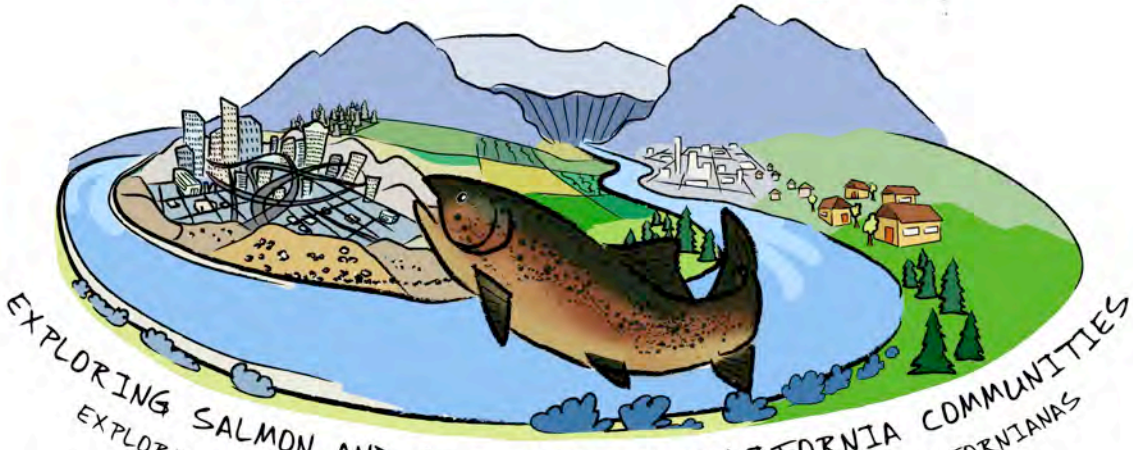
AguaPura



A Multi-Disciplinary Instructional Unit
for Non-Formal Educational Settings
and 6th Grade Classrooms

Developed collaboratively by

Adopt-A-Watershed

and

UC Cooperative Extension 4-H Youth Development Program

University of California
Agriculture and Natural Resources
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Exploring Salmon and Steelhead in California Communities

Explorando Salmón y Trucha del Mar en Comunidades Californianas

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This curriculum was developed collaboratively by Adopt-A-Watershed and University of California Cooperative Extension 4-H Youth Development Program.

Foreword

Salmon and steelhead were once abundant throughout many of California's rivers and streams. Today, though their numbers are reduced, they are still a vital part of our state's ecosystems and are an important indicator of water quality and watershed health.

Through the activities in this unit, participants will explore relationships between the people and the salmon and steelhead that live, or once lived, within their community's watershed.

Funding for this unit was provided by the California State Department of Fish and Game; Resource Recovery Extension Act; Santa Barbara County Water Agency; California Coastal Commission Whale's Tail Grant; University of California, Davis Department of Human and Community Development; and California Communities Program Graduate Intern Grant.

About Adopt-A-Watershed

Though no longer in existence, Adopt-A-Watershed was an organizational and educational force on behalf of watershed sustainability for 15 years. These were the guiding principles of the organization:

> ***Our vision*** *is for education to serve as the cornerstone of a sustainable community, in which all citizens live their lives consciously choosing actions that ensure a healthy quality of life for current and future generations. Adopt-A-Watershed's place-based learning programs promote this vision by engaging students in meaningful activities that lead to an understanding of sustainability*

and how their choices and actions impact the community and the overall environment.

Our mission *is to empower communities to care for their watersheds and enhance student learning by providing local leadership development, educational tools, and access to a national network of resources.*

Who We Are
Adopt-A-Watershed is a non-profit organization that promotes educational enhancement, environmental stewardship, and community development through Place-Based Learning. We work with schools, youth education programs, community groups, and environmental organizations, guiding them through The 5-Steps to Leadership in Place-Based Learning (The 5-Step). The 5-Step develops leadership skills and strengthens organizational capacity to envision, create, and successfully implement high quality Place-Based Learning. The 5-Step is a proven model for educational, environmental, and community transformation.

Place-Based Learning and Watersheds
Place-Based Learning is simply using our place, where we live, as the context for learning. Participants learn through a process of exploration, action, and reflection. Place-Based Learning engages students and other participants in critical thinking and meaningful projects that enhance their understanding of the place where they live. It provides a framework that integrates the exploration of the socio-cultural aspects and the environmental qualities of the watershed and encourages action that benefits both people and the environment. Place-Based Learning programs provide opportunities for participants to engage in:

- *Integrated learning in the context and direct experience of place*
- *Community investigations and service learning projects*
- *Community education*
- *Reflection and assessment*

Why Watersheds? *Watersheds are containers for place. We all live in a watershed, from the urban inner-city to the most remote mountain town. The watershed is simply a way to geographically define one's place. Through exploration in our watershed we learn about the natural processes—such as fire, weather, or erosion—as well as human systems—such as urban development agriculture, or recreation—within our place.*

About UC Cooperative Extension (UCCE) 4-H Youth Development Program

The University of California, Davis, is first and foremost an institution of learning and teaching, committed to serving the needs of society. Our campus community reflects society in that it comprises all races, creeds, and social circumstances. The University has a strong research mission that provides services and resources to numerous and varied creative endeavors; this

includes enhancing partnerships and collaborations with government, industry, and international decision makers.

The California 4-H Youth Development Program is an integral part of the University of California. California 4-H programs engage tens of thousands of youth, ages 5-19, in hands-on learning activities and projects. Nationally, 4-H Youth Development projects are conducted in 3,051 counties and involve more than 6,750,000 youth. The educational research and development capacity of the University of California combines with the dissemination potential of 4-H to reach school-age children and youth.

The California 4-H Youth Development Program is part of the University of California Cooperative Extension (UCCE), the UC Division of Agriculture and Natural Resources' outreach arm, and has farm, 4-H, marine and nutrition, family and consumer sciences advisors based in more than 50 county offices. In addition, Cooperative Extension specialists are headquartered at UC Berkeley, UC Davis, and UC Riverside, where they conduct research and serve as resources for county-based advisors. As a land-grant institution, the Cooperative Extension mandate is tied to the welfare, development, and protection of California agriculture, natural resources, and people.

The 4-H mission is to "engage youth in reaching their fullest potential while advancing the field of youth development."

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- **Cheri Sanville, M.A.**, Botanist for Green Diamond Resource Company

- **Jan Duncan-Vaughn**, *Salmon in the Classroom* Coordinator

- **Kevin Cunliffe**, Planning Specialist with the Natural Resources Services Division of Redwood Community Action Agency

- **Rhonda Wiedenbeck**, North Coast Small Business Resource Center

- **Chris Ramsey**, Fish and Wildlife Interpreter for California Department of Fish and Game

- **John Sutter**, Teacher, Orick School

- **Margaret Trejo and Magdalena Rodriguez**, Resident Services, Housing Authority, City of Santa Barbara

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User's Guide

Agua Pura: Exploring Salmon and Steelhead in California Communities is a curriculum designed to enhance participants' understanding of salmon and steelhead and of the critical relationship these fish have to healthy watersheds. Through a variety of "hands-on" and "heads-on" learning activities, participants are encouraged to explore their surroundings and the connections between salmon and steelhead and the people in their community.

This online curriculum consists of thirteen activities that guide the user through an in-depth exploration of the relationship between salmon/steelhead and people and the watersheds that we share. It is place-based and *open-access,* meaning that you are free either to use the curriculum as a whole or to select individual activities for your group. The curriculum includes sample letters and worksheets in both English and Spanish. You can use it as a resource for a weekend project or as a guide for a half- to full-year's study. We estimate that it would take a minimum of thirty contact hours to complete the entire curriculum, but we invite you to adapt this material to your own needs, setting, and available time.

The curriculum was designed for 6th grade youth in classroom settings as well as in after-school programs or other non-formal venues. It can be adapted easily for a wider age range or audience. Classroom teachers please note: The curriculum is aligned with California Content Standards for 6th grade and the Sixth Grade California Science Learning Objectives in the Context of California's Environmental Principles and Concepts. Educators in non-formal setting are not expected to follow these standards or principle and concepts unless they so choose.

The curriculum has three goals of equal importance:

First, to help youth understand their relationship to their watershed and to salmon: to learn their ecological address; to explore how water, salmon, land, and people interact; and to understand how they, as residents of their watershed, affect those salmon-water-land interactions and the quality of the water around them.

Second, to develop scientific inquiry skills and critical thinking skills in participating youth. Every activity in this curriculum poses a question or presents a phenomenon to be explored. As they investigate salmon/steelhead and their watershed, participating youth practice the same basic scientific processes and critical thinking skills that scientists use.

Third, to encourage participants' active, intelligent, and caring participation in our communities' quest to care for our Earth and its natural resources. Mere understanding is not a sufficient outcome. Community service is an integral part of the curriculum because a commitment to act is an essential element of stewardship for our Earth. The skills and knowledge acquired by participating youth can empower them to act in a thoughtful manner while they continue to question and explore.

1. Get Ready to Think Like a Scientist!

Good news! You don't have to be a rocket scientist, or even a science teacher, to lead these activities. All you need is your own inquiring mind and the unshakable belief that science is, or should be, fun!

Underlying all of the activities are the basic concepts and processes scientists use every day. As a leader, you'll be introducing and practicing these with your group:

a) Observing:

Using all the senses (sight, smell, taste, touch, and hearing) to gain information.

b) Communicating:

Recording your discoveries, sharing them with others, and listening to others who may have observed things that you missed or have observed or expressed or differently. Communication, whether oral, written, or graphic, increases everyone's awareness and gives a fuller picture of the object or phenomenon.

c) Comparing:

Observing two or more things side-by-side to find similarities and differences. Some comparisons may be sensory, such as comparing how different things feel, sound, smell, taste, look, behave, or react. Measurement is another way to compare things: in this case, you are comparing something to a set of standardized units. You may weigh something (that is, compare it to an ounce or a pound); measure its length (compare its length to inches or centimeters); or measure its holding capacity (compare it to the scale on a measuring cup).

d) Organizing:

Grouping or classifying the things you are studying into categories (for example, leaves vs. twigs, red vs. green vs. blue). Another approach to organization is to order or sequence the items (for example, rank the rocks from hardest to softest, twigs from longest to shortest).

e) Relating:

Trying out or checking your ideas in a systematic way. Once you have an idea about how something works (a *hypothesis*), you can experiment to test the hypothesis. For example, in one of the activities you will make a model of a watershed. By changing parts of the model (such as the steepness, rate of rainfall, and presence of rocks or trees) one at a time, you will find how the parts relate to each other and to the whole watershed.

f) Inferring:

Based upon your findings in the above processes, you can begin to recognize and predict general patterns and relationships, thus forming a more comprehensive theory.

g) Applying:

Using your knowledge to solve problems. In **Agua Pura,** participants begin early to plan a community service project in which they will be able to apply the science they are learning to a community need they have identified.

The activities in the **Agua Pura** curriculum are designed to pose a question and provide a systematic exploration of it, using the thinking processes of the scientific method. Since there are no "right" results anticipated, there can be no "failure." You'll know your activities s are successful when participants come up with their own questions and together you start finding ways to answer them!

You can find additional information on experiential learning at the University of California's Science Technology and Environment Learning (STEL) Experiential Learning Web site (http://experientiallearning.ucdavis.edu).

2. Preparing Yourself for an Activity

You should plan on reading carefully through each activity before you begin. It would be a great idea to practice with a friend before you meet with a group of youth. The activities can be used separately, but if you do them all you will give participants a more powerful experience of the importance of watersheds. The activities have been designed so that later activities build on knowledge gained in earlier ones.

Keep in mind that it is important that you create an inclusive environment for all participants. All of you will be acting as co-investigators, and guides. You can remind participants that they are all scientists.

Each activity begins with a page of background information for the leader, which is intended as a quick reference for you. This page includes:
Overview: A summary of the intent of the activity.
Background Information: Information for you to share with the participants. You may read or summarize this information as you begin the activity
Objectives: An outline of the learning objectives for participants.
Time: The amount of time you should allow for the activity.
Materials You Will Need for the Entire Session: A list of all the materials you will need for every activity. You may want to copy this and use it as a checklist.
Worksheets: Each activity includes worksheets, which are given in both English and Spanish.

Resources: Web links to relevant resources are provided for many of the activities. These resources include relevant Web sites, online stories, and audio and video clips.
Advance Preparation: Suggestions on what you will need to do to prepare for the activity.
Setting the Stage: Guidance on setting the scene for the activity.
Conducting the Activity: An outline of the suggested format for the activity.
Wrap-Up: Exercises that allow you to see what your group remembers from completed activities and help the youth recall important observations and discoveries that may be useful to them in activities that follow.

3. Community Service Projects

The Community Service Projects portion of **Agua Pura: Exploring Salmon and Steelhead in California Communities** is important. Knowledge and good intentions alone are not sufficient to ensure good stewardship of the earth: Action is a necessary component of stewardship! As youth group leaders, you can help youth learn the group skills needed to work together to identify and carry out a community service project. By looking at our land as a watershed system, **Agua Pura** aims to help us all understand that our actions affect not only ourselves but also our community and our Earth.

Agua Pura provides a wealth of possible avenues for community service projects. For example, based on your community, you could design an:

A. **Education Project:** This would increase watershed awareness in the community and perhaps highlight a problem and some possible solutions. This could be done by designing, distributing, or showcasing:
   - posters outlining some of the results of your experimentation;
   - models of your watershed;
   - working demonstrations of some of your exploratory materials (for example, the water quality test results from your watershed, or leaf pack samples);
   - flyers showing common causes of water quality problems and suggested solutions;
   - flyers on alternatives to harsh chemical cleaning products.

Let your group's imagination fly!

B. **Restoration Project:** You might pick an actual trouble spot and work as a team to find and carry out a solution. This type of project would need careful coordination with an organization that has expertise in field restoration projects, but would be very satisfying.

   Many private organizations and government agencies are involved in restoration and data-gathering projects. It would be worthwhile to contact several organizations and agencies to see if there might be a project in which your group could participate. Youth groups have provided invaluable assistance in:
   - tree-planting projects (both for habitat and streamside bank stabilization);

- stream monitoring (data collection);
- seed collection for restoration work;
- preparing or distributing flyers on household hazardous waste pick-up days;
- stenciling storm drains to alert people to the fact that things dumped in the gutter end up in the creeks and groundwater.

There are many other possible projects besides these. Possible groups to contact:

Local chapter of the Native Plant Society
Local chapter of Trout Unlimited
The Salmonid Restoration Federation
California Fish and Game
U.S. Fish and Wildlife Service
U.S. Forest Service
U.S. Park Service
City and County Water Agencies
Local chapter of the Sierra Club
Regional Water Quality Control Boards
Local parks department
Audubon Society
Natural history museums

Feedback

Your feedback and suggestions on this curriculum are appreciated. Do you have additional resources that you think we should include? An activity that you would like to share? A story, audio or video clip, or photos you are willing to share? Please email the author at ammarzolla@ucdavis.edu.

Enjoy your explorations!

Overview

Many Californians are surprised to learn that salmon and steelhead may be living right in their neighborhood creek. In fact, five species of Pacific salmon as well as steelhead populations are native to California, were once abundant here, and were a significant part of the indigenous cultures. And while dams, fishing, development, pollution, and erosion have taken a toll, small populations can still be found today in coastal rivers and creeks up and down the state.

Pacific salmon and steelhead trout have unusual life cycles that take them from fresh water to the ocean, and then back again. The distances they travel and their return to the exact place where they started as eggs are truly amazing. Since salmon and steelhead use all portions of a river system – from small creek to river to estuary to ocean – and because they require cool, clean water to survive, their presence or absence is an indication of water quality and watershed health. For this reason, protecting and restoring salmon and steelhead habitat also means safer and more vital watersheds for people.

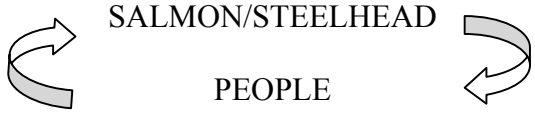
This unit is designed to enhance participants' understanding of salmon and steelhead, and the critical relationship these fish have to healthy watersheds. Through a variety of "hands-on" and "heads-on" learning activities, participants are encouraged to explore their surroundings and the connections between salmon and steelhead and the people in their community.

Using real-life investigation and problem solving skills, participants will:

- Investigate the natural history of their local salmon or steelhead population
- Find out how human activities have impacted the salmon and steelhead populations in local rivers and streams.
- Work with other community members to enhance salmon and steelhead habitat within the community.

Guiding Question
All through the unit, participants explore the guiding question:

How do people affect salmon and steelhead, and how do salmon and steelhead affect people?



This guiding question helps to focus participants' study and activities throughout the unit. Participants continually come back to this question as they acquire more knowledge about their community, salmon and steelhead, creek monitoring, and habitat restoration.

Unit activities support participants in exploring this question through investigations that help them find out:

- What are the needs of salmon and steelhead?
- What can we learn from the salmon and steelhead in our community's watershed?
- What value do people in our community place on salmon and steelhead and how has that changed over time?
- In what ways have salmon and steelhead populations changed in our watershed over time, and what are possible causes of those changes?
- How well does our watershed support salmon and steelhead, and what factors influence that?
- How do our everyday actions affect the salmon and steelhead in our watershed?
- In what ways do the salmon and steelhead in our watershed impact us?
- What can we do to improve or maintain the salmon and steelhead populations in our watershed?

Grade Level/Audience
The curriculum has been designed for 6th grade youth in classroom settings, after-school programs, and other venues. It can be adjusted easily for a wider age range or audience.

Use by Youth Groups

The activities in this package have been designed to fit comfortably into a wide variety of after-school and in-school educational programs and camps offered by youth-service agencies. Below are specific suggestions concerning how they might be used within particular organizations:

4-H Youth Development Program

This project material has been developed in consultation with the 4-H Youth Development Program staff and fits well into the 4-H project areas, Marine Biology and/or Oceanography, Environmental Stewardship and Citizenship and/or Community Pride. The materials can also be effectively used with the 4-H SERIES Recycle/Reuse Project materials. 4-H participants are encouraged to use Plastic in the Oceans as a basis for fair exhibits, demonstration talks, National 4-H Week activities, and other public events.

Boys and Girls Clubs of America

These learning activities may be used as a guide for club activities in environmental education, one of the six core services provided by the Boys and Girls Clubs programs. The activities may also complement individual clubs' existing programs in recycling, litter education, or marine science.

Girl Scouts

Within the Junior Girl Scout Program, these learning activities can be used for:

- Working toward badges in World of Today and Tomorrow (Science in Action; Water Wonders) or in World of the Out-of-Doors (Eco-Action; Outdoor Surroundings).
- Participating in the Contemporary Issues Program "Earth Matters," and earning the participation patch.
- Participating in environmental badge activities at Girl Scout summer day camp or long-term camp.
- Developing activities, under the Council Patch Program Plan, that involve community improvement projects and investigative and hands-on environmental awareness activities for a troop or council-wide event.

Camp Fire

These activities complement several projects in the Camp Fire Adventure, Discovery, and Horizon programs, including:

- Try-Ad projects and Action Crafts
- Torch Bearer projects in Environmental Issues or Special Interest
- Components for the national Project Good Earth
- As one of the three issues explored in an individual's WoHeLo Medallion project. The Curriculum can also be used in resident and day camp programs located near beaches, lakes, and rivers.

Unit Concepts
Through the unit activities, students will explore the following concepts.

1. Humans, and salmon and steelhead are part of the watershed and are supported by it.
    a. A watershed is the land area that collects and channels water to a body of water like a river or stream.
    b. Salmon and steelhead have specific habitat needs at different stages of their life cycle.
    c. Salmon and steelhead spend part of their life cycle in rivers or streams.
    d. Salmon, steelhead, and people require healthy watersheds for their well-being.

2. Human activities throughout the watershed affect the quality of streams.
    a. The characteristics of a river or stream affect its suitability as salmon and steelhead habitat.
    b. Every watershed has a unique history of human activity that has altered the characteristics and habitat suitability of its rivers and streams.
    c. The presence or absence of salmon and steelhead in a coastal river or stream that has historically supported these fish is an indicator of watershed health.
    d. The quality of salmon and steelhead habitat is a measure of watershed health.

3. Salmon, steelhead, and humans are members of a community.
    a. Salmon and steelhead have a key role in a healthy and dynamic watershed.
    b. Human activities affect the health of watersheds and the quality of salmon and steelhead habitat.
    c. People working together can often be more effective in influencing environmental decisions than individuals working alone.
    d. People can choose to exercise judgment, care, and planning in the use and management of watersheds, including minimizing impacts on salmon and steelhead populations.

Californio steelhead anglers by the Ventura River Estuary, 1909. Photo from the Mark H. Capelli Southern California Steelhead Watershed Archive

Standards

The Agua Pura: Exploring Salmon and Steelhead in California Communities unit teaches toward the following California Content Standards for 6th grade.

Subject	Topic	Standard	Unit Activity
Science, Grade 6	Focus on Earth Science	2b. Students know rivers and streams are dynamic systems that erode, transport sediment, change course, and flood their banks in natural and recurring patterns.	5: Salmon and Steelhead Creek Walk 6: Defining Our Watershed 11: Creek Monitoring
		5b. Students know matter is transferred over time from one organism to others in the food web and between organisms and the physical environment.	1: Getting to Know Salmon and Steelhead 2: The Incredible Journey
		5e. Students know the number and types of organisms an ecosystem can support depends on the resources available and on abiotic factors, such as quantities of light and water, a range of temperatures, and soil composition.	9: Salmon and Steelhead Life Stories Web Search 10: Designing for Salmon and Steelhead 12: Salmon and Steelhead Restoration Project
		7b. Students will select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data.	11: Creek Monitoring
		7c. Students will construct appropriate graphs from data and develop qualitative statements about the relationships between variables.	4: Community Survey
		7d. Students will communicate the steps and results from an investigation in written reports and oral presentations.	13: Community Celebration
		7f. Students will read a topographic map and a geologic map for evidence provided on the maps and construct and interpret a simple scale map.	6: Defining Our Watershed 8: Mapping Our Community

Subject	Topic	Standard	Unit Activity
		7h. Students will identify changes in natural phenomena over time without manipulating the phenomena (e.g., a tree limb, a grove of trees, a stream, a hill slope).	11: Creek Monitoring
History-Social Sciences, Historical and Social Sciences Analysis Skills – Grades 6 through 8	Chronological and Spatial Thinking	3. Students use a variety of maps and documents to identify physical and cultural features of neighborhoods, cities, states, and countries	6: Defining Our Watershed 7: Watershed Web Search 8: Mapping Our Community
	Research, Evidence, and Points of View	1. Students frame questions that can be answered by historical study and research.	4: Community Survey (possibly)
English-Language Arts, Grade 6	Reading	2.1 Identify the structural features of popular media (e.g. newspapers, magazines, online information) and use the features to obtain information.	7: Watershed Web Search 9: Salmon and Steelhead Life Stories Web Search
		2.3 Clarify an understanding of texts by creating outlines, logical notes, summaries, or reports.	7: Watershed Web Search 9: Salmon and Steelhead Life Stories Web Search
		3.2 Analyze the effect of qualities of the character on the plot and the resolution of the conflict.	9: Salmon and Steelhead Life Stories Web Search
		3.3 Analyze the influence of setting on the problem and its resolution.	9: Salmon and Steelhead Life Stories Web Search
		3.7 Explain the effects of common literary devices (e.g. symbolism, imagery, metaphor) in a variety of fictional and nonfictional texts.	9: Salmon and Steelhead Life Stories Web Search
	Writing	1.2.a Develop the topic with … precise verbs, nouns, and adjectives to paint a visual picture in the mind of the reader.	12: Creek Monitoring

Subject	Topic	Standard	Unit Activity
		1.4 Use organizational features of electronic text (e.g. bulletin boards, databases, keyword searches, e-mail addresses) to locate information.	7: Watershed Web Search 9: Salmon and Steelhead Life Stories (Web Search)
		2.1 Write narratives.	9: Salmon and Steelhead Life Stories (Web Search)
		2.3 Write research reports.	7: Watershed Web Search
	Speaking Applications	2.2 Deliver informative presentations.	13: Community Celebration
		2.5 Deliver presentations on problems and solutions.	12: Planning a Restoration Project
Mathematics, Grade 6	Statistics, Data Analysis, and Probability	1.1 Compute the range, mean, median, and mode of data sets.	4: Community Survey 11: Creek Monitoring
		2.2 Identify different ways of selecting a sample (e.g. convenience sampling, responses to a survey, random sampling) and which method makes a sample more representative for a population.	4: Community Survey

Tips for Managing the Unit

Resource Professionals
Collaboration with community individuals, organizations, and agencies is a cornerstone of the Adopt-A-Watershed and the UCCE 4-H Youth Development programs. For this unit, you will want to set up a partnership with one or more such resource professionals before you begin. Explain that you want to work with them to help increase participant understanding of the connection between watersheds, people, and salmon and steelhead, and that you hope participants will be able to gather helpful data and information for them. We have provided some suggestions in the Resources: Resource Agencies and Organizations section to get you started.

Contact these resource professionals when you need assistance with planning and completing the activities. (See the specific activity for more details.) Activities where you might seek help from a resource professional are listed below.

Activity	Help from Resource Professional
1: Getting to Know Salmon and Steelhead	Bring maps or displays for celebration event
3: Community Art Project	Assist in finding suitable project and venue for display
5: Salmon and Steelhead Creek Walk	Join class on creek walk to point out features
9: Salmon and Steelhead Life Stories Web Search	Talk with participants about specific life cycle and migration patterns of local salmon and steelhead
10: Designing for Salmon and Steelhead	For Enrichment, act as resource in raising salmon or steelhead eggs in the classroom
11: Creek Monitoring	Assist in determining the best time to monitor; join class on field study trip for help with water quality tests and scanning for salmon and/or steelhead; and meet with class after the trip to help analyze results
12: Salmon and Steelhead Restoration Project	Assist in planning and carrying out appropriate project
13: Community Celebration	Listen to participant presentations, receive the class's thanks

Using the Internet
Two activities in this unit involve participants in an internet search. Both activities provide a list of Web sites from which participants will gather all necessary information. As you know, you will also want to have a discussion with the participants on how to safely use the internet. There are likely firewalls already in place on your facility's computers, which will ensure that the participants are safely using the internet. Most important for this unit is to stress to participants that they will be able to find all the information they need on the Web sites provided with the activities and on the resource pages.

Articulation
This unit can be used alone or as a complement to other Adopt-A-Watershed and 4-H units. If other grades are part of the Adopt-A-Watershed program at your school, become familiar with how this unit fits with the other Adopt-A-Watershed units being used.

Whenever possible, gear current projects to past projects. Find out what participants have done in past years through either the Adopt-A-Watershed or 4-H programs by talking to their previous leaders or teachers.

Identifying a Study Site
If possible, identify a site that is known to support salmon and/or steelhead either currently or historically. Ask a resource professional familiar with salmon and steelhead in your area to help you identify an appropriate site or sites (see Resource Professionals). Be sure to consider safety issues when choosing a site (see Planning Field Study Trips and Water Safety sections).

If a study site has been identified in the past through your organization's Adopt-A-Watershed program, check files to find information, maps, and photos for the site.

Obtain permission for the group to visit the site you select and schedule all field trips well in advance.

Planning Field Study Trips
The following suggestions will help your field study trips run smoothly and safely:

- Get permission to use the site from the landowner or land manager.
- Schedule all field study trips well in advance.
- Visit the field study site – even if it's the schoolyard or neighborhood – before you take participants there.
- Note any potential hazards (broken glass, steep slopes, poisonous plants, traffic, etc.). Plan to avoid any hazards, or mark them with flagging and draw participants' attention to them. Also see the *Water Safety* section following.
- Make plans to accommodate participants with special needs, including those with physical disabilities. Assign helpers to assist these participants with tasks such as signing, translating, carrying, pushing a wheelchair, etc. Be sure the tasks are clearly defined.
- Locate nearby restrooms for the field study trips.
- After you set the date for the field study trip, arrange transportation, chaperones, permission slips, and lunches.
- If possible, arrange for a salmon and steelhead resource professional to accompany you on the field trip and to help answer participant questions or point out interesting features.
- Set behavior expectations with very clear rules, rewards, and consequences for the field study day. Emphasize the importance of safety and following directions.

