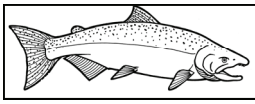


Festival Activity: A-Mazing Salmon Maze

Subject: Science

Concept: Predators of salmon

Key Vocabulary
- Predator
- Migration

Skills
- Motor skills
- Puzzle solving

Material
- □ Student activity sheets will be provided by the activity leader

Chinook salmon of the Leavenworth National Fish Hatchery experience an incredible journey from the Icicle Creek to the Pacific Ocean. Young fish migrate 500 miles through 7 dams to the ocean where they will mature into adult fish. On this journey, they will encounter many predators along the way.

Grade Level Expectations (GLEs) or Evidence of Learning

Science

1.3.10 Understand that an organism's ability to survive is influenced by the organism's behavior and the ecosystem in which it lives.

Objective

Students will identify five salmon predators.

Suggested Procedure

As you move through the life-size maze on your salmon **migration** (movement from one area to another), imagine yourself making your roundtrip journey to the ocean and then back up river to spawn. It's a dangerous and scary trip. You may be eaten by a **predator** (an animal that hunts, kills, and eats other animals). Good luck on your journey!

Festival Activity: Hooks and Ladders

Subject: Science

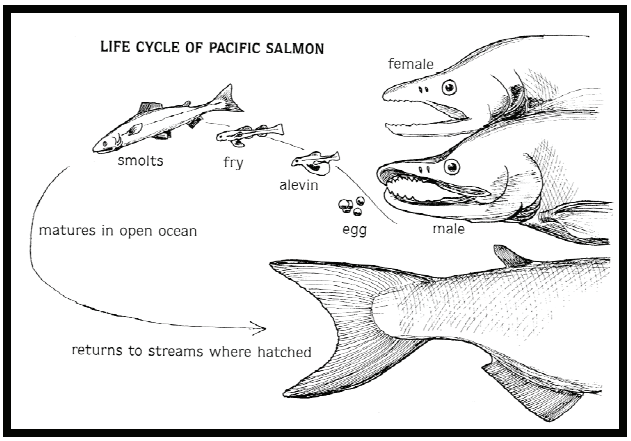
Concepts: Limiting factors affecting Pacific Salmon and natural and human obstacles

Vocabulary
- Migration
- Predators
- Life Cycle

Skills
- Simulation
- Kinesthetic concept development

Materials
□ None

Many fish live part of their lives in one habitat and then migrate to another habitat. Some make their migratory journey to mature and reproduce. The Pacific salmon is a spectacular example of a migrating fish.



Grade Level Expectations (GLEs) or Evidence of Learning

Science

1.3.10 Understand that an organism's ability to survive is influenced by the organism's behavior and the ecosystem in which it lives.

Objectives

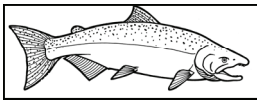
Students will: 1) see how **predators** (an animal that hunts, kills, and eats other animals) limit salmon populations throughout their life cycle and 2) learn about human-made obstacles and threats salmon encounter while returning to spawning grounds.

Suggested Procedure

1. A Salmon Festival activity leader will lead a discussion on the **life cycle** (stage of development that an organism goes through from egg to adult; the way that plants or animals are born, live, reproduce, and die) and migration of salmon.

2. Students will simulate the salmon's life cycle in this active salmon **migration** (movement by animals from one area to another to find food, or a new habitat or other animals of their kind) game.

Activity adapted with permission from Aquatic Project WILD.



Pre-Work: Quick Frozen Predators

Subject: Science

Concept: Predator-prey relationships

Key Vocabulary
- Predator
- Prey
- Estuary
- Anadromous

Skills
- Motor skills
- Strategizing
- Problem solving

Materials
- □ String, cones or chalk to delineate playing field
- □ Handkerchiefs for arm bands (students who are predators wear arm bands; ratio one predator per five salmon)
- □ Cards or pieces of cardboard or paper for food tokens (see procedure #1)

Location
A playing area that is 50 to 75 feet long

During an active version of "freeze tag", students will display a variety of behaviors in predator/prey relationships.

Grade Level Expectations (GLEs) or Evidence of Learning

Science

1.3.10 Understand that an organism's ability to survive is influenced by the organism's behavior and the ecosystem in which it lives.

