing…
- Visual and Performing Arts 2.4 (Create a work of art)

LINKS TO THE PREVIOUS LESSON:

The Fishing 101 and community fishing event could not happen without Community Partners. Writing letters of appreciation not only is a good learning activity for the students, but it also will encourage the Community Partners to continue to support and participate in the Fishing in the City program.

LINKS TO THE NEXT LESSON:

Writing letters of appreciation isn't directly linked to Lesson 8 (*What's a Watershed?*). Lesson 8 does, however, build on Lessons 1-5 because fish live in watersheds, and understanding and protecting watersheds is critical to being good stewards of freshwater habitats.

BACKGROUND INFORMATION FOR THE TEACHER:

Learning to appreciate things that others do is important for students. In some communities, many students feel entitled not only to things, but to services provided by others. Other students rarely have others show caring and sharing of knowledge. Writing thank-you letters can help all students learn to appreciate what others have done for them. It is also a great way to teach writing skills "in context."

Consider whether to have the students write their letters on a computer or whether to have them hand-write them. Or maybe have them write one by hand and one on the computer. (This may help with limited numbers of computers. Half of the class can be using computers while the other half writes by hand.) While computer-written letters look neater and can be easily spell-checked, hand-written letters help teach other skills and seem more personal.

ETHICAL CONSIDERATIONS AND CONSERVATION:

Taking time to reflect on what others have done for us allows us to appreciate those acts. Reflecting on what "Mother Nature" does for them may not only help students appreciate what nature provides us, but it may also encourage them to become better stewards of the environment.

VOCABULARY (SEE APPENDIX II FOR DEFINITIONS):

appreciate/appreciation Gaia

LESSON GOALS:

1. Students will increase their appreciation for the goods and services provided by the environment.
2. Students will increase their appreciation for the goods and services provided by the Community Partners.
3. Students will increase their writing and drawing skills.

TIME CONSIDERATIONS:

60 – 90 minutes, possibly spread over a couple of days

GROUPING SUGGESTIONS:

whole class and pairs of students

MATERIALS (FOR A CLASS OF 30):

writing materials (pencils and lined paper) or (possibly), computers

paper and drawing materials (crayons, colored pencils, markers)

PROCEDURES:

1. Decide whether the letters are to be hand-written or written on the computer, or one of each.
2. Ask the students whether they have ever done something for someone and been thanked for it. Ask how that felt. Elicit that being appreciated feels good. Ask whether they are more likely to help people if they get thanked or if they don't get thanked.
3. Point out that several people have helped them with this unit on fish, including the people that provided the Fishing 101 workshop, the people that helped with the fishing event, parents that helped with the *Fish Fry!* lesson, and stores that contributed ingredients for the *Fish Fry!* lesson.
4. Point out that none of this would have been possible if it we didn't have lakes and fish…if we didn't have nature. Tell the students that people sometimes refer to nature as "Mother Nature" or Gaia (the Earth personified as a goddess by the Greeks).
5. Tell the students that they will be writing two letters of appreciation – one to a Community Partner and one to Mother Nature or Gaia. Tell them that they will also make a drawing to accompany one or both of the letters.
6. Review your method for writing assignments…
    - Do you have students peer-edit?
    - Do your students work with older students?
    - Will you or parents edit before the final letters are sent?
    - What about computer use?

7. Discuss what should go into the letter(s): (list on the board?)
    a. date
    b. salutation
    c. body
        i. student might introduce himself/herself
        ii. why are they writing the letter?...what did they like about the workshop, event, or meal?
        iii. clearly and simply thank the person
        iv. possibly tell what the picture shows
    v. other?
    d. closing
    e. signature
8. Tell them that they should also draw a picture to send with one or both of the letters. Brainstorm with the students what might be in the drawing. List ideas on the board.
9. Give students time to write, edit, rewrite, and draw. This might be done over several days.
10. Post the letters to Mother Nature in the classroom.
11. Send the letters to Community Partners.

Duplication or Transparency Masters: none

ASSESSMENT SUGGESTIONS:

1. Letters can be assessed for Language Arts grades.

POINTS FOR WHICH TO ASSESS: Depends on where you are in your Language Arts instructional program.

VARIATIONS, ALTERNATIVES AND EXTENSIONS:

1. Students might work in teams of two.
2. Students can design "Certificates of Appreciation" rather than letters.
3. The class can create a "Thank-you poster" and all of the students can sign it.
4. Students can write Thank-you poems.
5. The class can create a stewardship pledge, with each student having a copy to take home.

REFERENCES AND RESOURCES: None

LESSON 8: *WHAT'S A WATERSHED?*

LESSON SUMMARY:

Using simple models, students find out what a watershed is. They then use maps to learn about their local watershed.

CONTENT STANDARDS AND EEI CORRELATIONS:

- Next Generation Science Standards:
  - 2-ESS1-1 (Use evidence from several sources to provide evidence that Earth events can occur quickly or slowly.)
  - 2-ESS2-1: (Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.)
  - 2-ESS2-2 (Develop a model to represent the shapes and kinds of land…)
  - 3-LS4-4 (Make a claim about…a solution to a problem caused when the environment changes…)
  - 4-ESS2-2 (Analyze and interpret data from maps to describe patterns in Earth's features.)
- History-Social Science: 3.3.3 (how the community has changed over time)
- EEI Units: *Living Things in Changing Environments* and *The Geography of Where We Live*

LINKS TO THE PREVIOUS LESSON:

none. Lesson 8 is, however, closely linked to Lessons 2 and 3 (*Home Sweet Lake* and *Worms for Lunch!*, respectively). Fish habitat is part of the watershed, and food chains and food webs depend on a healthy watershed.

LINKS TO THE NEXT LESSON:

In Lesson 9 (*A Fish Story*), students will summarize their learning by writing a story about a day in the life of a fish.

