Wildlife Express

September 2022 – Salmon

Activities:

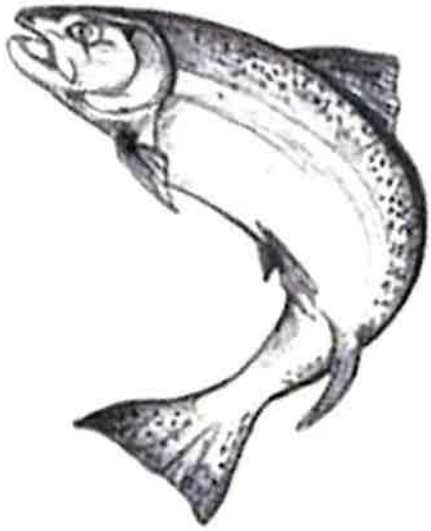
Hooks and Ladders: Students simulate the migration of Pacific salmon in this active ***Project WILD*** game. ***WILD About Early Learners*** version also included.

Aquatic Ecosystems: Students will become part of an aquatic ecosystem using a web activity.

Idaho Rivers: Students will label Idaho's major rivers and towns on a map.

Keystone Species: Students will be able to define keystone species and research an animal considered to be a keystone species. After researching, students will write a pyramid poem.

Life-sized salmon: Students use a grid to create a life-sized salmon.



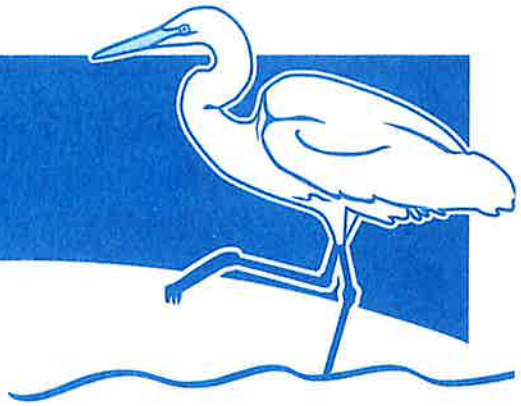
Other resources for you:

WILD About Anadromous Fish – a teacher workshop where you can earn professional development credit. Held in July. Idaho Project WILD | Idaho Fish and Game

*If you're in the Treasure Valley, email Lori.adams@idfg.idaho.gov to ask about Salmon Trunks available for check out (pick up and drop off). Free! We have one trunk focused on lifecycle and one focused on habitat.

Check out NOAA at this web address: An Incredible Journey: A Series of Educational Resources to Promote Salmon Stewardship | NOAA Fisheries They are offering a full curriculum and a free children's book called "The Incredible Journey."

Hooks and Ladders



Grade Level: Middle School

Content Areas:
Social Studies, Science, Environmental Education, Expressive Arts

Method: Students simulate the migration of and the hazards faced by Pacific salmon to illustrate their life cycle.

Materials: 500 feet of rope or string or six traffic cones for marking boundaries (masking tape if area is indoors); two cardboard boxes; 100 tokens (3" x 5" cards, poker chips; macaroni, etc.); jump rope

Activity Time:
one 30- to 60-minute session

People Power:
20 to 30 students or more

Setting:
Large playing area (100 feet x 50 feet), outdoors or indoors

Conceptual Framework Topic Reference: IDIIB

Terms to Know:
life cycle, limiting factors, population, migration, spawn, estuaries

Appendices: Let's Go Fishing!, Using Local Resources, Sustainable Seafood, Agencies and Organizations, The Ecosystem and Project WILD, Climate Change

Get ready to embark on the amazing life journey of the Pacific salmon.

Objectives

Students will (1) describe how some fish migrate as part of their life cycles, (2) identify the stages of the life cycle of one kind of fish, (3) describe limiting factors affecting Pacific salmon as they complete their life cycles, and (4) generalize that limiting factors affect all populations of animals.

Background

Many fish migrate from one habitat to another during their lives. Both the Atlantic and Pacific salmon are examples of fish that endure a spectacular migration.

The life cycle for Pacific salmon begins when the female deposits 1,000 to 5,000 eggs in her freshwater spawn. The eggs are deposited in a shallow gravel depression that she digs by flapping her tail from side to side. Once the eggs are deposited, the male fertilizes them; then both fish nudge the gravel back over the eggs to offer as much protection as possible. The eggs are susceptible to factors such as predation or oxygen deprivation. Within a few days, both the male and female salmon have completed their reproduction cycle and soon die.

Newly hatched salmon, called "alevins," live in the gravel and survive by absorbing proteins from their yolk sacs. After a few weeks, the yolk sacs are gone and the small fish, known as "fry," move into deeper water to find food on their own. Salmon remain in freshwater streams feeding and growing for many months or even years before migrating downstream to the ocean. These small ocean-bound salmon are now called "smolts." These salmon will feed in estuaries where fresh and saltwater mix. After a few weeks of adjusting to the brackish water, the young salmon swim into the ocean.

In the ocean, salmon grow rapidly by feeding on a rich food supply that includes other fish, shrimp, and crustaceans. Young

salmon may encounter many limiting factors; including sharks, Killer Whales, other marine mammals, and humans who are fishing salmon for commercial and personal uses.

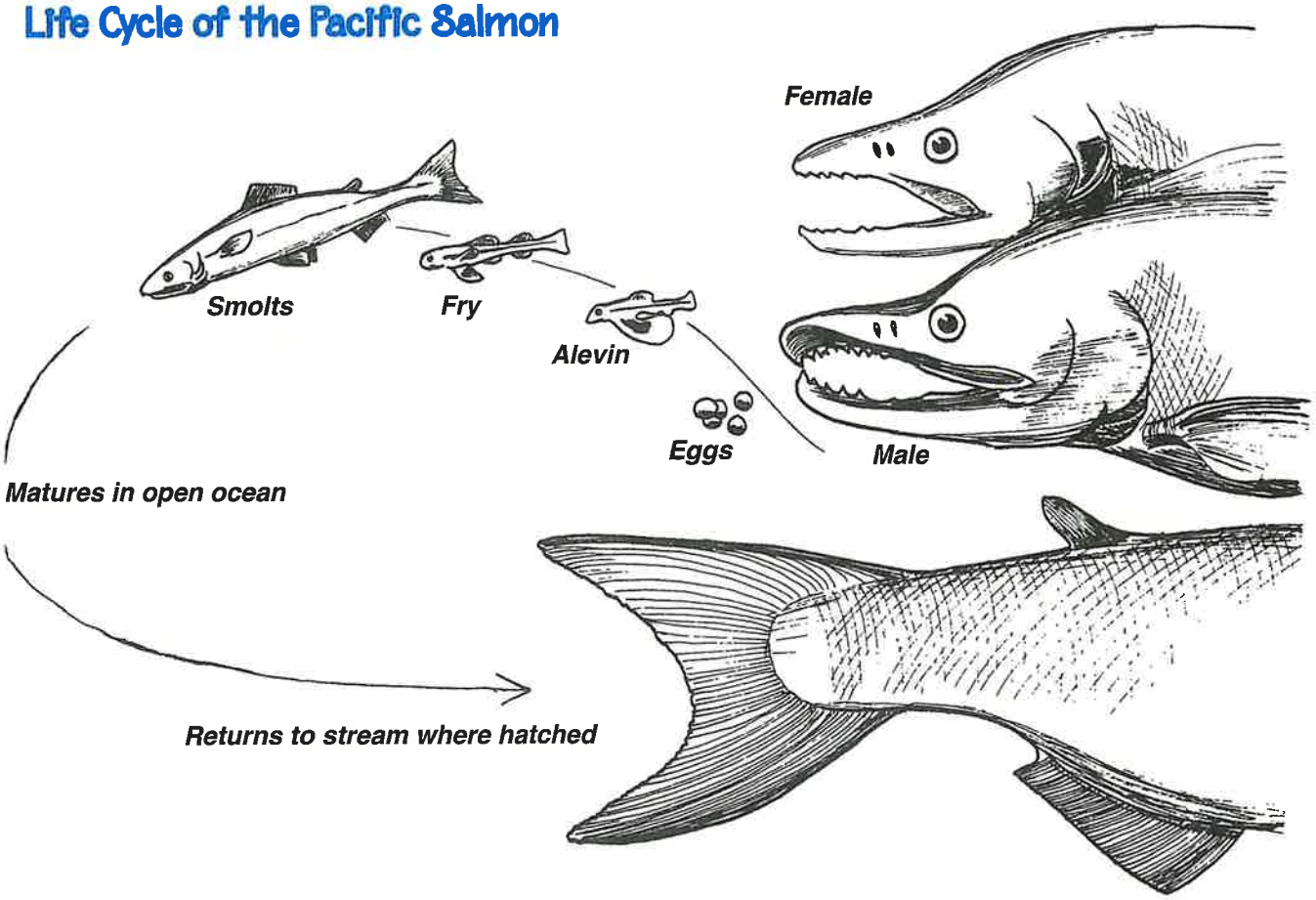
After two to five years in the ocean, Pacific salmon begin the journey that guides them to their own hatching sites. Pacific salmon spawn only once in their lives. Salmon have an inherent ability to return to their original streams. Juvenile salmon imprint or memorize the unique odors of their home streams. As returning adults, scientists hypothesize that salmon use their senses of smell to detect those odors and guide them upstream to where they were hatched. Once there, the salmon spawn and then die.

Salmon face a variety of limiting factors in the completion of their life cycles. A limiting factor is a reason or cause that reduces the population of an organism. Some limiting factors are natural, and some result from human intervention into natural systems. Natural limiting factors include drought, floods, predators, and inadequate food supply.

High human demand for salmon in recent years has inadvertently led to the problem of domestic salmon stock interfering with wild salmon stock. Salmon are farmed in open net pens, and every year millions of these domesticated salmon escape and enter surrounding marine environments or coastal rivers all over the world. The escape of domestic salmon results in numerous limiting factors for wild salmon: interbreeding with escaped domestic salmon, which is believed to result in maladaptive genetic variation; competition for food, habitat, and mates; and the transmittance of pathogens.