Objective

Students will discuss the relationship between a **predator** (an animal that kills and eats other animals for food) and **prey** (an animal that is killed and eaten by other animals for food).

Background

The salmon life cycle begins as an egg buried in loose gravel in a cool stream with lots of oxygen. When the salmon first hatch they are called alevins. They wait in the gravel until they finish the last of their yolk, then hurry to the surface for a quick gulp of air to fill their swim bladders.

The little salmon, now called fry, are whisked downstream with the current towards the ocean. Some species hang out in their native streams for months or even years, hiding in snags and other slack waters and feeding. Others ride the current to estuaries where they will wait while their bodies go through necessary changes for life in the salty oceans.

As the young fry near the **estuary** (a partly enclosed body of water where sea water and fresh water meet and mix), they become smolts. Their scales grow, they become more silvery to help blend into the ocean environment. The smolts feed in the estuary, trying to become as big as they can before braving the treacherous waters of the Pacific Ocean.

Salmon at sea might migrate thousands of miles or they may stay right off the coast. They may spend anywhere between 2 and 8 years feeding in the ocean before returning to their native rivers and streams to spawn. Their homing abilities are legendary and not entirely understood.

On the way back salmon make another stop in coastal estuaries. Like last time, their bodies go through chemical changes so they can survive in the freshwater of their home streams. This time they also stop eating and adopt their flashier, spawning colors. Males may get hooked snouts and humped backs. The journey home is a daunting one, only the strongest will survive to reproduce.

Those salmon who make it will go through the final task of their lives. The females will build gravel nests, called redds, with their tails. The males will fight for the opportunity to fertilize the females eggs. Although some steelhead and cutthroat will live to spawn again, most **anadromous** (fish that migrate from fresh water to salt water) salmon will die after spawning. Their bodies feed the stream environment.

Perils of the journey
The journey to and from the spawning grounds is dangerous indeed. Not even the egg is safe. Some predators prefer eggs because they are high energy sources of food. Careless hikers, unleashed dogs and other disturbances can destroy redds and either crush eggs or loose them to drift downstream. Too much erosion can cause silt to smother the redds and suffocate the eggs. Streamside vegetation and responsible forestry can help reduce this hazard.

When the fry emerge from the gravel they are very vulnerable to predators. They are small and need to learn very quickly how to hide. Predators are natural but around dams predators gather to await salmon fry that are spilled over the top or rocketed through bypasses. Young salmon must also be wary of dam turbines and irrigation water diversions. When the plant life along the streamside is removed the temperatures in the stream increase, the flow is reduced and there are fewer insects to eat. Pollution from cities and farms also takes its toll.

At sea, adult salmon must deal with not only the larger oceanic predators like sharks and killer whales, but also with commercial fisheries. The trip back upstream can be even more dangerous. Adults have to face natural predators like bear and eagles plus both commercial and recreational fishers. Dams block the path of migrating salmon. Those who make it up the fish ladders may become confused or even sick in the warmer slack waters above the dam. Pollution, erosion, and water diversions play key roles in preventing adults from successfully spawning by destroying good salmon spawning habitat.

Suggested Procedure (Before Class)

1. Make food tokens using cards, pieces of cardboard or paper. Note: The number of food tokens needed will be determined by your class size. Each student representing a salmon will need three food tokens. The game requires a ratio of one student representing a predator for each five students representing salmon.

For example if your class has 24 students:

- 20 students play salmon (four groups of five students)
  Note: 60 food tokens are needed (20 salmon x 3 tokens/salmon)