BACKGROUND INFORMATION FOR THE TEACHER:

Watersheds are sometimes called drainage basins. A watershed is an area of land where precipitation falls and runs downhill into a body of water such as the San Francisco Bay or the Pacific Ocean. Watersheds are of varying sizes; a creek has a small watershed, several creeks flowing into a river form the river's watershed, and river systems form still larger watersheds. Watersheds are separated by ridges.

Water running downhill has the ability to bring with it sand and silt. When the energy of the flowing water is dissipated, such as at the mouth of a river that flows into the San Francisco Bay, the water loses the ability to carry the sand and silt, and they are deposited.

Water is often called the "universal solvent" because of its ability to dissolve so many different chemicals. Flowing water brings with it chemicals such as pesticides and dissolved minerals.

ETHICAL CONSIDERATIONS AND CONSERVATION:

- What happens on the land in a watershed affects the associated water, whether it is a creek, a river or lake into which a creek flows, an underground aquifer, or, ultimately, the ocean. Therefore, human activity on land can have important impacts on water that is far away, and for a long period of time.

- Students need to learn not only how human activities such as misapplication of pesticides, herbicides and fertilizers, improper disposal of oil, and soil erosion can harm watersheds, but also how their actions can help protect and improve watersheds.

VOCABULARY (SEE APPENDIX I FOR DEFINITIONS):

drainage basin erosion pollution ridge watershed

LESSON GOALS:

1. The students will be able to define a watershed and describe how water moves through a watershed.
2. The students will be able to describe how pollution moves through a watershed.
3. The students will be able to tell how they as individuals can help protect a watershed.

TIME CONSIDERATIONS:

Part 1

Teacher preparation, obtaining materials: 10-15 minutes

Class activity time: 15-30 minutes

Part 2

Teacher preparation, obtaining materials: 15 – 30 minutes

Class activity time: 15-30 minutes

GROUPING SUGGESTIONS:

whole class and groups of 2-4 students

MATERIALS (FOR A CLASS OF 30):

Part 1

6-8 large baking trays. cafeteria trays, or box lids

6-8 pieces of wood (1" x 2" x 6" or similar size)

6-8 spray bottles containing water

8-10 pieces of aluminum foil (12" x 8")

permanent marking pens: 6-8 each: green, blue

water-based marking pens: 6-8 each: brown, black, red

towels and sponges for cleaning up

towels, newspaper, plastic tablecloths, or tarps to protect tables or desks from spills, as needed

Part 2

(preferably) 3-dimensional relief map of California or the San Francisco Bay Area.

If a 3-dimensional relief map is not available, a "shaded relief" or "physiographic" map can be used. (See pages 61 – 64) Check the Internet for printable maps of your area. The EEI curriculum units include California maps that may be suitable, including maps titled "Water for Life," "Natural Regions," and "View from Space." (See Appendix II.)

6-8 road or other maps that show local creeks, lakes, and other bodies of water.

PROCEDURES:

Part 1

1. Consider doing part 1 outside.
2. Support one end of the tray with a piece of wood or other support while you spray some water on the top end. Tell the students that the water represents rain.
3. Ask the students to tell what they observe about the water. Elicit that the water flows or runs downhill.
4. Fold some aluminum foil so that it forms ridges and a valley. Fold the top end of the foil over the end of the tray so that the valley runs downhill. Fold the foil at the bottom of the "valley" so that it forms a "cup." (See previous page.) Tell the students that the foil ridges represent hills and mountains and that the low area represents a valley with a creek or river in it. Ask the students what the cup at the bottom of the valley might represent. Elicit that it represents a lake or the ocean. "Rain" on the watershed and point out that the water runs from the hills to the lake or ocean – that it runs downhill.

Step 5

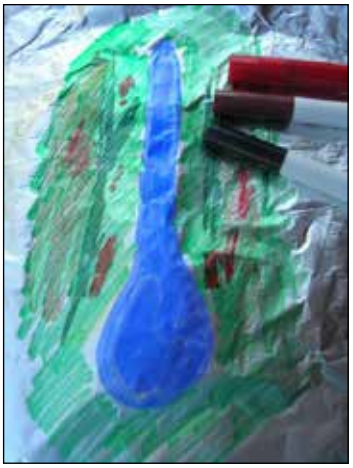
5. Use a dry, flat piece of foil, with the less shiny side up. Without tearing it, use the permanent blue marker to color a 0.75" – 1" swath down the center of the foil, representing a river ending in a 1.5" diameter "lake." Then use the green permanent marker to color a 2" area around the "water," representing fields and forests.
6. Carefully form mountains from the green area with the blue representing a river flowing to a lake. Let the ink dry as you ask the students to predict what will happen when it "rains" again.
7. "Rain" on the hills and valley and have the students note that the water flows from the "hills" down into the valley. Elicit that the water in the valleys is like creeks and rivers. Point out that the water in the creeks and rivers flows or drains to a lake or the ocean. Tell the students that the area drained by a creek is called a "watershed." Write "watershed on the board. Use the model to show a watershed.

   Point out how the crinkles in the foil represent smaller streams (tributaries) that bring water to the larger stream.

Step 6

8. Point out how the words water and shed are used to form the word "Water-shed."
9. Demonstrate that the "rain" runs off of land covered by forests and fields into the lake at the bottom without changing its color. It remains clean - not polluted by silt.
10. Issue each group of 3-5 students a piece of foil. Have them draw their own watersheds, including creeks, lake, and forests colored with blue and green permanent markers on the still flat foil sheets. (See Variation #1 below). **Tell them to NOT make ridges yet.**
11. With the foil still flat, issue brown, black, and red water-based markers. Have the students use the brown water-base pens to color some areas where the trees and fields have been

cut, exposing the soil. Have the students use the black water-base markers to draw some roads where oil or gasoline might drip. Have them use the red water-base markers to color some areas where chemicals such as paints, fertilizers, or pesticides are used.