Throughout their lives, salmon depend on a habitat that provides plants to shade streams and deep pools of cool, clear water for spawning and resting. Incorrect logging, grazing, mining, road building, and development practices often destroy streamside vegetation, erode land, and fill streams with silt that covers gravel beds.

Life Cycle of the Pacific Salmon



Dams are another limiting factor that block or slow migration to and from the ocean. Salmon become disoriented by the reservoirs formed by dams and become exposed to unhealthy conditions like high water temperatures and predators. Fish ladders can be installed to help salmon through the dams. Fish ladders can be water-filled staircases that allow migrating fish to swim around the dam.

Another threat to salmon is overfishing. Overfishing, combined with habitat destruction, is viewed by biologists as a cause for the decline of salmon populations.

NOTE: All possible conditions are not covered by the design of this activity. However, the activity does serve to illustrate three important concepts: life cycle, migration, and limiting factors.

Procedure

1. Ask students what they know about the life cycles of fish that live in their area. Do any local fish migrate to spawn? If yes, which ones? (Mullet, shad, Lake Trout, Striped Bass, suckers, carp, and salmon are examples of fish that migrate to spawn.)

2. Set up a playing field as shown in Diagram A, including spawning grounds, reservoir, downstream, upstream, and ocean. The area must be at least 100 feet by 50 feet. Assign roles to each of the students. Some will be wild salmon; others will be potential limiting factors to the salmon. Assign the students roles as follows:

- Choose two students to be the turbine team. They will operate the jump rope, which represents the turbines in hydroelectric dams. Later in the simulation, when all salmon have passed the turbine going downstream, those students move to the upstream side to become the waterfall-broad jump monitors. (See diagram.)

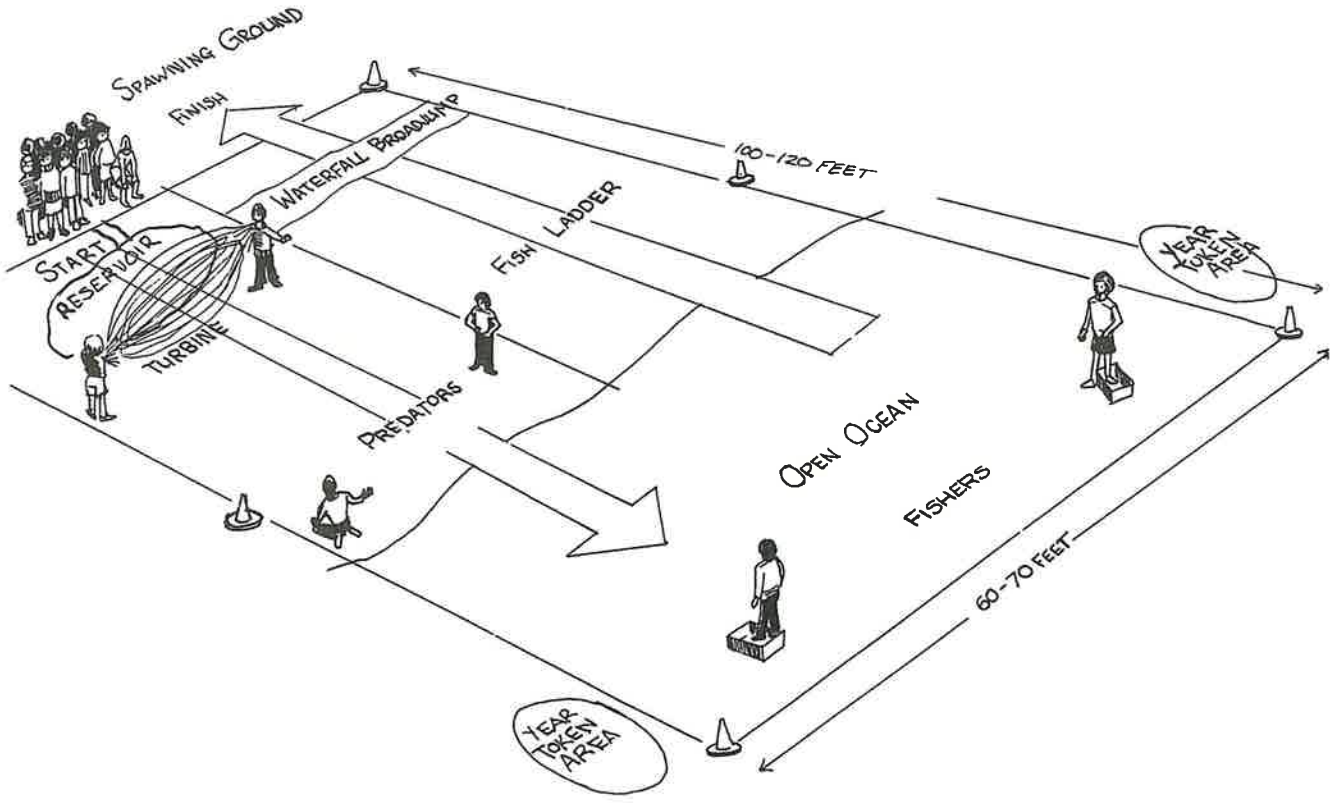


Diagram A

- Choose two students to be predatory wildlife. At the start of the simulation, predators will be stationed in the reservoir above the turbines to catch the salmon fry as they try to find their way out of the reservoir and move downstream. Then they will move to below the turbines where they catch salmon headed downstream. Later in the activity, when all the salmon are in the sea, these same two predators will patrol the area above the "broad jump" waterfalls. There they will feed on salmon just before they enter the spawning ground. (See diagram.)
- Choose two students to be domestic salmon that have escaped from a salmon farm. These students can replace or be in addition to the two students acting as predatory wildlife.
- Choose two students to be humans in fishing boats catching salmon in the open ocean. The students in fishing boats must keep one foot in a cardboard box to reduce their speed and maneuverability.
- All remaining students are wild salmon.

NOTE: These figures are based on a class size of 25 to 30. If the group is larger or smaller, adjust the number of people who are fishing and predatory wildlife accordingly.

3. Begin the activity with all salmon in the spawning ground. Salmon first move into the reservoir above the dam. They must stay in the reservoir while they count to 30. This pause simulates the disorientation that salmon face because of a lack of current in the lake to direct them on their journey. During this time, predators may catch salmon and escort them one at a time to become part of the fish ladder. The salmon then start their journey downstream. The first major limiting factor that salmon encounter is the turbines at the dam. At most dams, escape weirs guide migrating salmon past the turbines. The student salmon cannot go around the jump-rope swingers, but they can slip under the swingers' arms if they do not get touched while doing so. A salmon dies if the turbine (jump rope) hits it. The turbine operators may change the speed at which they swing the jump rope. Any salmon that "dies" at any time in this activity must immediately become part of the fish ladder. The student is no longer a fish, but becomes part of the physical structure of the human-made fish ladders now used by migrating salmon to get past barriers such as dams. The students who are in the fish ladder kneel on the ground, with one body space between them, as shown on the following page.

4. Once past the turbines, the salmon must pass some predatory wildlife or domestic salmon infected with a pathogen. These students, who have moved from the reservoir area to the area below the turbine, must catch the wild salmon with both hands—tagging isn't enough. Dead salmon are escorted by the

WILD Work

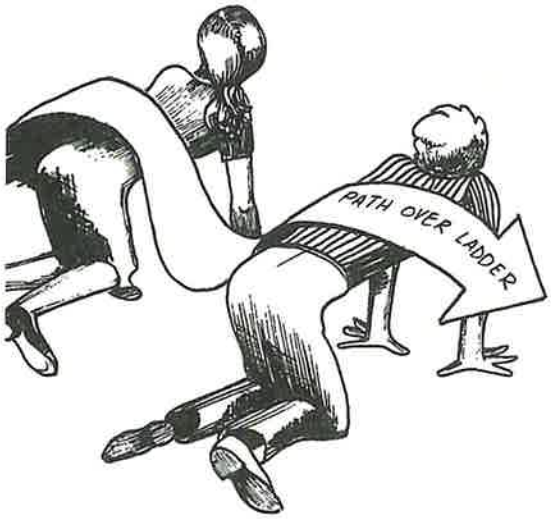
A **Fisheries Biologist** carries out a wide range of duties related to fish conservation, including monitoring populations of fish and other aquatic species, restoring habitat, controlling nuisance aquatic species, developing fishery management plans, and evaluating the impact of proposed construction projects. Education requirements to become a biologist typically include a Bachelor's degree in fisheries science or a related biological science; many positions require a graduate degree and field experience. A Fisheries Biologist must be comfortable working outdoors in all weather conditions.

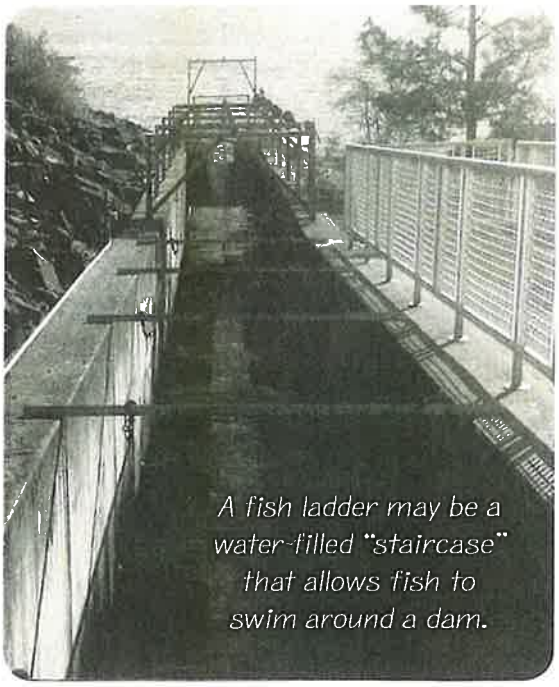
To find more information and view videos on this occupation, visit *www.projectwild.org/aquatic.*

In Step with STEM

Have students advise on how to adjust the playing field based on the outcomes after conducting a few trials of the activity. Students should try to maintain balance between fish populations, predator needs, and human needs (represented by the anglers). Students may adjust, for example, the speed at which the turbine (the rope) turns, the optimum distance between various parts of the playing field, the number of predators, the number of humans, or the distance required to jump across the waterfall. Relate these modifications to actions wildlife conservation professionals and engineers might make when balancing the needs of wildlife and people.