- 4 students play predator

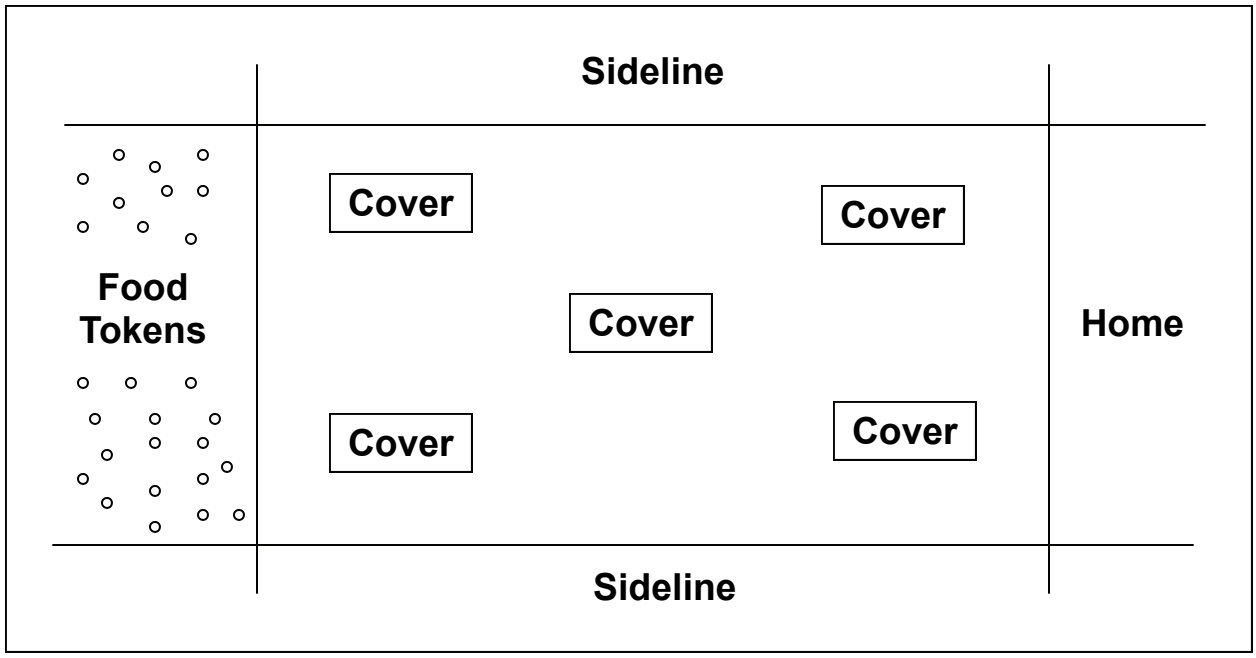
Extension activities may require more or less food tokens.

2. Attach a picture of one food item to each token.

Suggested Procedure (During Class)

1. Lay out the field as shown below (dimensions are not critical).

2. Set out three food tokens for each player (salmon).



3. Bring the students together. Have them pick an animal that is a predator of salmon (bald eagle, pike minnow, kingfisher, orca, sea lion, bear, human, etc.)

4. Ask for volunteers to be a predator. Make sure the ratio is maintained: one predator for every five salmon. Have the predators wear arm bands, and explain that their job is to catch salmon to eat.

5. The remaining students will represent salmon. To survive, however, they must make three trips to their food source and back to their home (collecting one food token per trip) without being captured by a predator.

6. Ask students what salmon use for shelter (logs, rocks, undercut banks, branches near the water, whitewater, etc.). Explain that these types of shelter will be represented on the playing field by rope or chalk.

7. Predators range throughout the playing field and capture their prey by tagging it. The prey may escape, however, by putting one foot within a cover area or by freezing absolutely still; only blinking and breathing are allowed (this method is used by salmon trying to hide from predators). Tagged or captured prey (salmon) must give their food tokens to the predator and then go to the sidelines. Each predator must capture two prey to survive.

8. The game begins with the prey safe in their home shelter. Remind “salmon” students that they must leave home to eat and survive.

9. Let students play the game until all prey are captured or for no more than seven or eight minutes; captured prey will soon grow restless. Count the number of successful predators and prey animals. Switch roles and play until everyone has been predator and prey.