12. Have the students carefully form ridges and a valley to form a watershed, including a cup at the bottom to represent the ocean or a lake.
13. Have the students use the spray bottles to rain on their watersheds. Ask them to observe what happens to the soil, oil, and pesticides. Elicit that they wash into the streams and then into the lake or ocean.
14. Define "pollution" and discuss how pollution from the land can enter creeks and ponds in a watershed.

    a. Discuss how watersheds eventually bring water and whatever chemicals it contains to the ocean.

    b. Discuss how what we do on land might affect fish and other animals that depend on the water, including people. Specifically address how we can protect waterways by not littering, not dumping chemicals, and protecting from soil erosion.

15. You may be able to rinse and flatten the foil for reuse in future years. Otherwise, save it for other projects or recycle it.

Part 2

1. Use a 3-dimensional relief map (preferably), or a shaded relief or physiographic relief map to show the students how the rivers and creeks flow together and eventually flow to the ocean.

   If you use a shaded relief map such as those provided with this lesson, use a foil watershed model to show how the shading on the map represents ridges and valleys.

Use the road maps for the following:

2. Show the students how to find creeks, lakes, the San Francisco Bay, the Pacific Ocean, and other bodies of water on the road map.
3. Help the students locate your school or neighborhood on the map.
4. Help the students locate nearby creeks or other bodies of water, and follow their path to the San Francisco Bay or the Pacific Ocean. Point out how creeks join rivers to form a tributary system. Point out how creeks join rivers on the map to form a system of streams/tributaries.
5. If you will be participating in a Fishing in the City fishing trip, locate the pond or lake where the event will take place. Help the students follow the path of water from the mountains to that lake, and from the lake to the San Francisco Bay or the Pacific Ocean.
6. Discuss how actions far from the lake, or from the Bay, can have an effect on the lake or bay. Be sure to include both "negative" actions such as spilling oil, overuse of pesticides, or soil erosion and "positive" actions such as picking up litter, disposing of chemicals properly and protecting plants.

Duplication or Transparency Masters (found at the end of the lesson):

Shaded Relief Maps of:

- California
- San Francisco Bay Area
- South San Francisco Bay Area
- North San Francisco Bay Area
- East San Francisco Bay Area

ASSESSMENT SUGGESTIONS:

1. Have the students respond to one or more of the following prompts orally (maybe think-pair-share) or in writing (maybe think-ink):

   a. Tell the path that a rain drop follows from a cloud above a mountain to the San Francisco Bay

   b. How might a forest fire in the mountains add pollution to the San Francisco Bay?

   c. How can not spraying chemicals on your lawn protect fish in the Bay?

   d. Why should used oil or extra paint not be dumped into the storm drain or sewer?

   e. How can planting trees and bushes along a stream help keep the water clean?

   f. How is the water cycle related to a watershed?

2. Have the students, individually or working with partners, draw a healthy watershed and one that has been damaged, including at least 3 ways that watersheds can be damaged and protected.
3. When visiting a creek, lake, or other body of water, ask students to point out things that can help or harm fish and other aquatic wildlife.
4. Take the class for a walk around the school campus. Point out things such as bare soil, litter, and oil spots in the parking lot that can harm watersheds. Ask students to explain how those things can harm fish and other aquatic wildlife, and how they and their families can help protect fish and other aquatic wildlife. Point out that healthy plants protect the soil by reducing the impact of falling rain and that their roots help hold the soil in place.
5. While outside, see if you can point out the hills that form part of your watershed.

POINTS FOR WHICH TO ASSESS:

1. Formative Assessment:
   a. As you demonstrate "rain" falling on the land (Steps 7 – 9), students should be able to point out that the rain runs downhill and enters the stream and then the "ocean/lake"at the bottom.
2. Summative Assessment:
   a. Students should show understanding of how pollution can enter a stream and how it can be reduced.

VARIATIONS, ALTERNATIVES AND EXTENSIONS:

1. To save time, or if you are concerned about your students using permanent markers, the teacher, an aide, an older student, or a parent can do the blue and green coloring (Part 1, step 5) ahead of time.
2. After the students fold the foil to form ridges, they might use blue permanent markers to show streams in the small valleys formed on the foil. However, this may be difficult for the students to do without flattening the ridges. It will also mean that you won't be able to reuse the foil next year because the crinkles/creek valleys formed next year won't necessarily be in the same places.

3. More complex versions of this activity, or related activities can be found in the following resources:

   Fishing: Get in the Habitat!: "Wonderful Watersheds"

   Project WET Curriculum and Activity Guide 2.0: activities: "Seeing Watersheds," "Blue River," "River Talk," "A-maze-ing Water," " Storm Water," and "Color Me a Watershed"

   Project WILD Aquatic: activities: "Blue Ribbon Niche," "Where Does Water Run," and "Watershed,"

   The Conifer Connection: "Washing a Watershed"

4. Students can build simple, not site-specific, watershed models of clay, salt/flour modeling material or even mud.
5. Students can build relief maps of their local watersheds using clay or salt/flour modeling material.
6. Overhead transparencies of relief maps can be used, or use a "document camera" projection system to show the relief map.
7. Consider using the maps that are part of the EEI curriculum units for part 2.
8. Students can use road maps to add rivers, lakes, and towns to the included shaded relief maps. They can label features such as your town, San Francisco Bay, and the Pacific Ocean.
9. If you use the shaded relief maps that are included in this lesson, consider having students color features such as lakes, rivers, and the San Francisco Bay.
10. Prior to duplicating the maps, mark the location of your school or community.
11. Either participate in the annual Coastal Cleanup in September as a class, or provide parents with information about it so that the students can participate with their family. For information, go to:

    www/coastal.ca.gov/publiced/ccd

REFERENCES AND RESOURCES:

California Environmental Protection Agency. Education and the Environment Initiative unit titled *The Geography of Where We Live*

California Environmental Protection Agency. Education and the Environment Initiative unit titled *Living Things in a Changing Environment*

Council for Environmental Education. *Project WILD Aquatic K-12 Curriculum and Activity Guide*

Minnesota Department of Natural Resources. *Fishing: Get in the Habitat! – MinnAqua Leader's Guide*

Project WET Foundation: *Project WET Curriculum and Activity Guide 2.0*

Roa, Michael. *The Conifer Connection*

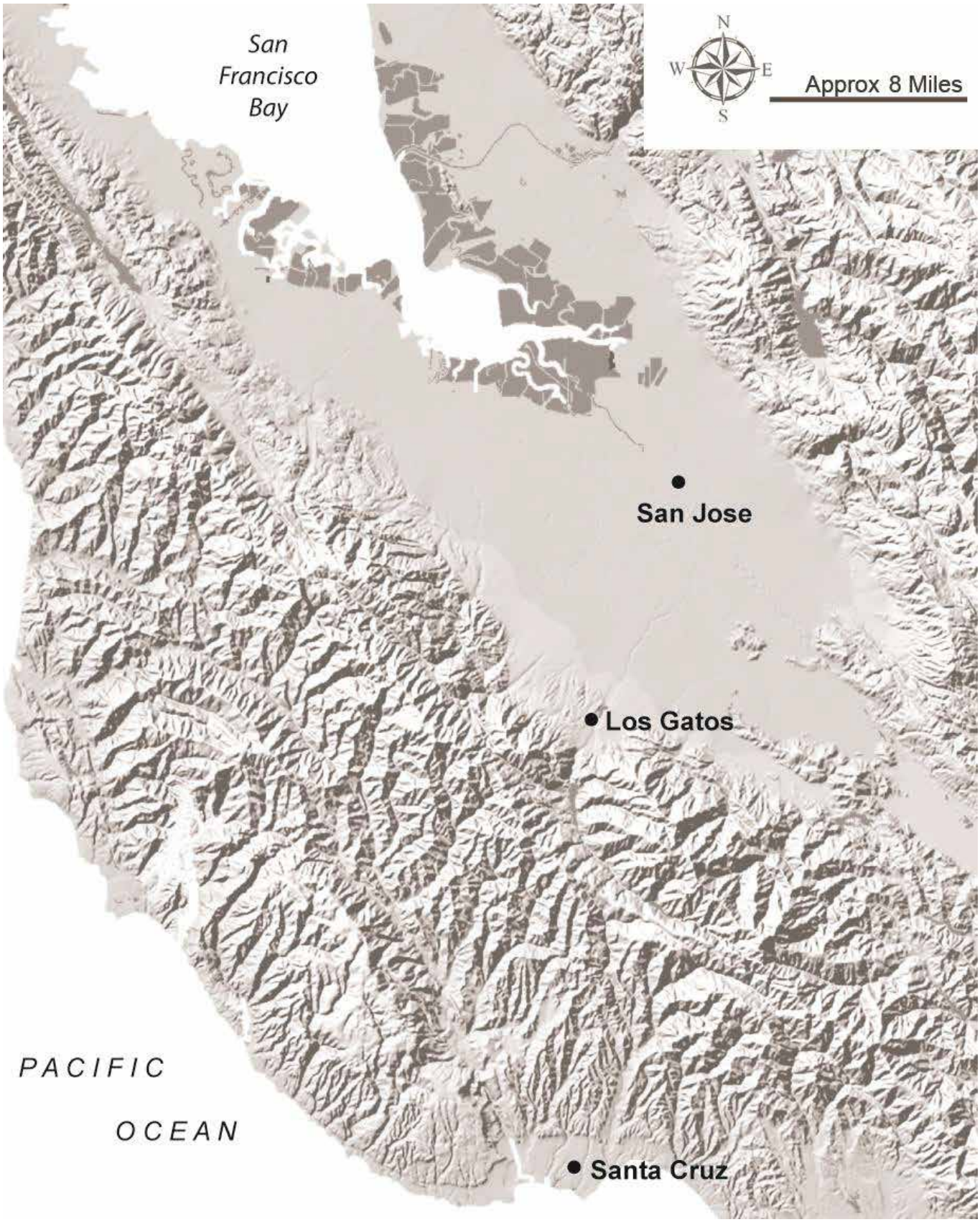
Science supply companies such as Acorn Naturalists, Science Kit, Carolina, and others have a variety of print and other resources available for studying watersheds. Acorn Naturalists has a simple "Make Your Own Watershed Kit" designed for grades 3-7.

