GENTLY DOWN THE SEYMOUR

Seymour Salmonid Society

Intermediate Resource



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Station A: Hatchery Tour

Learning Outcome:

Students will develop a basic understanding of how hatcheries support salmon populations by providing a protected environment for growth and survival. Through observing different life stages, feeding practices, and habitat features, students will learn how salmon are raised, cared for, and prepared for release into the wild.

Before You Go:

Students should know the life cycle of the Coho salmon. Review the reasons for the decline of salmon and why hatcheries were built.

During the Tour students will:

- Explore where salmon live using maps of the watershed.
- Learn to identify different salmon species.
- Observe salmon life stages from eggs to smolt.
- See how hatcheries raise and protect young salmon.
- Discuss how human activities impact salmon and how we can help.

Follow-up
Students may complete the classroom worksheet as review and/or assessment.







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Helping Salmon

Why Are There Fewer Salmon?

Scientists and communities believe there are fewer salmon because of human and environmental changes:

- People have caught too many salmon.
- The ocean is warmer and has less food.
- Rivers and streams have been changed by pollution, dams, roads, and buildings, making it harder for salmon to travel and survive.

How Can We Help Salmon?

Salmon need healthy habitats to survive. We can help by:

- Protecting rivers, streams, and ocean habitats.
- Being careful where we build roads, homes, and factories.
- Keeping trees and vegetation along stream banks.
- Limiting how many fish are caught.

The Seymour River:

The Seymour River was dammed to provide drinking water for the City of Vancouver. While this is important for people, the dam changed salmon habitat by:

- Blocking access to spawning areas upstream.
- Reducing water flow downstream, limiting habitat for salmon.

How Hatcheries Help Salmon?

Hatcheries support salmon populations by increasing survival during the most vulnerable life stages. At the hatchery, students learn that:

- Eggs and alevin are protected from predators and poor water conditions.
- Fry are raised in clean, controlled environments and fed regularly.
- Salmon are cared for until they are strong enough to migrate to the ocean.

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Seymour River Hatchery

Capturing Adult Spawners

Adult Coho salmon returning to spawn are caught with a big net in the river.

Incubating the Eggs

The eggs from the females are removed and fertilized with milt (sperm) from the males. The fertilized eggs are kept in trays. This is called incubation. There is always water flowing through the trays bringing oxygen to the eggs.

Feeding the Fry

To help the fry grow quickly, they are fed many times a day (up to 10 or 15 times!)

In the Ponds

When the fry are bigger, they are marked (fin clipped) to identify them as hatchery fish. Then they are moved to outdoor ponds and fed until they are ready to leave for the ocean (smolting). Nets and fences protect them from heron, mink, otter, and other hungry predators.

Releasing the Smolts

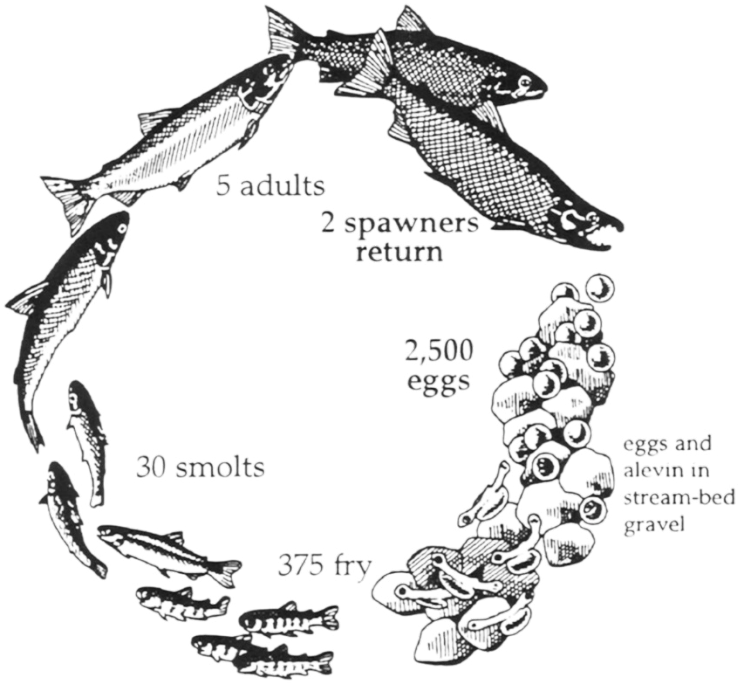
When the salmon smolts are ready for the ocean they are released into the river. Now the hatchery fish join the wild fish on their migration through the ocean.