- Inform participants and chaperones of appropriate clothing for the study trip. They should wear sturdy shoes and socks, (not sandals or flip-flops), long pants (not shorts), and long-sleeve shirts, especially if poison oak or ticks are a possibility. They should also wear jackets or hats, depending on the weather. They should bring drinking water and a daypack.
- Bring along a first aid kit, water, hand-wipes (so participants can clean their hands before lunch), and extra warm coats (in cooler weather), or hats and sunscreen (in warmer weather).

Water Safety

Working next to a creek full of water presents special safety issues that you should consider before heading out with a group of participants.

- Check with your administration about any special rules or precautions for participants on a creek-side field trip.
- Work with your salmon and steelhead resource professional (see *Resource Professionals*) to find a study site that is safe for participants.
- In late spring, summer, or early fall the creeks in California will likely have quite low flows, allowing participants to wade in to check gravel, collect water samples, etc. Whenever possible, schedule field trips away from the rainy season, when flows may be flashy.
- Decide with your resource professional whether it would be safe (and appropriate) for participants to wade into the water. If so, make sure that participants know never to go deeper than their knees. At that depth, if they fall they can always use their arms to keep their head above water. If it is not safe to enter the water, make sure participants know that.
- Require participants to stay with their team members, and make sure that they know to report to an adult if something unsafe happens to a team member. If possible, find out which participants can swim and which cannot.
- Make it a rule that participants must stay in line-of-sight of an adult.

Timeline

The time you will need for these activities will depend a great deal on how deeply you and your participants want to explore. Times are based on group sessions of approximately one hour. The entire unit will take at least 30 contact hours with participants.

Activity	Suggested Time
Part 1: Celebrating Salmon	
1: Getting to Know Salmon and Steelhead	One group session or more, depending on the celebration planned
2: The Incredible Journey	One group session
3: Community Art Project	One group session, plus time to complete project
Part 2: People, and Salmon and Steelhead in Our Community	

4: Community Survey	Two to three group sessions, plus time to complete surveys
5: Salmon and Steelhead Creek Walk	Two group sessions, plus time for creek walk
6: Defining Our Watershed	Three group sessions
7: Watershed Web Search	Two to four group sessions
8: Mapping Our Community	Two or more group sessions, depending on map created
Part 3: Salmon and Steelhead Life Cycle and Habitat	
9: Salmon and Steelhead Life Stories Web Search	Four to five group sessions
10: Designing for Salmon and Steelhead	One group session
Part 4: Habitat Monitoring and Restoration	
11: Creek Monitoring	Three group sessions, plus additional time for on-going monitoring
12: Salmon and Steelhead Restoration Project	One group session, plus time for conducting project and reflecting on project
Part 5: Conclusion	
13: Community Celebration	Two to four group sessions, plus time for preparing presentations

Participant Teams
Many of the activities in the unit suggest that participants work in teams of 4 or 5. For consistency and to aide in assessment of team work, set teams at the beginning of the unit and have participants stay in their teams throughout the unit.

Unit Assessment
Learning may be assessed in several ways:

- Team Portfolios

Throughout the unit, teams keep a portfolio of their work, enabling the educator and participants to assess their learning. At the conclusion of the unit, teams select from their portfolios four or five works that illustrate their accomplishments and learning, and that show the breadth and depth of their understanding. These completed portfolios may be displayed at the final celebration in Activity 13: Community Celebration.

- KWLR chart

  Throughout the unit, the group uses a KWLR chart to record participant questions and the new concepts they learn throughout the unit. The chart has four sections in which participants record:

  K – What We Know
  W – What We Wonder

L – What We Have Learned
R – What Resources We Have

This chart also provides a vehicle for participants to revisit the unit's guiding question with deeper and deeper understanding as they progress through the unit activities.

- Rubrics
  A rubric is a scoring guide that articulates the expected outcomes of learning activities. It differentiates different levels of student performance and can help guide student achievement.

  You may use the following Team Work Rubric and the Process Skills Rubric to assess participant work at the end of the unit or at checkpoints along the way. We have also included rubrics within two of the activities – Activity 7: Watershed Web Search and Activity 9: Salmon and Steelhead Life Stories Web Search. If you want to create your own rubric, you might try RubiStar, an online tool for writing rubrics *(http://rubistar.4teachers.org/index.php)*.

Team Work Rubric

	Excellent	Adequate	Unsatisfactory
Leadership	– Team member produced many new ideas. – Team member initiated organization of tasks. – Team member offered focus and direction for project.	– Team member produced some new ideas. – Team member participated in organization of tasks.	– Team member was passive. – Team member produced few new ideas. – Team member tended to do only what others told him or her to do.
Support	– Team member helped other team members when asked. – Team member listened to others' ideas. – Team member checked with others and offered help if needed.	– Team member helped other team members when asked. – Team member listened to others' ideas.	– Team member did not help others. – Team member criticized project or other group members.
Work Habits	– Team member was always prepared to work, met deadlines for tasks, and worked hard. – Team member was willing to make up for work others didn't do and to spend extra time to complete the project.	– Team member was prepared to work, met deadlines for tasks, and usually worked hard.	– Team member did not complete tasks, or otherwise hindered progress.

Adapted from "Peer Collaboration and Teamwork" Rubric Example, in *Project Based Learning Handbook: A Guide to Standards-Focused Project Based Learning for Middle and High School Teachers*. Novato, CA: Buck Institute for Education, 2003.

Process Skills Rubric

	Excellent	Adequate	Unsatisfactory
Applying	– Participant actively sought ways to apply concepts or skills to new situations or problems. – Participant gave several examples for applying a new concept or skill.	– Participant demonstrated ability to apply concepts or skills to new situations or problems.	– Participant did not demonstrate ability to apply concepts or skills to new situations or problems.
Analyzing	– Participant demonstrated a clear understanding of the concepts or skills. – Participant identified relationships between concepts or ideas. – Participant used his or her analysis to teach the concepts or ideas being studied.	– Participant demonstrated a clear understanding of the concepts or skills. – Participant identified relationships between concepts or ideas.	– Participant did not demonstrate an understanding of the concepts or skills. – Participant did not demonstrate ability to identify relationships between concepts or ideas.
Synthesizing	– Participant combined more than one idea, image, or object to form a cohesive whole. – Participant's synthesis was unique.	–Participant combined more than one idea, image, or object to form a cohesive whole.	– Participant did not demonstrate ability to combine more than one idea, image, or object to form a cohesive whole.

Adapted from "Critical Thinking" Rubric Example, in *Project Based Learning Handbook: A Guide to Standards-Focused Project Based Learning for Middle and High School Teachers*. Novato, CA: Buck Institute for Education, 2003.

Materials Needed

Books, articles, and Web sites are referenced in the activities and in the Resources section of the unit.

A comprehensive list of materials needed for the unit can be found in the Materials and Equipment section of the unit. Items are identified as either "supplied by the educator" or "included in the Adopt-A-Watershed unit kit." The kit can be purchased from Adopt-A-Watershed. (See the catalog at the Adopt-A-Watershed Web site.) The kit does not include materials that are easily supplied by the educator, like pencils, paper towels, etc., or items needed for such activities as the art project, restoration project, and community celebration, which are identified at the time of the activity.

Each activity has a list of materials needed for that activity. Items that are included in the kit are noted by an asterisk.

Background Information

Pacific salmon and steelhead trout have existed for at least two million years in the Pacific coastal areas of North America – from Baja California through Alaska. In the past 150 years, many salmon and steelhead populations have declined in abundance and biological diversity in California and in other parts of their range.

The decline of salmon and steelhead is relevant for all Californians living in our state, even if you aren't a fisherman and even if you don't like fish. That's because it can be seen as the proverbial canary in a coalmine – a signal of declining watershed health.

While there are some natural causes contributing to the decline of salmon and steelhead in California, human activities have played a significant role. Municipal water supplies, dams, farming, livestock, logging, and development all contribute to the loss and degradation of aquatic habitats.

The Salmon and Steelhead Life Cycle
The salmon and steelhead life cycle begins and ends when the spawning salmon lay their eggs in cool, clean rivers and streams, covering them with gravel for protection. When they first hatch, the baby salmon and steelhead (called **alevin**) are attached to a yolk sac, which nourishes them for a time. These tiny alevin stay hidden within the gravel of the streambed.

When the yolk sac is used up, the young salmon and steelhead must leave the gravel bed to look for food, which consists of tiny aquatic plants and animals. Called **fry** at this stage, the young salmon and steelhead are striped for camouflage. They are prey to predators like ducks, great blue herons, and larger fish. Some fry stay in fresh water only a few months, while others wait a few years before migrating to the ocean.

When they are ready to migrate, the young salmon and steelhead begin the dangerous trip to the ocean, encountering predators, dams, and other obstacles along the way. For protection, they swim at night and hide during the day.

For several weeks or months, the young salmon and steelhead stay in saltwater estuaries and bays where the river meets the ocean. They undergo a special process called **smolting** (and are called **smolts**), in which their bodies change in many ways to tolerate living in salt water. Salt is very dehydrating, so their bodies must become able to drink the saltwater and get rid of the excess salts through special salt cells in the gills and mouth lining, and through changes in the kidney.

Finally, the salmon and steelhead swim into the vast ocean. Within the ocean, many salmon and steelhead travel with ocean currents in circular routes. Some may wander up to 2,000 miles from their home stream, while others stay closer to home. Eating a rich seafood diet, including herring and anchovies, the salmon and steelhead mature into adult fish. In the ocean, they must avoid predators like tuna, seals, dolphins, whales, and human fishers.
After two to four years, depending on the species, salmon and steelhead are ready to reproduce, or **spawn**. At first, they use ocean currents, stars, and the earth's magnetic forces to find their

way to their home stream. As they get closer, they use their sense of smell to find the exact place where they were hatched. Their journey upstream is difficult; the salmon and steelhead must jump up waterfalls, find their way around dams, and avoid predators.

Once salmon and steelhead reach their spawning grounds, the female digs a nest, or **redd**, by turning on her side and flapping her tail to make a depression. She then deposits a few hundred pink or red eggs into the depression. A male swims next to her and fertilizes the eggs with a stream of liquid called **milt**, which is full of sperm.

The female covers the eggs when she digs the next nest just a foot or so upstream, throwing gravel onto the first nest. This process continues until an average of 3,000 eggs are laid. Pacific salmon die after spawning, usually within two weeks, but steelhead can live to spawn again. The eggs stay in the nest all winter and hatch in the spring, when the cycle will continue as before.

Fish that move from freshwater to saltwater and then back again are called *anadromous* fish. The benefit of an anadromous life style is that salmon and steelhead have access to a better food supply in the ocean, and yet their eggs and young are safer in the fresh water creek or stream.

While the anadromous life cycle has advantages, it also has two distinct disadvantages. It exposes salmon and steelhead to all sorts of hazards in the creek or stream, in the estuary, and then in the ocean. It also takes a lot of energy, not only for the long distances the salmon and steelhead have to travel, but also because their bodies must transform to live in very different salt water and freshwater environments.

Because of their migrating lifestyle and their sensitivity to water temperature and quality, salmon and steelhead are particularly vulnerable to changes in the waterway and beyond.

Species of Salmon and Steelhead Found in California
Steelhead trout and five species of Pacific salmon are all native to California. (The salmon family includes the Pacific salmon and steelhead trout, on which this unit focuses, but also includes other trout and chars.) Today, Chinook and coho salmon are the two most common species in California, along with steelhead. The other three—pink, chum, and sockeye—are extinct or rare here.

Chinook, coho, and steelhead have very similar life cycles, but they also have distinct differences that help to reduce competition among them.

Chinook Salmon

Chinook salmon are found in California from the Oregon border to as far south as the San Joaquin River. They are the largest of the Pacific salmon species. In California, they may weigh as much as 80 pounds and be over 4 feet long, but they are more commonly 15 to 30 pounds. Chinook are called "king salmon," probably because of their large size.

Chinook Salmon. Illustration from U.S. Forest Service

Young Chinook salmon spend from two months to a year in fresh water, and then may stay several months in the estuary before moving to the ocean. In the ocean, California Chinook usually head north and may reach as as far as Washington State. Chinook return to spawn when they are anywhere from two to seven years old. Most Chinook will enter freshwater in the fall (fall-run Chinook), but a few will enter in the spring (spring-run Chinook).

Coho Salmon

Coho salmon are found in California from the Oregon border south to the Big Sur River. They are much smaller than Chinook salmon; they are typically 16 to 32 inches long and weigh 7 to 12 pounds, but may get up to 20 pounds. They are also called "silver salmon."

Coho Salmon. Illustration from U.S. Forest Service

Young coho spend about a year in freshwater before moving to the estuary. In the ocean, coho usually travel shorter distances than Chinook, but may swim as far south as Baja California or as far north as Oregon. After spending two years in the ocean, most coho enter fresh water from November to January (winter-run coho). Coho often spawn in smaller streams than do Chinook.

Steelhead Trout

Steelhead trout are related to Pacific salmon, but they are actually the same species as rainbow trout. Steelhead trout and rainbow trout are two names that reflect two distinct life history patterns. Steelhead trout migrate to the ocean like salmon, while rainbow trout spend their entire life in the stream. Ocean-going forms of the trout can convert to resident forms during droughts or when a dam blocks access to the ocean.

Steelhead Trout. Illustration from U.S. Forest Service

Steelhead live in streams and rivers all along the California coast. They also live in tributaries in the Sacramento River and in northern Baja California. Steelhead trout grow much bigger

than rainbow trout, which stay in streams. They average 15 to 20 pounds, but may get as big as 28 pounds and be over 3 feet long.

They may spend one to four years in fresh water, then one to four years in the ocean. They usually migrate back to fresh water after two years in the ocean, returning to their spawning ground in either summer or winter. In either case, they wait until winter to spawn. Unlike salmon, steelhead do not necessarily die after they spawn. They will often go back to the ocean, and then return to fresh water to spawn again.

What Salmon and Steelhead Need in Their Creek Habitat

A habitat is the place where an organism lives; it may be a wetland, estuary, forest, grassland, river, stream, or ocean. An animal cannot survive without a habitat that provides the food, water, shelter, and reproductive conditions it needs.

For critical parts of their life cycle, salmon and steelhead depend on a freshwater creek or stream habitat. A suitable freshwater habitat contains the following elements.

- Cool, Clean, Oxygen-Rich Water
  Salmon and steelhead need cool water. The optimum temperature depends on the species and the life stage. In general, however, if the water temperature is higher than 64°F (18°C), salmon and steelhead may become sluggish and more susceptible to disease and predators. While temperatures in the 74° to 78°F (23° to 26°C) range may be lethal, steelhead in California can sometimes tolerate these higher temperatures for short periods of time. Their ability to do so depends partly on the age of the fish, the temperature to which it is already acclimatized, and how much food is available.

  The water also needs to be rich in oxygen. Water becomes more oxygenated as it bubbles over rocks and boulders, and is able to hold the oxygen better at lower temperatures.

  Salmon and steelhead also need water that is free of pollution. Heavy metals and organic contaminants, found in stormwater runoff, sewage, and industrial wastewater, are harmful to them. While nitrogen and phosphorus are important nutrients when present in low concentrations, high levels can cause excess algae to grow in the water; when the algae die, the decomposition process depletes the dissolved oxygen in the water, robbing salmon and steelhead of the oxygen they need.

- Gravel
  A healthy salmon and steelhead creek habitat consists of three different sizes of rocks. Salmon and steelhead need gravel beds for spawning and for the incubation of their eggs. The preferred gravel size depends on the species, but is generally from the size of a cherry to the size of a lemon (2 cm to 64 cm). To be suitable for egg incubation, the gravel must be free of silt (very fine particles of soil) and other sediments. If the spaces between the gravel are plugged with fine sediments, the eggs will suffocate and die.

Larger rocks, called cobble, are necessary to stabilize the creek bed. Cobble is generally from the size of a lemon to the size of a basketball (64 cm to 256 cm). Salmon and steelhead also need even larger rocks, called boulders, to provide shelter for young fry and spawners. (Boulders are anything larger than about a basketball, or over 256 cm.)

- Cover
  Salmon and steelhead need creeks that have lots of trees and shrubs growing along their edges. These plants shade the creek and help keep the water cool. By holding the soil with their roots, these plants also prevent erosion and help keep the water clean. Fallen logs and broken tree branches in the creek channel provide cover for salmon and steelhead protection from predators. Plants along the bank also help to provide food, as insects and spiders living on the plants fall into the water. This is especially important in small streams where plants may hang well out toward the middle of the stream.

- Riffles and Pools
  The salmon and steelhead creek habitat must contain areas with both riffles and pools. A riffle is a shallow area where water flows rapidly over a rocky or gravelly streambed. Riffles are important because they oxygenate the water and they provide habitat for insects and other invertebrates, which are food for young salmon and steelhead. Riffles are also where salmon and steelhead build their nests or redds.

  A pool is a deep area where the water flows more slowly. Here the water tends to be cooler than in the open areas. Salmon and steelhead need pools for resting and for hiding from predators. In many streams, fallen logs help create pool habitat by controlling water flow and the transport of gravel and cobble.

- Food
  Young salmon and steelhead depend on insects for food. Insects, like stoneflies, live in gravel creek beds, while other may fall into the water from the creek-side trees and shrubs. The insects need plant material and algae to eat, and are affected by pollutants, silt, and changes in water temperature and flow.

- Passage along the Creek to the Ocean
  The different segments of the creek must be connected to one another, at least during critical times of the year. Salmon and steelhead need to be able to move up and down the creek to search for food and suitable water conditions (for example, the lower reaches of the creek may get too warm in summer, while the upstream areas are cool enough). Dams, bridges, and road and railway culverts may block fish movement within the creek, and may also impede the movement of fish to and from the ocean.

A Healthy Salmon and Steelhead Run = A Healthy Watershed

Some people think that what they do on land cannot affect salmon and steelhead. In fact, how people behave on land is critical to the survival of salmon and steelhead. One reason is that water runs off the land and drains into creeks and rivers. Another is that much of the water Californians use in their homes, businesses, and agriculture is taken from rivers and streams, reducing available salmon and steelhead habitat.

A watershed is the area of land that drains into a particular body of water. Disturbances such as erosion, chemicals, and human structures all affect the flow of water and the content of that water. A healthy watershed is one in which:

- Rainfall is absorbed, and then released slowly.
- Plants and their roots help to hold the soil in place.
- Streams run clear and cool, and summer flows are not restricted.
- Water quality is high. This means that water has little suspended sediment, a high level of oxygen, cool temperatures, and lacks pollutants.
- Native fish and wildlife populations are healthy, productive, and diverse.
- Stream channels are stable and are not undergoing long-term adjustment to a major human disturbance (for example, erosion of gravel from the stream bed directly downstream from a dam).
- Natural disturbances like floods or landslides occur but the stream is able to recover and return to its more typical, stable condition. This is called dynamic equilibrium.
- Natural stream processes are allowed to take place (for example, the stream is free to meander and change course over time).
- There is adequate woody debris or large boulders to promote the formation of pools.
- Flood plains slow the velocity of occasional floods because the stream is free to flood over its banks.

As the characteristics of a healthy watershed overlap with salmon and steelhead needs, the presence or absence of salmon within a watershed is an indication of that watershed's healthiness.

Threats to Salmon and Steelhead
Many things that people do in the watershed harm salmon and steelhead.

- We use water for domestic, agricultural, and industrial uses. In doing so, we reduce both the quantity and quality of salmon and steelhead habitat. In California, there are over a thousand dams for the purpose of storing and distributing water. These dams not only pose a physical barrier to migrating salmon and steelhead and dry up salmon and steelhead habitat, but they also change the natural flow and temperature of water and the natural transport of sediment.

- We use chemicals that pollute water. The herbicides, pesticides, and fertilizers we use on farms or in our gardens often eventually end up in a stream or creek. Oil and grease from cars can also pollute streams.

- We build new houses, buildings, and roads. When development is near the creek itself, salmon and steelhead may be directly impacted. Many forms of development increase soil erosion, and the eroded soil winds up in the creek bed. There, the eroded soil can clog up the spaces between the gravel, smothering eggs, alevin, and aquatic insect larvae. Also, a watershed with many roads, parking lots, homes, businesses, and non-porous surfaces can cause more runoff, increasing the likelihood of flooding.

- We log trees. Poor logging practices can be harmful to creek habitats. It removes trees that help keep hillsides stable, and can cause soil and rocks to slip down the hill and into the creek bed. In other areas of the watershed, removing trees can cause water to run too quickly over the land. This can lead to increased erosion and to rapid increases in stream flows during rain or snowmelt.

- We raise livestock. Livestock can trample creek banks and cause them to erode. They can also eat creek-side vegetation that stabilizes the banks, and remove the shade that keeps water temperatures cool. Cattle can also compact soil, causing more rapid runoff.

- We fish. People enjoy eating salmon and steelhead, and obtain them through both commercial and sport fishing. There are regulations determining the number that people can catch based on an estimate of how many salmon and steelhead are in the ocean; if that estimate is too high, people may catch too many salmon and steelhead and not enough will return to spawn.

These actions themselves are not necessarily wrong, and many are necessary for human survival. However, the way we conduct these and other activities in the watershed can have a huge impact on salmon and steelhead. By managing these activities carefully, we can allow vital populations of both people, and salmon and steelhead in the watershed.

How to Help Salmon and Steelhead

When salmon and steelhead habitat becomes polluted, flooded by dams, drained, or paved over, they have nowhere else to go. In California, restoring and protecting salmon and steelhead habitat can be a complex problem that does not lend itself to a quick fix.

The activities in this unit will help students explore some of the complexities of this issue as they see that salmon and steelhead and the people in their community are interconnected. Working with a salmon and steelhead resource professional in your area, they will investigate ways to restore salmon and steelhead habitat in your local creek (See Activity 12: Salmon and Steelhead Restoration Project). In addition, some actions that everyone can take to help salmon and steelhead include:

- Using less water
- Reducing electricity use
- Reducing lawn area to decrease the need for watering
- Landscaping with native plants
- Gardening with organic compost
- Fixing oil leaks in cars
- Using less toxic household cleaners
- Keeping oil, soap, and other substances out of storm drains
- Keeping vehicles, livestock, and pets out of streams and lakes.
- Supporting organic farmers, who use fewer herbicides and pesticides when growing food.

Sources

California's Salmon and Steelhead Teacher's Guide and Student Activities, by Dianne Higgins.

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Salmon Protection and Watershed Network Reports. Accessed 12/19/06 at http://www.spawnusa.org/reports.html

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Dear Parent or Guardian:

As a kid did you enjoy peeking under rocks for bugs, splashing in a creek, or looking for fish? Moments like these are important because they help children learn about nature's cycles and connect to the world around them.

Your child will be participating in a program called *Agua Pura: Salmon and Steelhead*, which will allow your child to do these things and more. The goal of this program is to help young people understand the connection between people and the salmon and steelhead that live in our neighborhood waters. These amazing fish have a unique life cycle that takes them from our creeks to the ocean and back again. Your child will learn how we can affect these fish by changing the cleanliness of creek waters that they need to survive.

As part of the program, your child will participate in a number of art and science activities, including:

- Studying the local salmon or steelhead population
- Learning how human activities affect salmon and steelhead in local waters
- Working with people in the community to improve salmon and steelhead habitat
- Using art to express what he or she has learned about these native fish

We will need your help in a few ways:

1. Please join us in our activities on the following day(s):

2. For field trips, please make sure that your child is suitably dressed in sturdy shoes and socks (not sandals or flip-flops), long pants (not shorts), a long-sleeve shirt, and a jacket or hat, depending on the weather. Also send along a bottle of drinking water.

Thank you for your support!

Estimado Padre o Guardián:

¿De niño alguna vez gozó usted asomarse debajo de las piedras para encontrar bichos, salpicar en un río, o buscar peces? Momentos como éstos son muy importantes porque ayudan a los niños aprender de los ciclos de la naturaleza y los conectan al mundo alrededor de ellos.

Su niño estará tomando parte en un programa llamado *Agua Pura: El Salmón y La Trucha del Mar (El Steelhead)*, que permitirán a su niño hacer estas cosas y más. La meta de este programa es ayudar a niños y jóvenes a entender la conexión entre personas, el salmón y la trucha del mar que viven en las aguas de nuestros vecindarios. Estos peces asombrosos tienen un ciclo de vida único que los lleve de nuestros riachuelos al mar y a los riachuelos otra vez. Su niño aprenderá cómo podemos afectar estos peces por cambiar la limpieza de las aguas de los riachuelos que necesitan para sobrevivir.

Como parte del programa, los niños tomará parte en varias actividades del arte y la ciencia, incluyendo:

- Estudiar sobre la población local del salmón o de la trucha del mar
- Aprender cómo las actividades humanas afectan al salmón y a la trucha del mar en aguas locales
- Trabajar con personas en la comunidad para mejorar el hábitat del salmón y de la trucha del mar
- Usar el arte para expresar lo que ellos han aprendido de estos peces nativos

Necesitaremos su ayuda en algunas maneras:

1. Por favor acompáñenos en nuestras actividades en el día (los días) siguiente(s):

2. Para viajes de estudio, por favor asegúrese de que su niño este vestido adecuadamente: con zapatos firmes y calcetines (no sandalias ni chanclas), pantalones largos (no *shorts*), una camisa de manga larga, y una chaqueta o sombrero, dependiendo del tiempo y el clima. También asegúrese de mandar una botella de agua.

¡Gracias por su apoyo!

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Activity 1: Getting to Know Salmon and Steelhead

Chinook salmon. Illustration from California Department of Fish and Game.

Overview
This activity introduces young people, families, and community members to the unit and engages them in thinking about salmon and steelhead in their community. It also acquaints the group with members of the community who will partner with them in various unit activities.

Background Information
Salmon and steelhead have been a cause for celebration throughout time, and particularly in the coastal regions from Northern California to Alaska, where they are a crucial part of Native American culture.

In this Northwest region, salmon and/or steelhead was the most important staple food and most valuable natural product. Native Americans here considered salmon to be more than just a resource – they were thought of as sacred Salmon People. The human people showed their respect by greeting the returning Salmon People with song, prayers, special ceremonies, and celebrations. After catching and eating salmon, the people would return the bones to the ocean, where they would come back to life as more Salmon People. The Salmon People were believed to travel on invisible canoes, with the chiefs of the different families (species) standing in the stern to direct their movements landward.

In other parts of California, people depended less on salmon and steelhead as the main source of food. Still, tribes in Northeastern and Central California ate salmon and steelhead as part of their diet and looked for their return each year.

Sources
Museum Exposition of California Indian Life
(http://www.cr.nps.gov/history/online_books/berkeley/steward2/stewardc.htm)
Carnegie Museums
(http://www.carnegiemnh.org/exhibits/north-south-east-west/tlingit/salmon.html)

Objectives
Participants will (1) list what they know about salmon and steelhead, (2) describe what they would like to learn about salmon and steelhead, and (3) participate in an event with community members to celebrate salmon and steelhead.