Many fish migrate from one habitat to another during their lives. Both the Atlantic and Pacific salmon are examples of fish that endure a spectacular migration.





A fish ladder may be a water-filled "staircase" that allows fish to swim around a dam.

predator to become part of the fish ladder. Later, the salmon that survive life in the open ocean will pass through the fish ladder to return to the spawning ground. **NOTE:** Both the predatory wildlife/domestic salmon in the downstream area and the people fishing in the open ocean must take dead salmon to the fish ladder site. This action moves the predators/domestic salmon and fishing boats off the field regularly, helping to provide a more realistic survival ratio.

5. Once in the open ocean, salmon can be caught by fishing boats. Salmon must move back and forth across the ocean area in order to gather four tokens. Each token represents one year of growth. Once a fish has four tokens (four years' growth), that fish can begin migration upstream. The year tokens can be picked up only one at a time on each crossing. Remember, the salmon must cross the entire open ocean area to get a token. The "four years" that these trips take make the salmon more vulnerable; thus they are more readily caught by the fishing boats. For this simulation, the impact of this limiting factor creates a more realistic survival ratio of the population before the salmon begin the return migration upstream.

6. When four of the tokens have been gathered, the salmon can start upstream. The salmon must walk through the entire pattern of the fish ladder. This enforced trip through the fish ladder gives students a hint of how restricting and tedious the upstream journey can be. In the fish ladder, predators/domestic salmon may not harm the wild salmon.

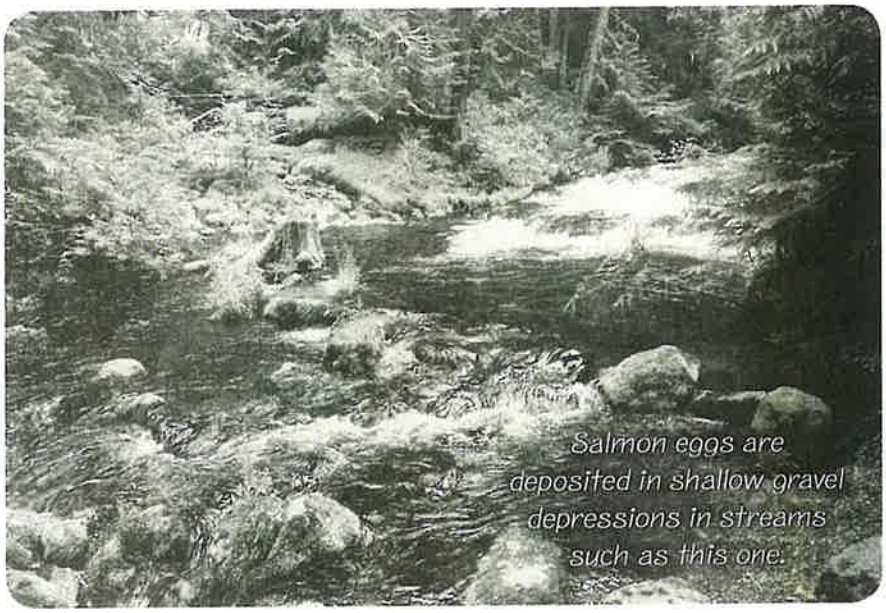
7. Once through the ladder, the salmon face the broad-jump waterfall. The waterfall represents one of the natural barriers salmon face going upstream. Be sure the jumping distance is challenging but realistic. The two former turbine students will monitor the jump. Salmon must jump the entire breadth of the waterfall to be able to continue. If a salmon fails to make the jump, then it must return to the bottom of the fish ladder and come through again. **NOTE:** When playing indoors, the broad-jump waterfall may be changed into a stepping-stone jump defined by masking tape squares on hard floors.

8. Above the falls, the two predators who started the simulation as predators below the turbines have now become the last set of limiting factors faced by salmon. They represent bears—one example of predatory wildlife. Again, remember that predators must catch salmon with both hands. If they catch a salmon, they must then take the student to become part of the structure of the fish ladder.

9. The activity ends when all salmon are gone before the spawning ground is reached—or when all surviving salmon reach the spawning ground.

10. Next, engage students in a discussion. Explore topics such as:

- the apparent survival or mortality ratio of salmon;
- the role of the barriers;
- the role of predatory wildlife and the people fishing;
- where the losses were greatest;
- where the losses were least;
- what the consequences would be if all the eggs deposited made the journey successfully; and
- what seemed realistic about this simulation and what did not.



Salmon eggs are deposited in shallow gravel depressions in streams such as this one.

11. Ask students to summarize what they have learned about the life cycle of salmon, the salmon's migration, and limiting factors that affect salmon. Make sure students have a clear working definition of limiting factors. Encourage students to make the generalization that all animals—not just Pacific salmon—are affected by limiting factors. Ask students to give examples of limiting factors. They might mention the availability of suitable food, water, shelter, and space; disease; weather; predation; and changes in land use and other human activities.

Variation: Atlantic Salmon

This activity can be easily adapted to feature Atlantic salmon. The most significant difference between Pacific and Atlantic salmon is that Atlantic salmon can spawn more than once. Many Atlantic salmon make their complete migratory journey and spawn two or more times. All Pacific salmon die after spawning only once. To adapt this activity for Atlantic salmon, students are to make as many complete migratory trips as possible. After the activity is finished, ask students to report how many times they successfully completed the migratory cycle. Graph the data. Have students explain how age influences mortality rates and susceptibility to limiting factors.

Variation: Striped Bass

This activity can also be adapted to feature Striped Bass rather than salmon. The Striped Bass is more widely distributed along United States' coastlines than either the Atlantic or Pacific salmon. Like the salmon, Striped Bass reproduce in freshwater and migrate to and mature in saltwater. They must also face the same limiting factors described in this activity.

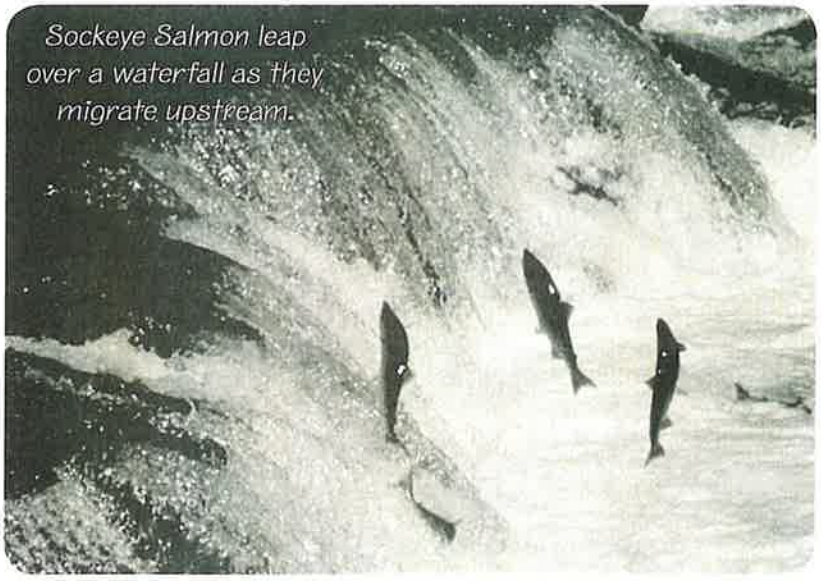
Extensions

1. Write a report on the life history of one species of salmon (e.g., Chinook or King, Chum or Dog, Pink or Humpback, Coho or Silver, Sockeye or Red, Atlantic). Create a mural showing the life cycle of this salmon.

2. Research and illustrate the life cycle of any local fish. If possible, look for one that migrates.

3. Compare how the life cycle of a Pacific salmon is similar to and different from the life cycle of one or more local fish.

4. Investigate similarities and differences in the migration and life cycles of an Atlantic and a Pacific salmon. Investigate the life cycle of salmon in the Great Lakes region of the United States.


Sockeye Salmon leap over a waterfall as they migrate upstream.

5. Visit fish hatcheries that work with migratory species and investigate how they function.

6. Explore ways that dams can be modified to let fish safely pass downstream and upstream. Design the "perfect" fish ladder.

7. Investigate and discuss commercial fishing for salmon. Investigate and discuss personal, including recreational, fishing for salmon.

8. Find out about laws protecting migratory species, including fish.

9. Consider the following approach, and try the activity again:

In the past 100 years, salmon have experienced many new limiting factors resulting from human activities. Dams, commercial fishing, timber harvest, road construction, and the presence of escaped domestic salmon have had a tremendous impact on wild salmon populations. In 1991, the Snake River Sockeye Salmon was placed on the federal endangered species list. In the past, tens of thousands of Sockeyes would make the 900-mile return trip from the sea to Idaho's mountain streams and lakes. There they spawned and died. Their offspring hatched and began their early development in freshwater. The actual migration to the Pacific Ocean could be completed in as few as nine days. Today, that trip takes more than 60 days. In 1991, only four Snake River Sockeye Salmon returned to their spawning grounds. In 2011, the number of salmon that returned to their spawning grounds was 1,118. Despite this significant increase from 1991, the endangered status of the Snake River Sockeye Salmon was reaffirmed in 2011.

To simulate these increases in salmon limiting factors, play several rounds of "Hooks and Ladders." Allow each round to represent the passage of 25 years. Start in 1850. In that year, do not include dams or commercial fishing operations in the scenario. As time passes, add the commercial fishing operations. Build dams (jump ropes) and add domestic salmon as the scenario progresses into the 21st century.

Describe some of the possible effects on salmon from increased limiting factors as a result of human activities and interventions. Discuss possible positive and negative effects on both people and salmon from these increases in limiting factors affecting salmon. When the activity reaches "the present," predict what might happen to salmon in the future. Recognizing the complexity of the dilemma, discuss possible actions, if any, that might be taken to benefit both people and salmon.