CALIFORNIA

SHADED RELIEF MAP

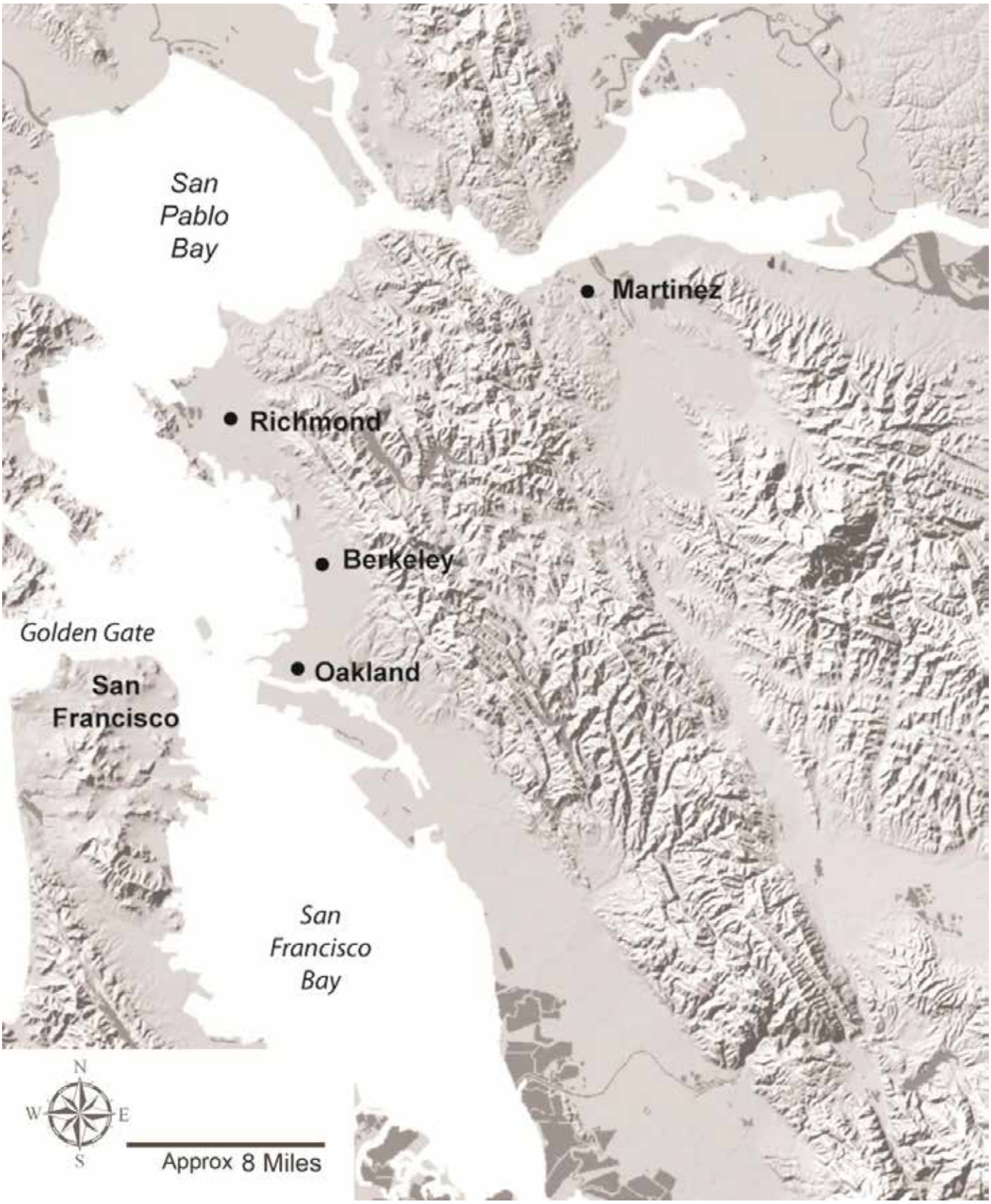
SOUTH SAN FRANCISCO BAY AREA

SHADED RELIEF MAP



EAST SAN FRANCISCO BAY AREA

SHADED RELIEF MAP



NORTH SAN FRANCISCO BAY AREA

SHADED RELIEF MAP

LESSON 9: *A FISH STORY*

LESSON SUMMARY:

Students write (and illustrate) A story about a day at a lake, either from the viewpoint of an angler or a fish.

CONTENT STANDARDS AND EEI CORRELATIONS:

- Common Core Standards in English/Language Arts (Grade 3)
  - Writing Standards: 3-W3 (Write narratives to develop real or imagined experiences…)
  - Writing Standards: 3-W4 (…produce writing…appropriate to task and purpose.)
  - Writing Standards: 3-W5 (…develop and strengthen writing…)
  - Writing Standards: 3-W6 (…use technology to produce and publish writing…)
- Visual and Performing Arts 2.4 (Create a work of art)

LINKS TO THE PREVIOUS LESSON:

This is the final lesson in the Third Grade *Learning to Fish, Fishing to Learn* Unit. The students' stories should show some learning about freshwater ecosystems and trout, and peoples' relationship to them.

LINKS TO THE NEXT LESSON:

This is the final lesson in the Third Grade *Learning to Fish, Fishing to Learn* Unit. Resources such as *Project WILD Aquatic*, Trout in the Classroom, and others that are listed in appendix VI provide a wealth of other lessons, activities, and resources.

BACKGROUND INFORMATION FOR THE TEACHER:

Consider whether to have the students write their letters on a computer or whether to have them hand-write them.

ETHICAL CONSIDERATIONS AND CONSERVATION:

Writing stories about aquatic habitats and experiences can help students internalize the learning in this unit, hopefully including the ethical and stewardship aspects of the lessons.

VOCABULARY (SEE APPENDIX I FOR DEFINITIONS):

angler fish story

LESSON GOALS:

1. Students will increase their appreciation for the goods and services provided by the environment.
2. Students will increase their writing and drawing skills.

TIME CONSIDERATIONS:

60 – 90 minutes, possibly spread over a couple of days

GROUPING SUGGESTIONS:

whole class and pairs of students

MATERIALS (FOR A CLASS OF 30):

writing materials (pencils and lined paper) and/or (possibly), computers, paper and drawing materials (crayons, colored pencils, markers)

PROCEDURES:

1. Decide whether the stories are to be hand-written or written on the computer.
2. Tell the students that they will be writing and illustrating a "Fish Story." Explain that people who fish, sometimes called anglers, sometimes tell stories about catching fish in which they exaggerate the size or number of fish that they catch…and that such stories are called "Fish Stories."

   Explain that the fish stories that they will be writing and illustrating do not have to be exaggerations, but that they should include some of the information that they have learned about fish and freshwater habitats.