Time
Setting the Stage: 30 minutes
Activity: One group session or more, depending on the celebration planned

Materials

- Sheets of chart paper or butcher paper
- Marker pens
- One or more of the following:
  - Video about salmon and steelhead* (see Resources: Videos, *http://groups.ucanr.org/sns/Resources/Videos.htm*)
  - Photos of salmon (see Individual Species Information under Resources: Information About Salmon and Steelhead, *http://groups.ucanr.org/sns/Resources/Information_About_Salmon_and_Steelhead.htm*)
  - Picture book about salmon* (see Children's Literature under Resources: Stories and Music, *http://groups.ucanr.org/sns/Resources/Stories_and_Music.htm*)
  - Salmon story (see Resources: Stories and Music *http://groups.ucanr.org/sns/Resources/Stories_and_Music.htm*)
  - Salmon fishing gear (borrowed from parent or other angler)
  - A salmon (from market or other source)
  - Music CD with song about salmon (see Resources: Stories and Music, *http://groups.ucanr.org/sns/Resources/Stories_and_Music.htm*)
- VCR and monitor or CD player (optional)
- Copies of "What I Know and What I Want to Learn" worksheet, 1 per participant
- Celebration food (see Advance Preparation below)
- Napkins, plates, cups, utensils as needed for the food
- Folder or binder for each team (see Participant Teams under Unit Overview: Tips for Managing the Unit)
- Camera

* = Included in Adopt-A-Watershed Kit

Advance Preparation

1. Decide on an appropriate celebration for introducing the unit. The purpose of the celebration is to help the participants and community members feel a connection and enthusiasm for the subject of salmon and steelhead. It can be as simple as a walk to your nearby creek, where participants taste salmon soup and listen to a children's book about salmon. Or, it can be as elaborate as a salmon and steelhead fair that has stations with a variety of activities staffed by parents and local resource specialists, commercial or sport fishers, or representatives of local fishing clubs.

   As much as possible, have participants help with ideas and preparations for the celebration.

Activities for the celebration may include:

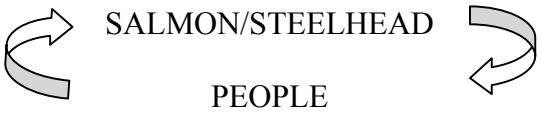
- Inviting indigenous people to share their cultural history and connection to salmon and steelhead through stories and activities.
- Making fish prints from a salmon for team portfolio covers (see Making Fish Prints under Resources: Art Projects, http://groups.ucanr.org/sns/Resources/Art_Projects.htm).
- Listening to an elder tell a story about salmon (see Resources: Stories and Music, *http://groups.ucanr.org/sns/Resources/Art_Projects.htm*).
- Watching a video about salmon (see Resources: Videos, *http://groups.ucanr.org/sns/Resources/Videos.htm*).
- Reading a picture book about salmon (see Children's Literature under Resources: Stories and Music, *http://groups.ucanr.org/sns/Resources/Stories_and_Music.htm*).
- Taking a walk along a nearby creek.
- Handling salmon fishing gear and a casting lesson.
- Viewing maps or displays brought by the salmon and steelhead resource professional.
- Listening to songs about salmon (see Resources: Stories and Music, *http://groups.ucanr.org/sns/Resources/Stories_and_Music.htm*).
- Tasting something made from salmon (see Resources: Recipes, *http://groups.ucanr.org/sns/Resources/Recipes.htm*).
- Beginning the Community Art Project (see Activity 3: Community Art Project).

2. Contact your local water district, state fish and game department, or other local agency or organization (see Resources: Resource Agencies and Organizations, http://groups.ucanr.org/sns/Resources/Resource_Agencies_and_Organizations.htm) to establish a resource professional contact for the unit. Explain the purpose of the unit and invite him or her to the salmon and steelhead celebration and to act as a group partner throughout the unit. Discuss working with him or her in planning and carrying out a restoration project, community art project, and other unit activities. See the Resource Professionals section under Unit Overview: Tips for Managing the Unit for a list of activities where you may seek help.
3. Gather materials for the celebration activities you plan.
4. Plan where you will have the celebration and make necessary arrangements. If you will be visiting the local creek or other natural area, read the suggestions for Planning Field Study Trips under Unit Overview: Tips for Managing the Unit.
5. Ask parents to help by bringing celebration food, keeping in mind any allergies or other dietary restrictions. If possible, include at least one thing made from salmon or that is fish-related:

    - A kid-friendly salmon recipe (see Resources: Recipes *http://groups.ucanr.org/sns/Resources/Recipes.htm*)
    - Store-bought salmon/cream cheese spread and bagel chunks
    - Store-bought smoked salmon and crackers
    - Fish-shaped crackers

6. Using 4 sheets of chart paper, prepare a "KWLR" chart, with the following question and graphic at the top of each sheet:

   How do people in our community affect salmon and steelhead, and how do salmon and steelhead affect people in our community?



7. Write one of the following labels on each sheet:

   K - What We Know
   W - What We Wonder
   L - What We Have Learned
   R - What Resources We Have

8. Prepare a binder or folder for each team to use as a portfolio.

9. On the day of the celebration, set up the materials and resources you have gathered for the event.

Setting the Stage

1. Introduce the unit by telling participants that they will be spending the next several weeks exploring salmon and steelhead and their connection to the community. Show them the KWLR chart with the guiding question of the unit, and explain that participants will be exploring how people in your community affect salmon and steelhead, and how salmon and steelhead affect people.

2. Using the KWLR chart, ask participants to name things they already know about the question and list their ideas under the "K" sheet (writing all their ideas, even if what they "know" is incorrect).

3. Ask participants to name things they wonder about salmon and steelhead and people, and list their ideas under the "W" sheet.

4. Ask participants to name experts they could ask, Web sites they could look at, books they could read, or other resources for finding the answers to their questions about salmon and steelhead.

5. Explain that the group will have a celebration to start off the unit. Have participants write invitations for their parents and other community members.

Conducting the Activity

1. On the day of the celebration, do the activities you have planned for the event.

2. As part of the event, explain to participants, parents, and other community members that the group will be investigating salmon and steelhead in your community. They will explore the question, "How do salmon and steelhead affect people, and how do people affect salmon and steelhead?"

   Point out that throughout the unit participants will be finding out:

   - Whether salmon and/or steelhead live or have lived in the community.
   - The different stages of the salmon and steelhead life cycle.
   - What salmon and steelhead need to survive.
   - The community's knowledge, beliefs, and attitudes about salmon and steelhead.
   - What participants can do to enhance understanding and responsibility for salmon and steelhead in the community.

3. Point out specific ways that you will be asking for parent and community help, including:

   - Help with the community art project (see Activity 3).
   - Participation in community survey (see Activity 4) and mapping activities (see Activity 8).
   - Chaperones for trips to the local creek (see Activity 5 and Activity 11).
   - Help in planning and carrying out a restoration project (see Activity 12).

4. Let participants, parents, and other community members know that they will also participate in a community celebration at the end of the unit (see Activity 13: Community Celebration). At that time, participants will share the work they have done with community members (so participants will want to do their best work throughout the unit).

5. Thank individual parents and other community members who helped with the event.

Wrap-Up

1. Ask participants to share what they enjoyed about the celebration event.

2. Have participants write thank-you notes to parents and community members who helped with the event.

3. Divide the class into teams for the duration of the unit.

4. Give teams their portfolio binders or folders. If participants made fish prints during the celebration, have them choose one and attach it to the front of the portfolio. Add the other fish prints to the portfolio. Tell the teams that they will be keeping a portfolio for the unit to help them see what they have learned.

5. Have each team pick a species of salmon or steelhead to represent their team. You may want to give each team time to design a poster representing the team.

6. Have participants fill in the worksheet, "What I Know and What I Want to Learn." Have them place the worksheets in the portfolios. At the end of the unit, they will have an opportunity to revisit the worksheet to reflect on their own learning.

7. Save the KWLR chart for use throughout the unit.

Name: _____

Date: _____

Coho salmon. Illustration from California Department of Fish and Game

What I Know and What I Want to Learn

What I know about salmon/steelhead and their connection to people	What I want to learn about salmon/steelhead and their connection to people

Name / *Nombre*: _____

Date / *Fecha*: _____

Coho salmon. Illustration from California Department of Fish and Game

What I Know and What I Want to Learn

Lo que sé y lo que deseo aprender

What I know about salmon/steelhead and their connection to people ***Lo que sé sobre salmón/trucha del mar (steelhead) y sus asociaciones con la gente***	**What I want to learn about salmon/steelhead and their connection to people** ***Lo que deseo aprender sobre salmón/trucha del mar (steelhead) y sus asociaciones con la gente***

Activity 2: The Incredible Journey

Salmon swimming up a waterfall. Photo from U.S. Fish and Wildlife Service.

Overview

In this activity, participants act out the salmon and steelhead journey from spawning ground, to the open ocean, and then back to spawning ground. In doing so, they begin to understand the unique characteristics of salmon and steelhead.

Background Information

This activity introduces participants to the interesting life cycle of salmon and steelhead by acting out a simplified version of it. Salmon face many challenges throughout their life cycle, including silt smothering the eggs, predators, pollution, disease, oxygen-poor water, high water temperatures, lack of food, and barriers such as dams and culverts. Only one or two salmon or steelhead from an egg nest (1/10 of 1%) make it back to their home streams to spawn.

For more information about the salmon and steelhead life cycle, see *Background Information* in the Unit Overview and *Life Cycle and Migration* under Resources: Information about Salmon and Steelhead *(http://groups.ucanr.org/sns/Resources/Information_About_Salmon_and_Steelhead.htm)*.

Objectives

Participants will: (1) simulate the salmon and steelhead journey from spawning ground to the ocean and back, and (2) identify obstacles these fish face at different parts of the journey.

Time

One group session

Materials and Resources

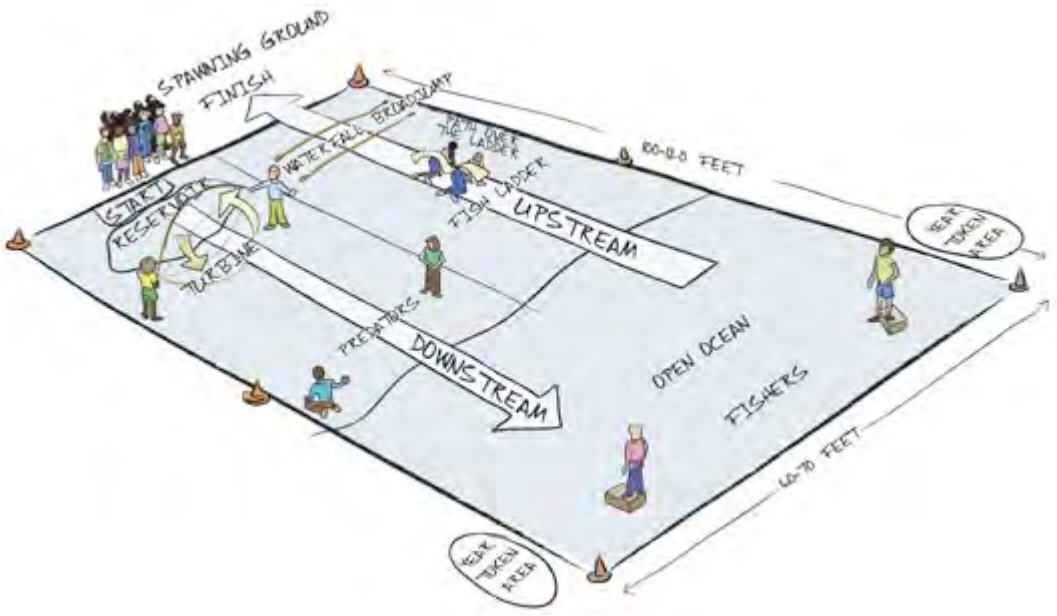
- Large playing area (at least 50 feet x 100 feet)
- One long jump rope and two short ones
- Existing painted lines, rope, traffic cones or other boundary markers
- Two cardboard boxes
- 100 tokens (may be poker chips, index cards, or other tokens)
- Whistle (optional)
- KWLR chart (started in Activity 1: Getting to Know Salmon and Steelhead)

Advance Preparation

1. Set up the boundaries for the game as shown in the illustration below (this game and the illustration used below are based on an activity from *Project Aquatic WILD*, page 71, called "Hooks and Ladders").
    - About one-fourth of the playing area will be for the salmon's downstream journey to the ocean. It will include a dam turbine (long jump rope) and predators.
    - Half of the playing area will be for the open ocean, and will have two fishing boats (boxes) with fishers.
    - The remaining one-fourth of the playing area will be for the salmon's upstream journey back to the spawning ground. Here salmon will pass through a fish ladder (crouching participants) and jump over a waterfall (broad jump).

2. The procedures for this activity assume a group size of about 30 participants. As you plan for the activity, add or subtract one predator and one fishing boat to adjust for a larger or smaller group.

3. Place the materials for the activity as shown:
    - Put the long jump rope in the turbine area.
    - Place the two cardboard boxes in the open ocean area.
    - Scatter half the tokens on each side of the open ocean, just outside the boundary.
    - Position the two short jump ropes at the waterfall area. They should be far enough apart to provide a challenging, but realistic, broad jump.



Lifecycle Game Setup

Setting the Stage

1. Begin by asking participants, "Why have people celebrated salmon and steelhead throughout the ages and why do they continue to celebrate salmon and steelhead? What makes these fish so special?"

2. Ask them, "What does the word 'migration' mean? What are some reasons that people migrate? Why might salmon and steelhead migrate?"

3. Tell participants that to help them understand these questions, they will be acting out the amazing journey of the salmon and steelhead migration from the spawning ground to the ocean and back again, and including some of the obstacles that salmon and steelhead face along the way.

Conducting the Activity

1. Take participants to the playing area and explain that most of them will act as salmon for the activity. Describe the journey that these "salmon" must take:
    - Spawning Ground: All of the salmon start in the spawning ground. When you blow a whistle (or give other signal), they will start their journey downstream.

    - Dam Turbine: After they begin their journey, the salmon face their first hazard - a dam turbine represented by two participants swinging the long jump rope. All salmon must go through the turbine. If a salmon is hit by the jump rope or a turbine operator's arm, it dies. Dead salmon become part of the fish ladder (see Fish Ladder). The turbine operators may change the speed of the turbine to try to catch salmon.

    - Predators: Once they pass the turbines, the salmon must face two wildlife predators (who may be larger fish, birds, or mammals). These predators must use both hands to catch the salmon. Upon catching a salmon, the predator must escort the dead salmon over to the fish ladder area (see Fish Ladder) before returning to catch more.

    - Open Ocean: All salmon that make it past the predators reach the open ocean. Here, salmon can be caught by fishers in fishing boats (boxes). The fishers must keep one foot in their box, but can slide the box around. As with the predators, they must catch salmon with both hands and must escort any dead salmon to the fish ladder area (see Fish Ladder) before returning to the ocean.

    - Year Tokens: salmon must swim back and forth across the ocean area and collect four tokens to represent four years of living in the ocean. They must cross the entire ocean before they collect a token, and they can only collect one token at a time.

- Heading Upstream: After safely collecting four tokens, salmon may start upstream. Here they encounter the fish ladder.

- Fish Ladder: The fish ladder is made up of all the participants who were caught by predators or fishers. To make the fish ladder structure, participants crouch on all fours in a row, with a yard-wide space between them. The salmon heading upstream must step over each person in the fish ladder. Predators may not harm the salmon in the fish ladder.

- Waterfall: After making it through the fish ladder, the salmon must now jump over a waterfall. A salmon must successfully broad jump the entire width of the waterfall to continue. If a salmon fails, it returns to the bottom of the fish ladder to try again.

- Predators: At the top of the falls, the salmon must once again get past some predators (bears or eagles). Predators must catch the salmon with both hands. If a predator catches a salmon, it must escort the dead salmon to become part of the fish ladder.

- Spawning Ground: A salmon surviving the entire course reaches the spawning ground and finishes the game.

2. Assign roles to participants:
    - Choose two participants to be turbine operators. After all the salmon have gone through the turbine, these participants move over to the waterfall to monitor the broad jump there.

    - Choose two participants to be predators. They patrol below the turbines to catch salmon heading downstream. When all the salmon reach the ocean, these participants move to the top of the waterfall to catch salmon before they enter the spawning ground. Predators must catch the salmon by touching them with both hands. When they catch a salmon, they must escort the dead salmon to the fish ladder before they can catch more.

    - Choose two participants to be fishers in fishing boats. The fishers must keep one foot in their boat (cardboard box). When they catch a salmon, they must take the dead salmon to the fish ladder.

    - All other participants are salmon.

3. Have participants go to their starting places. Blow the whistle (or give another signal) and help the group as it does the activity. The activity ends when all surviving salmon reach the spawning ground.

Wrap-Up

1. After doing the activity, lead participants in a discussion about it:
    - How many salmon did we have at the beginning of the activity? How many did we have at the end? Do you think this survival rate is realistic? Why or why not?
    - Which obstacles were the most difficult for the salmon in our activity? Which caused the most losses? Which obstacles do you think are the most treacherous for real salmon?
    - What are some of the organisms that depend on salmon or steelhead? (You may want to bring up the food web, which is one way organisms depend on each other for the transfer of matter.)
    - Steelhead don't necessarily die after they spawn as salmon do. They often return to the ocean and then come back to the spawning ground to spawn again. How would we need to adjust this activity to represent steelhead? What do you think the results would be then?
    - In what ways was this simulation realistic? In what ways was it unrealistic?
    - What threats and obstacles do salmon and steelhead face in their life cycle that are not represented here?
2. Have participants look at the KWLR chart to revisit the question of how salmon and steelhead and people affect each other in the community. They may want to adjust any of their ideas and make additions to the "K" (What We Know), "W" (What We Wonder), "L" (What We Have Learned), and R (Our Resources) sheets.

Enrichment

- Ask for participant suggestions for how to modify the game to add other obstacles or elements. Play the activity again with the modifications.
- Research ways that dams can be designed or modified to be more fish-friendly, allowing migrating fish to go downstream and upstream safely.

Activity 3: Community Art Project

Adult male Coho salmon in breeding (top) and oceanic (bottom) forms. Illustrations from National Oceanic and Atmospheric Administration.

Overview

Participants plan and take part in a community art project designed to celebrate salmon and steelhead and their connection to the community. This on-going project will be presented at the conclusion of the unit and may be initiated as part of the celebration in Activity 1: Getting to Know Salmon and Steelhead.

Background Information

A community art project is an activity that co1nnects students with their community through art. This connection may occur in one or more ways:

- Students work with community members to create the art.
- Students use the community as a subject of the art.
- Students create pieces of art to show or give to the community.

In this activity, the community art project has an added purpose: to strengthen the connection between their community and salmon and steelhead.

By taking part in a community art project, participants gain a positive sense of themselves as valued and contributing members of the community. They also gain an appreciation of salmon and steelhead and these fish's connection to the community.

For more information about community art projects, see The Arts Resources Network "Community Art" pages *(http://www.artsresourcenetwork.org/community_arts/why_community_arts/default.asp).*

Objectives

Participants will (1) create a piece of art that celebrates salmon and steelhead, (2) learn about the physical characteristics, life cycle, and behavior of salmon and steelhead, and (3) present their art to the community.

Time

One group session to introduce the project, with additional time as necessary over the course of the unit to complete project.

Materials

- KWLR chart (started in Activity 1: Getting to Know Salmon and Steelhead)
- Everything needed for chosen art project
- Camera

Advance Preparation

Collect ideas for a community art project celebrating salmon and steelhead. Possibilities:

- Salmon Tiles – a mural or mosaic (see an example of salmon tiles at *http://dnr.metrokc.gov/wrias/7/trail.htm* made by middle school students).
- Salmon Mural – mural painted on wall or paper (see a sample procedure at *http://www.kuidaosumi.com/murals/muralguide.html]*.
- Fotonovela – picture stories about salmon (see sample instructions from Harvard School of Public Health *[http://www.hsph.harvard.edu/healthliteracy/photonovel/student.pdf],* or in Spanish, Estudiantes Transformando Historias en Fotonovelas *[http://www.gratisweb.com/mcazaurhcp/f-index.htm]*).
- Salmon Flash Animation – salmon story or life cycle (see a sample project at *http://www.kcts.org/affairs/features/salmoncity/index.asp*).
- Salmon Quilt – with individual participants making squares (see sample class quilt procedure at *https://pao.cnmoc.navy.mil/educate/neptune/lesson/art/QUILT.HTM*).
- Salmon and Steelhead Sculptures – Decorate molded forms (see sample salmon sculptures *[http://www.clcookphoto.com/fishcards.htm]* or check out a source of tabletop-size unpainted steelhead forms *[http://www.cowpainters.com/tabletop_main.html]*).
- Art Cards for Fundraiser – Make cards to raise money for a restoration project (see a sample procedure at *http://www.princetonol.com/groups/iad/lessons/high/Lauren-cards.htm*).
- Salmon Batik Banners – depicting different impressions of salmon and steelhead or the salmon life cycle (see sample salmon batiks at *http://www.robinparis.co.uk/community/art.htm*).

2. Look for an artist to partner with you on the project:
    - If you already have an artist-in-residence program at your school or district, find out about including this project as part of the program.
    - Have participants ask around – one of their neighbors or a friend's grandparent may be an artist.
    - Check with local art centers or museums for an artist who might want to work with your group.
    - Contact city, county, or state art commissions for artist-in-residence programs or lists of local arts organizations.
    - Call the art department at your local college or university. Senior or graduate students are often looking for community art projects to be involved in.

3. When you and your participants have found an artist to work with, explain your goals and have the artist make suggestions for the project. Let him or her know what will be workable and what may be a challenge for your participants or setting.

4. If you won't be working with an artist, find a parent or other community member to help manage the project.

5. Explore possible funding for the project, either through your normal budget process or from the community. You might seek donations or a small grant from the local arts commission, educational institution, or local service clubs or businesses.

6. Break the project down into manageable steps. Consider what participants will need to know about salmon and steelhead to successfully complete the project, and plan the schedule of unit activities and project work accordingly.

7. Depending on your project, find a venue for temporarily or permanently displaying the finished project. Designate an area for displaying and storing work mid-project.

8. Ask parents and participants to help collect materials for the project. Whenever possible, use recycled or reusable materials.

9. Plan to "unveil" the completed project as part of the Community Celebration (see Activity 13: Community Celebration).

Setting the Stage

1. Tell participants that they will be planning and doing a community art project on salmon and steelhead. Explain to the participants the purpose of the activity. Ask, "What is community art? Why do people do community art?"

2. Describe the project ideas you have collected (see Advance Preparation), and have the group help you select one of the projects to do.

Conducting the Activity

Note: If you are working with an artist, do these steps together with the artist.

1. If you are working with an artist, introduce participants both to the artist and to his or her work.

2. Show participants the KWLR chart and ask, "What do we need to know about salmon and steelhead to do our chosen project?" For example, if participants will be making salmon banners, they may need to have an accurate idea of what salmon look like. If they will be creating ceramic tiles depicting the salmon life cycle, they will need to know the stages of the life cycle.

3. Add their ideas to the "W" sheet. Share your plan for the unit activities (see Advance Preparation, step #6) and make sure that it includes the necessary information participants have identified.

4. Work with participants to develop a project plan so that everyone has a clear idea of their contribution to the project. If participants will be creating individual parts to make a whole, make sure that the parts will coordinate with each other.

5. Allow plenty of time to start and complete the project you've planned. If the project will take several group sessions, display works-in-progress in the spot you've designated for that (see Advance Preparation). Take photos at different stages of the project.

Wrap-Up

1. Display the completed art projects either temporarily or permanently as planned (see Advance Preparation). Include the project as part of Activity 13: Community Celebration at the end of the unit.

2. Lead a discussion about the project.
    - How did you like being part of a community art project?
    - What did you find challenging about this project?
    - How does this art project benefit the community?
    - How might it benefit salmon and steelhead?
    - What did you learn through the art project?
    - What other art projects would you like to do?

Enrichment

Participants create a Web page about the project to post on the school or program Web site. They can include digital photos (from digital camera or scanned from prints) to document the project and write text describing the process.

Activity 4: Community Survey

Salmon illustration, Lewis and Clark expedition. Photo from U.S. Fish and Wildlife Service.

Overview

Participants create and conduct a survey to find out what members of the community know and believe about salmon and steelhead.

Background Information

For many communities throughout California, salmon and steelhead represent a complex set of issues that may involve jobs, property rights, water rights, food resources, and more. In other communities, the majority of people may not even know that salmon and/or steelhead live or once lived there. One way for participants to learn how people in your community view salmon and steelhead is through a survey.

A survey is the collecting of information about a group through interviews or questionnaires. It usually uses a representative sample of the group to learn about the whole group. Surveying is a great way for participants to get to know their community. It provides a vehicle for talking with people throughout the school or neighborhood about salmon and steelhead. It also promotes inquiry-based learning and gives participants practice in doing first-hand research.

Objectives

Participants will (1) create a community survey about salmon and steelhead, (2) find out community attitudes and beliefs about salmon and steelhead, (3) get to know members of the community, and (4) organize and present survey results using graphs and text.

Time

Setting the Stage: One group session
Activity: At least one or two group sessions, plus time between to complete surveys (more time needed if the group will develop its own survey)

Materials

- Sample surveys (see Advance Preparation)
- Strips of chart paper for designing survey (optional)
- Marker pens (optional)
- Chart paper for recording survey results
- Camera (optional)

- KWLR chart (started in Activity 1: Getting to Know Salmon and Steelhead)

Advance Preparation

1. Look at a couple of resources to find out how to design an effective survey (see Resources: Surveys and Community Mapping, *http://groups.ucanr.org/sns/Resources/Surveys_and_Community_Mapping.htm*).

2. Decide whether your group will create its own survey or whether you will provide one. A survey you create may include questions such as
    - How long have you lived in our community?
    - What do you think is the best thing about our community?
    - What do you think is our community's biggest challenge?
    - Do you know whether salmon or steelhead live in our creek? How do you know?
    - Do you think salmon and steelhead are important to our community? Why or why not?
    - What do you think people do that may harm or impact salmon and steelhead in our creek?
    - What do you think people do that may enhance salmon and steelhead in our creek?

3. Consider different possibilities for conducting the survey to propose to participants. For example, participants may survey with a written questionnaire or an oral interview; they may survey other youth at the school or program site, parents and family members, landowners along a local creek or river, people who live and work at the local harbor or seaport, attendees at a community event, customers at a grocery store, or people they encounter on a walk through town.

4. Depending on what you and the group plan for the survey (see Setting the Stage), make the necessary arrangements to carry out the plan.

5. Collect a few example surveys to share with participants (see Resources: Surveys and Community Mapping, *http://groups.ucanr.org/sns/Resources/Surveys_and_Community_Mapping.htm*), and make enough copies so that teams can look at a few or have them look at them online.

6. If participants will be designing survey questions, look over a few resources on designing surveys *(http://groups.ucanr.org/sns/Resources/Surveys_and_Community_Mapping.htm).*

7. Plan what final product you want participants to create from the survey. Participants may create simple graphs with paper and pencil that can be included in Activity 8: Mapping Our Community. Participants may also prepare a more elaborate presentation using computer software, digital photos, and so on.

8. Prepare a chart for participants to record the results of the survey. The chart should list all the survey questions and have space for recording the responses.

Setting the Stage

1. Ask participants, "What is a survey?" If they do not know, explain using the definition in the Background Information.

2. As an example of a survey, ask participants whether they prefer chocolate or vanilla ice cream (or other food choice). Using raised hands, count the participants who prefer chocolate and those who prefer vanilla. Lead participants in a quick analysis of the results by asking:
    - Which flavor is more popular in our group?
    - Do you think the results would be different in another group?
    - Do you think we could use this survey as representative of the whole community's preferences?
    - Why might it be useful to know what flavor the kids in our group prefer?

3. Point participants to the "W" (What We Wonder) sheet of the KWLR chart, and ask:
    - What do we want to learn from our survey?
    - How might we use the information we get?
    - What might we want to ask in our survey?

    List these possible survey topics on the board.

4. Talk with participants about different possibilities for conducting the survey (see Advance Preparation), and help them decide on a plan for carrying it out. The plan should include where, when, how, and how many surveys they will conduct.

Conducting the Activity
Part One – Designing the Survey

Note: If your group will be using a survey you provide (see Advance Preparation), skip to Part Two.

1. Give teams a few example surveys to read (either on paper or online, *http://groups.ucanr.org/sns/Resources/Surveys_and_Community_Mapping.htm*).

2. Based on what they observe about surveys, have them list three or four guidelines for writing survey questions (for example, questions have no right or wrong answer, questions offer possible responses, and so on).

3. Ask a participant from each team to share one or two of their guidelines. Record their responses on the board.

4. Look over the guidelines and, if necessary, add other suggestions for designing a strong survey (see Advance Preparation).