10. Find out if salmon exist in your state. If so, are they native or were they introduced?

Evaluation

1. List, describe, and illustrate the major stages in a Pacific salmon's life cycle.

2. Identify and describe some of the limiting factors that affect salmon as they complete their life cycles.

3. Identify and describe some limiting factors that might affect other animal populations.

Standards and Correlations

Observe and explore the characteristics of plants and animals.

Resources

A Salmon for Simon by Betty Waterton

Salmon Stream by Carol Reed-Jones

What is A Fish? by David Eastman

Salmon Princess: An Alaska Cinderella Story by Mindy Dwyer

The Magic School Bus Goes Upstream: A Book about Salmon Migration by Joanna Cole

The Salmon (Life Cycles) by Sabrina Crewe

Swimmer by Shelley Gill

Come to Our Salmon Feast by McKeowon Martha

Salmon Story by Brenda Guiberson

Red Tag Comes Back by Fred Phleger

Down to the Sea: The Story of a Little Salmon and His Neighborhood by Jay Nicholas

Salmon Summer by Bruce McMillian

Download children singing a Salmon Song (words to song on page 54)

To hear Salmon song on page ___ http://www.shastalink.k12.ca.us/bellavista/Rene/Salmon%20Song/song.htm or Google: Salmon song Shastalink

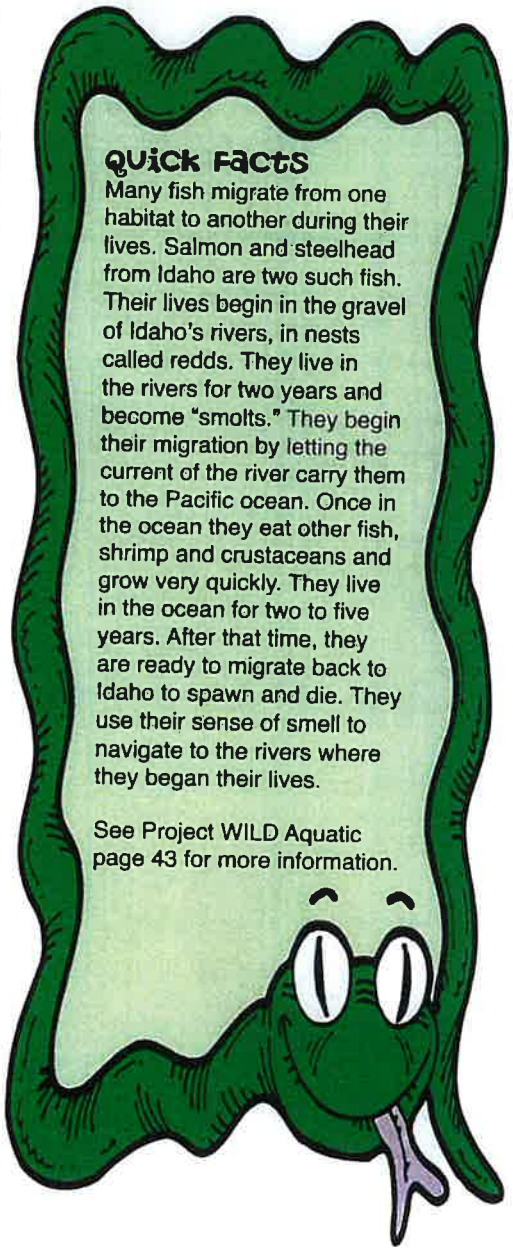
Hooks and Ladders

Children learn about the life cycle of Idaho salmon and steelhead.

Quick Facts

Many fish migrate from one habitat to another during their lives. Salmon and steelhead from Idaho are two such fish. Their lives begin in the gravel of Idaho's rivers, in nests called redds. They live in the rivers for two years and become "smolts." They begin their migration by letting the current of the river carry them to the Pacific ocean. Once in the ocean they eat other fish, shrimp and crustaceans and grow very quickly. They live in the ocean for two to five years. After that time, they are ready to migrate back to Idaho to spawn and die. They use their sense of smell to navigate to the rivers where they began their lives.

See Project WILD Aquatic page 43 for more information.



Words to know

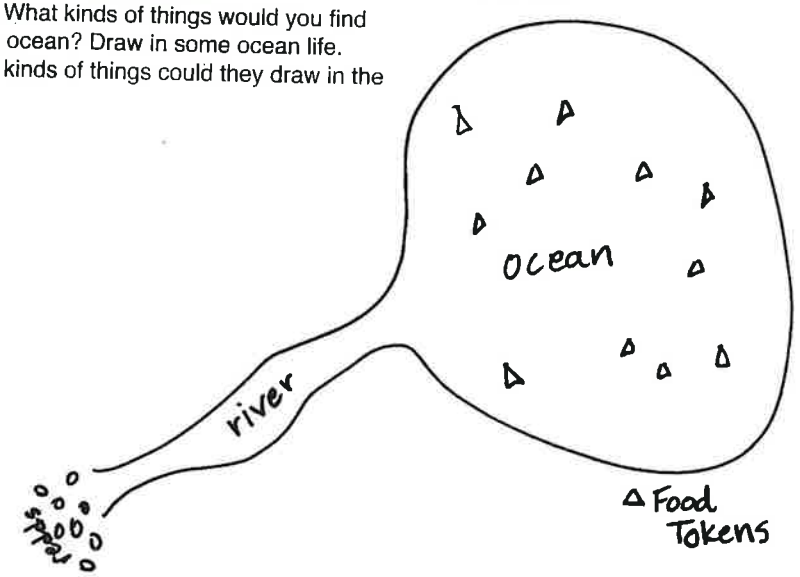
migrate **smolt** **redd** **salmon**
fresh water **salt water** **ocean**
anadromous **upstream** **downstream**

Materials and prep

sidewalk chalk
Salmon Stream by Carol Reed-Jones
tokens or fish shapes made from construction paper (at least 3 per child)

Procedure

1. Prepare activity area ahead of time by drawing a river and ocean on the playground with chalk. (See sample below). Place tokens in the ocean.
2. Read *Salmon Stream* by Carol Reed-Jones.
3. Take children outside and show them the river/ocean diagram. Give them the opportunity to draw more items to the area. What kinds of things would you find in the ocean? Draw in some ocean life. What kinds of things could they draw in the river? Add trees along the "riverbanks." This will help with orientation of the playing area. Tell the children they are going to pretend they are salmon.
5. Ask them to tell you what they know about a salmon's lifecycle and show them how to travel through the course. Start on a redd. Have children walk (backwards, if you feel they're capable) down the river. When they reach the ocean, they should collect three tokens, one at a time, to represent the years spent in the ocean. When they have three tokens, they may travel back up the rivers to Idaho (where life begins & ends).
6. Let them run through the course with no limiting factors (predators, fishermen or dams). All "salmon" should survive. (In this activity we are focusing on the lifecycle, not the limiting factors.)
7. Next, ask children to brainstorm what things could happen to salmon on their journey. Predators, fishermen, and dams are a few you could discuss.



Music & Movement

This is the way

(To the tune of *"Here We Go Around the Mulberry Bush"*)

This is the way we migrate to the ocean.... backwards most of the way. (walk backwards)

This is the way we grow really big...while we're in the ocean. (eating motions with mouth)

This is the way we find our way home....a few years later. (sniffing air)

This is the way we dig our redds....when we're ready to spawn. (shake backends)

Finger play

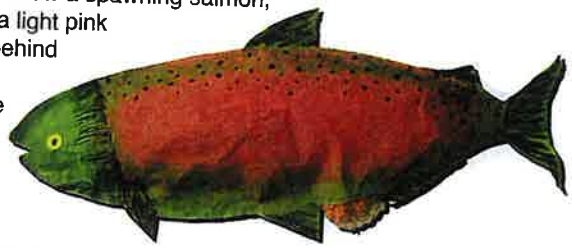
Teach children the names of the 5 Pacific salmon by using their hand. Each finger represents one of the species. Have children hold up their hand. Chum is thumb (notice the rhyme), Sockeye is pointer finger, King (Chinook or King) is middle finger, (biggest salmon), Coho is the ring finger, Pink is the pinkie (smallest salmon).

For other songs to reinforce the lifecycle of the salmon see page 61.

Art project

Stuff a salmon

Draw a front and back of a fish pattern on butcher paper for the children to cut out and paint. Stuff the fish with newspaper and staple together. If you would like to show a spawning salmon, paint bubble wrap a light pink color and place it behind the anal fin. Have children identify the different parts of a fish. Hang the fish from your ceiling or on a bulletin board.



Migration map

Create a model of the salmon's journey out of play dough. To make play dough, mix together, 2 ½ c flour, 1 c salt, 1 t alum. In a separate bowl, mix 3 T vegetable oil, 1 C very hot water and food coloring. Combine the two bowls of ingredients. Knead until smooth. This recipe makes enough for 4 – 6 children to have a fist sized portion. If more is desired, mix in small batches. Children should include redds, stream, river, ocean, trees, fish etc. in their models.

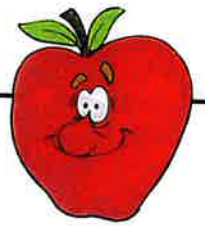
Gyotaku

Purchase fish at the grocery store. (Or go fishing for some!) Use tempera paint to paint the fish and print onto butcher paper. When printing, remember to paint the fish and put the paper that you are printing on top of the fish. Gently place the paper on the top of the fish and pat. Do not rubber stroke. Gyotaku is a form of Japanese fish painting.

Wrap up

- ***Name five Pacific salmon.***
- ***Tell what migrate means.***

Snack
Goldfish crackers or Swedish fish candy



Centers & extensions

Salmon Coloring Sheet
See page 59.

Salmon Lifecycle Flap Book
See page 60.

Have a fish fry!

Sockeye Scents
Project WILD page 61.
Early Childhood Version: Instead of having 4 scents for each tributary, have each child identify just one scent to get to the correct tributary.