   Explain that the story might be told from the viewpoint of a child or an adult, or even from the viewpoint of a fish. The fish might be a young fish (a fry), a small fish such as a minnow, or a bottom feeder such as a catfish.
3. Brainstorm with the students to come up with some possible storylines. List some on the board. Some storylines might be:

   a. The day I caught my first fish.

   b. When my dad and I went fishing

   c. Our family trip to the lake

   d. I went fishing and didn't catch anything

   e. The one that got away

   f. The polluted lake

   g. When we helped clean up the lake

   h. From a fish's viewpoint:

      i. a day in my life at the lake

      ii. the day that I got caught

      iii. the day that I got caught and got away

      iv. living in a polluted lake

   Students can suggest other storylines, or you can suggest themes such as:

   i. fairness

   j. safety

   k. stewardship of the environment

   l. food chains and webs

   m. the recreational value of fishing

4. Review your procedures for writing assignments…
   - Do you have students peer-edit?
   - Do your students work with older students?
   - Will you or parents edit?
   - What about computer use?
   - Length?
   - Do you use graphic organizers in planning writing assignments?
5. Discuss what should go into the story, such as

   a. interesting incident or plot

   b. body: beginning, middle, end

   c. that it should show something that they learned about fish or freshwater environments.

      Consider brainstorming some of the things learned in this unit and listing them on the board, including

      requirements for healthy trout habitats (lack of silt, cool water)

      food chains

      food webs

      fish anatomy

      watersheds

      ethics, rules, regulations
6. Tell them that they should also draw a picture to illustrate their story.
7. Remind them that their story should show something that they learned about fish or freshwater environments.
8. Give students time to write, edit, rewrite, and draw. This might be done over several days.

Duplication or Transparency Masters: none

ASSESSMENT SUGGESTIONS:

1. When you give the writing assignment, provide the students with a rubric that shows what goes into a well written story. Have the students do a self-assessment of their stories, or have other students use the rubric to review and edit their peer's stories and give them the chance to revise before turning them in for grading.
2. Stories can be assessed for Language Arts grades as well as the science learning.

POINTS FOR WHICH TO ASSESS: Depends on where you are in your Language Arts instructional program.

VARIATIONS, ALTERNATIVES AND EXTENSIONS:

1. As an "into" activity, read a story about a fish to the class, perhaps a folk tale or Native American story.
2. Students might work in teams of two.

REFERENCES AND RESOURCES: None

APPENDICES

I. SAMPLE LETTER

You may find this sample letter helpful as you approach your unit on fish and freshwater ecology. Parents can be a great asset in this unit. Of course you should modify it to suit your needs. You should probably send it home at least two weeks before starting the unit.

(School Letterhead)

Date

Dear Parents and Guardians

On (day and date) our class will be starting work on an exciting unit on fish and freshwater ecology. We will be doing some activities that I think may be of interest to you, and I hope that you can join us for some of them. This letter is a "heads-up" note. More details will follow as the dates approach.

The highlight of the unit will be a fishing expedition to (location of fishing event). This is part of the Fishing in the City Program, sponsored by the California Department of Fish and Wildlife. They will arrange to have the lake stocked with trout and/or catfish for our students to try to catch, and fishing gear will be provided! Volunteers from (name of service club) will not only help us on that day, but they will also be visiting our class on (day and date of Fishing 101 workshop) to teach our class some of the basics of fishing – Fishing 101. They will even give each child a box of fishing tackle to keep! (The fishing is restricted to the children only, but you are welcome to accompany your son or daughter.)

We will, of course, need transportation for that fishing event. Prior to the trip, we will be cooking some fish at school. The tentative date for our fish fry is (day and date). We will need some parents to help with that. Do you have an electric frying pan that you might be able to lend? Might you be available to help with the cooking, serving, and cleanup? Do you have any contacts that might be able to donate fish or other cooking ingredients? We plan to have "veggie burgers" available for students that don't eat fish.

Here is a summary of ways that you may be able to help. Dates are tentative at this time.

(day and date)
Fish Fry at school. We need electric frying pans, cooking and eating utensils, fish, veggie burgers, cooking ingredients, and cooks!

(day and date)
Fishing 101 lesson at school. You are welcome to join us at (time). Please let me know if you are coming, though, and be sure to check in at the office.

(day and date)
Fishing trip to (lake). We'll be leaving school at (time), returning at (time). We need help with transportation. You are, of course, welcome to join your child during the day as he or she fishes. More details will be sent home as the dates approach.

I hope that you will be able to join us for at least one of these exciting events. Save the dates! Please contact me if you have any questions or would like to help. Also, if, for any reason, we should not take your child's picture for possible use in publicizing the program, please let us know by sending a note.

Sincerely,

II. GLOSSARY

Angler: a person who tries to catch fish with a hook and line

Appreciate/appreciation: to value or be thankful for something

Aquatic: having to do with water

Bacteria: a type of microscopic one-celled organism

Biome: a part of the world with a certain climate where certain types of plants and animals live

Camouflage: a color pattern that makes it difficult for an animal to be seen

Carnivore: an organism that mostly eats animals for food

Catch-and-Release: the act of catching fish and then letting them go

Caudal Fin (Tail Fin): the fin found at the back end of a fish; in most fish, the caudal fin is the main organ for propulsion through the water

Clean: to prepare a fish for eating by removing inedible parts such as internal organs, skin, and scales

Coloration: a color pattern

Decomposer: an organism such as a bacterium or fungus that obtains nutrients by breaking down dead plants and animals

Drainage Basin: the land drained by a river system; a watershed

Environment: the place where a living thing lives, including both the living and non-living parts

Erosion: the wearing away of something, especially of land or soil by wind or water

Fin: a thin, membranous organ of a fish, usually used in swimming

Fish Story: an exaggerated story, often about a fish caught or "the one that got away"

Freshwater: of or living in water that is not salty

Gaia (Gaea): the Earth, or the Earth personified as a goddess; Mother Earth

Gill: an organ for breathing in the water (obtaining oxygen from the water). In fish, the gills are bone arches covered with thin-walled blood vessels and covered by a gill cover

Gill Cover: a bony plate covering and protecting a fish's gills

Gravel : a mixture of small rocks coarser/larger than sand

Habitat: the place where something lives

Herbivore: an animal that primarily eats plants for food

Limit: in fishing, the number of fish that one may legally catch in a given period of time such as a day

Omnivore: an organism that eats both plants and animals for food

Oxygen: an element that is essential for life. Fish obtain the oxygen that they need by using their gills to obtain oxygen that is dissolved in the water.