5. Remind participants of the topics they identified for the survey (see Setting the Stage), and direct each team to write two or three possible questions for the survey. They should write each question on a strip of chart paper using a marker pen.

6. Post the draft questions and have the group read them over. Look for any duplicates or near-duplicates. Help the group identify the strongest set of questions from the list.

7. Divide the set of questions among teams and ask them to review the question they've been given. They should try answering the question as if it were new to them. Encourage them to edit the question if needed to make it clearer or stronger. Have them write the final question on another strip of chart paper.

8. Post the final questions and have the group make sure that the questions are in the best order and are as clear as possible.

9. Ask a participant or team to write or type up the questions to make the final survey.

Part Two - Conducting and Analyzing the Survey

1. Give participants copies of the survey, and review survey safety and etiquette:
    - If surveying people outside of your family, have a parent or other adult go with you.
    - If people don't want to participate, don't force them.
    - Thank people for their time, whether they participate or not.
    - Accept all ideas without laughing or reacting.
    - Don't try to change people's minds.

2. Ask participants to predict how other people will respond to the survey questions.

3. Have participants conduct the number of surveys they have decided is appropriate.

4. Help participants put the results of the survey onto the group chart.

5. Give each team a survey question to analyze. Have them prepare a graphic representation (pie chart, bar graph, or other) of their question results. If it is a quantitative question, they should compute the range, mean, median, and mode of the data. They should also write a summary or conclusion from the results.

6. Have teams present their analysis to the group.

Wrap-Up

1. Lead a discussion about the survey, including:
    - What did we learn from the survey?
    - What was the most interesting thing we learned?
    - What was the most surprising thing we learned?
    - On which questions did people seem to agree most?

- What value do people in our community place on salmon and steelhead? How has that changed over time?
- On which questions did people seem to disagree most?
- Does there seem to be any controversy in our community regarding salmon and steelhead? If so, what is the issue?

2. Have teams place a copy of their work in their portfolios, and also save a copy to be used in Activity 8: Mapping Our Community.

3. Have participants look at the KWLR chart. Have them think about the guiding question: How do people affect salmon and steelhead, and how do salmon and steelhead affect people? Ask whether there is anything they would add to or adjust on the chart given what they learned from the community survey.

Enrichment

- Participants may use a spreadsheet program or word processing software to create graphs, tables, and charts to display their results.

- Participants can begin to collect newspaper articles about salmon and steelhead, and add to their collection over the course of the unit. They might analyze how the viewpoints or information presented correlate to participants' findings in the survey.

- Have participants find and bring to the group news items or advertisements that quote survey results. For each item, help participants analyze what is being reported or claimed. For example, what does it mean when a commercial claims that a product is the "most popular choice according to a recent survey" or when someone running for office is two points ahead in one poll, but two points behind in another?

Activity 5: Salmon and Steelhead Creek Walk


Steelhead trout in creek. Photo by David Pritchett.

Overview
Background Information
Objectives
Time
Materials
Advance Preparation
Setting the Stage
Conducting the Activity
Wrap-Up
Enrichment

Overview

In this activity, participants visit their local creek (or stream or river) to observe and describe the habitat and how people might be influencing it. As they continue through the unit activities, they will build on what they find here, learning how salmon and steelhead depend on an appropriate habitat and how human actions affect that habitat.

Background Information

Human activities within the watershed - even far away from the creek or river - greatly affect whether salmon and steelhead can live there. In this activity, participants visit the local creek to get an overall sense of its condition and to begin looking for ways that people affect the salmon and steelhead habitat.

For information about what salmon and steelhead need in their creek habitat, see the Background Information section in the Unit Overview.

In addition to steelhead, there are five different Pacific salmon species along the west coast of North America, all of which used to live in at least some parts of California. Today, only Chinook, coho, and steelhead can be found within California, and even their ranges have been greatly reduced.

The status maps you will use in the activity show the current and past ranges of the six different species of Pacific salmon and steelhead. Following are definitions for the different status categories used on the maps:

- **Extinct—**The species was present in the area at one time, but is no longer found there. This is also called *locally extinct.*
- **At Risk—**The species is at risk of extinction in the area. Fewer than 1,000 fish survive long enough to spawn.
- **Special Concern—**The species is vulnerable to decline in the area.
- **Low or No Risk—**The species is present within the area and is at no apparent risk of decline or extinction.
- **Not Evaluated—**There is not enough information to determine the status of the species in the area.

Objectives
Participants will (1) study status maps to determine whether their local creek or stream is within the current or past range of different salmon and steelhead species, (2) visit their local creek or stream to describe the habitat, and (3) use their observations to begin a map of the creek.

Time
Setting the Stage: 10-15 minutes
Activity, Part One: One group session
Activity, Part Two (walk): One hour or more
Wrap-Up: One group session

Materials

- Color copy of each of six Pacific Salmon and Steelhead Status Maps (*http://www.inforain.org/salmonstrategy/stockstatus.html,* click on Stock Status Maps)
- Copies of Creek Walk Checklist, 1 per team
- Clipboards, 1 per team*
- Paper and pencils for each team
- First aid kit(s)
- Suitable clothing and shoes for participants (see Planning Field Study Trips under Unit Overview: Tips for Managing the Unit)
- Camera (optional)
- Other materials needed for study trip (see Planning Field Study Trips under Unit Overview: Tips for Managing the Unit for further suggestions)
- KWLR chart (started in Activity 1: Getting to Know Salmon and Steelhead)

* = Included in Adopt-A-Watershed Kit

Advance Preparation

1. If you haven't already done so, identify a suitable study site (see Identifying a Study Site under Unit Overview: Tips for Managing the Unit for suggestions).

2. If you are not able to take participants to a field site, you can try doing this activity through a "virtual" field trip using aerial photos and other photographic images of the creek site:
    - Search for and view aerial photos or other maps on TerraServer-USA *(http://www.terraserver.microsoft.com/default.aspx)*
    - Photo Finder - Find and order aerial photos from the USGS *(http://edcsns17.cr.usgs.gov/finder/finder_main.pl?dataset_name=NAPP)*
    - Do an online image search for the name of your creek.
    - Check with your local historical society for older photos of the creek site.

3. Set the date and plan for the field study trip, including any safety issues (see Planning Field Study Trips under Unit Overview: Tips for Managing the Unit).

4. If your field study site is more than about 1/4 mile long, plan to have teams observe and map different sections of the creek. You will need an adult chaperone for each team.

5. Make one color copy of each of the Pacific Salmon and Steelhead Status Maps (http://www.inforain.org/salmonstrategy/stockstatus.html, click on Stock Status Maps).

6. Make copies of the Creek Walk Checklist.

7. If possible, arrange for your resource professional to join you at the site (see Resource Professionals under Unit Overview: Tips for Managing the Unit).

8. Within a week before the creek walk, make a quick trip to the site to check for unexpected hazards, such as high flows, changes in access trails, or pollution. If anything about the site appears unsafe, check with your resource professional about finding another site.

Setting the Stage

Remind participants about what they learned from Activity 4: Community Survey about whether salmon and/or steelhead live in your local creek and how people affect salmon and steelhead. Ask them how else they might be able to confirm whether salmon and/or steelhead live there.

Conducting the Activity

Part One – Getting Ready for the Creek Walk

1. Explain that one of the ways participants can determine whether salmon or steelhead live in the local creek is by checking out the range of where they can be found. Show participants the Salmon and Steelhead Status Maps, and explain:
    - That there are six different species of Pacific salmon and steelhead that live along the western coast of North America
    - That the maps show where the salmon and steelhead species can be found now and where they once lived, but are extinct
    - What the different colors of the map show about the salmon and steelhead in a given area (see Definitions of Status in the Background Information)

2. Give each team one of the maps.

3. Have teams look at their map, locate where the study community would be on the map, and determine the status in that area of the species indicated on the map. Ask teams to share what they learn from their maps.

4. Explain that participants will be taking a walk along the creek to observe and describe the habitat and how people might affect the creek. Ask participants the following, listing their responses on the board (at this point, accept all their ideas):

- What is a habitat?
- What things must a habitat include? (food, water, air, space, conditions for reproduction)
- What might we see that would tell us how people affect the creek and salmon and steelhead? (Participant responses may include, "Trash in the creek," "A road along the creek," or "Someone fishing.")

5. Hand out copies of the Creek Walk Checklist and read it over together. Ask participants to review the lists you made on the board to see whether there is anything to add to the checklist.

6. Explain that as part of the creek walk, participants will sketch a map of the creek to help them notice details and remember what they see. Participants will include some of this information in community maps they will make in Activity 8: Mapping Our Community.

7. Ask students what a map legend or key is. If they do not know, tell them that it explains the symbols used on a map.

8. Explain that each team will work together to answer the questions and sketch their maps. Each team member will have a job: The recorder will write the team's responses on the checklist, the sketcher will sketch the team's map, the mapper will mark on the map where the team saw the checklist items, and the reporter will report to the whole group what the team learned.

9. Make clear your behavior expectations for the creek walk and explain any logistical details. Be sure to talk about any safety issues such as poison oak, water safety, or wearing sunscreen (see Planning Field Study Trips under Unit Overview: Tips for Managing the Unit).

10. Answer any questions participants may have about the checklist, the map, or the walk.

Part Two – Creek Walk

1. On the day of the creek walk, make sure that participants are appropriately dressed. Review the purpose of the walk.

2. As soon as you arrive at the site, gather the group and ask, "What safety concerns might there be here? What potential hazards do we have to look out for? What areas appear to be fragile (such as stream banks or certain plants)? How can we avoid damaging the habitat here?"

3. Point out boundaries for the walk and review behavior expectations. Make sure that adult chaperones know what you want them to do with the participants.

4. Encourage participants to work as quietly as they can so that they will be more likely to see wildlife.

5. Have participants work together to sketch out a map and find the information on their Creek Walk Checklist.

Wrap-Up

1. Go through the worksheets as a group. For each item, have teams share what they observed.

2. Display the participants' maps.

3. Have participants look at the KWLR chart. Have them think about the guiding question: How do people affect salmon and steelhead, and how do salmon and steelhead affect people? Ask whether there is anything they want to add to or adjust on the chart based on what they learned from the creek walk.

4. Have teams add their checklist and map to their portfolios.

5. Explain to participants that the maps will be used again in Activity 8: Mapping Our Community and in Activity 11: Creek Monitoring, when participants will be learning more about the habitat needs of salmon and steelhead.

Enrichment

Using a field guide for the local area, make a bulletin board of plants and animals that may be found at the field study site to help participants learn to identify them.

Names: _____
Date: _____

Creek Walk Checklist

What to do:

- Look at the creek as a whole: Is the section you are studying straight or curved? What features really stand out?
- On a separate piece of paper, sketch a map of the creek section showing its general shape and any major features.
- As you walk along the creek, check off and describe each thing you observe. Add these features to your map showing where you saw them. You may need to create a legend or key describing the symbols you use to represent different features on your map.

1. The bottom of the creek is made of:

☐ Concrete
☐ Rocks
☐ Gravel
☐ Sand
☐ Soil
☐ Other:_____

The creek bottom:

☐ Is the same all along this section.
☐ Changes in places along this section.

2. The water is:

☐ Clear
☐ Muddy
☐ Greenish
☐ Yellowish to brownish
☐ Foamy
☐ Oily
☐ Smelly
☐ Creek is dry
☐ Other: _____

The water:

☐ Is the same all along this section.

☐ Changes in places along this section.

3. Animals you see in and around creek:

☐ Fish. How big and how many:_____

☐ Insects. What kind(s): _____

☐ Birds. Describe: _____

☐ Other animals. What kind(s): _____

☐ Animal signs (like bird nests, beaver dams, animal tracks). What kind(s): _____

_____

☐ Other: _____

4. Plants you see in and around creek:

☐ Algae. Describe: _____

☐ Grass. Describe:_____

☐ Shrubs. Describe:_____

☐ Trees. Describe:_____

☐ Other:_____

5. Human structures you see in and around creek:

☐ Trail or path

☐ Road

☐ Concrete creek bed

☐ Dam

☐ Bridge

☐ Stormwater drain or other discharge pipe

☐ Playground

☐ Parking lot

☐ Picnic tables

☐ Metal utilities cover ("manhole" lid). How is lid labeled? (sewer, water, telephone, electric utility):_____

☐ Building(s). What kind(s):_____

☐ Other:_____

6. Other signs of people in and around creek:

☐ People (other than the group). What are they doing? _____

_____

☐ Trash. What kind(s): _____

☐ Shopping cart

☐ Park

☐ Animal pasture

☐ Landfill

☐ Golf course

☐ Other: _____

7. Other clues about how people affect this creek:

_____

_____

_____

8. Other clues about whether salmon and steelhead could live in this creek:

_____

_____

_____

Adapted from "Stream Walk Questionnaire," *Hands on Save Our Streams: The Save Our Streams Teacher's Manual for Grades One through Twelve*. Gaithersburg, MD: Izaak Walton League of America, 1996.

Names / *Nombres*:_____
Date / *Fecha*:_____

Creek Walk Checklist
Lista de verificación para la caminata a riachuelo

What to do / *Qué hacer*:

- Look at the creek as a whole: Is the section you are studying straight or curved? What features really stand out?
- On a separate piece of paper, sketch a map of the creek section showing its general shape and any major features.
- As you walk along the creek, check off and describe each thing you observe. Add these features to your map showing where you saw them. You may need to create a legend or key describing the symbols you use to represent different features on your map.

- *Mire el riachuelo en su totalidad: La sección que estudias ¿es curva o recta? ¿Cuales características sobresalen?*
- *En otro papel, trace un mapa del riachuelo que demuestre su forma general y algunas características que sobresalgan.*
- *Al andar por el riachuelo, cancele (tache) y describa cada cosa que usted observa. Agregue estas características a su mapa indicando donde usted las vió. Puede ser que es necesario hacer una guía que describe los símbolos que usted usa para representar las características diferentes.*

1. The bottom of the creek is made of / *El fondo del riachuelo está hecho de*:
   - ☐ Concrete / *Cemento*
   - ☐ Rocks / *Rocas*
   - ☐ Gravel / *Grava*
   - ☐ Sand / *Arena*
   - ☐ Soil / *Tierra*
   - ☐ Other / *Otro*: _____

The creek bottom / *El fondo del riachuelo*:

- ☐ Is the same all along this section. / *Es igual lo largo de esta sección.*
- ☐ Changes in places along this section. / *Cambia durante la sección.*

2. The water is / *El Agua es*:
   - ☐ Clear / *Transparente*
   - ☐ Muddy / *Fangoso*
   - ☐ Greenish / *Verdoso*
   - ☐ Yellowish to brownish / *Amarillento…*

☐ Foamy / *Espumoso*
☐ Oily / *Grasoso*
☐ Smelly / *Maloliente*
☐ Creek is dry / *El riachuelo está seco*
☐ Other / *Otro*: _____

The water / *El Agua*:
☐ Is the same all along this section. / *Es igual lo largo de esta sección.*
☐ Changes in places along this section. / *Cambia durante la sección.*

3. Animals you see in and around creek / *Los animales que se ven en y alrededor del riachuelo*:
☐ Fish. How big and how many / Peces. Que tan grandes y cuantos: _____
☐ Insects. What kind(s) / *Insectos. De que tipo*: _____
☐ Birds. Describe / *Aves. Descríbalos*: _____
☐ Other animals. What kind(s) / *Otro tipo. Cuales*: _____
☐ Animal signs (like bird nests, beaver dams, animal tracks). What kind(s) / *Rastros de animales (como nidos de pájaro, diques de castor, huellas). Que tipo*: _____
_____
☐ Other / *Otro*: _____

4. Plants you see in and around creek / Las plantas que se ven en y alrededor del riachuelo:
☐ Algae. Describe / *Algas. Describa*: _____
☐ Grass. Describe / *Césped. Describa*: _____
☐ Shrubs. Describe / *Arbustos. Describa*: _____
☐ Trees. Describe / *Árboles. Describa*: _____
☐ Other / *Otro*: _____

5. Human structures you see in and around creek / *Estructuras humanas que se ven en y alrededor del riachuelo*:
☐ Trail or path / *Arrastres o senderos*
☐ Road / *Caminos*
☐ Concrete creek bed / *Cama de concreto*
☐ Dam / *Dique*
☐ Bridge / *Puente*
☐ Stormwater drain or other discharge pipe / *Desaguadero o otros tubos de descarga…*

☐ Playground / *Campo de juegos*
☐ Parking lot / *Estacionamiento*
☐ Picnic tables / *Mesas*
☐ Metal utilities cover ("manhole" lid). How is lid labeled? (sewer, water, telephone, electric utility) / *Tapadera metálica de utilidades (tapa de alcantarilla) ¿Cómo está marcada? – la alcantarilla, el agua, el teléfono, la utilidad eléctrica*: _____

_____

☐ Building(s). What kind(s) / *Edificio. ¿Que tipo?*: _____
☐ Other / *Otro*: _____

6. Other signs of people in and around creek / *Señales de personas en o alrededor del riachuelo*:
☐ People (other than the group). What are they doing? / *Personas (aparte del grupo) ¿Que hacen?* _____

_____

☐ Trash. What kind(s) / *Basura. ¿Que tipo(s)?*: _____
☐ Shopping cart / *Carritos de mercado*
☐ Park / *Parque*
☐ Animal pasture / *Pasto de animal*
☐ Landfill / *Vertedero*
☐ Golf course / *Campo de golf*
☐ Other / *Otro*: _____

7. Other clues about how people affect this creek / *Otros indicios de cómo la gente afecta este riachuelo*:

_____
_____
_____

8. Other clues about whether salmon and steelhead could live in this creek / *Otros indicios de si el salmón y la trucha del mar (el steelhead) pueden vivir en este riachuelo*:

_____
_____
_____

Adapted from "Stream Walk Questionnaire," *Hands on Save Our Streams: The Save Our Streams Teacher's Manual for Grades One through Twelve*. Gaithersburg, MD: Izaak Walton League of America, 1996.

Activity 6: Defining Our Watershed

Juvenile steelhead. Illustration by Duane Raver/ U.S. Fish and Wildlife Service.

Overview

Your local creek is only one part of a watershed, which includes all the land that drains into that creek. As participants learn more about the needs of salmon and steelhead, they will find that people's activities throughout the watershed can affect salmon and steelhead habitat. In this activity, participants are introduced to the concept of watershed, and then learn to use a topographic map to find the boundaries of the local watershed.

Background Information

A watershed is all the land that "sheds" water into a particular body of water. The boundaries of a watershed are the mountains, hills, and other high points where land slopes toward the water.

Learning about the area of land that drains into a body of water is critical to understanding how well that water can support salmon and steelhead. Everything that occurs in the watershed affects the water and, thus, the possible salmon and steelhead habitat within it. For more information about watersheds, see the Background Information in the Unit Overview.

Participants learn to use a topographic map in this activity to help them understand the features of the landscape. This type of map, which uses lines to represent specific elevations, is a representation of a three-dimensional surface on a flat piece of paper.

Objectives

Participants will (1) make a simple model of a watershed, (2) learn to read a topographic map, and (3) use a topographic map to identify the boundaries of their local watershed.

Time

Setting the Stage: One group session
Activity, Part One: One group session
Activity, Part Two: One group session

Materials

- Topographic maps of your community, 1 per team (see Advance Preparation)
- Colored pencils or crayons

- Sheets of scratch paper, 1 per person
- Blue, black, brown, and red water-based pens*
- Paper towels for each person
- Spray bottle of water*
- Materials needed for topographic map activity you choose (see Advance Preparation)
- Completed Creek Walk Checklist worksheets from Activity 5: Salmon and Steelhead Creek Walk
- Camera (optional)

* = Included in Adopt-A-Watershed Kit

Advance Preparation

1. Obtain several copies of a topographic map of your community, one copy for each team. The map should include the locations of both your school or meeting place and the study site. If your watershed is large, it may spread over multiple topographic maps. Possible sources:
    - Topozone *(http://www.topozone.com/)* offers interactive topographic maps of the entire United States. You can search meant for a map and print it for free.
    - The USGS Web site *(http://topomaps.usgs.gov)* sells 1:24,000-scale maps of the United States. You can find and order the map you need online.

2. Choose one of the following lessons to help participants learn to read topographic maps. Read through the lesson plan and get ready to teach it for Part One.
    - "Potato Mountain: Reading/Understanding Topographic Maps" - Participants map a carved potato to practice with topographic maps in this lesson plan from Penn State Sustainable Forest program. *(http://sftrc.cas.psu.edu/LessonPlans/EarthSciences/PotatoMountain.html)*
    - "Contour Maps with Dogstails" - In this lesson plan from National Geographic, participants slice lumps of clay to learn how to read topographic maps. *(http://www.nationalgeographic.com/xpeditions/lessons/01/g68/dogstails.html)*
    - "How to Read a Topographic Map" - This set of lesson plans from the United States Geological Survey uses sample maps to help participants learn about topographic maps. *(http://interactive2.usgs.gov/learningweb/teachers/mapsshow_lesson4.htm)*

3. Gather all the materials you will need.

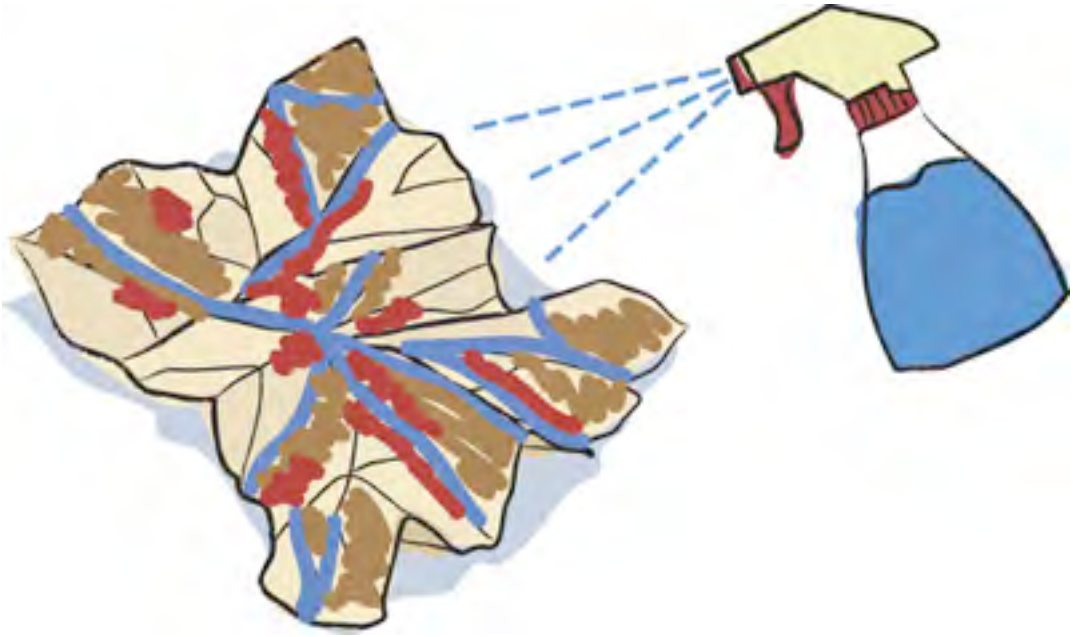
Setting the Stage

1. Ask participants, "Where do you think the water in our creek comes from? What is a watershed?" If participants are not familiar with the concept of watershed, explain what it means.

2. Conduct a quick demonstration of a watershed by having participants make a watershed model using a sheet of scratch paper. Have participants:
    - Crumple up the scratch paper into a loose ball.
    - Open up the paper and place it on a desk or table without flattening it completely. It should have various relief features on it that resemble mountain ridges and valleys.
    - Use blue water-based pens to mark the "creeks" on their paper and where they think water will collect as it runs downhill.
    - Use black water-based pens to outline the ridges that separate one creek from another creek.
    - Use brown water-based pens to draw exposed soil that could wash away in the watershed.
    - Use red pens to draw possible pollutants they may find in their watershed, such as soap from washing cars, parks with lots of dog poop, or pesticides on lawns.
    - Place paper towels underneath the model.
    - Keep the model on the desk and spray a very light mist of water over it.
    - Observe where water runs down and where it collects.
    - Describe ways that the model is similar to and different from the local creek.

Crumpled Paper Watershed Stage 1

Crumpled Paper Watershed Stage 2



Crumpled Paper Watershed Stage 3

Note: For another quick and simple model of a watershed using your hands and a spray bottle, see the 4-H curriculum *From Ridges to Rivers: Watershed Explorations (http://clubs.ca4h.org/sanluisobispo/r2rwe/).*

Conducting the Activity

Part One – Learning to Read a Topographic Map

Using the lesson plan you have selected, give participants practice learning to read a topographic map (see Advance Preparation).

Part Two – Outlining Our Watershed

1. Give each team a copy of the topographic map of your community. Help participants get oriented to the map by giving them major streets, highways, or other landmarks in your area and having them find them on the map.

2. Ask teams to find where your school or meeting place is on their map, and mark the location using a crayon or colored pencil.

3. Have the teams find the creek where your study site is located, and mark the creek along its entire length. Also have them mark your study site.

4. Help participants find the contour lines and the markings that tell the elevation. Have participants use these lines to find out the elevation of your school or meeting place and the elevation of the study site.

5. Explain to participants that to locate the watershed that drains into your creek, they should look for the highest ridges or hills around the creek. These ridges are called the drainage divides, and they separate one watershed from another. Have participants outline the shape of the watershed by following the highest contour line that surrounds your creek. They should mark this shape using a colored pencil.

6. Ask participants to think about whether water would flow in the direction of higher or lower elevations. Then, help them to determine the direction of water flow across the watershed. They should draw blue arrows showing the direction of flow across the land to the creek water.

7. Have participants locate and mark other places they are familiar with within the watershed such as parks, the library, or certain stores.

8. Have participants add to the map any human structures they found on their creek walk.

Wrap-Up

1. Lead a discussion about what participants learned from the mapping activity:
    - What barriers are there along our creek?
    - How much land drains into our creek? What is the approximate area?
    - What relationship is there between the boundaries of our community and the boundaries of the watershed?
    - How does the land that drains into the creek influence the creek itself?

- Why might it be important to consider the land that drains into our creek when we are thinking about salmon and steelhead?

2. Have teams add copies of their maps to their portfolios.

Enrichment

Within urban environments, creeks are sometimes piped underground to avoid roads, factories, or housing. If your creek seems to "disappear" from the map somewhere along its course, it may be underground for that part. Find out what might be in the way of the creek, and how human constructs affect the creek's flow.

Activity 7: Watershed Web Search

Overview
Background Information
Objectives
Time
Materials and Resources
Advance Preparation
Setting the Stage
Conducting the Activity
Wrap-Up
Assessment
Resources

Overview
In this activity, participants carry out an Internet investigation of their local watershed. They deepen their understanding of watersheds as they learn how the watershed connects the people and salmon living there. To show what they learn, participants create a pamphlet that answers questions about the local watershed.

Background Information
For information about watersheds, see the Background Information in the Unit Overview and links on the Watershed Web Search participant worksheet.

Objectives
Participants will (1) conduct an Internet search to learn about their local watershed, (2) learn how people's actions affect the water in the watershed, (3) find out who is working to protect the local watershed and the salmon and/or steelhead in it, and (4) create a pamphlet that defines what a watershed is and explains how people's everyday actions in the watershed affect the salmon and/or steelhead that live or could live in the creek.

Time
Activity: Two to four group sessions

Materials and Resources

- Access to Internet
- Notebooks or writing paper (for taking notes)
- Sample pamphlets (optional)*
- Drawing paper for each person
- Colored pencils or pens for each person
- Glue sticks
- Scissors
- Watershed Web Search worksheet (copies optional)
- Copies of Rubric for Watershed Pamphlets (optional)

* = Included in Adopt-A-Watershed Kit

Advance Preparation

1. Plan your schedule so that each participant can spend one to three group sessions on the Web search and another group session making the pamphlet.

2. Arrange computer lab time as necessary.

3. Read over the Watershed Web Search worksheet to familiarize yourself with the participant task.

4. (Optional) Make copies of the Watershed Web Search worksheet for each participant.