HOME CONNECTIONS

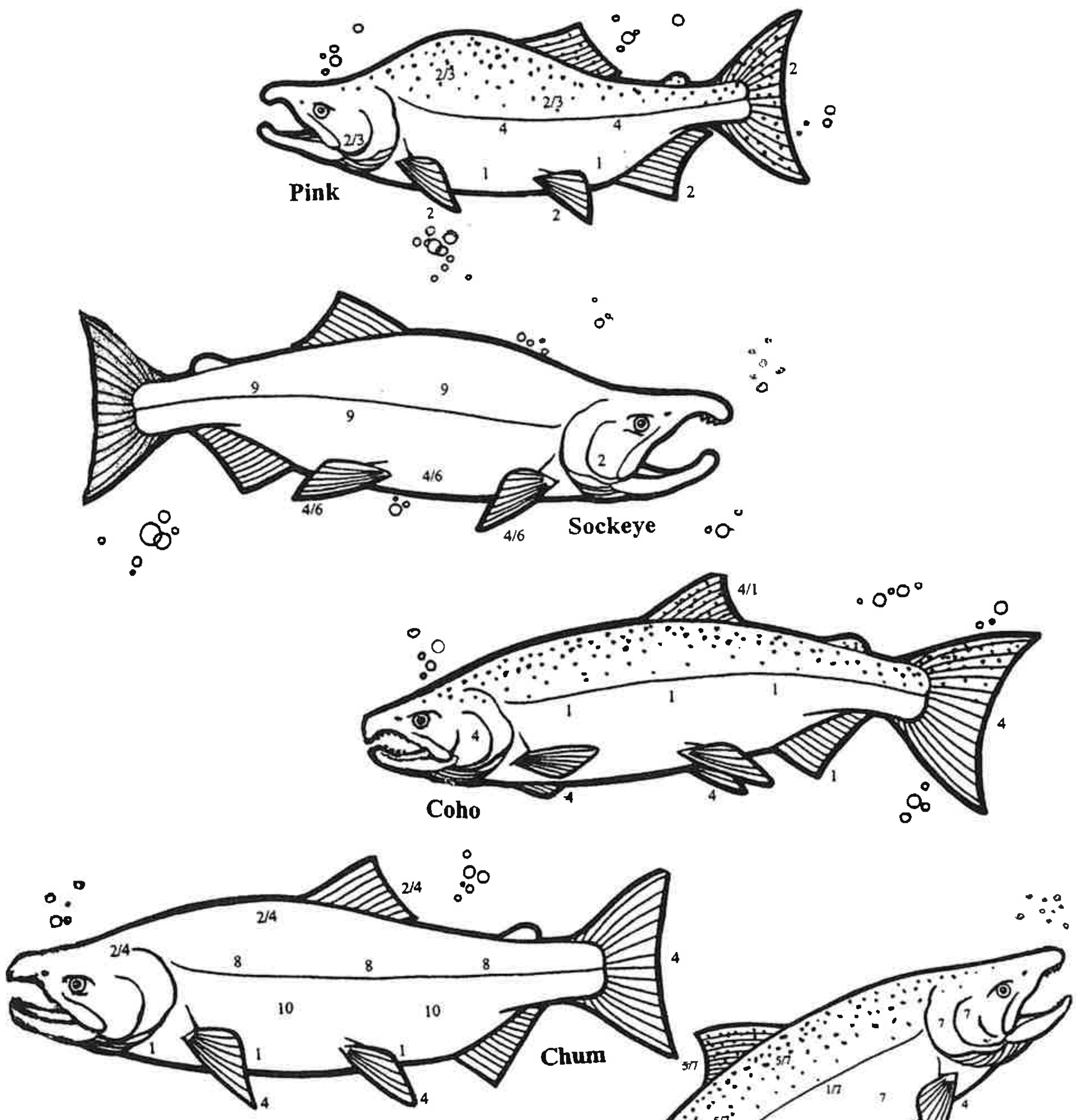
Draw a picture of a salmon in your journal. Include the head, gills, body, fins, and tail.

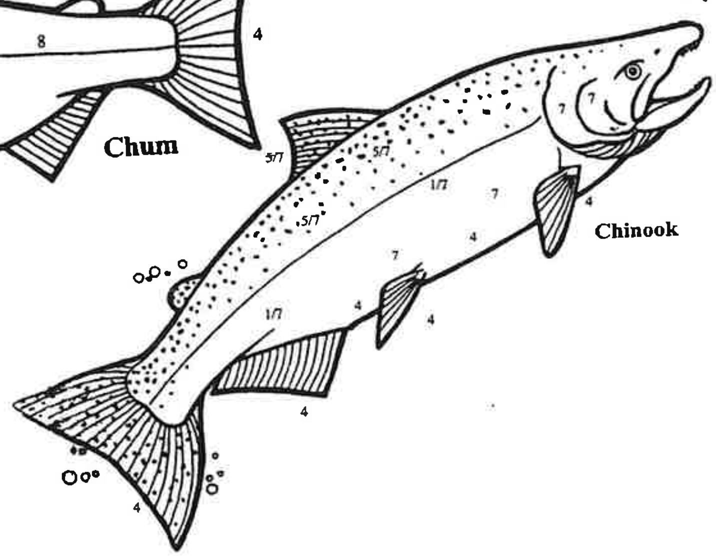
Cook a salmon dinner with your parents.

Teach your parents the names of the five Pacific salmon.

Hooks and Ladders—Color the Fish

Directions: Copy a page for each child and provide crayons of the appropriate colors. Review the colors with the children before beginning.
Source: USFWS Pacific Region





Using the color key provided, color the fish.

1 Salmon Pink	6 White
2 Olive green	7 Brown
3 Turquoise Blue	8 Yellow
4 Silver/Gray	9 Red
5 Black	10 Purple

Aquatic Ecosystems

Objectives: Students will: 1) identify components of the ecosystem, 2) describe connections between elements of the ecosystem, 3) discuss hypothetical changes in the ecosystem, and 4) identify how energy flows through the aquatic ecosystem.

Method: Students will become part of an aquatic ecosystem using the web activity.

Materials: 1 set of Aquatic Ecosystems cards on the following pages

Background: Plants produce food (stored energy) from inorganic elements and are combined into a group called "producers." Plants use sunlight to provide energy for the chemical process called photosynthesis that takes place within their cells. The raw materials for this process are carbon dioxide and water. The oxygen that is produced is a waste product. The food energy they produce is stored for themselves.

The producers form the base or bottom of the food chain or food web. Animals that eat the producers are called "consumers." Consumers that eat only plants are called herbivores, and animals that eat other animals are called carnivores. Some animals eat both plants and animals and are called omnivores.

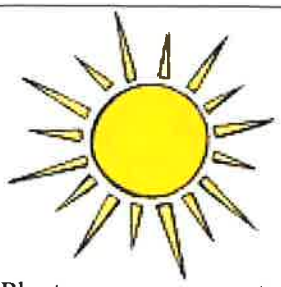
At each stage of the food web, food energy transfers, which is used for many different things. It may be used for growth, reproduction, waste, respiration, or stored as fat or oil. Consequently, there is less available food as you move up to next level.

Procedure:

1. Copy Aquatic Ecosystem cards and write the answers (the *Guess Who or What's*) on the back of each card.
2. Read the John Muir quote, "When you try to change a single thing, you find it hitched to everything else in the universe."
3. Ask students to share ideas about what Muir meant. Do they agree with the statement?
4. Explain that in this activity, each student will become part of a system that includes plants, people, animals, and their environment (an ecosystem).
5. Pass out the cards. Have each student read the card silently and think of who or what might follow. Ask them to look at the back of their card. There they will find the answer. Students should then begin mingling and find the person who is their Guess Who? As they do this, have them form a line. The line should become a circle when the two suns come together. Once the complete circle is formed, have students read their cards aloud, in order.
6. You can do this activity with yarn. It works well to show the interconnectedness. To do this, the beginning sun holds the yarn and reads his or her card. Once the students decide on the "Guess Who?", the sun holds on to the end of the yarn and throws the ball of yarn to the selected answer or the next person. This student reads his or her card and repeats the process (throwing yarn to the person who comes next). Continue until everyone is holding the yarn and a web is formed.
7. Once the circle or web is complete, discuss the following questions:
    1. Are the components of the ecosystem connected?

2. Does the pattern created by the string remind you of something? (Connections in an ecosystem are complex, more like the strands in a spider web than the links of a chain.)
3. What if questions: (sample)
    a) In times of drought, there is less water available to an ecosystem. Let's say that our ecosystem is experiencing a drought. Raise your hand if you represent water in some form. Just those people give two short, gentle tugs on the yarn. Who felt it? Is there anyone who was not somehow affected by the drought?
    b) What if our policymakers decided to let fishermen in the ocean catch as many salmon as they wanted and whenever they wanted? What might happen to the number of salmon in the ocean? Would that affect our salmon in Idaho?
    c) Let's say that a forest is improperly logged. When the rains come, the soil and debris are washed into the stream. The sediment in the water eventually settles on the river bottom. If it settles on the salmon or steelhead eggs, how would they be affected? How would this affect other parts of the ecosystem?
4. Start rolling up the yarn and ask how John Muir's quote relates to the web.
5. Ask if people are part of the ecosystem. What negative and positive effects can they have on the ecosystem?

Evaluation:
Describe at least three connections between elements of that ecosystem.
Describe changes that could occur in the ecosystem.
Describe how energy flows through an aquatic ecosystem and give an example.



I am the **sun**. Plants use my energy to make food, even simple water plants like…..Guess who?

I am a **cutthroat trout**, Idaho's state fish. I live in all kinds of environments and eat all kinds of insects and fish, including sculpin. I also feed many of Idaho's animals, including this reptile who targets me when I am young….Guess who?

I am **algae**. In the water, I grow on rocks and other substrate, or I float on the surface, depending on my kind. When I make food from the sun's energy, I use some to stay alive, and I store some. I am eaten by aquatic insects including…Guess who?

I am a **garter snake**. Many people don't know that I swim underwater to eat small fish. Although I am a predator, I am also prey. I could easily become food energy for this long-legged, long-beaked wading bird…Guess who?

Mayfly

stonefly

caddis fly

I am a **mayfly, stonefly or caddisfly.** I use some of the energy I get from plants, such as algae, to live, but some I store. I am a source of food, and energy for this small, bottom-dwelling fish…Guess who?

