

## Salmon Scavenger Hunt

### OVERVIEW

Go on a salmon scavenger hunt to find out about threats to salmon populations. Gather information about some of the reasons wild salmon have gone from such incredible abundance to relative scarcity, and about some of the things people are doing to help salmon recover.

### OBJECTIVES

Describe several ways in which human activities impact salmon at various points in their life cycle.

### GRADE LEVEL

6-8

### SUBJECTS

Science

Social Studies

Language Arts (research skills)

### VOCABULARY

alevin, aquaculture, dissolved oxygen, egg, fry, hatchery, silt, smolt

### TIME

One session plus research time

### MATERIALS

copies of the "Salmon Scavenger Hunt" handout  
research materials  
Internet access

### NATIONAL SCIENCE STANDARDS

This activity supports the following National Academy of Sciences science education standards.

Grades 5-8:

Standard F: Science in Personal and Social Perspectives—Populations, resources, and environments

### NATIONAL SOCIAL STUDIES STANDARDS

This activity supports the following National Council for the Social Studies standards.

Middle Grades:

Standard IX: Global Connections—d

Standard X: Civic Ideals and Practices—e, f, j

## **Before You Begin**

Make one copy of "Salmon Scavenger Hunt" handout for each student, arrange for access to the Internet, and collect research materials about salmon. (See Salmon Resources at [http://worldwildlife.org/windows/pdfs/salmon\\_resources.pdf](http://worldwildlife.org/windows/pdfs/salmon_resources.pdf).)

## **What to Do**

### **1. Set up the scavenger hunt.**

Begin by asking the students to tell you what they know about the status of salmon. Are the fish as abundant as they once were? Why or why not? What problems affect different stages of the salmon's life cycle? What kinds of things are people doing to help salmon? Once you've gotten an idea of the students' base of knowledge, explain that they are going to go on a scavenger hunt to find answers to these and other questions.

### **2. Hand out the scavenger hunt sheet.**

Divide the group into teams of four or five students. Next, hand out a copy of the scavenger hunt sheet to each student. Explain that each team should work together to find as many of the items on the sheet as they can. They can divide up the work in any way they want. Suggest that they search on the Internet, in the library, or through any research materials you have collected. (Note: You may want to talk with your students about how they might evaluate the accuracy of information presented in resource materials, especially information found on the Internet. Remind them that, just because something has been printed or posted online, it isn't necessarily true. They should note where the information came from and try to determine whether the author or organization responsible for the information is a reliable source.) Also explain that they may not be able to find every item on the list in the time allotted, but that they should do the best that they can. Now give the students time to do their scavenger hunt.

### **3. Review student findings as a group.**

Once the students have completed their scavenger hunts, gather as a large group. Review their findings and have them add up their points. Were there any surprises on the list? Did everyone understand the threats?

### **4. Review threats to salmon.**

Ask your students to consider the ways in which people compete with salmon for the land and water essential for the well being of both. Name some human activities that threaten salmon (*overfishing, fish farms, dams, forestry operations, farming and ranching, mining, and development--see "Fish Fate" for more*). Do those activities have any benefits? To whom? (*Dams generate electricity, forestry supplies wood products, development provides people with homes, and so on.*) Why might that make salmon conservation a controversial issue? (*There are good reasons for and against activities that harm salmon populations, and it's difficult to balance the needs of people with the needs of salmon.*)

## **Fish Fate—Major Reasons Salmon Are in Trouble**

Since 1991, at least 26 runs (specific populations) of salmon in the Pacific Northwest, excluding Alaska, have been listed as endangered or threatened under the Endangered Species Act. (And four more runs are candidates for listing.) In general, salmon species that spend a larger proportion of their lives in fresh water are in greater trouble than those that spend less time in fresh water. And the salmon that spawn in southern states are in more trouble than those that spawn further north. (For example, salmon in Alaska are doing better than salmon in California.)