5. Decide whether you want participants to create their pamphlets for a specific audience (such as other participants, parents, or community members).

6. (Optional) If you will be using it, make copies of the Rubric for Watershed Pamphlets *(http://sns.ucdavis.edu/public/user/files/curriculum/activity_7_rubric.pdf)*.

Setting the Stage

1. Remind participants of the crumpled paper watershed models they made in Activity 6: Defining Our Watershed. Ask them to list human activities in the watershed that could affect the water. If necessary, you might have them start by thinking about what was represented by each of the different colored inks in the model, and how these things affect the water. (The blue ink represented water, the brown ink represented soil, and the red ink represented pollutants such as lawn chemicals or dog feces.)

2. Explain to participants they will do a Web search to learn more about their local watershed and how people's actions could affect the water in the watershed. Describe how participants will look at a number of different Web sites to find answers to questions about their watershed, take notes on the answers, and then use their notes to create a pamphlet.

3. If possible, show participants a few sample pamphlets to give them an idea about what they will be making.

Conducting the Activity

1. As a group, read over copies of the "Watershed Web Search" worksheet, or have participants look at them on their computers. Make sure that they understand their task.

2. If you will be using it, give participants copies of the Rubric for Watershed Pamphlets. Read it over together and answer any questions they might have about the criteria.

3. Get participants set up on the computers to do their Web search.

4. As participants work, circulate among them and help them focus on the information they need to answer the questions. Encourage them to answer the questions as completely as possible and to take notes in their own words.

5. Many of the Web sites have links to other sites with relevant information. As time allows, you may want to encourage participants to expand their search to explore related topics dealing with their local watershed.

6. When participants have finished answering the questions, have them begin making their pamphlets. Give them drawing paper, colored pens, and access to glue sticks and scissors, or have them use Print Shop or other layout software to create the pamphlet.

7. Participants may use a "Q & A" format for their pamphlet, listing the questions they researched along with their answers. If you have identified a specific audience for the pamphlets (see Advance Preparation), suggest that they keep that audience in mind when writing the pamphlet so that it meets that audience's reading level and other needs.

Wrap-Up

1. Have participants share their pamphlets with others in the group. If possible, arrange for them to share their pamphlets with their intended audience.

2. Have participants place their pamphlets in their team portfolios.

Assessment
Use the rubric provided to assess (or to have participants self-assess) participants' pamphlets.

Rubric for Watershed Pamphlets

	Excellent	Acceptable	Unsatisfactory
Content	• The pamphlet included all of the required content (answers to all five questions, at least one map, and at least one photo or illustration). • The information was well organized and well written.	• The pamphlet included most of the required content (answers to five questions, a map, and a photo or illustration). • The information was organized and well written.	• Some or all of the required content was missing. • The information was not organized or was not well written.
Grammar/ Mechanics	• No errors.	• Contained only minor errors that did not interfere with understanding the information.	• Contained significant errors that interfered with understanding the information.
Appearance	• The pamphlet design was unique and creative, with much attention to detail.	• The pamphlet design was neat in appearance and well designed.	• The pamphlet did not appear neat or carefully designed.

Watershed Web Search Worksheet

Introduction
People and salmon and steelhead share watersheds. By studying watersheds, you will learn:

- How people affect the water and fish in your watershed – even if they don't get near the creek or lake.
- Who in your community is working to protect the watershed and salmon and steelhead.

The Task
Your job in this Web search is to learn about your community's watershed and how the watershed connects people to salmon and steelhead. As you conduct your search, you will answer a set of questions. Then, to show what you have learned, you will create a pamphlet that tells people in your community how their everyday actions affect the salmon and steelhead in your watershed.

The Process

1. Read over the following questions. You will be looking for answers to these questions as you visit the different Web sites below. Take notes so that you can write answers to these five questions for your pamphlet.

- What is a watershed?
- What watershed do we live in?
- How do people affect the water and fish in our watershed?
- How can we help to keep our water clean and safe for people and animals?
- What groups in our community are working to protect our watershed?

2. Use the Web sites below to conduct your search. You will need to visit several different Web sites to answer these questions. Take notes in your own words.

3. Use your notes on these questions to create a pamphlet about your local watershed and how people's actions in the watershed affect salmon and steelhead. Your pamphlet should include:

    - A title
    - Answers to the five questions
    - One or more maps of your community or watershed
    - At least one other photo or illustration

Resources
Look at these Web sites to help you answer the questions about your local watershed.

What a watershed is	Visit the Conservation Technology Information Center at Purdue University *(http://www.ctic.purdue.edu/KYW/glossary/whatisaws.html).* Read the definition of a watershed and watch the *What Is a Watershed?* video. Read and learn about the different components of a watershed on this Web site: *http://wrc.iewatershed.com/index.php?pagename=AboutWatersheds.* It focuses on Chesapeake Bay, but the concepts apply to any watershed. What is a Watershed? Take a look at this definition, drawing, and quote by John Wesley Powell to help you understand what a watershed is *(http://www.epa.gov/win/what.html).*
What watershed we live in	Using the National Atlas of the United States of America *(http://www.nationalatlas.gov),* you can make a custom map of any area in the United States. Click on Map Maker and keep clicking on your area of the map to narrow the scope. Click on the "Water" button and you will be able to add to your map watershed boundaries, major bodies of water, dams, and stream monitoring stations in your area. Using the California Water Quality Standards Inventory Database *(http://www.ice.ucdavis.edu/wqsid/wqodbase.htm),* find a map of your local watershed. You can search by the name of your county or by the name of your local creek or river.
How people affect water and fish in our watershed	Watch the *Everyone Impacts a Watershed* video at the Conservation Technology Information Center *(http://www.ctic.purdue.edu/KYW/glossary/whatisaws.html).* Play a Watershed Game to see the results of decisions you make concerning watersheds and national parks, agriculture, neighborhoods, and cities *(http://www.bellmuseum.org/distancelearning/watershed/watershed2.html).* Answer the question, "What's Wrong with This Picture?" *(http://www.epa.gov/owow/nps/kids/)* to learn how different things people do in the watershed can hurt water and fish.
What we can do to help keep water clean and safe	Read about six things that you can do yourself, and encourage others to do, to help keep water clean and safe *(http://www.tvakids.com/environment/cleanwater.htm).*
Groups working to protect watersheds	Use the Locate Your Watershed – Watershed Information Network *(http://cfpub.epa.gov/surf/locate/index.cfm)* to find information about your local watershed, like who is working on watershed issues. Type in your local zip code, stream name, or city name to "locate your watershed."

Watershed Web Search Worksheet
Búsqueda en la red de cuenca

Introduction / *Introducción*

People and salmon and steelhead share watersheds. By studying watersheds, you will learn:

- How people affect the water and fish in your watershed – even if they don't get near the creek or lake.
- Who in your community is working to protect the watershed and salmon and steelhead.

Las personas, el salmón y la trucha del mar (el steelhead) comparten las mismas cuencas. Estudiando las cuencas, usted aprenderá

- *Cómo las personas afectan el agua y los peces en las cuencas – aunque no se acerquen al riachuelo ni al lago.*
- *Quién en su comunidad trabaja para proteger la cuenca, el salmón y la trucha del mar.*

The Task / *El Propósito*

Your job in this Web search is to learn about your community's watershed and how the watershed connects people to salmon and steelhead. As you conduct your search, you will answer a set of questions. Then, to show what you have learned, you will create a pamphlet that tells people in your community how their everyday actions affect the salmon and steelhead in your watershed.

Su trabajo en esta búsqueda en la red es aprender de la cuenca de su comunidad y cómo la cuenca conecta las personas al salmón y la trucha del mar. Cuando usted realiza su búsqueda, usted contestará un conjunto de preguntas. Entonces, para mostrar lo que usted ha aprendido, usted creará un folleto que les dirá a personas en su comunidad cómo sus acciones diarias afectan el salmón y la trucha del mar en la cuenca.

The Process / *El Proceso*

4. Read over the following questions. You will be looking for answers to these questions as you visit the different Web sites below. Take notes so that you can write answers to these five questions for your pamphlet.
   Lea las preguntas que siguen. Usted buscará las respuestas a estas preguntas mientras visita las páginas de la red. Tome notas para que usted pueda escribir las respuestas a estas cinco preguntas para su folleto.

- What is a watershed? / *¿Que es una cuenca?*
- What watershed do we live in? / *¿En que cuenca vivimos?*
- How do people affect the water and fish in our watershed? / *¿Cómo es que la gente afecta el agua y los peces en la cuenca?*
- How can we help to keep our water clean and safe for people and animals? / *¿Cómo podemos ayudarnos a mantener el agua limpia para las personas y los animales?*
- What groups in our community are working to protect our watershed? / *¿Qué grupos en nuestra comunidad trabajan para proteger la cuenca?*

5. Use the Web sites below to conduct your search. You will need to visit several different Web sites to answer these questions. Take notes in your own words.
   Usa las páginas de la red que siguen para conducir su búsqueda. Tendrás que visitar varias páginas para responder a las preguntas. Tome notas en sus propias palabras.

6. Use your notes on these questions to create a pamphlet about your local watershed and how people's actions in the watershed affect salmon and steelhead. Your pamphlet should include:
   Use sus notas en estas preguntas para crear un folleto de su cuenca local y cómo nuestras acciones en la cuenca afectan al salmón y a la trucha del mar. Su folleto deberá incluir:

   - A title / *Un título*
   - Answers to the five questions / *Respuestas a las cinco preguntas*
   - One or more maps of your community or watershed / *Uno o más mapas de su comunidad o de la cuenca*
   - At least one other photo or illustration / *Por lo menos una otra foto o ilustración*

Resources / *Recursos*

Look at these Web sites to help you answer the questions about your local watershed.
Mire estos sitios de la red para contestar las preguntas sobre su cuenca local.

What is a watershed / *Que es una cuenca*	Visit the Conservation Technology Information Center at Purdue University *(http://www.ctic.purdue.edu/KYW/glossary/whatisaws.html).* Read the definition of a watershed and watch the *What Is a Watershed?* video. *Visita el* Conservation Technology Information Center at Purdue University *[Centro de información de tecnología de conservación]. Lea la definición de la cuenca y mire el video* What Is a Watershed*?[¿Que es una cuenca?]* Read and learn about the different components of a watershed on this Web site: *http://wrc.iewatershed.com/index.php?pagename=AboutWatersheds.* It focuses on Chesapeake Bay, but the concepts apply to any watershed. *Lea y aprenda de los componentes diferentes de una cuenca en este sitio. Se enfoca en la Bahía Chesapeake, pero los conceptos se pueden aplicar a cualquiera cuenca.* What is a Watershed? Take a look at this definition, drawing, and quote by John Wesley Powell to help you understand what a watershed is *(http://www.epa.gov/win/what.html).* *¿Qué es una cuenca? Mire esta definición, dibujo y cita hechos por John Wesley Powell para entender lo que es una cuenca.*

What watershed we live in / *En que cuenca vivimos*	Using the National Atlas of the United States of America *(http://www.nationalatlas.gov),* you can make a custom map of any area in the United States. Click on Map Maker and keep clicking on your area of the map to narrow the scope. Click on the "Water" button and you will be able to add to your map watershed boundaries, major bodies of water, dams, and stream monitoring stations in your area. *Usando el* National Atlas of the United States of America *[Atlas nacional de los Estados Unidos], puede hacer un mapa de cualquier área de los Estados Unidos. Presione en* Map Maker *y continué presionando en su área del mapa para estrechar el alcance. Presione el "*Water*" botón y será capaz de añadir fronteras a la cuenca, las masas de agua, los diques, y los sitios para vigilancia del riachuelo.* Using the California Water Quality Standards Inventory Database *(http://www.ice.ucdavis.edu/wqsid/wqodbase.htm),* find a map of your local watershed. You can search by the name of your county or by the name of your local creek or river. *Usando el* California Water Quality Standards Inventory Database *[Base de datos estándares de la calidad del agua de California], encuentre un mapa de su cuenca local. Usted puede buscar por el nombre de su condado o por el nombre de su riachuelo o río local.*
How people affect water and fish in our watershed / *Como las personas afectan el agua y los peces en nuestra cuenca*	Watch the *Everyone Impacts a Watershed* video at the Conservation Technology Information Center *(http://www.ctic.purdue.edu/KYW/glossary/whatisaws.html).* *Mire el video* Everyone Impacts a Watershed *[Todos afectamos la cuenca] en el* Conservation Technology Information Center *[Centro de información de tecnología de conservación].* Play a Watershed Game to see the results of decisions you make concerning watersheds and national parks, agriculture, neighborhoods, and cities *(http://www.bellmuseum.org/distancelearning/watershed/watershed2.html).* *Juegue un* Watershed Game *(Juego de cuenca) para ver los resultados de las decisiones que usted hace con respecto a la cuenca, parques nacionales, agricultura, vecindarios, y ciudades.* Answer the question, "What's Wrong with This Picture?" *(http://www.epa.gov/owow/nps/kids/)* to learn how different things people do in the watershed can hurt water and fish. *Conteste la pregunta, "*What's Wrong With This Picture?*" [¿Que tiene de raro la foto?] para aprender las cosas que las personas hacen que dañan el agua y los peces.*
What we can do to help keep water clean and	Read about six things that you can do yourself, and encourage others to do, to help keep water clean and safe *(http://www.tvakids.com/environment/cleanwater.htm).*

safe / *Lo que podemos hacer para mantener el agua limpia y saludable*	*Lea de seis cosas que puede hacer usted mismo, y anime a otros que hagan, para mantener el agua limpia y saludable.*
Groups working to protect watersheds / *Grupos que trabajan para proteger cuencas*	Use the Locate Your Watershed – Watershed Information Network *(http://cfpub.epa.gov/surf/locate/index.cfm)* to find information about your local watershed, like who is working on watershed issues. Type in your local zip code, stream name, or city name to "locate your watershed." *Use el* Locate Your Watershed – Watershed Information Network *[Localiza tu cuenca-Red de información de cuenca]) para encontrar información sobre su cuenca local, como quien trabaja para resolver los problemas de la cuenca. Escriba su código postal local, el nombre del río, o el nombre de la ciudad para "*locate your watershed*" [localizar su cuenca]*.

Activity 8: Mapping Our Community

Salmon sketch by Lewis and Clark. Photo from U.S. Fish and Wildlife Service.

Overview

In this activity, participants create a map of their community to depict connections between the people and the salmon and/or steelhead that live or once lived there. Participants incorporate into the map things they learned from earlier activities, including:

- Community Survey *(http://groups.ucanr.org/sns/Unit%5FActivities%5F%28for%5FTeachers%29/Activity_4-_Community_Survey.htm)*
- Salmon and Steelhead Creek Walk *(http://groups.ucanr.org/sns/Unit%5FActivities%5F%28for%5FTeachers%29/Activity_5-_Salmon_and_Steelhead_Creek_Walk.htm)*
- Defining Our Watershed *(http://groups.ucanr.org/sns/Unit%5FActivities%5F%28for%5FTeachers%29/Activity_6-_Defining_Our_Watershed.htm)*
- Watershed Web Search *(http://groups.ucanr.org/sns/Unit%5FActivities%5F%28for%5FTeachers%29/Activity_7-_Watershed_Web_Search.htm)*

Note: The procedure describes making a community map on poster board, but you may choose to have your group make a Web-based map. In that case, participants may insert miniature pictures of key features so that when someone clicks on a picture, a written summary of information appears (see Dynamic Digital Mapping under Resources: Aerial Photos and Mapping, *http://groups.ucanr.org/sns/Resources/Aerial_Photos_and_Mapping.htm*).

Background Information

Wendell Berry, American poet and conservationist, says if you don't know *where* you are, you don't know *who* you are. Making a map of the community helps to deepen participants' sense of place and to further ground their study of salmon and steelhead in connection with their community and their watershed. The maps they create will help them to think about their community from the perspective of salmon and steelhead.

For more information about fostering a sense of place, see the Research on Place and Space Web site *(http://pegasus.cc.ucf.edu/%7Ejanzb/place/placesense.htm)* for a list of resources and links.

Objectives

Participants will (1) use and understand existing maps of the community and (2) create a map that shows the connections between people and salmon and steelhead within the community.

Time
Setting the Stage: One group session
Activity: One or more group sessions

Materials

- Topographic maps of your community (from Activity 6: Defining Our Watershed)
- 3' x 3' (or larger) detailed street map of your community
- A skeleton map of your community (see Advance Preparation)
- Resource maps of your community (optional, see Advance Preparation)
- Overhead projector
- Overhead transparency
- Poster board for each team
- Masking tape
- Colored pens or crayons for each team
- Glue sticks for each team
- KWLR chart (started in Activity 1: Getting to Know Salmon and Steelhead)

Advance Preparation

1. Obtain a detailed street map of your community from a local store or through your auto club, local tourist office, or library.

2. Obtain or create a "skeleton" map of your community that simply shows its boundaries and a few major streets. You may get such a map at mapquest.com or a similar online mapping site or from your town's tourist Web site or a similar source.

3. If possible, find one or two examples of resource maps of your community—such as a map of bicycle routes, parks, wildlife, tourist sites, or restaurants.

4. Make an overhead transparency of the skeleton map.

5. Gather other materials from the Materials list.

Setting the Stage

1. Begin by asking the group what kinds of information a city map or town map shows.

2. Point out that many maps focus on one kind of information, such as just parks or schools. If you have them, show some examples of resource maps of your community (see Advance Preparation).

3. Explain to participants that they will be creating a map of your community that shows the community's connection to salmon and steelhead. Tell participants that they will incorporate into their maps information they have gained from earlier activities.

Conducting the Activity

1. Ask, "What might we include in our map to show connections between our community, and salmon and steelhead?" List their ideas on the board. Participants might suggest things like:
    - The creek
    - The watershed boundary
    - Actions that affect the water (like putting pollutants on the ground)
    - Groups that help salmon and steelhead

2. If participants need help thinking of ideas, have them recall what they learned from the previous activities.

3. Discuss what symbols or icons participants could use on their maps to represent the different elements, and discuss the importance of a map key or legend.

4. Point out that in creating the maps, participants may place symbols and other elements within the map itself, but may also add photographs, graphs, tables, lists, or other supporting details and draw arrows to the map.

5. For each team's map, tape poster board onto a wall and project the map transparency (see Advance Preparation) onto it. Help the team trace the map onto the poster board and label key streets and other features shown on the skeleton map.

6. Give teams time to flesh out the details of their community maps, inserting the information identified in step 1. Teams should label their maps and include at least 10 ways that the community is connected to salmon and steelhead.

Wrap-Up

1. Have teams share their maps with the group.

2. Display the maps in the community or school library. Seek other possible public venues (city hall, the local water or resource agency, and so on).

3. Have participants look at the KWLR chart. Have them think about the guiding question: How do people affect salmon and steelhead, and how do salmon and steelhead affect people? Ask whether there is anything they could add to or adjust on the chart in light of the community mapping activity.

Enrichment

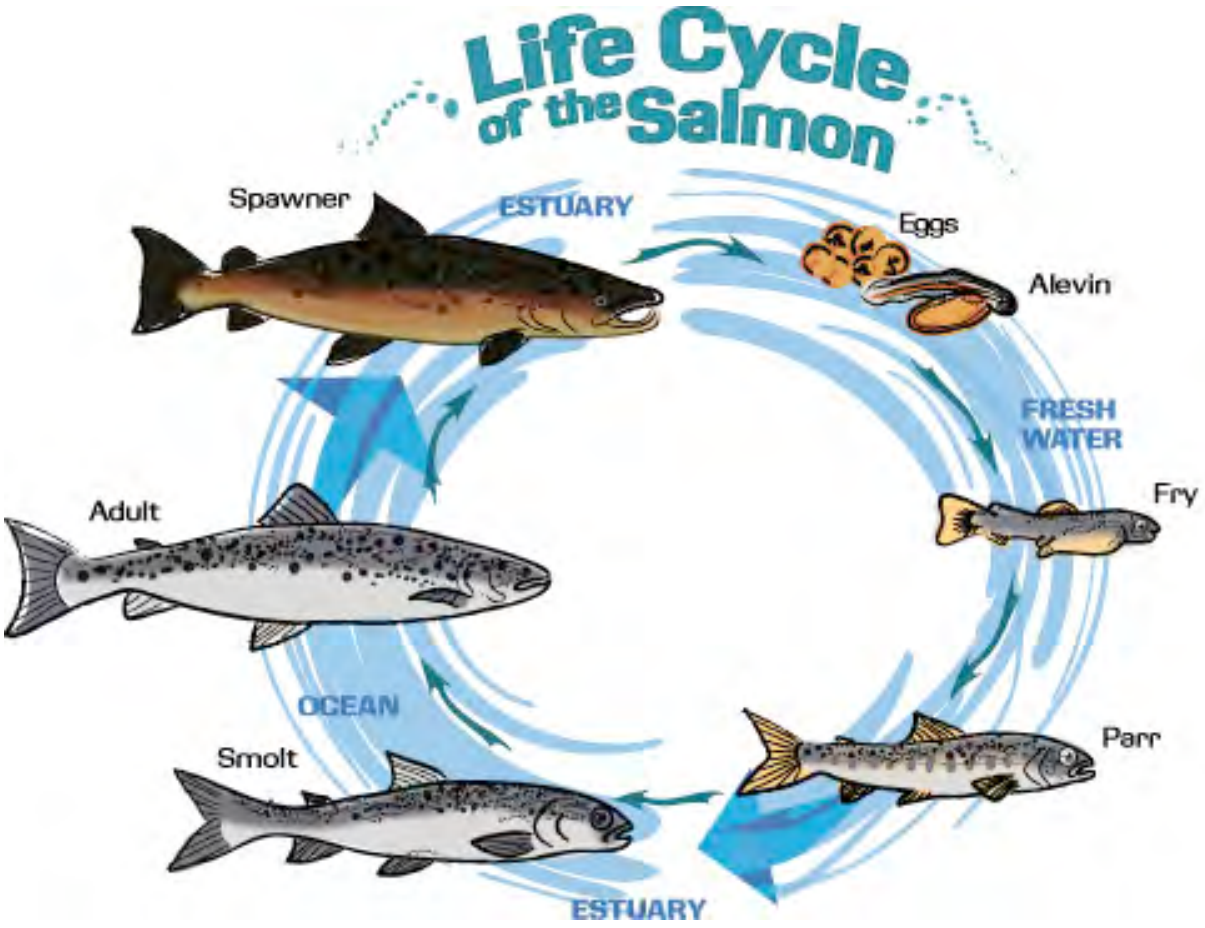
Build a 3-D model of your local watershed. See the 4-H curriculum *From Ridges to Rivers: Watershed Explorations (http://clubs.ca4h.org/sanluisobispo/r2rwe/)* for more information.

Activity 9: Salmon and Steelhead Life Stories Web Search

Overview
Background Information
Objectives
Time
Materials and Resources
Advance Preparation
Setting the Stage
Conducting the Activity
Wrap-Up
Enrichment
Assessment

Overview

In this activity, participants conduct an Internet investigation to learn about the natural history of local salmon and/or steelhead. They then write a story that describes the life of a salmon or steelhead from the local creek, including a description of each stage of its life cycle and what people can do to help salmon and steelhead. Participants will build on this information in the activities that follow as they design appropriate habitats for salmon eggs and plan for habitat monitoring.



Background Information
For information about the salmon and steelhead life cycle, see the Background Information in the Unit Overview and the links on the Salmon and Steelhead Life Stories Web Search worksheet.

Objectives
Participants will (1) conduct an Internet search to learn about the life cycle stages and migration patterns of local salmon and steelhead species, and (2) write a story that describes the life of one salmon or steelhead fish that hatches in the local creek, including what it looks like, what it needs, where it is on its journey, and any challenges it faces at each life cycle stage. They conclude the story by suggesting ways people can help salmon and steelhead.

Time
Activity: Four to five group sessions

Materials and Resources

- Access to Internet
- Map of California that includes local creek area*
- Student notebooks or writing paper
- Colored pencils or pens (optional)
- Glue sticks (optional)
- Salmon and Steelhead Life Stories Web Search worksheet (hard copies optional)
- Copies of the "Salmon and Steelhead Life Cycle" worksheet, 1 per person
- Sample life-cycle stories for participants to read (see Children's Literature under Resources: Stories and Music, *http://groups.ucanr.org/sns/Resources/Stories_and_Music.htm*)*
- Copies of Rubric for Salmon and Steelhead Life Stories, 1 per person (optional)
- KWLR chart (started in Activity 1: Getting to Know Salmon and Steelhead)

* = Included in Adopt-A-Watershed Kit

Advance Preparation

1. Plan your schedule so that each participant can spend two (or more) group sessions on the Web search and another one or two group sessions writing the story.

2. Arrange computer lab time as necessary.

3. Collect two or more salmon life-cycle stories for participants to read as examples. Try to choose ones that are different in writing style and plot for students to compare.

4. Read over the participant pages to familiarize yourself with the task.

5. Make copies of the "Salmon and Steelhead Life Cycle" worksheet, the "Salmon and Steelhead Life Stories Web Search" pages (if you want participants to have a hard copy), and the Rubric for Salmon and Steelhead Life Stories (if you will be using it).

6. Invite your salmon and steelhead resource professional (see Resource Professionals under Unit Overview: Tips for Managing the Unit) to join the group for the Wrap-Up to hear participants read their stories. Ask him or her to talk with participants about the specific life cycle and migration patterns of local salmon and/or steelhead. For example, he or she might explain whether there are different spawning runs during the year in your area, how long these fish typically spend in the ocean before heading back upstream, where they tend to end up in the Pacific Ocean, who is studying salmon and/or steelhead in your area, what they are trying to learn to restore salmon and/or steelhead populations, and so on.

7. Post the map of California on the wall.

Setting the Stage

1. Ask participants what a life cycle is and have them name some stages of the human life cycle (for example, fetus, newborn, infant, and so on). For a couple of the stages ask, "How is a person in this stage different from one in the stage before or after? What do people need at this stage to thrive? (For example, toothless infants need food that they can swallow without chewing.) Is it possible to go to the next stage of the life cycle without going through this stage?"

2. Reminding participants of Activity 2: The Incredible Journey, ask them what life cycle stages salmon and steelhead go through in their migration (do not be concerned about accurate names at this point). Ask participants to name the stage(s) that might occur in the local creek and those that occur in the ocean.

3. Looking at a map of California, have participants trace the path that a salmon and/or steelhead would need to follow to get from your local creek to the ocean and then back again. Make a list of the bodies of water it would pass through on its journey.

4. Explain to participants that they will do a Web search to learn more about the life cycle of salmon and steelhead and what salmon and steelhead need at different times and places in their lives. Point out that this Web search will help them determine whether the local creek is a good place for salmon and steelhead to live.

5. Explain that as in the previous Web search (Activity 7: Watershed Web Search), participants will look at a number of different Web sites to find answers to questions about salmon and steelhead. For this activity, participants will use their notes to write a story about a salmon or steelhead that comes from your local creek. The story must include all the different stages of the salmon's life cycle and include illustrations of the different stages. At the end they should suggest ways people might help their salmon or steelhead.

6. Point out that the life stories are slightly different for each salmon and steelhead species. Whenever possible, participants should include in their stories the information that is specific to the native species in your area. Ask participants to name the species of salmon

and/or steelhead that are native to your area (see Activity 5: Salmon and Steelhead Creek Walk).

Conducting the Activity

1. As a group, read over copies of the Salmon and Steelhead Life Stories Web Search worksheet, or have participants look at them on their computers. Make sure they understand their task.

2. (Optional) Give participants copies of the Rubric for Salmon and Steelhead Life Stories if you will be using it. Read over it together and clarify any questions they might have about the criteria.

3. Get participants set up on the computers to do their Web search. Give each participant a copy of the Salmon and Steelhead Life Cycle worksheet for writing notes.

4. As participants work, circulate among them and help them focus on the information they need to answer the questions. Encourage them to answer the questions as completely as possible and to take notes in their own words.

5. Many of the Web sites have links to other sites with relevant information. As time allows, you may want to encourage participants to expand their search to explore related topics on salmon and steelhead life cycles and migration.