I am a **great blue heron** and am often mistaken for a crane. I feed in ponds, rivers, and streams by day, eating snakes, fish, frogs, crayfish, and insects. At night I like to roost high up in a …Guess what?

I am a **sculpin**, one of 8 Idaho native species. I use the energy I get by eating fish and insects to live, but I also store some energy in my muscles. I am food and an energy source for this larger fish…Guess who?

I am a **cottonwood tree**. I provide food and shelter for many animals, and I prevent erosion. I am only found in areas where my roots can always get water. That is why I am so common along these waterways…Guess where?

I am a **river**. Water that feeds me starts in the mountains as snow or rain and flows to the ocean. I carry these fish to the ocean as juveniles and provide a highway for their return as adults.

I am a **river otter**- often confused with the much smaller mink. I rely on crayfish, trout, and other fish to sustain me. All of us depend on this essential natural resource…Guess what?

I am a **spawning salmon**. I started in the water as an egg. When I was only 1 ½ years old, I rode the river's current thousands of miles to the ocean, encountering many obstacles along the way. In the ocean, I act as a food source for killer whales and many others. I will return to the waters of my birth after one, two, or three years at sea. I will spawn and become…Guess who?

I am **cold, clean water**. I am essential to all forms of life, but I am useless if I am polluted. Riffles and waterfalls fill me with this dissolved gas that fish and others extract from me with their gills…Guess what?

I am the **carcass of an adult salmon**. I have spawned to start the next generation. Now I will release the nutrients I gathered from the ocean into the environment. I will nourish plants and animals as far as two hundred miles from the river. I am a keystone species. The end of my life is the beginning of life for others. This "freshwater lobster" loves to eat me…Guess who?

I am **oxygen**. Fish use their gills to take me out of the water, but I am also absorbed by these small, round living things that will eventually become a fish…Guess what?

I am a **crawdad** or **crayfish**. I eat almost anything, dead or alive, and am pretty tasty myself. I am the favorite food for herons, mink, raccoons, and this playful river animal....Guess who?

We are **salmon eggs**. Our mother built a special nest called a redd for us by digging in the river gravel with her tail. We are safe in the redd, but those of us that didn't get buried properly become food for sculpins, birds, insects and this orange spotted fish that is a member of the char family… Guess who?

I am a **bull trout**. Sometimes I am not spoken of so kindly because I eat other fish and eggs, but that is my job. I depend on juvenile salmon and other fish for my livelihood; without them our populations would decline. I, along with cutthroat, rainbow, and steelhead trout, am a popular sport fish for these humans…Guess who?

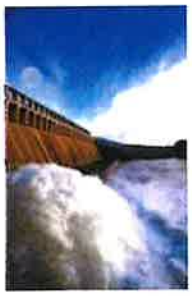
I am a **fry**. If I am a Chinook, sockeye or steelhead fry I will spend a year or two in freshwater before I migrate to the ocean. If I am a rainbow trout or kokanee fry, I will spend my entire life in freshwater. If my habitat has been damaged, these manmade facilities may be used to offset the losses to natural reproduction…Guess what?

I am an **angler**. Some people call me a fisherman, but because women also like to fish, the word angler is more appropriate. I do my best to be a good sport by following special rules designed to protect the fish. When I reach the age of 14, I must have one of these permits to legally fish…Guess what?

I am a **fish hatchery**. I may be used to produce fish for anglers or for conservation purposes. Many hatcheries have been built to offset the loss of salmon and steelhead, caused by construction of these manmade structures that block or reduce the passage of juveniles and adults…Guess what?

I am a **fishing license**. Some of the money anglers spend on me is used to improve fish habitat. One type of improvement or restoration involves the addition of this material to a river or stream, particularly in spawning areas... Guess what?

I am a **dam**. The most common purposes for my construction are flood control, water storage for irrigation, power generation, and navigation (allowing ships to move freely up and downriver). Like everything else, dams have costs and benefits. It is up to us to make decisions about dams and other environmental issues…Who are we?



I am **gravel**. Spawning trout, salmon, and steelhead require clean gravel and cold water so that their eggs will develop properly. The nest, or redd, provides a safe place that allows oxygen to flow in and waste products to be carried out. Soon after the eggs hatch, the young fish live off of their remaining yolk sac until it is completely absorbed. The young fish are now called…Guess what?

We are **society**. We all depend on natural resources to make a living, for sustenance and for recreation. Water of course, is one of our most precious and necessary natural resources. Ultimately, we depend on water in these two forms...Guess what?

I am **rain and snow**. I come from the clouds that form as water evaporates from the Earth. By far, the largest source of moisture is these huge bodies of water… Guess what.

I am an **adult salmon**. Because I am a very important food source to many animals, including humans, I must be managed carefully in the oceans and freshwater environments. Although my survival and abundance is largely affected by conditions in the freshwater environment, ocean productivity is also important. I depend on many food items in the ocean, including this 1-inch shrimp-like creature that is also essential to whales…Guess who?

I am the Earth's **oceans**. 75% of planet earth consists of water, and only 1% of that water is fresh water. Human bodies are also made up of 75% water. Coincidence? I am able to provide plenty of room for hundreds of different fish. Many people make a living by catching fish that eventually land on dinner plates. These people are… Guess who?

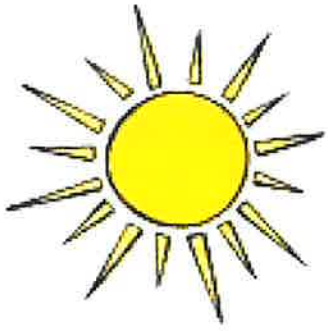
I am **krill**. I am an essential source of food for many ocean creatures including the largest animal to ever live on the planet- the blue whale! A blue whale can be 100 feet long, weigh 150 tons and eat 40,000,000 krill a day. I depend on smaller creatures for my energy…Guess who?

We are **commercial fisher people**. Our livelihoods depend on sustainable fisheries which in turn depend on a healthy environment. In order to avoid overharvest, we are required to follow fishing rules and regulations. These regulations are determined by people whose job it is to protect the fisheries…Guess who?

We are **plankton**. We are the tiny organisms adrift in the oceans and freshwater environs that represent the foundation of the food web. Plant plankton is called phytoplankton and animal plankton is called zooplankton. Like all plants, phytoplanktons rely on this energy source to produce our own food…Guess what?

I am a **policymaker**. I rely on information from biologists to set fishing regulations that will protect fisheries resources. My decisions are particularly important for fish species whose populations are declining. I must be especially careful when making decisions about threatened or endangered species like these…Guess who?

The **sun**. The END (and the BEGINNING).



Idaho Rivers

Subject: Social Studies

Objectives: Students will label Idaho's major rivers and towns on a map.

Materials:
□ *Wildlife Worksheet* (Idaho map)
□ colored pencils
□ Reference map of Idaho or internet access

Procedure:
1. Ask students to brainstorm the names of rivers in Idaho. Write the names on the board.
2. Tell the students they will be learning where major rivers of Idaho are located and labeling them on a map.
3. Hand out the Wildlife Worksheet (Idaho Map). Using the internet and maps from the library, locate and label the following rivers and towns (Add some of your own, too!):

Rivers:	**Cities:**	**Also Label:**
Henrys Fork	Twin Falls	Continental Divide
Clearwater River	McCall	45th Parallel
Snake River	Stanley	Bordering States & Canada
Boise River	Salmon	Lake Pend Oreille
Salmon River	Pocatello	Coeur D'Alene Lake
Big Wood River	Idaho Falls	Capital City: Boise
Bruneau River	Coeur D'Alene	
Payette River	Sandpoint	
Kootenai River	Bonners Ferry	

4. When they're all finished labeling,
5. Have students keep their maps in their binders for reference.

*Many of the rivers have forks. Depending on the level of students, you might want to have them draw them in and label them.

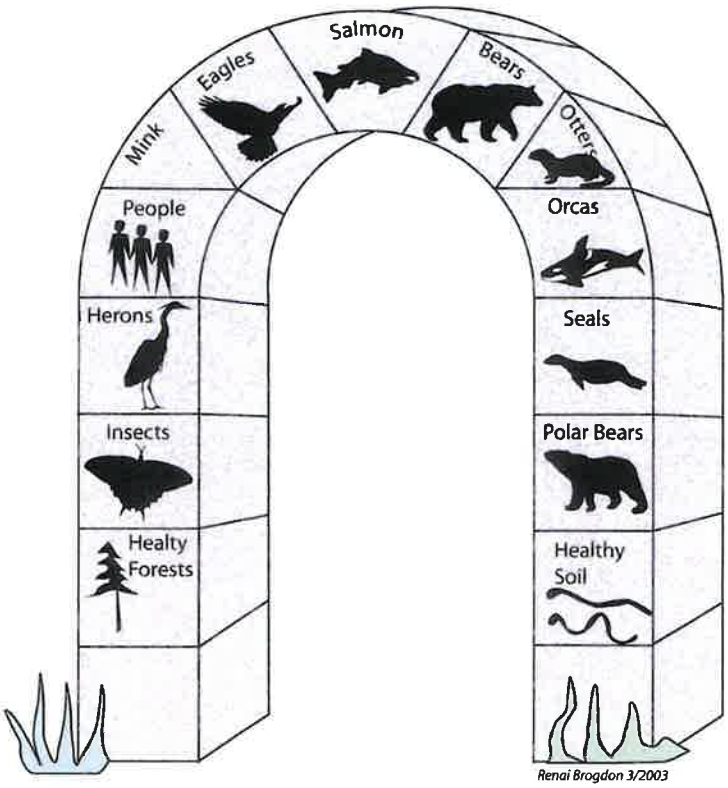
Wildlife Worksheet

Using maps of Idaho, label rivers and other waterways of Idaho on this map. Add towns and places of special interest too! Color!