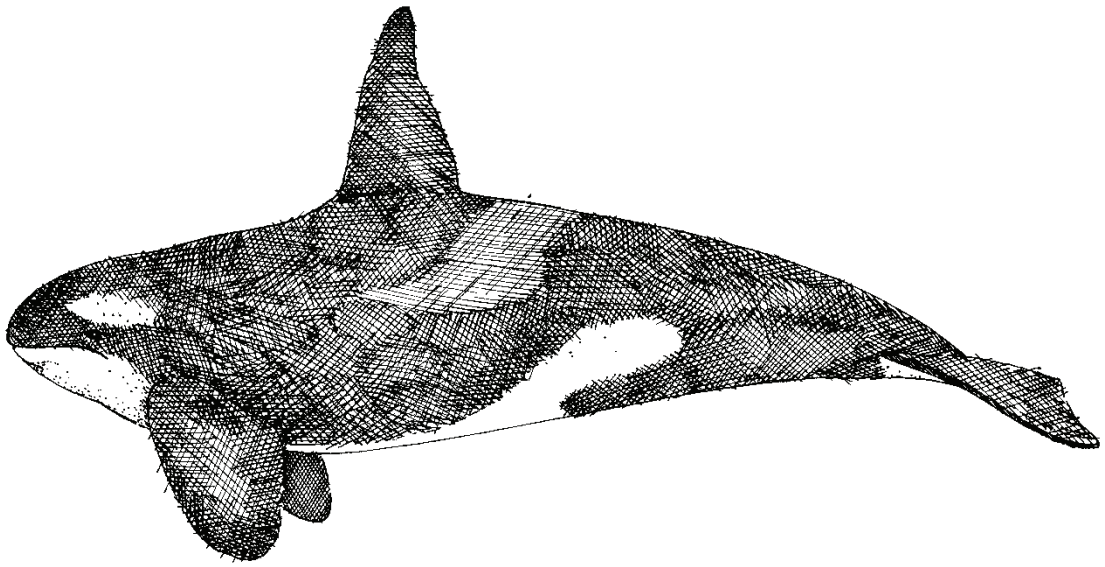
Extensions

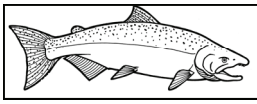
Experiment with different amounts of food, size of playing field and/or number of predators.

Lead a discussion on behavior of prey and predators.

- What was the predator’s best hunting strategy?
- Strike fast or hunt slow?
- Did the predators work together?
- How did the prey stay safe?
- What was their strategy?

Activity adapted with permission from Project WILD.





Post-Work: Migration Madness

Subject: Science

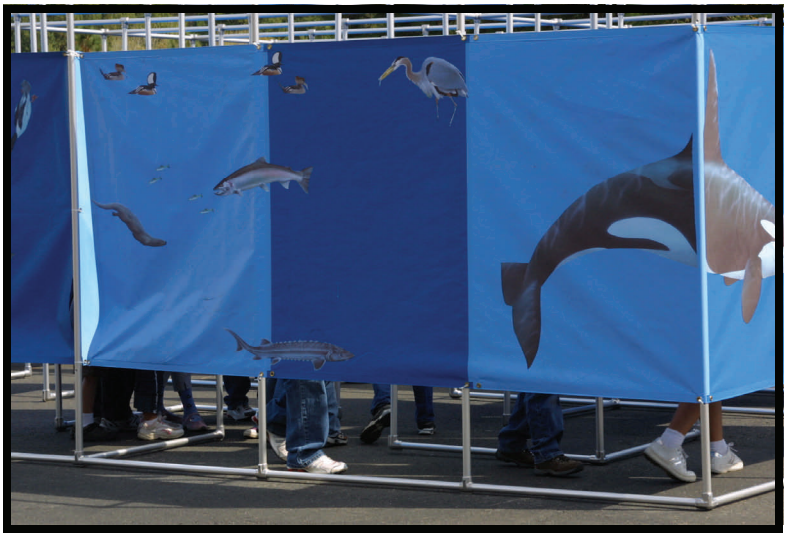
Concept: Natural threats vs. human threats to salmon

Key Vocabulary
- Natural threats
- Human threats

Skills
- Solving puzzles
- Classification

Materials
- □ Student Worksheet, "Fish Maze", one per student
- □ Pencil

Your students will become a salmon trying to make it back to it's home stream. Along the way, they will encounter many natural and human threats as they struggle to complete their life cycle!



Grade Level Expectations (GLEs) or Evidence of Learning

Science

1.3.10 Understand that an organism's ability to survive is influenced by the organism's behavior and the ecosystem in which it lives.

Objective

Students will identify natural and human threats to salmon during their migration to the ocean.