6. When participants have finished answering the questions, have them read two or more stories about salmon and steelhead that you have collected (see Advance Preparation).

7. As a group, compare the writing styles, character development, setting, plot, and literary devices used in the different stories. Ask:
    - How do the characters' qualities affect the plot?
    - What influence does the setting have on the problem and resolution?
    - What effect do literary devices (such as symbolism, imagery, and metaphor) have on the story?

8. Have participants begin drafting their stories using paper and pencil or word processing software. You may need to help them print or download pictures of each life stage.

9. Allow time for participants to create a first draft of their story and then to revise it into a final draft.

Wrap-Up

1. Have participants read aloud their salmon or steelhead life stories to an audience including the group and your salmon and steelhead resource professional. Afterward, have the resource professional talk with participants about the specific life cycle and migration patterns of the local salmon and/or steelhead (see Advance Preparation).

2. Have participants place their stories in their team portfolios.

3. Have participants look at the KWLR chart. Have them think about the guiding question: How do people affect salmon and steelhead, and how do salmon and steelhead affect people? Ask whether there is anything they could add to or adjust on the chart, given what they have learned about the salmon and steelhead life cycles.

Enrichment

- Arrange for participants to share their stories with a group of younger children.

- Challenge participants to create an imaginary animal species. They should think about what the species looks like, how it behaves, where it lives, and what it needs at each stage of its life. Have participants write a complete natural history of their imagined species.

- Find out about state, federal, and international laws and treaties that protect migratory salmon and steelhead or other migratory species (see Laws Protecting Salmon and Steelhead under Resources: Information about Salmon and Steelhead, *http://groups.ucanr.org/sns/Resources/Information_About_Salmon_and_Steelhead.htm*).

Assessment
Use the rubric provided to assess (or to have participants self-assess) participants' stories.

Rubric for Salmon and Steelhead Life Stories

	Excellent	Acceptable	Unsatisfactory
Content	• The story included all of the required content (description of salmon or steelhead at each stage, including pictures, needs, threats, and what people can to help). • The information was well organized and integrated well into the story.	• The story included most of the required content. • The information was organized and was included as part of the story.	• Some or all of the required content was missing. • The information was not organized or was not included as part of the story.
Use of Literary Devices	• The story used several different literary devices such as conflict and resolution; metaphor; imagery; and symbolism. • The story showed a clear relationship between the setting and the conflict or problem. • The story clearly showed how the qualities of the character affected the plot and resolution of the story.	• The story used one or two different literary devices. • The story showed a relationship between the setting and the conflict or problem. • The story showed how the qualities of the character affected the plot and resolution of the story.	• The story did not use any literary devices. • The story did not show a relationship between the setting and the conflict or problem. • The story did not show how the qualities of the character affected the plot and resolution of the story.
Grammar/ Mechanics	• No errors.	• Contained only minor errors that did not interfere with understanding the story.	• Contained significant errors that interfered with understanding the story.

Salmon and Steelhead Life Stories Web Search Worksheet

Introduction
Imagine what your life would be like if you were a salmon or steelhead! Starting out as an egg in a creek bed, you hatch and grow and make your way hundreds of miles to the open ocean and then back again.

By studying the life cycle and migration of salmon and/or steelhead in your area, you will learn:

- How salmon and steelhead change at different stages of their lives
- Where they live at each stage
- What they need to survive at each stage
- What challenges they face at each stage
- What people can do to help salmon and steelhead

The Task
Your job in this Web search is to learn about the life cycle and migration path of salmon and/or steelhead in your local area. As you conduct your search, you will answer a set of questions about salmon and steelhead. Then, you will use your answers to write a story about the life of a salmon or steelhead that hatches in your local creek.

The Process

1. Read over the following questions. You will be looking for answers to these questions as you visit the different Web sites below.

- What species of salmon and/or steelhead live, or used to live, in your local watershed? Choose one species to study.
- What are the different stages of the salmon or steelhead life cycle?
- For each stage of the salmon or steelhead life cycle:
    - What is the name of the stage?
    - What does the salmon or steelhead look like?
    - What size is it?
    - What is its habitat? Where does it live? (Describe the location in as much detail as you can. What's the name of the creek or river?)
    - What does it need to thrive?
    - What threats does it face?
    - How do people affect it?
    - What can people do to help it?

2. Use the Web sites below to conduct your search. You will need to visit several different Web sites to answer these questions. Take notes in your own words, using the Salmon and Steelhead Life Cycle worksheet.

3. Read some sample stories about salmon and steelhead with your group to compare different writing styles.

4. Use your notes to write a story about a salmon or steelhead from your local creek. Your story should include:

- A title
- A description of every life cycle stage, including:
    - What the salmon or steelhead looks like at that stage
    - Its habitat and where it is at that stage (describing the place in as much detail as you can, including the name of the creek or river)
    - What specific things it needs to survive at that stage
    - What threats or obstacles it faces at that stage
    - What people can do to help salmon and steelhead
- Literary devices such as metaphors, symbolism, or imagery (or others identified by your teacher).

Resources
Look at these Web sites to help you answer the questions about salmon and steelhead life cycles.

Stages of the salmon and steelhead life cycles	Description of the salmon life cycle *(http://library.thinkquest.org/05aug/00548/species--life%20cycle.html).* Another overview of the salmon life cycle *(http://www.vanaqua.org/salmontales/english/learningcentre/lifecycle.php).* Salmon life cycle: early stages *(http://www.krisweb.com/aqualife/lifecycle_early.htm).* For practice with salmon migration and salmon life-cycle words, try a word search. Go to Bubble's Glug-Glug word search *(http://www.goldseal.ca/kids/homepage.asp).*
What salmon and steelhead eggs need	Find out what salmon eggs need to hatch *(http://library.thinkquest.org/05aug/00548/GoodStream.html).* Then try designing a stream that will let the most salmon eggs hatch *(http://library.thinkquest.org/05aug/00548/StreamBuilder.html).*
Migration patterns	Read a description of the salmon's migration *(http://www.ecotrust.org/publications/natural_history.html).*
How people affect salmon and steelhead	Play the Salmon Challenge Game to learn how people's everyday activities can affect water and salmon and steelhead health *(http://dnr.metrokc.gov/wlr/waterres/sc.htm).* Click on Caring for Sammy to learn about things that people can do to help salmon *(http://www.goldseal.ca/kids/homepage.asp).*

Name: _____
Salmon or Steelhead Species Being Studied: _____

Salmon and Steelhead Life Cycle

	Life Cycle Stage: _____	Life Cycle Stage: _____	Life Cycle Stage: _____	Life Cycle Stage: _____	Life Cycle Stage: _____	Life Cycle Stage: _____
What does a salmon or steelhead look like at this stage? Draw a picture and describe.						
What size is it?						
Describe its habitat.						

	Life Cycle Stage: _____	Life Cycle Stage: _____	Life Cycle Stage: _____	Life Cycle Stage: _____	Life Cycle Stage: _____	Life Cycle Stage: _____
What is the name of the creek, river, or ocean where it lives?						
What does it need to thrive? (For example, what are its water, oxygen, food, and temperature needs?)						
What threats or obstacles does it face?						
How do people affect it?						

	Life Cycle Stage: _____	Life Cycle Stage: _____	Life Cycle Stage: _____	Life Cycle Stage: _____	Life Cycle Stage: _____	Life Cycle Stage: _____
What can people do to help it?						

Salmon and Steelhead Life Stories Web Search Worksheet
Búsqueda en la red de historias de vida del salmón y de la trucha del mar (steelhead)

Introduction / *Introducción*
Imagine what your life would be like if you were a salmon or steelhead! Starting out as an egg in a creek bed, you hatch and grow and make your way hundreds of miles to the open ocean and then back again.
¡Imagínese como fuese su vida si usted fuera un salmón o una trucha del mar (steelhead)! Empezar como un huevo en una cama de riachuelo, sale del huevo y crece y avanza centenares de millas al océano abierto y regresa atrás otra vez.

By studying the life cycle and migration of salmon and/or steelhead in your area, you will learn:
Al estudiar el ciclo de vida y la migración del salmón y/o de la trucha del mar en su área, Ud aprenderá:

- How salmon and steelhead change at different stages of their lives
- Where they live at each stage
- What they need to survive at each stage
- What challenges they face at each stage
- What people can do to help salmon and steelhead

- *Como el salmón y la trucha del mar cambian durante sus etapas diferentes*
- *Donde ellos viven en cada etapa*
- *Lo que ellos necesitan para sobrevivir en cada etapa*
- *Lo que desafían en cada etapa*
- *Lo que las personas pueden hacer para ayudar al salmón y a la trucha del mar*

The Task / *La Tarea*
Your job in this Web search is to learn about the life cycle and migration path of salmon and/or steelhead in your local area. As you conduct your search, you will answer a set of questions about salmon and steelhead. Then, you will use your answers to write a story about the life of a salmon or steelhead that hatches in your local creek.
Su trabajo en esta búsqueda de la red es aprender del ciclo de vida y la migración del salmón y/o de la trucha del mar en su área local. Al realizar su búsqueda, usted contestará un conjunto de preguntas del salmón y de la trucha del mar. Entonces, usted usará sus respuestas para escribir un cuento de la vida de un salmón o una trucha del mar que sale de su huevo en su riachuelo local.

The Process / *El Proceso*
1. Read over the following questions. You will be looking for answers to these questions as you visit the different Web sites below. / *Lea rápidamente las siguientes preguntas. Usted estará buscando las respuestas a estas preguntas mientras visita las siguientes páginas.*

    - What species of salmon and/or steelhead live, or used to live, in your local watershed? Choose one species to study.

¿Qué especie de salmón y/o trucha del mar vive, o vivió, en su cuenca local? Escoja una especie para estudiar.

- What are the different stages of the salmon or steelhead life cycle? /
  ¿Cuales son las etapas diferentes del ciclo de vida del salmón o de la trucha del mar?
- For each stage of the salmon or steelhead life cycle: /
  Por cada etapa del ciclo de vida del salmón o de la trucha del mar:

  - What is the name of the stage? / *¿Cómo se llama la etapa?*
  - What does the salmon or steelhead look like? / *¿Qué parece el pez?*
  - What size is it? / *¿Cuál es su tamaño?*
  - What is its habitat? Where does it live? (Describe the location in as much detail as you can. What's the name of the creek or river?)
    ¿Cuál es su morada? ¿Donde vive? (Describe la ubicación con todo detalle posible. ¿Cómo se llama el riachuelo o el río?)
  - What does it need to thrive? / *¿Qué necesita para prosperar?*
  - What threats does it face? / *¿Qué peligros encara?*
  - How do people affect it? / *¿Cómo lo afectan las personas?*
  - What can people do to help it? / *¿Qué pueden hacer las personas para ayudarlo?*

2. Use the Web sites below to conduct your search. You will need to visit several different Web sites to answer these questions. Take notes in your own words, using the Salmon and Steelhead Life Cycle worksheet. / *Use los sitios de la red que siguen para realizar su búsqueda. Usted necesitará visitar varias páginas de la red para contestar estas preguntas. Tome notas en sus propias palabras, utilizando la hoja El ciclo de vida del salmón y de la trucha del mar.*

3. Read some sample stories about salmon and steelhead with your group to compare different writing styles. / *Lea algunos cuentos del salmón y de la trucha del mar con su grupo, para comparar los estilos diferentes de escritura.*

4. Use your notes to write a story about a salmon or steelhead from your local creek. Your story should include: / *Utilice sus notas para escribir un cuento de un salmón o una trucha del mar de su riachuelo local. Su cuento debe incluir*:

   - A title / *Un título*
   - A description of every life cycle stage, including: /
     Una descripción de cada etapa del ciclo de vida, que incluya:
     - What the salmon or steelhead looks like at that stage /
       Qué parece un salmón o una trucha del mar durante esa etapa
     - Its habitat and where it is at that stage (describing the place in as much detail as you can, including the name of the creek or river) /
       Su morada y donde está en esa etapa (describa el lugar en cuanto detalle sea posible, e incluya el nombre del riachuelo o del río)
     - What specific things it needs to survive at that stage /
       Las cosas específicas que necesita para sobrevivir durante esa etapa
     - What threats or obstacles it faces at that stage /

Las amenazas u obstáculos que encara durante esa etapa
    - What people can do to help salmon and steelhead / *Lo que las personas pueden hacer para ayudar al salmón y a la trucha del mar*
- Literary devices such as metaphors, symbolism, or imagery (or others identified by your teacher). / *Dispositivos literarios como metáforas, simbolismo, o imágenes (u otros identificados por su profesor).*

Resources / *Recursos*

Look at these Web sites to help you answer the questions about salmon and steelhead life cycles./ *Miren estos sitios de la red para contestar las preguntas de los ciclos de vida del salmón y de la trucha del mar (steelhead).*

Stages of the salmon and steelhead life cycles / *Las etapas del ciclo de vida del salmón y de la trucha del mar*	Description of the salmon life cycle / *Descripción del ciclo de vida del salmón (http://library.thinkquest.org/05aug/00548/species--life%20cycle.html).* Another overview of the salmon life cycle / *Otra descripción del ciclo de vida del salmón (http://www.vanaqua.org/salmontales/english/learningcentre/lifecycle.php).* Salmon life cycle: early stages / *Ciclo de vida del salmón: primeras etapas (http://www.krisweb.com/aqualife/lifecycle_early.htm).* For practice with salmon migration and salmon life-cycle words, try a word search. Go to Bubble's Glug-Glug word search'/ *Para practicar las palabras sobre la migración y el ciclo de vida de salmón, trate una búsqueda de palabras. Vaya a* Bubble's Glug-Glug word search *[La búsqueda de palabras de Glug-Glug de Burbuja*] *(http://www.goldseal.ca/kids/homepage.asp).*
What salmon and steelhead eggs need / *Lo qué los huevos del salmón y de la trucha del mar necesitan*	Find out what salmon eggs need to hatch / *Averigüe qué es lo que los huevos del salmón necesitan para salir del huevo (http://library.thinkquest.org/05aug/00548/GoodStream.html).* Then try designing a stream that will let the most salmon eggs hatch / *Entonces trate de diseñar una corriente que permita que la mayoría de los huevos del salmón salgan del huevo (http://library.thinkquest.org/05aug/00548/StreamBuilder.html).*
Migration patterns / *Patrones de migración*	Read a description of the salmon's migration / *Lea una descripción de la migración del salmón (http://www.ecotrust.org/publications/natural_history.html).*

How people affect salmon and steelhead / *Como es que la gente afecta al salmón y a la trucha del mar*	Play the Salmon Challenge Game to learn how people's everyday activities can affect water and salmon and steelhead health / *Juegue* the Salmon Challenge Game *[El juego del desafío de Salmon] para aprender cómo las actividades diarias de las personas pueden afectar el agua y la salud del salmón y de la trucha del mar (http://dnr.metrokc.gov/wlr/waterres/sc.htm).* Click on Caring for Sammy to learn about things that people can do to help salmon / *Presione* Caring for Sammy *[Cuidando por Sammy] para aprender las cosas que las personas pueden hacer para ayudar al salmón (http://www.goldseal.ca/kids/homepage.asp).*

Name / *Nombre*: _____
Salmon or Steelhead Species Being Studied / *Especie del salmón o de la trucha del mar que Ud. estudia:*_____

Salmon and Steelhead Life Cycle / *El ciclo de vida del salmón y de la trucha del mar*

	Life Cycle Stage / *Etapa del ciclo de vida*: _____	Life Cycle Stage / *Etapa del ciclo de vida*: _____	Life Cycle Stage / *Etapa del ciclo de vida*: _____	Life Cycle Stage / *Etapa del ciclo de vida*: _____	Life Cycle Stage / *Etapa del ciclo de vida*: _____	Life Cycle Stage / *Etapa del ciclo de vida*: _____
What does a salmon or steelhead look like at this stage? Draw a picture and describe. / *¿Qué parece un salmón o una trucha del mar durante esta etapa? Dibuje y describa.*						
What size is it? / *¿De que tamaño es?*						

	Life Cycle Stage / *Etapa del ciclo de vida*: _____	Life Cycle Stage / *Etapa del ciclo de vida*: _____	Life Cycle Stage / *Etapa del ciclo de vida*: _____	Life Cycle Stage / *Etapa del ciclo de vida*: _____	Life Cycle Stage / *Etapa del ciclo de vida*: _____	Life Cycle Stage / *Etapa del ciclo de vida*: _____
Describe its habitat./ *Describa su morada.*						
What is the name of the creek, river, or ocean where it lives? / *¿Cómo se llama el riachuelo, el río, o el mar donde vive?*						
What does it need to thrive? (For example, what are its temperature food, water, and oxygen, needs?) / *¿Qué necesita para prosperar? (¿Por ejemplo, qué temperatura, tipo de alimento, agua, y oxígeno necesita?)*						

	Life Cycle Stage / *Etapa del ciclo de vida*: _____	Life Cycle Stage / *Etapa del ciclo de vida*: _____	Life Cycle Stage / *Etapa del ciclo de vida*: _____	Life Cycle Stage / *Etapa del ciclo de vida*: _____	Life Cycle Stage / *Etapa del ciclo de vida*: _____	Life Cycle Stage / *Etapa del ciclo de vida*: _____
What threats or obstacles does it face? / *¿Qué amenazas u obstáculos peligrosos encara?*						
How do people affect it? / *¿Cómo es que la gente lo afecta?*						
What can people do to help it? *¿Qué podemos hacer para ayudarlo?*						

Activity 10: Designing for Salmon and Steelhead

Chinook (top), Steelhead (largest fish), and Coho (in front of steelhead) from the Shasta River, northern California. Photo by Lisa Thompson.

Overview

Participants design a tank habitat that mimics as closely as possible the creekbed habitat of spawning salmon and steelhead, and salmon and steelhead eggs, alevin, and fry. In creating their designs, participants focus on the habitat requirements of salmon and steelhead at these critical phases of their lives, when they may be present in the local creek.

Background Information

In the Enrichment to this activity, we suggest that your group raise salmon or steelhead from eggs to fry. To do this, the group would receive salmon or steelhead eggs from a hatchery, raise them in a tank, and then release the young fry at a designated site in the wild. While this project can be a lot of work, it is a wonderful learning opportunity for participants. Through this experience, they learn to care about salmon in a deeply personal way as they gain a practical understanding of salmon and steelhead habitat requirements.

There are many organizations around California that can support groups wanting to incubate salmon or steelhead eggs. For information about raising salmon or steelhead, check with your resource professional for a local organization or contact one of the organizations listed in Resources: Raising Salmon and Steelhead *(http://groups.ucanr.org/sns/Resources/Raising_Salmon_and_Steelhead.htm)*. Local organizations may be able to help you get the needed equipment and permits, acquire eggs, and release the fry.

Because of the sensitivity of salmon and steelhead in California, the Department of Fish and Game regulates the raising and releasing of salmon and steelhead. Educators must obtain an approved authorization from the Department of Fish and Game to raise salmon or steelhead eggs and release the fish in a designated site in the wild. That site might not be in your watershed, so be aware that you may have to travel some distance to release your fry.

Objectives

Participants will (1) design a tank habitat for eggs and young salmon or steelhead that will meet their needs for water temperature, oxygen level, and substrate, and (2) compare their tank design with tank set-up instructions online to see how well it meets the needs of salmon and steelhead.

Time
One group session

Materials and Resources

- Drawing paper, 1 per team
- Colored pens or pencils for each team
- Empty 20- to 30-gallon aquarium (optional)
- Aquarium or scientific supply catalogs, online or hard copies (optional)
- Access to Internet
- Equipment for setting up a salmon or steelhead egg incubator (optional, see Advance Preparation)

Advance Preparation

1. (Optional) For their tank designs, it is helpful for participants to see what types of equipment are actually available. Collect copies of catalogs that may come to your science department, or have available online catalogs for participants to see (see Resources: Scientific Supply Companies, *http://groups.ucanr.org/sns/Resources/Scientific_Supply_Companies.htm*).

2. (Optional) Ask your salmon and steelhead resource professional to connect you with a program for raising salmon and steelhead eggs *(http://groups.ucanr.org/sns/Resources/Raising_Salmon_and_Steelhead.htm)*. You must have written authorization from the California Department of Fish and Game to raise and release salmon or steelhead (see Background Information). If you do participate in such a program, you will need to acquire the necessary equipment to actually set up and monitor a salmon and steelhead tank. Ask the program coordinator for specific details. Plan for the salmon or steelhead fry's release when they are about one and a half inches in length (about six weeks after you get the eggs).

Setting the Stage

1. Ask participants, "What have we learned so far about what spawning salmon and/or steelhead and salmon and/or steelhead eggs, alevin, and fry need to live in our local creek?" (They need clean water, cool temperatures, gravel, plenty of dissolved oxygen, and moving water.)

2. Explain to participants that they will use what they learned about the habitat requirements of young salmon and steelhead to design a suitable tank habitat for salmon and steelhead eggs and fry. If your group will actually be raising salmon or steelhead eggs, tell participants that their designs will help them set up a suitable tank for them.

3. Show participants the aquarium (if you have one), and ask, "What things might we need to add or do to this aquarium to make it suitable for salmon and steelhead eggs, alevin, and young fry?"

Conducting the Activity

1. Give each team a sheet of drawing paper and colored pens or pencils.

2. Explain that each team must develop a tank design that will meet the needs of salmon eggs, alevin, and young fry. Assuming that they start with an aquarium tank, teams will plan together what they would put in, on, or around the tank to make it a suitable habitat. The team should work together to draw a picture of their design.

3. Point out that teams may "invent" equipment as necessary to their designs, or they can look at catalogs or Web sites (if you have them available) to see what might be helpful for meeting certain habitat needs.

4. Circulate among the teams to answer any questions or to help resolve any issues.

5. When teams have completed their designs, post them on the wall. Have a participant from each team briefly describe their tank's design features, including how the design meets the salmon and steelhead needs for clean water, cool temperatures, bottom materials (gravel), food, plenty of dissolved oxygen, and moving water.

Wrap-Up

1. Have participants compare their designs to Salmon in the Classroom: Closed System Tank Set-Up and Maintenance *(http://www.renton.wednet.edu/salmon/clostank.html)*. You can also download instructions for tank setup from the California Department of Fish and Game's Web site *(http://www.dfg.ca.gov/caep/docs/FishGoToSchool.pdf)*.

2. Have teams place their tank designs in their portfolios.

Enrichment

Raise salmon or steelhead eggs. Have participants keep journals to document the changes they observe over time. (See Advance Preparation for information about how to get started.) Discuss how the fish may have to adjust to the natural conditions in the wild after growing up in the tank (different types of food, presence of predators, and so on). Matching tank temperatures to the temperature of the stream where the salmon or steelhead will be released will help the fish grow at the same rate as wild fish. If their growth rates are suppressed by overly cold water, the fish you raise may be smaller than wild fish when they get released, which would lead to higher predation rates than natural (larger fish swim faster and are more likely to escape predators).

Activity 11: Creek Monitoring

Coho salmon smolt from the Shasta River, northern California. Photo by Lisa Thompson.

Overview

Participants perform a variety of assessments of the local creek to determine whether it is a suitable habitat for salmon and steelhead.

Background Information

Working closely with the salmon and steelhead resource professional, participants monitor several different aspects of the creek to determine its suitability for salmon and steelhead. In general, a healthy salmon and steelhead habitat contains areas with riffles (shallow areas where water flows rapidly over gravel or rocks) and pools. It has different sizes of rocks and plenty of overhead cover from trees and plants. It also has cool, clear, running water that is free of pollution. For more information about these habitat needs, see the Background Information in the Unit Overview and Fish Habitat in Freshwater Streams *(http://anrcatalog.ucdavis.edu/pdf/8112.pdf)*.

Depending on which water quality test kit you use, participants can test for the following:

- **Temperature** is a measure of the warmth or coolness of the water, and an important habitat factor for salmon and steelhead. The optimum temperature depends on the species and the life stage. In general, however, if the water temperature is higher than 64° F (18° C), salmon and steelhead may become sluggish and more susceptible to disease and predators. While temperatures in the 74°-78° F (23°-26° C) range may be lethal, salmon and steelhead in California can sometimes tolerate these higher temperatures for short periods of time. In California, the temperature of a creek or stream can vary tremendously at different times of the day or in different locations along the stream. If the temperature in one place is too warm, salmon and steelhead will seek out a different location with cooler water.

  Agriculture, reservoirs, industrial discharges of heated water, and the plant cover over the creek can all affect water temperature.

- **Turbidity** is a measure of water clarity. Salmon and steelhead require clear (non-turbid) water. Turbid water contains suspended matter such as clay, silt, chemicals, or microscopic organisms and can be caused by soil erosion, high levels of algae, or disturbances of the creek bottom.

- **Dissolved oxygen (DO)** tells how much oxygen is dissolved in the water. Salmon and steelhead require water with high dissolved oxygen levels. As DO actually decreases overnight, the best measurements are taken in the pre-dawn hours or with a logging DO meter (see Advance Preparation).

- **pH** is a measure of how acidic or basic the water is and ranges from 0 (very acidic) to 14 (very basic). Natural water usually has a pH between 6.5 and 8.0. Industrial waste and agricultural runoff can affect pH. Fish usually cannot withstand pH values lower than 4.0 to 5.0. Values this low are rare in California (low pH is more of a problem in the Northeast, due to acid rain).

- **Nutrients (including phosphate and nitrate)** in the creek, like nutrients in a garden, are essential for growth. They become a problem when their concentration levels are too high. Excess nutrients in the water can cause excess plant growth (especially algae). When these excess plants die and decompose, they can cause dissolved oxygen levels in the water to drop. Common sources of excess nutrients are soil erosion and water runoff carrying fertilizers from farms, lawns, and golf courses. Other sources include sewage and storm drain discharge and industrial discharge.

  (Note: Water quality test kits do not all measure for the same nutrients. Ask your salmon and steelhead resource professional for a suitable range for the particular nutrient parameters included in your kit.)

- **Coliform bacteria** are normal bacteria that live in the digestive tract and feces of humans, other mammals, and birds. While not harmful themselves, their presence in water indicates sewage or fecal contamination. When coliform bacteria levels are high (greater than 200 colonies per ml), salmon and steelhead are more susceptible to disease. At these levels, people may also be exposed to diseases like dysentery, typhoid fever, hepatitis, and ear infections.

Objectives

Participants will (1) conduct a number of assessments of the local creek and (2), based on the data and what they know about salmon and steelhead habitat requirements, evaluate whether the creek is a suitable habitat.

Time

Setting the Stage: 30 minutes
Activity: At least three group sessions, with additional time for on-going monitoring

Materials

- KWLR chart (started in Activity 1: Getting to Know Salmon and Steelhead)
- Team portfolios, with completed work from:
  - Activity 4: Community Survey - survey results
  - Activity 5: Salmon and Steelhead Creek Walk - creek map and worksheet
  - Activity 7: Watershed Web Search - pamphlets
  - Activity 8: Mapping Our Community - community maps

    - Activity 9: Salmon and Steelhead Life Stories Web Search - Salmon and Steelhead Life Cycle worksheet
- Copies of Creek Monitoring worksheet (see Advance Preparation, step 4), 1 per team
- Clipboards (or other hard writing surface), 1 per team*
- Pencils for each team
- For Water Quality station: water-quality testing kit (see Advance Preparation)*
- For Riffles, Runs, and Pools station: yard s tick or meter stick
- For Gravel station: tape measure* and rulers
- For Water Speed station: tape measure*, flags* or other markers, small oranges or sticks, stopwatch with a second hand
- For Salmon and Steelhead Scan station: polarized glasses
- Flags* or other markers for stations and boundaries
- Camera
- Chart paper (optional)
- Graph paper (optional)
- Writing paper for each person

* = Included in Adopt-A-Watershed Kit

Advance Preparation

1. Talk with your salmon and steelhead resource professional (see Resource Professionals under Unit Overview: Tips for Managing the Unit) about which monitoring activities will be suitable for your participants and your creek. Depending on your situation, you may plan to conduct one or all of the suggested assessments. Take into account:
    - What participants want to find out about the creek habitat (see Setting the Stage, step 1)
    - Any safety concerns of participants working near or in the creek (see Water Safety under Unit Overview: Tips for Managing the Unit)
    - How much time you have
    - What materials you have or can obtain
    - How many adults can assist in monitoring
    - Who else may be using the data collected

2. If possible, time this activity to coincide with the periods that salmon and/or steelhead might actually be in the creek either as young fry or as spawners. Consult your salmon and steelhead resource professional about the best timing, keeping in mind water safety as well (see Water Safety under Unit Overview: Tips for Managing the Unit).