Keystone Species & Pyramid Poem

Subject: Science

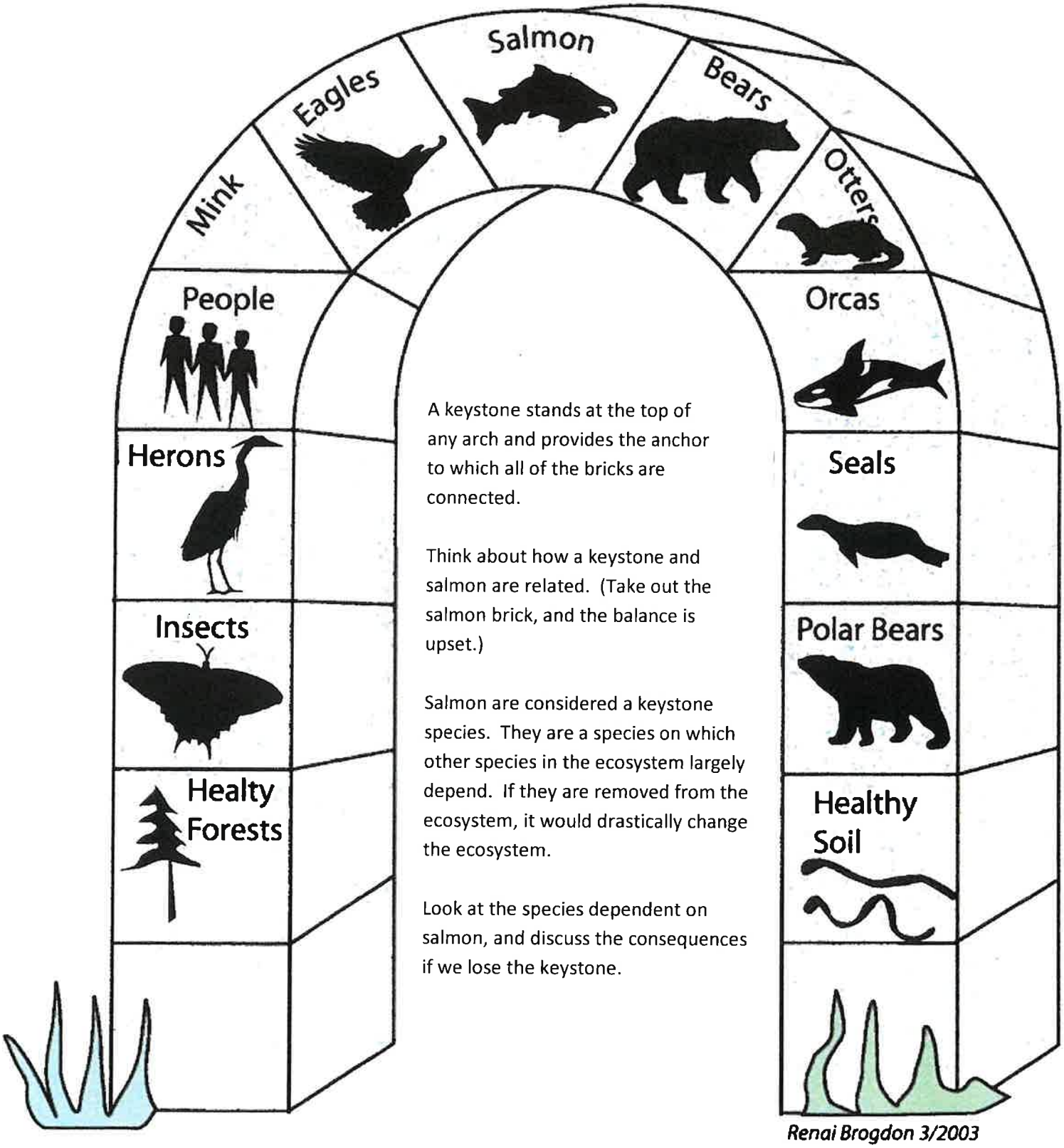
Objective: Students will be able to define keystone species and research an animal considered to be a keystone species. After researching, students will write a pyramid poem with a slide show presentation.



Materials:
□ Wildlife Worksheet keystone species worksheet (optional)
□ Pyramid Poem Wildlife Worksheet

Procedure:

1. In this month's Wildlife Express, read about how salmon are a keystone species. Review that any animal removed from an ecosystem will change that ecosystem in some way. Keystone species have a devastating effect on the ecosystem if they disappear. Sometimes these animals are at the top of the food chain, and sometimes they are not. Ask students to think of other animals they feel might be considered keystone species in Idaho.
2. Research keystone species on the internet. Some examples are sea otters, prairie dogs, bison, elephants, tiger sharks and others. Let students choose their keystone species to research.
3. Once they find out why their animal is considered a keystone species, have them write a pyramid poem (see Wildlife Worksheet) on their animal. Slide presentation optional! It would be a fun technology component! ☺



A keystone stands at the top of any arch and provides the anchor to which all of the bricks are connected.

Think about how a keystone and salmon are related. (Take out the salmon brick, and the balance is upset.)

Salmon are considered a keystone species. They are a species on which other species in the ecosystem largely depend. If they are removed from the ecosystem, it would drastically change the ecosystem.

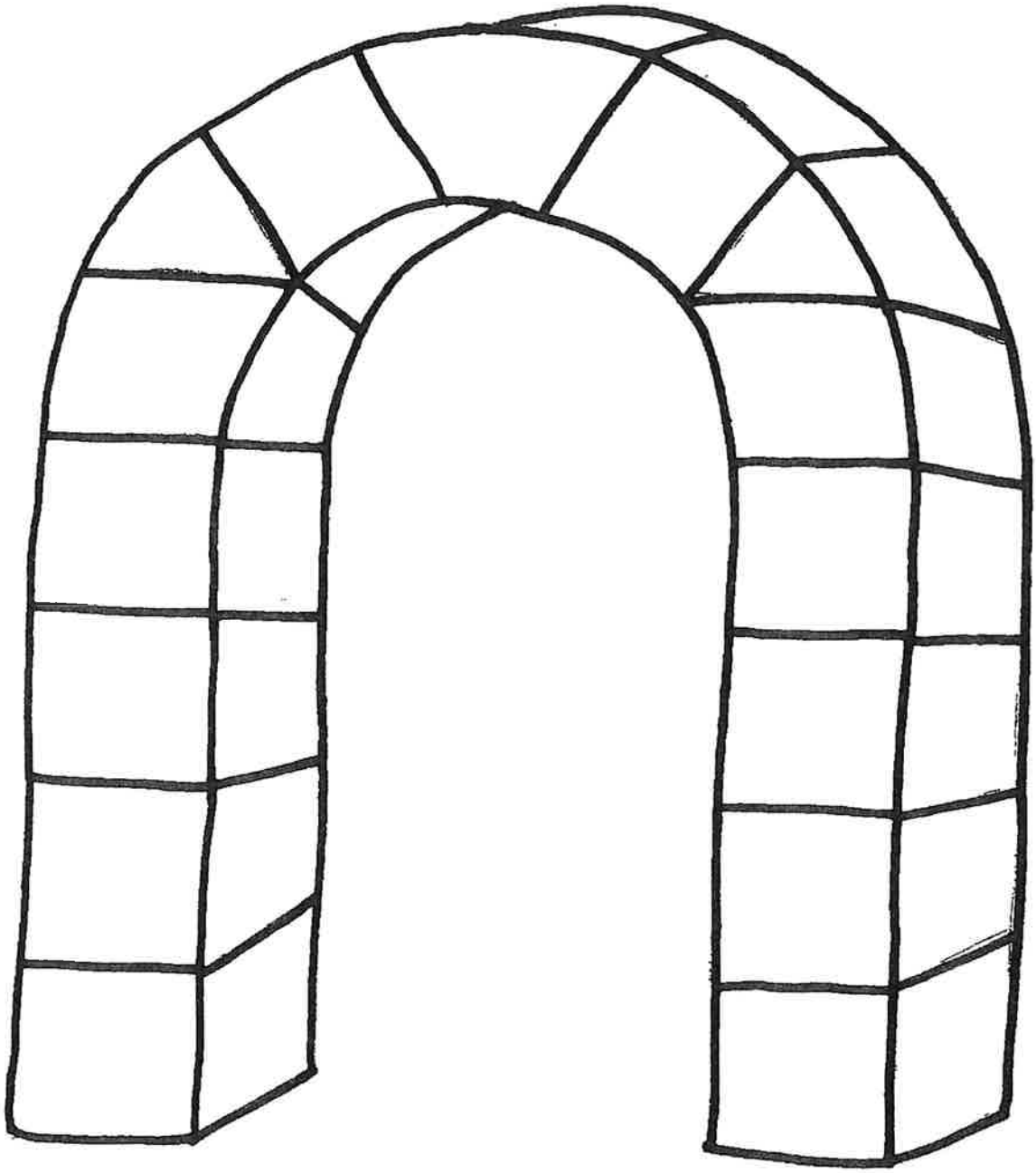
Look at the species dependent on salmon, and discuss the consequences if we lose the keystone.

Renai Brogdon 3/2003

Wildlife Worksheet

Keystone Species

Draw in your keystone species and the animals that depend upon it.



Wildlife Worksheet

Pyramid Poem

The pyramid poem is a four-line poem. The first line is a noun. The second line consists of two adjectives describing the first line's noun. The third line has three gerunds, or "ing" verbs, which relate to the noun. The last line is a question about the noun.

For example:

Salmon
Strong, swift
Swimming, spawning, dying
Why are salmon so important to Idaho?

How to start?

What is your animal? _____

What does your animal look like?_____

What can your animal do? (What action?)

_____

What is a question you could ask about your animal?

_____

Create your Powerpoint slide show. Include the following:

A. At least two slides with an image
B. A slide with a quick take movie or slide with sound
C. One slide showing references
D. Use one slide per poem line

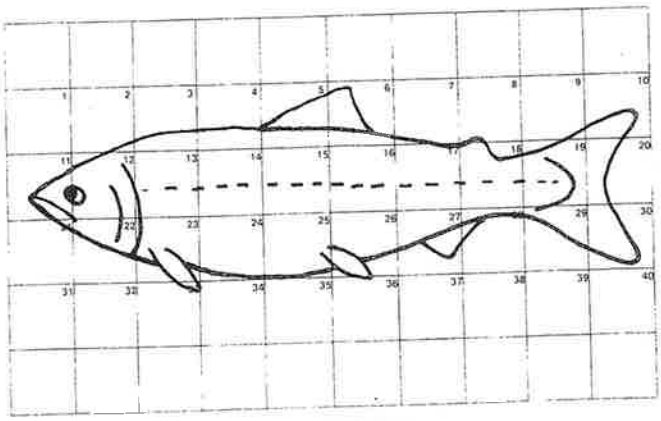
Life-Sized Salmon Activity

Objective: Students use scale drawings to create a life-sized Chinook or sockeye salmon.