Suggested Procedure

1. Distribute Student Worksheet, "Fish Maze."

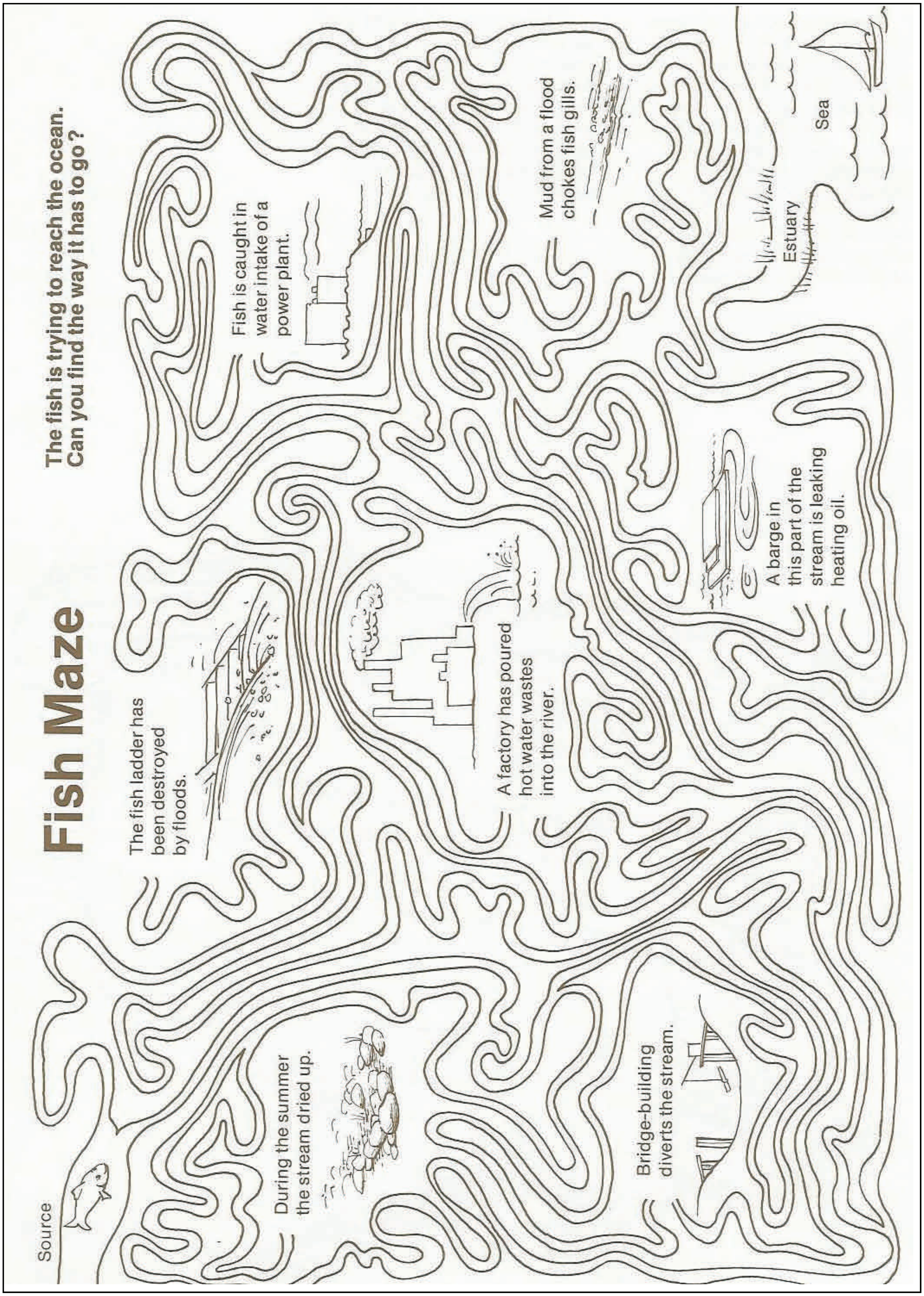
2. Have students complete the maze.

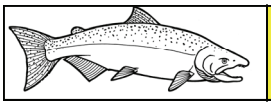
3. Discuss the **natural threats** (caused by nature) and **human threats** (caused by people) pictured in the fish maze.

4. Instruct students to place a red circle around the natural threats in the maze.

5. Instruct students to place a blue "x" over the human threats in the maze.

Student Worksheet: Fish Maze





Post-Work: Life Cycle Hexaflexagon

Subject: Science

Concept: Salmon life cycle

Key Vocabulary
- Anadromous
- Fish ladders
- Redds

Skills
- Following written or verbal instructions
- Puzzle solving

Materials
- □ Ruler
- □ Scissors
- □ Clear tape

Salmon, the king of the fish, are one of the great natural resources of the Pacific Northwest. For Northwest Indian tribes they hold special religious meaning. For all of us in the Northwest they are a part of our culture and recreation.