The following list discusses some of the major reasons that salmon are in trouble.

**1. Commercial and recreational overfishing** have historically posed a major threat to salmon by removing too many wild salmon from natural populations. Fortunately, both types of fishing are now regulated, but overfishing is still a problem for some salmon populations.

**2. Aquaculture** (fish farm) operations, if not regulated properly, release wastes that can harm salmon by washing into waterways and decreasing oxygen supplies. Wastewater from these operations can also carry antibiotics and other pollutants. Escaped farm-raised fish (which are typically Atlantic salmon—even in salmon farms on the West Coast) can spread diseases to wild fish and may compete with wild populations for food and spawning areas. In addition, sea lice and other parasites are a problem for many farmed fish. When wild fish swim near a fish farm, those wild fish can pick up parasites that pose a significant threat to their survival.

**3. Dams** are one of the biggest causes of salmon decline. There are more than 1,000 dams obstructing the flow of water in Washington alone. By slowing and changing natural water flows, dams can lead to an inadequate water supply downstream, raising water temperatures and allowing too much silt to collect. Hydroelectric dams can block fish from moving upstream to spawn, and they can reduce the number of juvenile salmon that successfully migrate to the ocean. Even dams with fish ladders can create problems for salmon. Adults may have difficulty negotiating them, becoming disoriented or injured in the process. And juveniles can easily become caught in the turbines if they don't use the fish ladders while moving downstream.

**Dikes** prevent coastal flooding by reducing the size of flood plains or preventing tidal surges from the sea. Estuaries, where rivers meet the ocean, are primary habitats for young salmon to mature, feed, and adjust to salty, ocean water. Squeezing salmon populations in shrinking estuarine habitats can be extremely detrimental to salmon populations. When a dike is built between the ocean and the estuary, the lack of salt water quickly kills off salt-water dependent marsh fish (such as salmon, herring, and perch) and invertebrates (such as clams and mussels); this die-off, in turn, decreases the amount of food for marsh birds. The absence of salt water also causes the vegetation to shift dramatically from salt grasses to freshwater plants.

**4. Forestry operations** can create problems for salmon. Removing trees can lead to increased water flow across the surface of the ground, increasing erosion and subsequently allowing more silt to wash into the stream. Removing trees and other plants that grow along streamsides can also reduce stream shading and cause water temperatures to rise. And clearing of forests right up to the stream banks deprives the stream of large trees that would otherwise fall into the streams and provide crucial fish habitat. In the last 50 years, two-thirds of the old-growth forests in the state of Washington have been logged. Those forests were particularly important elements in keeping streams healthy for salmon as they provided essential shading and cover.

**5. Farming and ranching** may also remove vegetation that shades the stream or that would otherwise end up in the stream and provide fish habitat. Farming and ranching operations may channel streams and drain wetlands, drastically changing the flow of water that is needed by salmon. In addition, when livestock are allowed access to streams, they can destroy banks and stream bottoms, increase the amount of silt in streams, contaminate the water with their droppings, and destroy fish-nesting sites. By removing water for irrigation or livestock watering, farmers and ranchers can change stream flows. In addition, pesticides and fertilizers that wash off agricultural lands may poison fish or reduce oxygen supplies.

**6. Mining for gravel** is another threat to salmon because it destroys streambeds, disturbing spawning grounds and causing increased water flows.

**7. Expansion of cities and housing developments** across the land is another major source of problems for salmon. Humans are competing for the same water and land that are essential for the preservation and productivity of healthy wild salmon populations. People have altered natural water courses, eliminated or degraded wetlands, cut down trees, and introduced toxic chemicals—particularly petroleum products, lawn and garden chemicals, sewage, and air pollution byproducts—into waterways. Loss of the estuarine wetland habitat, which is essential for healthy salmon populations, has been especially extensive.