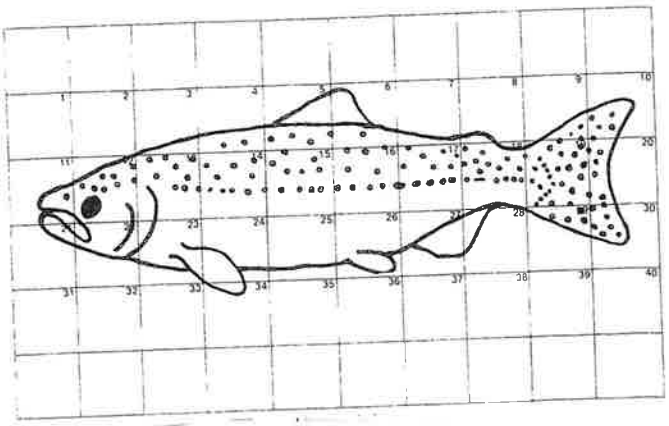
Method: Students enlarge one-inch squares to three (sockeye) or four (Chinook) inch squares and put together the pieces to create a life-sized drawing.

Directions:

1. Make a copy of the sockeye or Chinook drawing on the following pages. Cut out the one-inch squares.
2. Determine if you are drawing the Chinook or sockeye and cut construction paper squares. Cut three-inch squares for sockeye or four-inch squares for Chinook. For both, you will need approximately 40 squares. (Some have nothing drawn on them). The easiest way to ensure that the large squares match the one-inch squares is by numbering each construction paper square to correlate with one of the 1X1" squares. It's also best to number the square in the top right corner, as they are numbered on the original. If you have older students, you could hand out a small and large square and have them write the number themselves. I find it much easier to number them before you hand them out.
3. Ask the students to enlarge the one-inch square to the large square. Starting with the first numbers, begin taping the drawings to the wall.
4. When complete, outline in a marker. If doing both fish, compare, measure, etc!

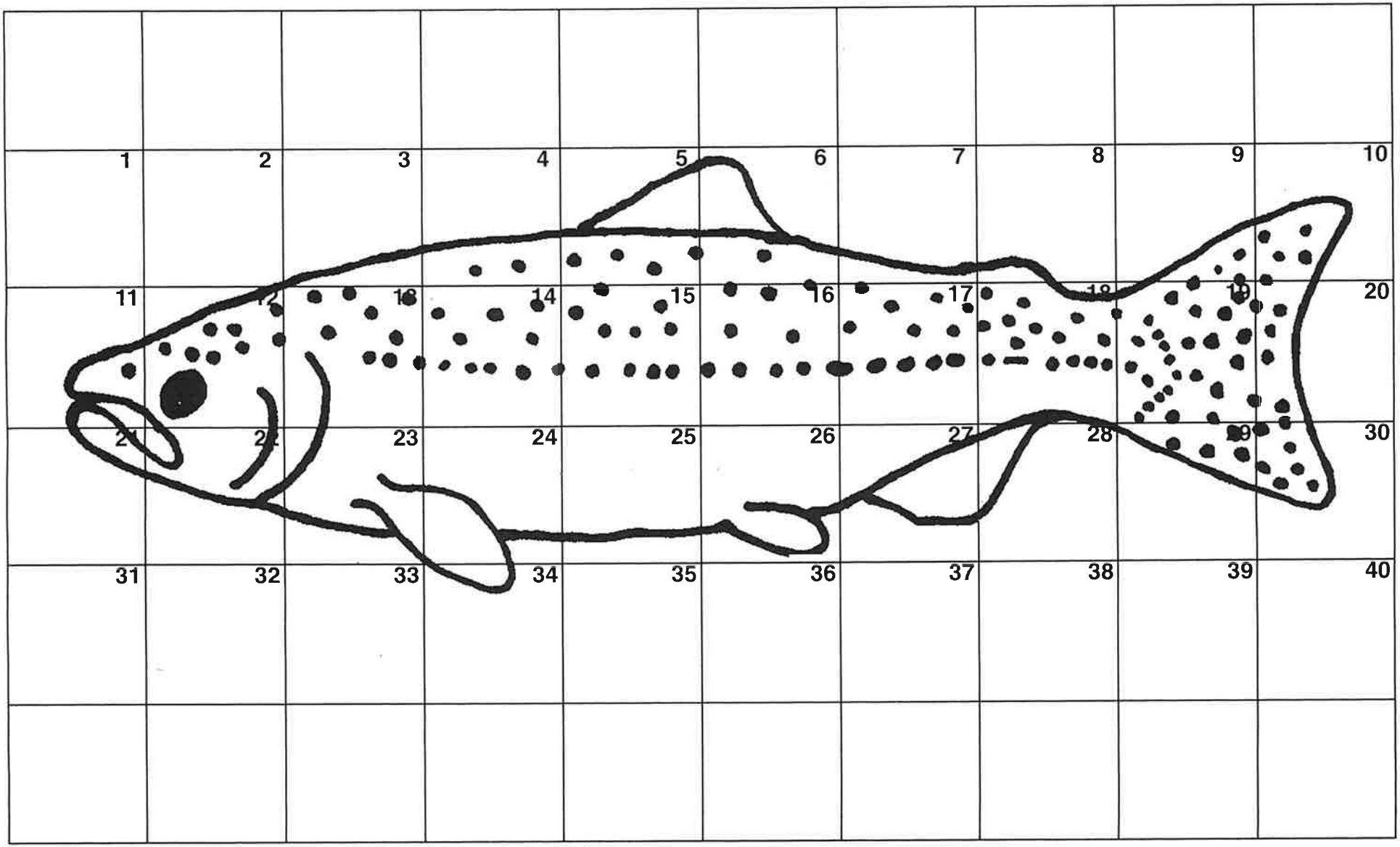


Sockeye (3 inch squares)



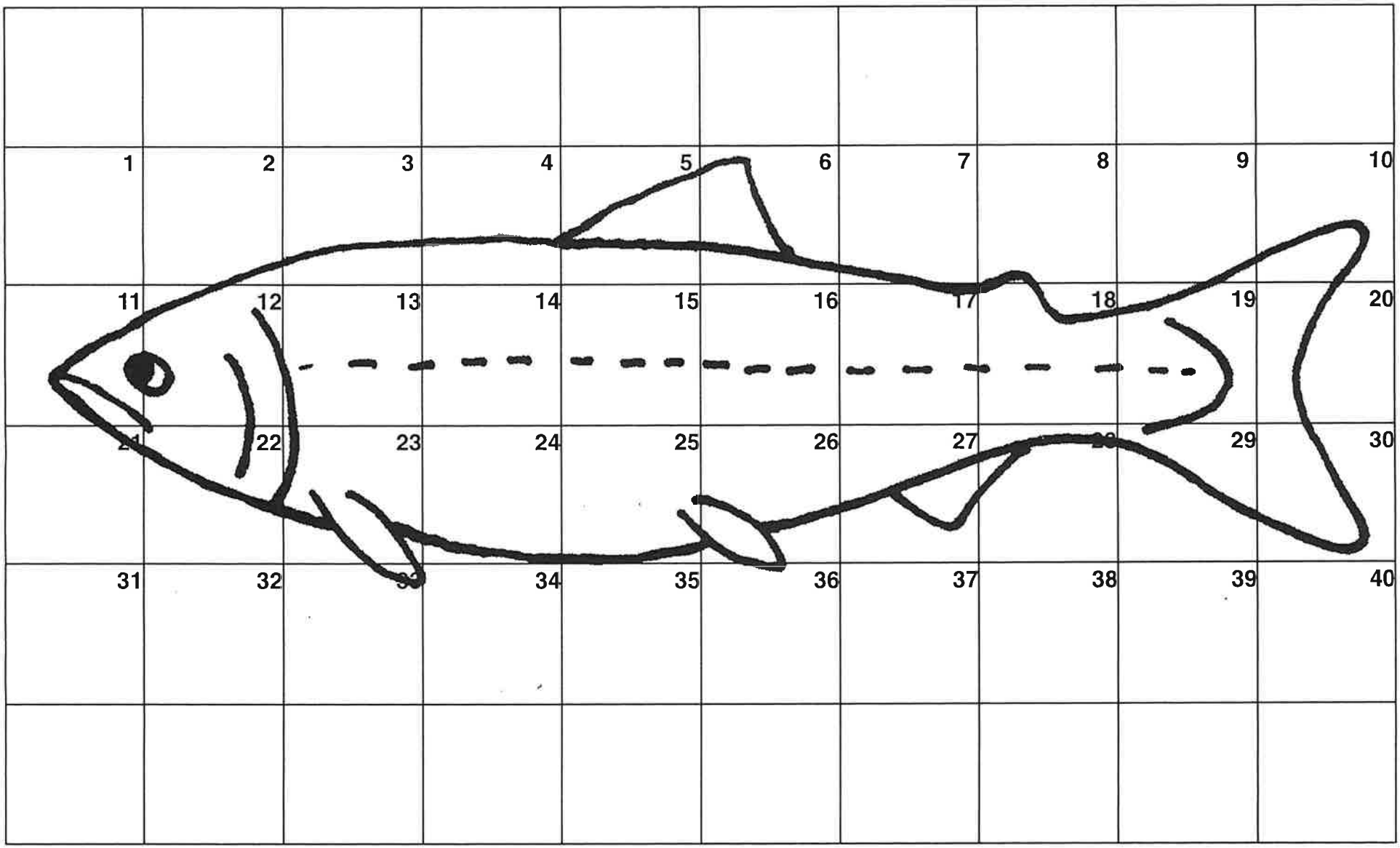
Chinook (4 inch squares)

Chinook



1 inch = 4 inches

Sockeye



1 inch = 3 inches