3. Obtain a water quality testing kit through purchase of the Adopt-A-Watershed kit for this unit (see the Adopt-A-Watershed Web catalog, *http://www.adopt-a-watershed.org/?p=product_line*), or through your salmon and steelhead resource professional, a local creek watcher's organization (see Resources: Resource Agencies and Organizations, *http://groups.ucanr.org/sns/Resources/Resource_Agencies_and_Organizations.htm*) or a science supply company (see Resources: Science Supply Companies, *http://groups.ucanr.org/sns/Resources/Scientific_Supply_Companies.htm*).

Basic water quality testing kits will enable you to test for parameters such as temperature, turbidity, dissolved oxygen, pH, nutrients, and coliform bacteria (see Background Information). Read over the testing kit directions before doing the activity.

4. Print one copy of the Creek Monitoring worksheet, and insert under the Water Quality section the tests your group will be conducting. As there can be a wide variation in local conditions, ask your salmon and steelhead resource professional to confirm what results would be suitable for the salmon and/or steelhead in your area, and insert this information in the appropriate place on the worksheet. Make copies of the worksheet for each team.

5. Ask your salmon and steelhead professional to accompany your group on the field study trip and to help with the water quality testing and salmon scanning activities. Also ask him or her to meet with the group after the trip to discuss their results.

6. If possible, arrange with your salmon and steelhead resource professional for the use of a logging DO (dissolved oxygen) meter, which will give more accurate results than the DO test in your water quality kit. Have him or her obtain DO measurements at your creek site for participants to analyze. Also, ask whether he or she has any spare 24-hour temperature loggers to set up at the site (in air and in the water) for the duration of the unit. This data would help to give participants a sense of the daily and seasonal variations in temperature.

7. If possible, arrange for participants to monitor the creek on an on-going basis, as this will provide a more accurate picture of the creek habitat than monitoring just once. Consider your group schedule to determine when, how often, and over what time period participants will do the monitoring. Involve participants in the planning when practical.

8. Within the week before the assessment, make a quick trip to the site to check for unexpected hazards, such as high flows, changes in access trails, or pollution. If anything about the site appears unsafe, check with your resource professional about finding another site.

9. Gather the necessary materials for the creek assessments you plan to do.

10. If your participants are unable to monitor in the field, plan to use real-time Web-based data on stream flow, temperature, and dissolved oxygen to monitor creek conditions (see Resources: Monitoring, *http://groups.ucanr.org/sns/Resources/Monitoring.htm*).

11. Set the date and plan each field study trip (see Planning Field Study Trips under Unit Overview: Tips for Managing the Unit).

12. Plan how to manage the creek assessments. You might have teams rotate to different stations set up along the creek site, with at least one adult at each station.

    - Parent volunteers can easily manage the Riffles, Runs, and Pools; Overhead Cover; Stream Velocity; Gravel Size; and Salmon and Steelhead Scan stations.
    - You or the salmon and steelhead resource professional (if available) should plan on managing the Water Quality station. Depending on the water quality parameters you will be testing, you may need to double the time (and number of participants) at this station.
    - Salmon and steelhead are easily spooked by noise and other disturbances. They will then hide under cover or move to another part of the stream. Either plan to do the Salmon and Steelhead Scan together as soon as you arrive at the field study site, or place the Salmon and Steelhead Scan station well upstream of the other stations to minimize disturbance.
    - Decide where to put each of the other stations along the creek site. The Water Quality station should be upstream of all stations except the Salmon and Steelhead Scan station.

13. On the day of the field study trip:
    - Go over the station directions with parent volunteers to make sure they understand their task.
    - Ask the salmon and steelhead resource professional (if available) to point out salmon and/or steelhead so that parent volunteers can help participants find them for the Salmon and Steelhead Scan station.

Setting the Stage

1. Have participants look at the KWLR chart and identify questions they still have about the salmon and/or steelhead in your watershed. For example, participants may still have unanswered questions such as, "Is our creek a healthy habitat for salmon and steelhead?" or "Why don't salmon and/or steelhead live in our creek any more?" Explain that they will have an opportunity to monitor the creek for a variety of different conditions, and ask them to point out which of their questions could be answered through this activity.

2. Ask participants what conditions salmon and steelhead need for a suitable creek habitat. Have them look at the KWLR chart and their completed Salmon and Steelhead Life Cycle worksheets to help them recall specific conditions. List these conditions on the board.

3. For each condition listed in step 2, ask participants for their ideas about how they could tell whether that condition is present in the local creek. For example, how would they know whether the water is free of pollution? You might have them look at their worksheets and maps from Activity 5: Salmon and Steelhead Creek Walk for ideas.

4. Hand out copies of the Creek Monitoring" worksheet and read over it together. Point out that the assessments measure the various conditions that salmon and steelhead need in their creek habitat, and will help participants to determine the suitability of the local creek as salmon and steelhead habitat. Ask, "Which assessments will help to answer the questions we have (from step 1)?"

5. Explain the procedure for each of the creek assessments that participants will be doing (the assessments will depend on their questions from step 1 and on suggestions from your salmon and steelhead resource professional (see Advance Preparation, step 1).

6. Do a practice run of the water quality tests the group will be doing.

7. Review your behavioral expectations for the creek monitoring and explain any logistical details (see Planning Field Study Trips under Unit Overview: Tips for Managing the Unit).

8. Answer any questions participants may have about the assessment or the field study trip.

Conducting the Activity

1. At the field study site, point out or mark the overall boundaries. Mark a spot for each of the assessment stations.

2. Ask the group, "What safety concerns might there be here? What potential hazards do we need to look out for? What areas appear to be fragile (such as stream banks or certain plants)? How can we avoid damaging the habitat?" Review behavior expectations. Make sure that adult chaperones know what you want them to do with participants.

3. Have each team start at one of the stations. (If you will be doubling up at the Water Quality station, have two teams start there.) Give participants about 10-15 minutes at each station before giving the signal to rotate.

4. After participants have completed all the stations, gather the group together to share their findings. For each assessment (temperature, dissolved oxygen, stream velocity, and so on), discuss:
    - What were our results for this assessment?
    - Why might different teams have gotten different results?
    - Do you notice anything in the immediate area that might affect the results? (For example, turbidity, which is an indication of erosion, may be affected by the lack of vegetation along the creek.)
    - (If salmon or steelhead were present) What were the salmon or steelhead doing? How did they seem to be using different parts of the habitat?

5. Back in the classroom or meeting room, use chart paper (or the board) and help participants make a group compilation of the results. Have participants compute the range, mean, median, and mode of the data for each assessment.

6. If you have received DO or 24-hour temperature data from your salmon and steelhead resource professional (see Advance Preparation), share that data with the group and have participants make a graph of the data over time.

7. Participants should look at the results of each assessment and determine whether that condition meets the needs of salmon and steelhead, or whether the data are inconclusive. Make sure participants understand that their results represent just one point in time along one section of the creek. While the data can help identify possible problems, participants cannot definitively determine the overall health of the watershed based on these results alone.

8. For any results that do not fall within the suitable ranges, have teams look at the data they have compiled from previous activities for clues as to the causes. They might find clues in their:
    - Survey results (from Activity 4: Community Survey)
    - Creek maps (from this activity and Activity 5: Salmon and Steelhead Creek Walk)
    - Pamphlets (from Activity 7: Watershed Web Search)
    - Community maps (from Activity 8: Mapping Our Community)
    - Salmon and Steelhead Life Cycle worksheets (from Activity 9: Salmon and Steelhead Life Stories)

9. Invite your salmon and steelhead resource professional to meet with the group to view their results and to provide a big picture or long-term view of your local creek or watershed conditions that affect salmon and/or steelhead.

10. Discuss:
    - How well does our watershed seem to support salmon and/or steelhead? What factors influence its ability to support salmon and/or steelhead?
    - What does the presence or absence of salmon or steelhead tell us about the quality of the water in the creek, the condition of the watershed, or other factors of the watershed?
    - In what ways could our creek or watershed be restored as a habitat for salmon and/or steelhead?
    - Healthy streams are important for salmon and steelhead, and they are also important for people. Is there anything we learned about the creek that could affect people?
    - How else do salmon and steelhead and people affect each other?

11. Explain to participants that in the next activity (Activity 12: Salmon and Steelhead Restoration Project), they will use what they have learned to plan and carry out a restoration project.

12. If you planned to conduct long-term monitoring of the creek (see Advance Preparation), revisit the creek to repeat the assessments. Help participants make graphs and charts showing the data they collect over time. Have participants look for patterns in the data. Does their assessment of the creek as a suitable salmon and steelhead habitat change over time?

Wrap-Up

1. Have participants look at the KWLR chart again. Add their ideas to the "L" sheet (What We Have Learned) and "W" sheet (What We Wonder). Discuss:
    - What have we learned as a result of this activity?
    - Did we find the answers to our questions about salmon and/or steelhead in our creek (from Setting the Stage, step 1)?
    - If not, what else might we do to answer these questions?
    - Do you have any new questions about salmon and steelhead?

2. Have participants write their responses to the following questions:
    - Is our creek a suitable habitat for salmon and steelhead? What facts and observations support your view?
    - In what ways do people affect whether the creek is suitable for salmon and steelhead? What facts and observations support your view?
    - What could people in our community do to restore salmon and steelhead habitat?

3. Direct participants to place their responses to the questions and their completed worksheets into their team portfolios.

Enrichment

- An amazingly accurate indicator of a creek's water quality is the number and kinds of insect larvae, snails, worms, and other invertebrates living there. Some of these invertebrates are quite sensitive to pollution and will only be found in very clean water, while others can tolerate poorer water quality. Surveying the macroinvertebrates (those that can be seen with the naked eye) in your creek is a fascinating activity to do with participants. It does require walking in the creek with a kick net as well as some familiarity with the organisms. Ask your salmon and steelhead resource professional about whether this assessment would be suitable for your creek situation. Take into consideration participant safety (see Water Safety under Unit Overview: Tips for Managing the Unit and whether walking in the creek could harm salmon or steelhead, or their habitat. For information see Habitat Monitoring under Resources: Monitoring, *http://groups.ucanr.org/sns/Resources/Monitoring.htm*).

- For an assessment of the size of gravel and rocks in a creek bed, help participants sample and measure rocks in the creek itself. As in the activity, at marked intervals participants reach down into the water and, without looking, pick up the first rock their finger touches at the end of their boot. For this, you will need to stretch a measuring tape or string across the creek. Make sure that the creek level is safe and that participants walking across the

creek will not harm salmon or steelhead or their habitat (see Water Safety under Unit Overview: Tips for Managing the Unit). For detailed directions on doing a pebble count, see Field Procedures: Pebble Count *(http://www.clallam.net/streamkeepers/assets/applets/PebbleCt.pdf)*.

- Check the California Department of Fish and Game Threatened and Endangered Species Web site *(http://www.dfg.ca.gov/hcpb/species/t_e_spp/tespp.shtml)* for listed species in California. Have participants choose one of the species to research, answering questions such as:

    - How has the population of this species changed over time?
    - What habitats does this species depend on?
    - What are threats to this species?
    - What are people doing to increase this species in California?

Names: _____
Date: _____

Creek Monitoring

Water Quality
Salmon and steelhead need water that is cool, clear, oxygenated, and free of pollution. Use a water quality testing kit to measure the following parameters. Follow the directions provided on the testing kit. Mark on your map where the water was collected.

	Your Reading	Suitable Range for Local Salmon/Steelhead
Temperature:	_____	_____
Turbidity:	_____	0-10 NTU
pH:	_____	6.5-8.5
Dissolved Oxygen (DO):	_____	6 parts per million or more
Coliform Bacteria:	_____	0-200 colonies per ml
Other tests:		
_____	_____	_____
_____	_____	_____
_____	_____	_____

Riffles, Runs, and Pools
A healthy salmon stream has riffles, runs, and pools.

- A riffle is a shallow area of a stream where water flows rapidly over a rocky or gravelly streambed. It shows up as ripples on the water surface. Riffles oxygenate the water (put oxygen into it), are good bug habitats, and are where salmon and steelhead make their redds, or nests.
- A run is an area of the stream where the water is traveling pretty fast, but doesn't show ripples.
- A pool is a deep area of a stream where the water flows very slowly. Salmon and steelhead hang out in pools because it is deeper and safer here than in open areas of the creek. The deeper water provides cover from predators such as birds.

1. Count the number of riffles, runs, and pools you see along this section of the creek:
Riffles _____ Runs _____ Pools _____

2. Add the riffles, runs, and pools to your creek map.

3. If you can do it safely, measure the width and the depth of one of the pools:

Width _____ Depth _____

4. Are the pools related to any other features in the stream, such as waterfalls, boulders, or logs? What do you think would happen to the pools if there were no logs or boulders in the creek?

Cover

Tree branches hanging over the creek provide shade, which helps to keep the water cool for salmon. The roots of trees and shrubs also stabilize the banks of the creek so that silt does not clog the creek bed. Logs and large branches in the water give salmon and steelhead places to hide.

1. Count the number of trees along this stretch of the creek: _____

2. Looking straight up, estimate the percentage of the sky over the creek that is covered by trees and shrubs: ___ 100% ___ 75% ___50% ___ 25% ___0%

3. Show the overhead cover on your creek map. Also show on your map any logs or large branches in the creek.

Gravel

A healthy salmon and steelhead creek bed consists of three sizes of rocks:

- Gravel (2 cm to 64 cm – from pea size to lemon size) is used for spawning nests.
- Cobble (64 cm to 256 cm – from lemon size to basketball size) stabilizes the creek bed.
- Boulders (larger than 256 cm – basketball size and up) are used by salmon and steelhead for shelter.

Other streambed materials are bedrock and fine sediment. Bedrock is solid ground that does not wash away, while fine sediment – sand, very small rocks, clay, or dirt – easily washes downstream.

1. Find an area along the creek where there is a stretch of rock or gravel. Lay the measuring tape along its length. One participant stands at each foot mark (or 30 cm mark) on the tape so that the toe of his or her shoe is even with the mark. Without looking, reach down and touch the rock or stone that is at the end of the shoe. Pick it up and measure it with a ruler. Record below.

2. Repeat this process until your team has measured a sample at each mark along the tape. Record where the rock is from (like "2-foot mark") and its size. Then, classify each rock as gravel, cobble, or boulder.

Where from: _____ Size of rock:_____ Type of rock: _____
Where from: _____ Size of rock:_____ Type of rock: _____
Where from: _____ Size of rock:_____ Type of rock: _____
Where from: _____ Size of rock:_____ Type of rock: _____
Where from: _____ Size of rock:_____ Type of rock: _____

3. Looking at the creek, can you see areas in it with gravel, cobble, and boulders? Mark these areas on your map.

Stream Velocity
The stream velocity is how fast the water is going. Salmon and steelhead prefer water that is moving, but not moving too fast (usually less than 4 feet per second or 1.2 meters per second). If the water is moving faster than they like, the fish will stay behind rocks and logs or near the bottom or banks, then dart out briefly into faster water to chase prey.

1. Place a flag or marker on the edge of the creek near a run (see Riffles, Runs, and Pools above). Using a tape measure, measure out 10 yards (or meters) along the edge of the creek. Keep the tape measure as straight as possible and parallel to the creek direction. Place a flag or marker at the 10-yard (or meter) mark.

1. To measure stream velocity, drop an orange or stick in the water at the first marker and time with a stopwatch how long it takes to reach the second marker.

   Time to go 10 yards (or meters): _____
   What is that in feet (or meters) per second? _____

2. Mark on your map where you measured the velocity.

3. Notice whether the velocity is the same all across the creek. Mark on your map places where it seems to be slower or faster than the area you measured.

Salmon and Steelhead Scan
Approach the creek very quietly and slowly from the downstream end of the site. Stay low so that it is harder for fish to see you. Since fish usually face upstream looking for food, they may not see you at first if you move from downstream to upstream. Using polarized sunglasses (if you have them) to help cut any glare, look for salmon and/or steelhead in the water. If you don't have sunglasses, look for the fish in the shaded areas of the creek.

If you see any salmon or steelhead, describe what they look like and what they are doing.

_____
_____
_____
_____

Names/ *Nombres*: _____
Date/ *Fecha*: _____

Creek Monitoring
Vigilando el Riachuelo

Water Quality / *Calidad del Agua*

Salmon and steelhead need water that is cool, clear, oxygenated, and free of pollution. Use a water quality testing kit to measure the following parameters. Follow the directions provided on the testing kit. Mark on your map where the water was collected.

Salmón y trucha del mar (steelhead) necesitan agua fresca, clara, oxigenado, y libre de contaminación. Use un equipo de prueba de la calidad del agua para medirlos parámetros siguientes. Siga las direcciones indicadas en el equipo de prueba de la calidad del agua. Marque en su mapa donde recogió el agua.

	Your Reading *Su medida*	Suitable Range for Local Salmon/Steelhead *Gama apropiada para Salmón y Trucha del mar locales*
Temperature / *Temperatura*:	_____	_____
Turbidity / *Turbiedad* :	_____	0-10 NTU
pH / *pH*:	_____	6.5-8.5
Dissolved Oxygen (DO) / *Oxígeno dissuelto*:	_____	6 parts per million or more
Coliform Bacteria / *Bacterias del coliform*:	_____	0-200 colonies per mL

Other tests / *Otros análisis*:

_____	_____	_____
_____	_____	_____
_____	_____	_____

Riffles, Runs, and Pools / *Riffles, Fluyes, y Charcas*

A healthy salmon stream has riffles, runs, and pools.
Un arroyo saludable para salmón tiene riffles, fluyes y charcas.

- A riffle is a shallow area of a stream where water flows rapidly over a rocky or gravelly streambed. It shows up as ripples on the water surface. Riffles oxygenate the water (put oxygen into it), are good bug habitats, and are where salmon and steelhead make their redds, or nests.

  Un riffle es un área que no es profundo del arroyo donde el agua corre rápidamente sobre un fondo rocoso y con grava. Se muestra como ondulacíones en la superficie del agua. Riffles oxigenen el agua (le meten oxígeno), son buenos habitat para insectos, y son donde salmón y trucha del mar hacen sus jerarquías.

- A run is an area of the stream where the water is traveling pretty fast, but doesn't show ripples.
  Un fluye es un área del arroyo donde el agua corre rápido, pero no tiene ondulacíones.

- A pool is a deep area of a stream where the water flows very slowly. Salmon and steelhead hang out in pools because it is deeper and safer here than in open areas of the creek. The deeper water provides cover from predators such as birds.
  Una charca es un área profundo del arroyo donde el agua corre bien despacio. Salmón y trucha del mar se mantienen en las charcas porque es más seguro allí que en los áreas abiertas del riachuelo. La profundidad del agua les da cubierta de los depredadores como aves.

1. Count the number of riffles, runs, and pools you see along this section of the creek:
Cuente el número de riffles, fluyes, y charcas que ve a lo largo de esta sección de la riachuelo:
Riffles/ *Riffles* _____ Runs/ *Fluyes* _____ Pools/ *Charcas* _____

2. Add the riffles, runs, and pools to your creek map
Agregue los riffles, fluyes, y charcas a su mapa del riachuelo

3. If you can do it safely, measure the width and the depth of one of the pools:
Si puede cuidadosamente, mida la anchura y la profundidad de una de las charcas:
Width/ *Anchura* _____ Depth/ *Profundidad* _____

4. Are the pools related to any other features in the stream, such as waterfalls, boulders, or logs? What do you think would happen to the pools if there were no boulders or logs in the creek?
¿Están relacionadas las charcas con otras características del arroyo, como cascadas, cantos rodados, y registros? ¿Que piensa que les pasaría a las charcas si no hubieran cantos rodados y registros en el riachuelo?

Cover / *Cubierta*
Tree branches hanging over the creek provide shade, which helps to keep the water cool for salmon. The roots of trees and shrubs also stabilize the banks of the creek so that silt does not clog the creek bed. Logs and large branches in the water give salmon and steelhead places to hide.
Ramas de los árboles que cuelgan sobre el riachuelo proporcionan sombra, que ayuda en mantener el agua fresca para el salmón. Las raíces de los árboles y los arbustos estabilizan los bancos del riachuelo para que el légamo no estorbe el fondo del riachuelo. Registros y ramas grandes en el agua les dan al salmón y trucha del mar lugares para esconderse.

1. Count the number of trees along this stretch of the creek: _____
Cuente el número de árboles que están a lo largo de esta sección del riachuelo

2. Looking straight up, estimate the percentage of the sky over the creek that is covered by trees and shrubs: ___ 100% ___ 75% ___50% ___ 25% ___0%
Mirando directamente arriba, calcule el porcentaje del cielo que está cubierto por los árboles y arbustos.

3. Show the overhead cover on your creek map. Also show on your map any logs or large branches in the creek.

Demuestre esa cubierta en su mapa del riachuelo. También demuestre en su mapa cualquier canto rodado y registro.

Gravel / *Grava*

A healthy salmon and steelhead creek bed consists of three sizes of rocks:
Un fondo del riachuelo sano para salmón y trucha del mar contiene piedras de tres tamaños:

- Gravel (2 cm to 64 cm – from pea size to lemon size) is used for spawning nests.
  Grava (2 cm a 64 cm – del tamaño del chicharro al tamaño del limón) se usa para frezar jerarquías.

- Cobble (64 cm to 256 cm – from lemon size to basketball size) stabilizes the creek bed.
  Piedrin (64 cm a 256 cm – del tamaño del limón al tamaño del baloncesto) estabiliza el fondo del riachuelo.

- Boulders (larger than 256 cm – basketball size and up) are used for shelter.
  Cantos rodados (más grande que 256 cm – del tamaño del baloncesto al más grande) se usa para abrigarse.

Other streambed materials are bedrock and fine sediment. Bedrock is solid ground that does not wash away; while fine sediment – sand, very small rocks, clay, or dirt – easily washes downstream.

Otros materiales del fondo del arroyo son roca de fondo y sedimento. Roca de fondo es suelo sólido que no se erosione; pero el sedimento – arena, piedras chiquitas, arcilla, o tierra –se erosione a causa de la corriente.

1. Find an area along the creek where there is a stretch of rock or gravel. Lay the measuring tape along its length. One participant stands at each foot mark (or 30 cm mark) on the tape so that the toe of his or her shoe is even with the mark. Without looking, reach down and touch the rock or stone that is at the end of the shoe. Pick it up and measure it with a ruler. Record below.

Encuentre un área del riachuelo donde hay un parte de piedra o grava. Ponga la cinta métrica a lo largo del área. Un participante se para en la marca de 1 pie (o 30 cm) en la cinta para que su dedo este pleno con la marca. Sin mirar, estréchese para tocar la piedra que está en frente del zapato. Recójala y mídala con una regla. Apunte el dato en el lugar indicado.

2. Repeat this process until your team has measured a sample at each mark along the tape. Record where the rock is from (like "2-foot mark") and its size. Then, classify each rock as gravel, cobble, or boulder.

Repita este proceso hasta que su grupo ha medido cada marca a lo largo de la cinta. Apunte de donde viene la piedra (por ejemplo "a 2 pies") y el tamaño. Entonces clasifique la piedra como grava, piedrin, o canto rodado.

Where from/ *De donde viene*: _____ Size of rock/ *Tamaño de piedra*:_____
Type of rock/ *Clase de piedra*: _____

Where from/ *De donde viene*: _____ Size of rock/ *Tamaño de piedra*:_____
Type of rock/ *Clase de piedra*: _____

Where from/ *De donde viene*: _____ Size of rock/ *Tamaño de piedra*:_____
Type of rock/ *Clase de piedra*: _____

Where from/ *De donde viene*: _____ Size of rock/ *Tamaño de piedra*:_____
Type of rock/ *Clase de piedra*: _____

Where from/ *De donde viene*: _____ Size of rock/ *Tamaño de piedra*:_____
Type of rock/ *Clase de piedra*: _____

3. Looking at the creek, can you see areas in it with gravel, cobble, and boulders? Mark these areas on your map.

Mirando el riachuelo, puede ver áreas con grava, piedrin, y cantos rodados? Apunte estas áreas en su mapa.

Stream Velocity / *Velocidad del Arroyo*

The stream velocity is how fast the water is going. Salmon and steelhead prefer water that is moving, but not moving too fast (usually less than 4 feet per second or 1.2 meters per second). If the water is moving faster than they like, the fish will stay behind rocks and logs or near the bottom or banks, then dart out briefly into faster water to chase prey.

La velocidad del arroyo es cómo rápidamente mueve el agua. Salmón y trucha del mar prefieren agua mueve, pero que no se mueve muy rápido (en general menos que 4 pies por segundo o 1.2 metros por segundo). Si el agua mueve más rápido que les gustan, el salmón y la trucha del mar se esconden detrás de piedras y registros, o en el fondo o bancos, y de allí saltan brevemente al agua de alta velocidad para seguir presa.

1. Place a flag or marker on the edge of the creek near a run (see Riffles, Runs, and Pools above). Using a tape measure, measure out 10 yards (or meters) along the edge of the creek. Keep the tape measure as straight as possible and parallel to the creek direction. Place a flag or marker at the 10-yard (or meter) mark.

Ponga una bandera o un marcador al borde del riachuelo o cerca de un fluye (revise Riffles, Fluyes, y Charcas). Use la cinta métrica, mida 10 yardas (o metros) al borde del riachuelo. Mantenga la cinta métrica lo más recto posible y paralelo al riachuelo. Ponga una bandera o un marcador en la medida de 10-yardas (o metros).

2. To measure stream velocity, drop an orange or stick in the water at the first marker and time with a stopwatch how long it takes to reach the second marker.

Para medir la velocidad del arroyo, meta una naranja o un palillo en el agua en el primer marcador y tome tiempo con un reloj cronómetro para ver cuanto tiempo se toma en llegar al segundo marcador.

Time to go 10 yards (or meters) / *Tiempo para recorrer 10 yardas (o metros)*: _____

What is that in feet (or meters) per second? / *Calcule esa respuesta en pies (o metros) por segundo*: _____

2. Mark on your map where you measured the velocity.
Marque en su mapa donde tomó la velocidad.

3. Notice whether the velocity is the same all across the creek. Mark on your map places where it seems to be slower or faster than the area you measured.
Preste atención a la velocidad a lo largo del arroyo; ¿es igual por todo el arroyo? Apunte en su mapa los lugares donde la corriente se mueve más rápida o más lenta que el área usted midió.

Salmon and Steelhead Scan / *Búsqueda de Salmón y Trucha del mar*
Approach the creek very quietly and slowly from the downstream end of the site. Stay low so that it is harder for fish to see you. Since fish usually face upstream looking for food, they may not see you at first if you move from downstream to upstream. Using polarized sunglasses (if you have them) to help cut any glare, look for salmon and/or steelhead in the water. If you don't have sunglasses, look for the fish in the shaded areas of the creek.
Acerque al riachuelo contra de la corriente, de manera tranquila y cuidadosa. Agáchese para que los peces no le vean a usted. Los peces buscan comida contra la corriente así que pueden no verle al principio si usted se contra la corriente. Usando lentes del sol polarizados (si los tiene) para desviar el reflejo, busque salmón y trucha del mar en el agua. Si no tiene lentes del sol, búsquelos en las áreas del riachuelo con sombra.

If you see any salmon or steelhead, describe what they look like and what they are doing.
Si ve salmón o trucha del mar describa como parecen y que están haciendo.
_____
_____
_____
_____

Activity 12: Salmon and Steelhead Restoration Project

Male Coho salmon from a river in Alaska.
Photo by U.S. Fish and Wildlife Service.