Pollution: harmful material in an environment; usually refers to harmful material added to the environment by human activities

Regulation: something that controls something else, or the act of controlling something; a law or rule

Restore/Restoration: to return something to its previous or natural state

Ridge: a long narrow elevated region of land. Ridges separate watersheds.

Riparian: refers to a stream bank; the land area, including plants, along the edge of a lake or stream

Sand: small particles of rock; larger than clay but smaller than gravel

Scale: noun: thin, flat plates forming the protective outer covering of a fish's skin; verb: to scrape the scales from a fish's skin in preparation for cooking it

Scavenger: an animal that feeds on animals that are already dead

Sediment/Sedimentation: organic and inorganic matter that settles to the bottom of a body of water; the process of such settling

Silt/Siltation: small particles of rock (sand and clays) deposited by water; the process of such settling (silt is primarily rock particles (inorganic material); sediments may include organic materials)

Tail Fin: see Caudal Fin

Temperature: a measure of the amount of heat/heat energy in something

Watershed: see Drainage Basin

III. STANDARDS

The following California State Content Standards can at least partially be taught through the activities in this unit of study. While *Learning to Fish, Fishing to Learn* is primarily a third grade unit, some Next Generation Science Standards for grades two and four are included.

Next Generation Science Standards:

Grade Two:

- 2-LS4-1: Make observations of plants and animals to compare the diversity of life in different habitats.
- 2-ESS1-1: Use information from several sources to provide evidence that Earth events can occur quickly or slowly.
- 2-ESS2-1: Compare multiple solutions designed to slow or prevent wind or water from changing the shape of the land.
- 2-ESS2-2: Develop a model to represent the shapes and kinds of land and bodies of water in an area.

Grades Kindergarten to Two:

- K-2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Grade Three:

- 3-LS4-3: Construct an argument with evidence that in a particular habitat some organisms can survive well some survive less well and some cannot survive at all.
- 3-LS4-4: Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

Grade Four:

- 4-LS1-1: Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
- 4-ESS2-2: Analyze and interpret data from maps to describe patterns in Earth's features.

Grades Three to Five:

- 3-5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

Common Core Standards in English/Language Arts:

Reading Standards for Informational Text:

- 3-RI1: Ask and answer questions to demonstrate understanding of a text…
- 3-RI2: Determine the main idea of a text; recount the key details…
- 3-RI4: Determine the meaning of general academic and domain-specific words…
- 3-RI7: Use information gained from illustrations…and the words…to demonstrate understanding…
- 3-RI10: …read and comprehend informational texts…

Writing:

- 3-W3: Write narratives to develop real or imagined experiences or events using effective technique…
- 3-W4: …produce writing in which the development and organization are appropriate to task and purpose.
- 3-W5: …develop and strengthen writing as needed by planning, revising, and editing…
- 3-W6: …use technology to produce and publish writing…

Speaking and Listening:

- 3-SL1: Engage effectively in…discussions with diverse partners…building on others' ideas and expressing their own clearly.
- 3-SL 2 Determine the main ideas…of information presented in diverse formats, including… orally.
- 3-SL3: Ask and answer questions about information from a speaker…

Common Core Standards in Mathematics:

- 3.MD 2: Measure…volumes and masses…using standard units…

IV. EDUCATION AND THE ENVIRONMENT INITIATIVE

In 2003, the California legislature passed the Education and the Environment Initiative (EEI). The EEI resulted in the development of Environmental Principles and Concepts (EP&C) that are important for people to understand if they are to be environmentally literate. Along with the EP&C, 85 units of study were developed in the areas of science and history/social studies. These units support the teaching of existing content standards from an environmental perspective and include teaching of the EP&C. The third grade EEI units with which *Something's Fishy!* align are indicated in the lessons.

To find out more about the EEI, or to obtain DVDs of the units, go to: www.calepa.ca.gov/education/eei (To obtain DVDs, go to the contact section and then get in touch with the contact for your area.)

The EEI units of study, including printable maps, can be downloaded at: wwwl.calepa.ca.gov/education/eei/curriculum

Environmental Principles & Concepts

In 2004, the State of California adopted the following Principles to help guide environmental education in California. Each Principle has several "Concepts" that were also developed, but in the interest of space, the concepts are not listed here.

Principle I: ***People depend on natural systems.***
The continuation and health of individual human lives and of human communities and societies depend on the

health of the natural systems that provide essential goods and ecosystem services.

Principle II: ***People influence natural systems.***
The long-term functioning and health of terrestrial, freshwater, coastal and marine ecosystems are influenced by their relationships with human societies.

Principle III: ***Natural systems change in ways that people benefit from and can influence.***
Natural systems proceed through cycles that humans depend on, benefit from, and can alter.

Principle IV: ***There are no permanent or impermeable boundaries that prevent matter from flowing between systems.***
The exchange of matter between natural systems and human societies affects the long-term functioning of both.

Principle V: ***Decisions affecting resources and natural systems are complex and involve many factors.***
Decisions affecting resources and natural systems are based on a wide range of considerations and decision-making processes.

The following third grade EEI units correlate well with the Community Fishing in the City program.