Grade Level Expectations (GLEs) or Evidence of Learning

Science

1.3.10 Understand that an organism's ability to survive is influenced by the organism's behavior and the ecosystem in which it lives.

Background

Salmon are beautiful creatures that have one of the most unusual life cycles in the animal world. They are born in freshwater streams many miles from the Pacific Ocean. When they are strong enough, they swim to the ocean, sometimes traveling hundreds of miles to get there. Fish that are born in freshwater and then migrate to saltwater are called **anadromous** fish.

Salmon spend their adult lives in the ocean, from one to five years depending on the species. During this time, they may swim as far north as the gulf of Alaska or south to the coastline of California. Then something amazing happens.

In the vast ocean, they manage to find the mouth of the Columbia River. They enter the estuary and head up the Columbia River. With unerring instinct, these majestic fish leap water falls and jump up **fish ladders** (a structure like a ladder with fast, flowing water to help fish up and over dams) at dams to get back to the exact stream where they were born. Once they reach their birth place, they build nests called **redds**. Here they lay eggs and spawn, before dying. As the eggs hatch, a new generation of fish will take their place.

Objectives

Students will: 1) identify the five Pacific salmon, 2) learn the stages in a salmon's life cycle, and 3) learn the migration paths of the five different species of Pacific salmon by creating a hexaflexagon.

Note: The construction of the hexaflexagon can be difficult for students. You may want to assist students through the step by step process or make one for the classroom to share.

Suggested Procedure

1. Place drawing with printed side up on a table. Place ruler on paper to connect point A to point A. Using the long edge of one scissors blade, press the scissors on paper and move along the line from point-to-point to make an indent/mark. (This is known as scoring.) Be careful not to cut through paper. Accurate scoring and folding is essential for easy manipulation of the finished hexaflexagon.

2. Repeat Step #1 for point B to point B, C-C, through point F-F. When done, A-A through F-F will be vertically scored.

3. Repeat Step #1 for point G-G, H-H, I-I, through P-P. These lines are diagonally placed.

4. Cut out the hexaflexagon along the OUTSIDE border.

5. With the printed side up, fold all vertically scored lines face-to- face. (A-A through F-F). Then, straighten out each fold.

6. Fold all diagonally scored lines (G-G through P-P) so they are back-to-back. Then straighten out each fold.

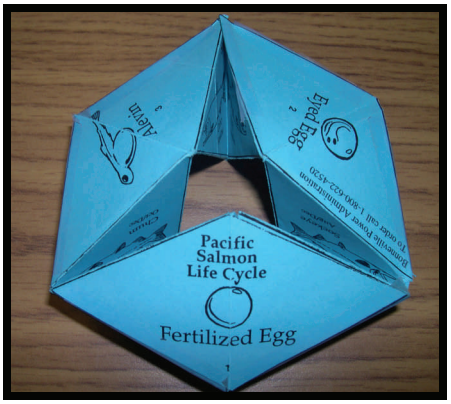
7. Hold the hexaflexagon with the printed side down and the two beak-like flaps pointed towards you. Bring the “eyed egg” section to fit over Triangle II. Align and tape open edges.

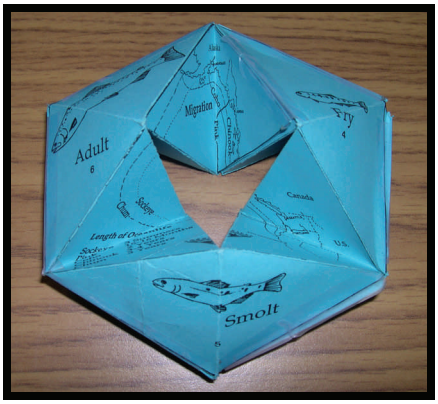
8. Bring the “alevin” section over Triangle III. Align and tape.

9. Bring the “fertilized egg” section over Triangle IV. Align and tape upper one-half of section only. Leave two beak-like flaps free.

10. Take Triangle VI and align over Triangle I and tape together. Place top-half of beak-like flap showing “fertilized egg” over Triangle VI and place beak-like flap showing “migration” over Triangle V. Align flaps and tape in place.

11. Turn hexaflexagon, checking for any open edges. Tape all open edges to allow for maximum use and durability.





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