**8. Hatcheries** can also harm salmon, even though they were originally developed to boost salmon stocks. These facilities take salmon eggs and sperm from adult salmon, hatch the eggs, and raise the young. Then they release the young into streams. However, sometimes these successful “progeny” are returned to the hatchery and unknowingly bred together, which can create salmon that are unfit to survive in the wild. Today, hatcheries are usually careful to use eggs and sperm from parents that are well adapted to the stream in which they will be released. This was not the case in the past, which led to the release of fish that were less able to survive in the wild. Hatchery fish may carry diseases that affect wild fish, so that threat is monitored now too. And sometimes hatchery fish don’t return to their own streams. Instead, they end up in streams far from their origins. When this happens, they interbreed with wild fish and reduce the wild fish population’s ability to survive. Commercial and recreational fishers catch many hatchery-raised salmon. Because those fish don’t end up returning to salmon streams, they don’t die in the streams and, subsequently, replenish the nutrient supplies in the streams.

**9. Invasive species** not native to the Pacific Northwest—including *Spartina* grass, zebra mussels, Chinese mitten crabs, European green crabs, and Eurasian millfoil (an aquatic plant)—are spreading through the region and altering salmon habitats. For example, *Spartina* grass has already spread across 6,000 acres in Washington, crowding out the eelgrass that provides important rearing habitat for young salmon.

**10. Natural predators**, such as seals, sea lions, and seabirds, now exist in numbers that are out of proportion to the numbers of salmon they prey upon. Salmon and their predators have coexisted for centuries, but salmon populations have come under stress from many sides, reducing salmon numbers and causing an unnatural predator-prey balance.

**11. Global warming**, many scientists believe, may cause exceptionally high sea temperatures at lower latitudes, which will force salmon and other fish to move north if they can.

## ASSESSMENT

Using the information obtained through the scavenger hunt, have the students write an essay or a letter to a newspaper editor. The writing should describe the current status of salmon, what threats exist, and what is being done to alleviate those threats.

**Unsatisfactory**—Three or fewer concepts are incorporated; incomplete ideas are presented.

**Satisfactory**—Four concepts are included in the essay or letter, at least three of which are presented as complete ideas.

**Excellent**—Four or more well-developed concepts are included, and there is a logical flow to the essay or letter.

## EXTENSIONS

- Depending on the level of your group, you may want to organize mini-debates or mock town meetings around one or more of the topics discussed in step 4. Have the students debate the merits of keeping or removing a local dam that generates inexpensive power for a substantial number of residents but threatens a salmon species. Or have them argue for and against a new housing development in salmon habitat. They can use the Internet to find reasons people cite for and against these activities.
- Many of the issues brought up in this activity tie directly to the concepts of watersheds. You may wish to expand this activity to take a more in-depth look at watersheds—including the watershed your students live in. You may even want to monitor the health of a nearby stream.

## CREDIT

Activity adapted from *Oceans of Life—An Educator's Guide to Exploring Marine Diversity*, a resource of World Wildlife Fund's *Windows on the Wild* biodiversity education program. For more information on WOW please visit [www.worldwildlife.org/windows](http://www.worldwildlife.org/windows).

## Salmon Scavenger Hunt

**1) List five things that can destroy salmon eggs. (2 points each)**

- 1.
- 2.
- 3.
- 4.
- 5.

**2) List four ways that urban development can harm wild salmon. (2 points each)**

- 1.
- 2.
- 3.
- 4.

**3) List two natural predators of wild salmon in each stage of development. (2 points each)**

Egg

- 1.
- 2.

Alevin

- 1.
- 2.

Fry

- 1.
- 2.

Smolt

- 1.
- 2.

Adult

- 1.
- 2.

Spawner

- 1.
- 2.

**4) List two ways each of the following can harm wild salmon. (3 points each)**

Dams

- 1.
- 2.

Forestry

- 1.
- 2.

Farming/Ranching

- 1.
- 2.

Fish Farms and Hatcheries

- 1.
- 2.