California's Economy – Natural Choices

The Geography of Where We Live

Living Things in Changing Environments

Structures for Survival in a Healthy Ecosystem

V. FISHING IN THE CITY DOCUMENTS

See the following pages.

STATE OF CALIFORNIA - Natural Resources Agency Edmund G. Brown, Jr., Governor
DEPARTMENT OF FISH AND WILDLIFE
7329 Silverado Trail
Napa, CA 94558
(707) 944-5500

PARAMETERS FOR PARTNERS

San Francisco Bay Area Fishing in the City

School-based fishing and watershed education programs

These parameters outline the roles partners play in development of a school-based watershed education and fishing program.

Premise

Fishing in the City is a community-based approach to creating repeatable fishing opportunities for youth and their families. Fishing events are offered as a part of a larger class exploration and study of the local watershed. Fishing is used as a hook to help students understand the importance of environmental stewardship.

Objectives

- Provide a positive recreational and learning experience for youth and their families.
- Create a link between watershed study and formal education programs.
- Assist youth in learning about their local watershed and how human activities affect the quality of water in local streams, lakes and the bay.
- Provide students with the skills and tools to continue fishing on their own.
- Serve as a catalyst for youth to interact with inter-generational role models.
- Fulfill the goals and objectives of each partner.

PARTNER RESPONSIBILITIES

Participating School

- Assign an Event Coordinator to work with other partners.
- Secure commitment from all teachers in selected grade level for the program.
- Develop and implement watershed study/fish ecology lessons prior to and following the fishing event.
- Provide classroom time for the "Fishing 101" led by service club members.
- Sign waiver for publicity release for students.
- Provide "Hold Harmless" insurance to sponsors and facility.
- Work with service club to insure transportation of students to the fishing site.
- Provide first aid materials and services during the fishing event.
- Complete and submit information form on school's participation.
- Display a banner at the event.
- Participate in an evaluation of the program.

Service club

- Assign an Event Coordinator to work with other partners.
- Provide volunteer mentors to teach "Fishing 101" in the classroom.

- Recruit volunteers to assist students at the lake (1:3 adult/student ratio).
- Secure rods and reels for the event and rod loaner program.
- Cover costs of tackle; tackle boxes, bait, volunteer refreshments (morning snack and lunch) and other incidentals.
- Check all fishing rods following the event.
- Display a banner to identify their organization.
- Provide lunch for the school children.
- Provide transportation for students from the school to the fishing site.
- Complete and submit information form on club's participation.
- Participate in an evaluation process for the program.

Lake Managers

- Prepare the site for events.
- Provide first aid equipment and qualified staff.
- Provide staff for event.
- Waive fees for the event.
- Complete and submit information form on agencies participation.
- Coordinate all onsite activities.
- Participate in an evaluation process for the program.

The Department of Fish and Wildlife

- Recruit and coordinate service club, school and municipality.
- Provide expertise in development of the fishing program.
- Provide training to service clubs in "Fishing 101"
- Facilitate meetings, as needed.
- Provide biological expertise at the lake, as needed.
- Help secure fish for the event.
- Provide "Kids Book of Fishing" and other publications or displays.
- Assist the teachers in development of watershed study program, as needed.

Other event partners

- Provide fully contained displays.
- Provide banner for display.
- Complete and submit information form on club's participation.

Other partners can include local science and nature centers, tackle retailers, water districts, storm water pollution prevention programs, fishing clubs or anyone else with an interest in kids, fishing and clean water.

If you have questions or would like more information on creating a Fishing in the City program in your community, please contact Ethan Rotman, Fishing in the City Coordinator for the San Francisco Bay Area at (415) 892-0460 .

VI. RESOURCES AND REFERENCES

California Department of Fish and Wildlife. *Freshwater & Ocean Fishing Regulations.* Sacramento, CA. California Department of Fish and Wildlife, revised annually.

California Department of Fish and Wildlife. *Freshwater Sport Fishing Regulations*. Sacramento, CA. California Department of Fish and Wildlife, revised annually.

California Environmental Protection Agency. Education and the Environment Initiative unit titled *The Geography of Where We Live*. Sacramento, CA: California Environmental Protection Agency, 2010.

California Environmental Protection Agency. Education and the Environment Initiative unit titled *Living Things in a Changing Environment.* Sacramento, CA: California Environmental Protection Agency, 2010.

Council for Environmental Education. *Project WILD Aquatic K-12 Curriculum and Activity Guide*. Houston, TX: Council for Environmental Education, 2013.

Council for Environmental Education. *Project WILD K-12 Curriculum and Activity Guide*. Houston, TX: Council for Environmental Education, 2006.

F.I.S.H. - Fishing Is Simple Handbook. Ponca City, OK.: Future Fisherman Foundation, 2008.

Fishing in the City/California Department of Fish and Wildlife. *After the Catch...* . Sacramento, CA. California Department of Fish and Wildlife, undated.

Khosia, Maya. *Web of Water: Life in Redwood Creek*. San Francisco, CA: Golden Gate National Parks Association, 1997.

Minnesota Department of Natural Resources. *Fishing: Get in the Habitat! – MinnAqua Leader's Guide.* St. Paul, MN.: Minnesota Department of Natural Resources, 2007.

Project WET Foundation: *Project WET Curriculum and Activity Guide 2.0*. Bozeman, MT.: Project WET Foundation, 2011.

Roa, Michael. *A Guide to the Side of the Sea.* Sacramento, CA.: California Department of Parks and Recreation, 2005.

Roa, Michael. *Redwood Ed*. Sacramento, CA.: California Department of Parks and Recreation, 2007.

Roa, Michael. *The Conifer Connection.* Sacramento, CA.: California Department of Parks and Recreation, 2011.

Schmidt, Bob. *Sport Fishing and Aquatic Resources Handbook*. Dubuque, IA: Kendall/Hunt Publishing Company, 1991.