Overview

In this activity, participants review what they have learned about their community, the needs of salmon and steelhead, and the state of the local creek, and then choose and carry out a project for enhancing salmon and/or steelhead in the local watershed.

Note: You may choose to implement the actual project as part of Activity 13: Community Celebration and invite members of the community to participate.

Background Information

After monitoring the local creek to see how well it meets the needs of salmon and steelhead, participants use what they have learned to plan and carry out a restoration project. They may join with a resource agency, industry, or a private organization to contribute to a project already underway, or may initiate a new project. See Advance Preparation for possible project ideas.

Keep in mind that projects affecting fish or the flow of the creek must be reviewed and approved by the State Department of Fish and Game. Your local or county authorities may also have additional permitting requirements. Check with your salmon and steelhead resource professional (see Resource Professionals under Unit Overview: Tips for Managing the Unit) before you get started on any project.

Objectives

Participants will (1) identify possible threats to salmon and/or steelhead in the local watershed, (2) brainstorm possible actions for reducing those threats, (3) choose and carry out a restoration project that will help salmon and/or steelhead in the local watershed, and (4) use haiku poetry to reflect on the project.

Time

Setting the Stage: One group session
Activity: Will vary depending on project

Materials

- KWLR chart (started in Activity 1: Getting to Know Salmon and Steelhead)

- Chart paper (optional)
- Strips of paper 4 inches x 11 inches or larger, or 3-inch x 5-inch sticky notes
- Marker pens
- Tape
- Blank paper for each pair
- Copies of Choosing a Project worksheet, 1 per team
- Copies of Planning a Project worksheet, 1 per person
- Camera
- Additional materials for selected project
- Drawing paper
- Colored pens, pencils, charcoal, or other art supplies
- Examples of haiku poetry

Advance Preparation

1. Scope out ideas for a restoration project. Possibilities include:

    - *Creek restoration* - Participants reconstruct eroding stream banks, remove small dams or weirs, or otherwise physically restore the creek. For more information:
        - Stand by Your Stream - "Streamside Restoration - A Team Effort" from the Department of Natural Resources at Cornell University *(http://www.dnr.cornell.edu/ext/wetlands/streams/teameffort.pdf)*
        - Restoration Efforts in California:
          California Conservation Corps
          (http://www.ccc.ca.gov/SPECIAL/SRP/srp.htm)
          Salmonid Restoration Federation
          (http://www.calsalmon.org)
        - River Corridor and Wetlands Restoration Links (listed by state) *(http://www.epa.gov/owow/wetlands/restore/links/)*
    - *Creek revegetation* - Participants plant vegetation along the creek to combat erosion, provide shade for cooling the water, and offer creek habitat for insects. For more information:
        - Streamside Revegetation Manual (from Streamside Native Plants in British Columbia)
          (http://members.shaw.ca/nativeplants/streamside_revegetation.html)
        - From Erosion Control Magazine, "Come Together: Revegetation Projects Require Concerted Efforts" *(http://www.forester.net/ec_0005_come.html)*
        - Brochure - Plant it Right: Restoration Planting Techniques from Washington State University
          (http://cru.cahe.wsu.edu/CEPublications/misc0337/misc0337.pdf)
    - *Creek clean-up* - Participants organize a clean-up of trash and other debris in and along the creek. For more information on how to conduct a creek clean-up, see Streamkeeper Savvy: Tips for Helping Streams
      (http://www.streamkeeper.org/tools/tips.htm)

- *Storm drain stenciling* - Participants paint signs on storm drains throughout the watershed to inform people that they drain directly into the local waterway—not through a water treatment facility. For more information, see Earthwater Stencils *(http://www.earthwater-stencils.com)* or contact your city public works department.
- *Newsletter or Web site* - Participants create a newsletter or Web site that describes their unit activities and offers suggestions for how the community can enhance salmon and steelhead living in the watershed. See the following Web site examples:
    - The Salmon Cam by Ms. Haugen's science class, Florin High School in Sacramento, California *(http://www.salmon.room.net/)*
    - The Salmon Page by Riverdale Grade School in Oregon *(http://www.riverdale.k12.or.us/salmon.htm)*
- *Video* - Participants develop a video about the salmon and steelhead in the watershed to present to community leaders. For suggestions on how to do this, see Adobe's Video Documentary lesson plan. *(http://www.adobe.com/education/digkids/lessons/documentary.html).*

2. Talk with your salmon and steelhead resource professional (see Resource Professionals under Unit Overview: Tips for Managing the Unit) about possible projects in your area or for your specific site.

3. If you are considering a creek restoration or revegetation project, be sure to think about:

    - Who owns the land where the restoration or habitat enhancement will be implemented? Is it public or private?
    - What laws apply? What permits or permissions are necessary to gain access?
    - What will be the impact of participants walking throughout the area and how will that affect the desired outcome of the project?

4. Before planning a specific project, check with your resource professional for information about laws, regulations, and permits that may apply to your chosen project. Tell participants about your research so that they are aware that laws and regulations are intended to protect the water, air quality, and wildlife for the common good.

5. If your participants will be doing a creek restoration or revegetation project, visit the site with the appropriate resource expert to plan the project. Look for potential hazards and any fragile areas (such as stream banks or vegetation).

6. If your school or organization is doing other Adopt-A-Watershed units, map the location of the restoration project. Be sure to label the map with the site's longitude, latitude, and the street address, if applicable. After the project, you will file this information, along with participant reports and pictures, in the Adopt-A-Watershed files so that they can be used for comparison in future years.

7. Set dates for doing the project, as well as for any meetings that should take place before the project begins.

8. Prepare needed materials.

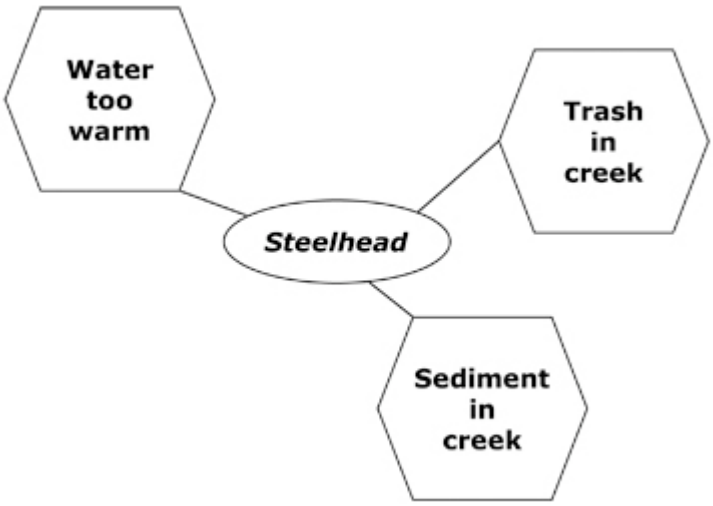
9. Make transportation arrangements and get permission slips, if needed (see Planning Field Study Trips under Unit Overview: Tips for Managing the Unit).

Setting the Stage

1. Have participants look at the KWLR chart and ask them what they have learned about their local creek and the impact people and salmon and steelhead have on each other within the watershed. Explain that they will have an opportunity to carry out a restoration project to enhance salmon and/or steelhead in your local watershed. The first step will be deciding on a project to do.

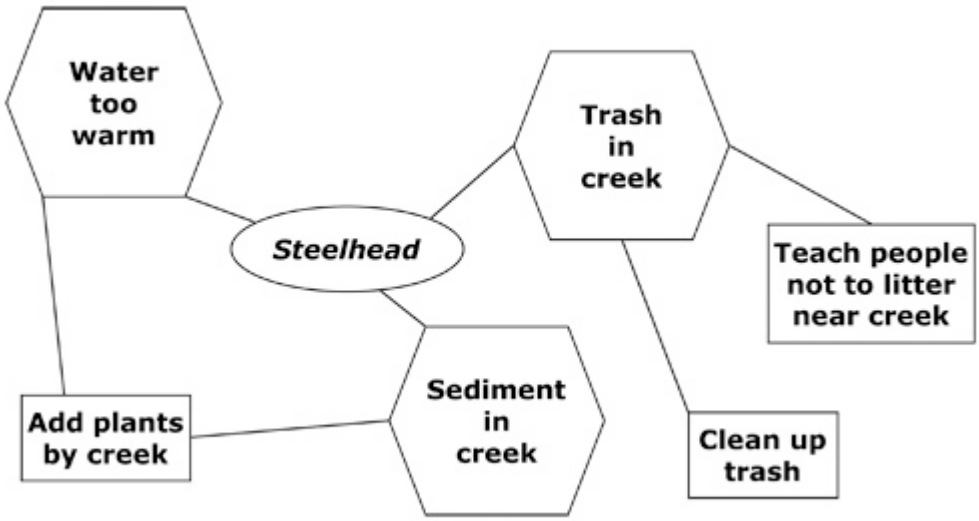
2. On chart paper or on the board, write the name of your local salmon and/or steelhead species and draw a circle around it. For example:

3. Ask participants to name some of the threats to salmon and/or steelhead in the local creek that they have learned about through the unit activities, particularly from Activity 11: Creek Monitoring. Add these as hexagons surrounding the original circle. Add lines to show connections. For example:



4. Have participants pair up, and give each pair a blank piece of paper. Have the pairs copy the diagram from the chart or board.

5. Explain to participants that they will use this "mind map" to brainstorm ideas for things the group might do to reduce threats to salmon and steelhead. Pairs will add their ideas to their diagram as rectangles, connecting them with lines. Encourage pairs to be as creative as possible. At this point, they should not be concerned about how practical their ideas are. They should, however, try to come up with at least two ideas for each threat identified by the group. Some of their ideas may connect to more than one threat. For example:



6. Have pairs add their ideas to the group diagram on the chart paper or board.

7. At this point, you may introduce the project ideas you have scoped out (see Advance Preparation).

Conducting the Activity

Part One – Planning the Project

1. Have each team use the Choosing a Project worksheet to analyze one of the project ideas identified in Setting the Stage or that you have scoped out (see Advance Preparation).

2. Have teams present their analysis to the group. If participants recommend doing a particular project, make a big note of that on the mind map.

3. Help participants identify one project from the recommended list to carry out.

4. After selecting the project, help participants plan the necessary tasks to implement the project. Ask participants to think of all the tasks they would need to do to carry out the project. Write each task on its own strip of paper (or sticky notes), and post them on the wall. As a group, look over the tasks and determine which would need to happen first, second, and so on. Rearrange the strips (or sticky notes) as needed so that you end up with a chronological listing of the tasks.

5. Have participants transcribe the tasks in order onto the Planning a Project worksheet (or have one participant transcribe the tasks, and make copies of the whole page for the group).

6. For each task, help participants plan who will do it, how they will do it, what resources (materials and information) they will need to do it, and when it will be done. Have them write this information on their individual worksheets.

Part Two – Implementing the Project

1. Facilitate participants in doing the project steps as planned.

2. If conducting a creek restoration or enhancement project, have participants make a large sign with the date of the project, the name of the group, the name of the watershed, and the name of the project in BIG letters. Have participants take "before and after" pictures of their project using the sign.

3. Have participants take photos of any displays or products they make, and provide documentation of the results of the project. For a systematic way of documenting the project by establishing points and taking photographs, see A Guide to Photo Plots *(http://www.cbr.washington.edu/salmonweb/).*

Part Three – Reflecting on the Project

1. At the project site and after the project is complete, gather in a circle and discuss:

   - What were the most rewarding aspects of the project?
   - What were the most challenging aspects?
   - How might we measure our project's success?
   - Is there anything we would do differently next time?

2. Ask if any of the participants have read or written haiku poetry and if anyone knows what haiku poems are typically about. (Nature.) Ask participants if they know the structure of a haiku poem. (Haikus are three-line poems. The first line has five syllables, the second line has seven syllables, and the third line has five syllables.)

3. Read several haiku poems to the group. Ask participants to share their observations about the poems.

4. Give participants time to write haiku poems of their own emphasizing what the restoration project has meant to them personally. Ask them to illustrate their poetry with the art supplies provided.

5. Ask volunteers to share their poems and illustrations.

Wrap-Up

1. Have participants use their photos or other documentation as the basis for writing a summary of the project. They should write a description of the project, why the group chose this particular project, what it did, what effect the project had on salmon and/or steelhead (if known), and what effect it had on people (including themselves). Have them place all the materials and their poems in their team portfolios.

2. Have participants look at the KWLR chart and add things they have learned under "L" and any new questions under "W."

Enrichment

- Contact your local newspaper and share the results of your project.

- Make a video of your project and share with other classrooms in your school, with others in the community, or with your elected officials.

Names: _____
Date: _____

Choosing a Project

Project Idea:

_____

_____

1. What difference would this project make to salmon and steelhead?

2. What difference would it make to the community?

3. Are there people in our community working on this project? How could we work with them?

4. What would we need to know to do this project?

5. What resources would we need to do this project?

6. How much time would this project take?

7. What safety issues would we need to consider for this project?

8. Would you recommend that the group do this project? Why or why not?

Names: _____
Date: _____

Planning a Project

Project task	What is needed to do it?	Who will do it?	How will it be done?	When will it be done?

Names / *Nombres*: _____
Date / *Fecha*: _____

Choosing a Project
Escoger el proyecto

Project Idea / ***Idea del proyecto***:

_____

_____

1. What difference would this project make to salmon and steelhead?
¿Qué diferencia haría este proyecto con respecto al salmón y a la trucha del mar (el steelhead)?

2. What difference would it make to the community?
¿Qué diferencia haría a la comunidad?

3. Are there people in our community working on this project? How could we work with them?
¿Hay personas en nuestra comunidad quienes trabajan en este proyecto? ¿Como podemos trabajar con ellos?

4. What would we need to know to do this project?
¿Que es lo que tendríamos que saber para hacer este proyecto?

5. What resources would we need to do this project?
¿Que recursos necesitaríamos para hacer este proyecto?

6. How much time would this project take?
¿Cuanto tiempo nos tomaría hacer este proyecto?

7. What safety issues would we need to consider for this project?
¿Qué aspectos de seguridad necesitaríamos considerar para este proyecto?

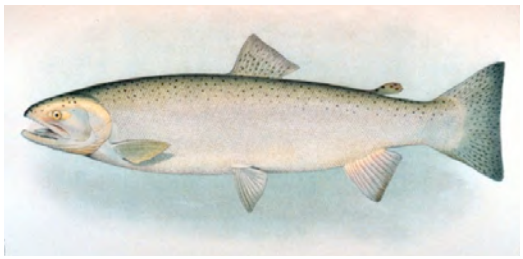
8. Would you recommend that the group do this project? Why or why not?
¿Recomendaría usted que el grupo hiciera este proyecto? ¿Por qué si o por qué no?

Names / *Nombres*: _____
Date / *Fecha*: _____

Planning a Project
Planear el proyecto

Project task / ***Tarea del proyecto***	**What is needed to do it?** ***¿Que es necesario para hacerlo?***	**Who will do it? /** ***¿Quién lo hará?***	**How will it be done?** ***¿Cómo será hecho?***	**When will it be done?** ***¿Cuándo será hecho?***

Activity 13: Community Celebration



Steelhead Trout. Illustration from National Oceanic and Atmospheric Administration.

Overview

For this activity participants invite members of the community to a celebration where they present the results of the unit activities, unveil their community art project, show portfolios of their work, and express appreciation for the help they received. In this way, the unit comes full circle, as the participants are now salmon and steelhead "experts" presenting what they have learned to members of the community.

Background Information

Celebrating hard work and success is an important component of learning within a community context. Throughout this unit, participants have explored their community's connections to salmon and steelhead. By planning a celebration event, participants gain experience in communicating with the community and reflecting on what they have learned and accomplished. Taking time to celebrate helps participants to see that their actions really do make a difference—both to the salmon and steelhead and to the people in their community.

Objectives

Participants will (1) plan a celebration of what they have learned and accomplished through the Agua Pura: Exploring Salmon and Steelhead in California Communities unit, (2) create thank-you cards for the salmon and steelhead resource professional, community artist, and other community members who helped them in the unit, (3) create a presentation and share what they have accomplished with community members, and (4) celebrate their hard work.

Time

Setting the Stage: One to two group sessions, plus time for participants to prepare their presentations and other celebration events
Activity: One to two group sessions

Materials

- Participants' work from throughout the unit, including:
  - Team portfolios
  - Completed community art project (from Activity 3)
  - Watershed pamphlets (from Activity 7)
  - Community maps (from Activity 8)

    - Life stories (from Activity 9)
    - Tank designs (from Activity 10)
    - Products from restoration project (from Activity 12)
    - Haiku poems (from Activity 12)
    - Photos of students doing activities and projects
- Photos and other materials for making "thank-you" cards
- Celebration food (see Advance Preparation)
- Napkins, plates, cups, utensils as needed for the food
- Copies of Planning a Project worksheet, 1 per team (from Activity 12: Salmon and Steelhead Restoration Project)
- Copies of Reflecting on the Unit worksheet, 1 per person
- Completed copies of the What I Know and What I Want to Know worksheet (from Activity 1: Getting to Know Salmon and Steelhead)

Advance Preparation

1. Decide on a suitable location for the celebration, involving participants in the process as much as possible. Depending on the activities your participants plan, you might have the celebration at a picnic area by your local creek, the permanent location of your community art project, the school auditorium, or your meeting room. Make the necessary arrangements for the location you choose. If you will be visiting the creek or other off-site location, follow the suggestions for Planning Field Study Trips under Unit Overview: Tips for Managing the Unit.

2. Choose a date and time for the celebration and have participants write invitations to community members. Be sure to invite parents, your salmon and steelhead resource professional, the community artist, and anyone else who has helped with the unit. You might also invite local politicians, representatives from local watershed groups, or other community members who would be interested in participants' work.

3. As part of the celebration planning, participants may decide what refreshments they would like to have (see Setting the Stage). About a week before the event, send home a note to some or all of the parents asking for their help in providing food and drink, making clear what to bring, and when and where to bring it. Communicate any food allergies or other restrictions as necessary.

Setting the Stage

1. Propose to participants that they plan an event to celebrate their hard work and successes throughout the unit and to unveil or display their community art project.

2. Have teams look at their team portfolios to review what they have learned over the course of the unit. Have them select from their portfolios four or five works that illustrate their accomplishments and learning, and that show the breadth and depth of their understanding.

3. Explain that participants will be able to share their portfolios at the community celebration. Ask them what else they would want to share with parents and other members of the community about the unit activities. List their ideas on the board. For example, they might:
    - Show a slide presentation of the habitat restoration project.
    - Prepare and deliver an informative presentation on unit activities.
    - Make a bulletin board display of watershed pamphlets (from Activity 7) and tank designs (from Activity 10).
    - Post the community maps (from Activity 8).
    - Read their salmon or steelhead life stories (from Activity 9) or haiku poems (from Activity 12).
    - Lead a shortened version of the Incredible Journey game (from Activity 2).
    - Guide community members on a creek walk.

4. Ask them what kind of food and drink they would like to have and what other activities they would want to include in the celebration. For example, they might want to have salmon- and steelhead-related decorations, foods, music, or stories (see Advance Preparation from Activity 1: Getting to Know Salmon and Steelhead for suggestions). List their ideas on the board.

5. If necessary, help participants narrow down the activities to a manageable number. Help each team choose an activity to plan and execute. For example, a team might be in charge of decorations, food, bulletin boards, a slide show presentation, or presenting the community art project.

6. Give each team a copy of the Planning a Project worksheet from Activity 12: Planning a Restoration Project. The team should list on their worksheet the tasks that would be involved in their activity, and then decide who will be doing what task. Check each team's worksheet to make sure that participants have thought of every task and have divided up the tasks fairly. If participants plan to give oral presentations, make sure that they include the task of practicing the presentations before the celebration.

7. Depending on the activities planned, help participants decide on a suitable location for the celebration (see Advance Preparation).

8. Allow time for participants to carry out any tasks that must be done before the event.

Conducting the Activity

1. On the day of the event, help participants set up the event activities they have planned.

2. Help participants carry out the activities they planned for the event. Be sure to:
    - Unveil the community art project.
    - Have different participants present and/or describe the unit activities and what they learned through them.

- Give parents time to look at participants' portfolios and the other work on display (community maps, participant brochures, salmon or steelhead life stories, poetry, and the KWLR chart).
- Introduce the salmon and steelhead professional, community artist, and any other members of the community who helped participants throughout the unit, and publicly thank them for their participation.
- Serve food and drink.

Wrap-Up

1. Have participants look at the KWLR chart and add any final thoughts or questions.

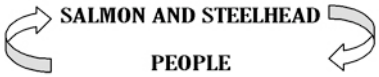
2. Ask participants to read the "What I Know and What I Want to Learn" worksheets they filled out at the beginning of the unit (see Activity 1: Getting to Know Salmon and Steelhead). Have them think about what they knew at the beginning of the unit, what they wanted to learn, and what they did learn. Ask them to complete the "Reflecting on the Unit" worksheet as a way to self-assess their learning.

3. Meet with individual teams to review their portfolios. Have them share with you the pieces they have included in their portfolios, why they chose each piece, and how the portfolio as a whole shows what they have learned. You may use the Team Work Rubric and the Process Skills Rubric provided in the Unit Overview: Unit Assessment to assess their work.

Name: _____
Date: _____

Reflecting on the Unit

1. What is the meaning of the graphic symbol for the unit?



2. How do people in our community affect salmon and/or steelhead? How do salmon and/or steelhead affect people in our community?

3. What do you think were the three most important things you learned in this unit? Describe each thing and how it was important.

-
-
-

4. What three things did you enjoy doing the most in this unit? Describe each thing and why you enjoyed it.

-
-

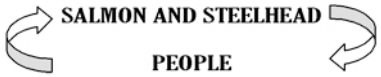
•

Name / *Nombre*: _____
Date / *Fecha*: _____

Reflecting on the Unit

Reflexionar sobre la unidad

1. What is the meaning of the graphic symbol for the unit?
¿Qué significa el símbolo de esta unidad?



2. How do people in our community affect salmon and/or steelhead? How do salmon and/or steelhead affect people in our community?
¿Cómo es que la gente de la comunidad afecta al salmón y a la trucha del mar (el steelhead)? ¿Cómo es que el salmón y la trucha del mar afectan a la gente de la comunidad?

3. What do you think were the three most important things you learned in this unit? Describe each thing and how it was important.
¿Cuáles son tres de las cosas más importantes que aprendió usted de esta unidad? Describa cada una y describa porque son importantes.

•

•

•

4. What three things did you enjoy doing the most in this unit? Describe each thing and why you enjoyed it.
¿Cuáles son las tres cosas que le gustaron a usted más de esta unidad? Describa cada una y porque le gustaron.

-
-
-

Materials and Equipment

The following list indicates which materials are needed for each activity, the quantity of each material needed, and the source of each item.

Item Categories:
E = Provided by Educator
Kit = Included in Adopt-A-Watershed Kit
CM = Included in Curriculum Materials

Item and Description	Quantity	Activity Number	Item Category
Chart paper	As needed	1, 4, 12	E
Marker pens	As needed	1, 4, 12	E
Video about salmon/steelhead	1 or more	1	Kit
Photos of salmon/steelhead	As needed	1	E (optional)
Salmon/steelhead picture books	As needed	1	Kit
Salmon/steelhead stories	As needed	1	E (optional)
Salmon fishing gear	As needed	1	E (optional)
Salmon/steelhead	As needed	1	E (optional)
Salmon music CD	As needed	1	Kit
VCR and monitor	1	1	E
Copies of What I Want to Know worksheet	1 per person	1, 13	E, CM
Celebration food	As needed	1, 13	E
Napkins, plates, cups, utensils	As needed	1, 13	E
Folder or binder	1 per team	1	E
Camera	As needed	1, 3, 4, 5, 6, 11, 12	E
Jump ropes, 1 long, 2 short	3	2	E
Boundary markers	As needed	2	E
Cardboard boxes	2	2	E
Tokens (poker chips, index cards, etc.)	100	2	E
Whistle	1	2	E (optional)
KWLR chart	1	Throughout Unit	E

Sample surveys	A few	4	E
Color copies of Salmon/Steelhead Status Maps	6	5	E
Copies of Creek Walk Checklist	1 per team	5, 6, 11	E, CM
Clipboards	1 per team, 10	5, 11	Kit
Paper and pencils	As needed	5, 7, 9, 11, 12	E
First-aid kit	1	5, 11, 12	E
Topographic maps of coummunity	As needed	6, 8	E
Color pens or pencils	As needed	6, 7, 8, 9, 10, 11	E
Scratch paper	1 per person	6	E
Water-based pens: blue, black, brown, red	Several	6	Kit
Paper towels	4 per person	6	E
Spray bottle	1	6	Kit
Sample pamphlets	A few	7	Kit
Drawing paper	1 per person	7, 10, 11	E
Glue sticks	As needed	7, 8, 9	E
Scissors	As needed	7, 8, 9	E
Copies of Watershed Web Search worksheet	1 per person	7	E, CM (optional)
Copies of Rubric for Watershed Pamphlets	1 per person	7	E, CM (optional)
Street map of community	1	8	E
Skeleton map of community	1	8	E
Resource maps of community	A few	8	E (optional)
Overhead projector	1	8	E
Overhead transparency	1	8	E
Poster board	1 per team	8	E
Masking tape	As needed	8	E
Map of California	1	9	Kit
Copies of Salmon/Steelhead Life Stories Web Search worksheet	1 per person	9	E, CM (optional)
Copies of Salmon/Steelhead Life Cycle worksheet	1 per person	9	E, CM
Sample Life Cycle Stories	A few	9	Kit

Copies of Rubric for Salmon/Steelhead Life Stories	1 per person	9	E, CM (optional)
20- to 30-gallon aquarium	1	10	E (optional)
Aquarium supply catalogs	A few	10	E (optional)
Copies of Requirements for Salmon/Steelhead Eggs Web page	1 per person	10	E (optional)
Equipment for raising salmon/steelhead	As needed	10	E (optional)
Copies of Creek Monitoring worksheet	1 per team	11	E, CM
Low-cost water monitoring kit from LaMotte, or another such kit	1	11	Kit
Yard stick or meter stick	1	11	E
Tape measure, 50 foot	1	11	Kit
Ruler	1	11	E
Flagging	1 roll	11	Kit
Orange or sticks	1 per team	11	E
Polarized glasses	For 1 team	11	E
Graph paper	As needed	11	E (optional)
Stopwatch with second hand	1	11	E
Sticky notes	Several	12	E
Copies of Choosing a Project worksheet	1 per team	12	E, CM
Copies of Planning a Project worksheet	1 per person	12, 13	E, CM
Examples of Haiku poems	A few	12	E
Copies of Reflecting on the Unit worksheet	1 per person	13	E, CM

Adopt-a-Watershed Kit Contents

The following list describes each item included in the Adopt-a-Watershed kit, the source for each item, and the purchase price.

Item Description	Source	ISBN/SKU#	Price
A Last Wild Salmon (DVD)	Amazon.com	B0001A072U	$32.95
A Salmon for Simon (Book)	Amazon.com	0888992769	$4.95
The Salmon Princess (Book)	Amazon.com	1570613559	$9.95
Swimmer (Book)	Amazon.com	0934007241	$9.95
Salmon Creek (Book)	Amazon.com	0888996446	$12.95
Come Back Salmon (Book)	Amazon.com	0871564890	$7.95
Flabbergasted (CD)	Zunzuntunes.com		$15.00
California Water Map	Water-ed.org/store	2000	$10.00
GREEN Water Quality Monitoring Kit	Acornnaturalists.com/store	TEST-7202	$29.95
Bostitch Stanley 50-Foot Tape Measure	Business-supply.com	BOS34103	$14.73
Officemate Hardboard Clipboard	Business-supply.com	OIC83100	$0.89 each
24 oz. Continental Sprayer and Bottle (3 pack)	Business-supply.com	CNC92238P	$5.27
Staedtler Lumocolor Water-Based Markers	Business-supply.com	STD3163	$1.16 each
Tatco Caution Barricade Tape	Business-supply.com	TCO10700	$22.46
Rubbermaid Latching Lid Tote (22 gallon)	Business-supply.com	RUM2161CPBBFR	$19.19
AAA California Map			