**5) List two other potential threats to wild salmon. (3 points each)**

- 1.
- 2.

**6) What are three steps people are taking to help wild salmon? (4 points each)**

- 1.
- 2.
- 3.

**7) What are three things you can do to protect salmon? (4 points each)**

- 1.
- 2.
- 3.

## ANSWER KEY

### 1) List five things that can destroy salmon eggs.

- Disturbance of gravel (such as by movements of adult salmon, animals crossing the stream, and so on)
- Predation
- High water temperatures
- Freezing
- Suffocation by being covered with silt
- Pollution
- Flooding that washes them downstream
- Disease

### 2) List four ways that urban development can harm wild salmon.

- Clearing trees and shrubs from stream corridors (which can increase water temperatures in rearing areas)
- Increasing water runoff by increasing the amount of pavement
- Reducing water flows in waterways by diverting water for human use
- Releasing pesticides, fertilizers, oil, coolants, road deicers, and other chemicals into waterways
- Filling in wetlands
- Putting dikes in estuaries

### 3) List two natural predators of wild salmon in each stage of development.

#### **Egg**

fish, raccoons, ducks

#### **Alevin**

large aquatic insects, fish

#### **Fry**

fish, minks, otters, fish-eating birds

#### **Smolt**

fish, minks, otters, fish-eating birds

#### **Adult**

humans, seals, sea lions, orcas, sharks

#### **Spawner**

bears, eagles

### 4) List two ways each of the following can harm wild salmon.

#### **Dams**

- Block salmon movement both upstream and downstream
- Alter water flow
- Slow movement of young fish to ocean and thus increase their risk of predation and disease
- Affect stream and river habitat by retaining sediments (such as gravel and cobbles) that would serve as spawning habitat

- Kill salmon in the turbines

### **Forestry**

- Increase water temperatures by clearing vegetation and removing shade
- Reduce woody debris, which serves as fish habitat in streams
- Introduce pesticides to waterways
- Increase amount of sediment in waterways that may cover nests or cover stream bottoms and thus eliminate the habitat adults need to spawn

### **Farming/Ranching**

- Increase soil erosion by washing silt into waterways
- Introduce fertilizers and pesticides into waterways
- Degrade streams when cattle have access to them
- Reduce amount of water in stream by diverting water for irrigation
- Channel streams
- Remove large trees and woody debris from waterways

### **Fish Farms and Hatcheries**

- Fish from farms and hatcheries may interbreed with wild fish and reduce the genetic fitness of the offspring.
- Fish from farms and hatcheries may introduce diseases to wild fish and compete with wild fish for food.
- These operations use up limited spawning habitat.
- They expose wild fish to antibiotics and other chemicals and may decrease oxygen supplies by increasing the amount of wastes in waterways.

### **5) List two other potential threats to wild salmon.**

- invasive species
- climate changes
- changes in ocean conditions caused by global warming
- overfishing

### **6) What are three steps people are taking to help wild salmon?**

- Leaving wide vegetation buffers along streams
- Keeping oil and other pollutants out of storm drains
- Removing dams that have outlived their usefulness and improving other dams so that fish can get past them
- Keeping livestock away from stream banks to prevent erosion and keep animal droppings out of the water
- Restricting the number of fish people are allowed to catch
- Reducing runoff and soil erosion
- Using cover crops between plant rows to absorb extra fertilizer and reduce runoff and erosion
- Reducing pesticide and fertilizer use
- Reducing the use of water and electricity
- Participating in stream restoration projects
- Educating others about the threats salmon face
- Writing letters to elected officials and fisheries managers to encourage them to take specific actions that will help salmon recover

**7) What are three things you can do to protect wild salmon?**

- Reduce use of water and electricity
- Participate in stream restoration projects
- Educate others about the threats salmon face
- Contact elected officials and fisheries managers to let them know how you feel about protecting wild salmon and their freshwater habitats