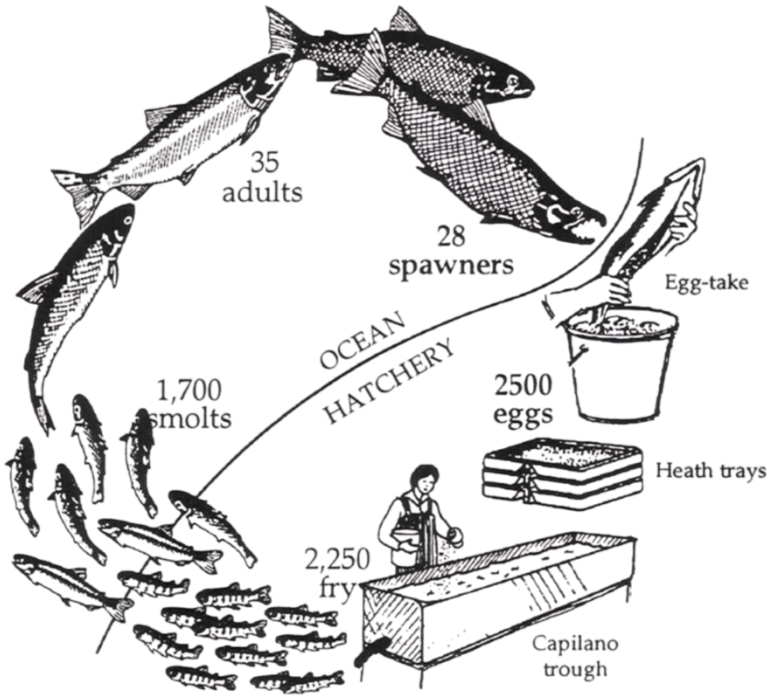
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Salmon Life Cycle

In nature, about 2 Coho survive to be spawners for every 2,500 eggs spawned.



When the natural life cycle is disturbed, some Coho may be raised in a hatchery, where more fry survive to one day travel to the ocean.



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Review & Resources – Student Worksheet

What are some reasons why there are less salmon in the ocean and rivers?

What are some of the ways we can help salmon?

What are some of the ways hatcheries can help salmon?



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Station B: Aquatic Invertebrates

Learning Outcome:

To share the importance of aquatic invertebrates as food for fry and as part of a stream food chain. To identify aquatic invertebrates and learn how they indicate stream health.

Before You Go:

Students should know the lifecycle of aquatic invertebrates and their importance as a food source.

During this Station students will:

- Learn what aquatic invertebrates are and their link to salmon.
- Collect invertebrates from the stream using samplers and brushes.
- Examine and identify invertebrates using microscopes and keys.
- Infer water quality and creek health.







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Aquatic Invertebrates

Snacks For Fry:

Salmon fry eat small animals called aquatic invertebrates that live in streams. These invertebrates spend all or part of their lives in water and don't have a backbone. Most have gills, like fish, so they can breathe underwater.

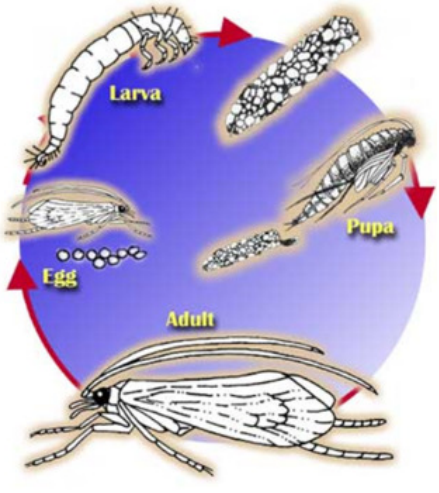
Salmon fry eat aquatic invertebrates that drift by in the water current. They will also leap out of the stream to catch adult insects flying above the water. Sometimes, invertebrates fall into the water from trees and bushes along the stream bank, and salmon eat those too!

Most aquatic invertebrates spend the winter and spring underwater. While they are in the water, they are called nymphs or larvae. By summer, many are ready to leave the stream. They swim to the surface, crawl onto rocks, stream banks, or tree trunks, shed their old skins, and emerge as winged adults.

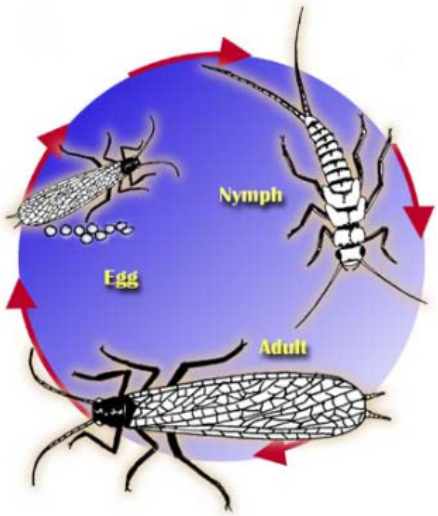
Invertebrates like mayflies or mosquitoes usually spend only a short time as adults, just long enough to find a mate. After mating, females lay eggs in the stream, starting a new life cycle.

Where Can You Find Aquatic Invertebrates?

Aquatic invertebrates live in streams, rivers, and pools. You can find them buried in mud, crawling under rotting leaves, hiding under rocks, or tucked into cracks in logs.



Life Cycle of a Caddisfly



Life Cycle of a Stonefly

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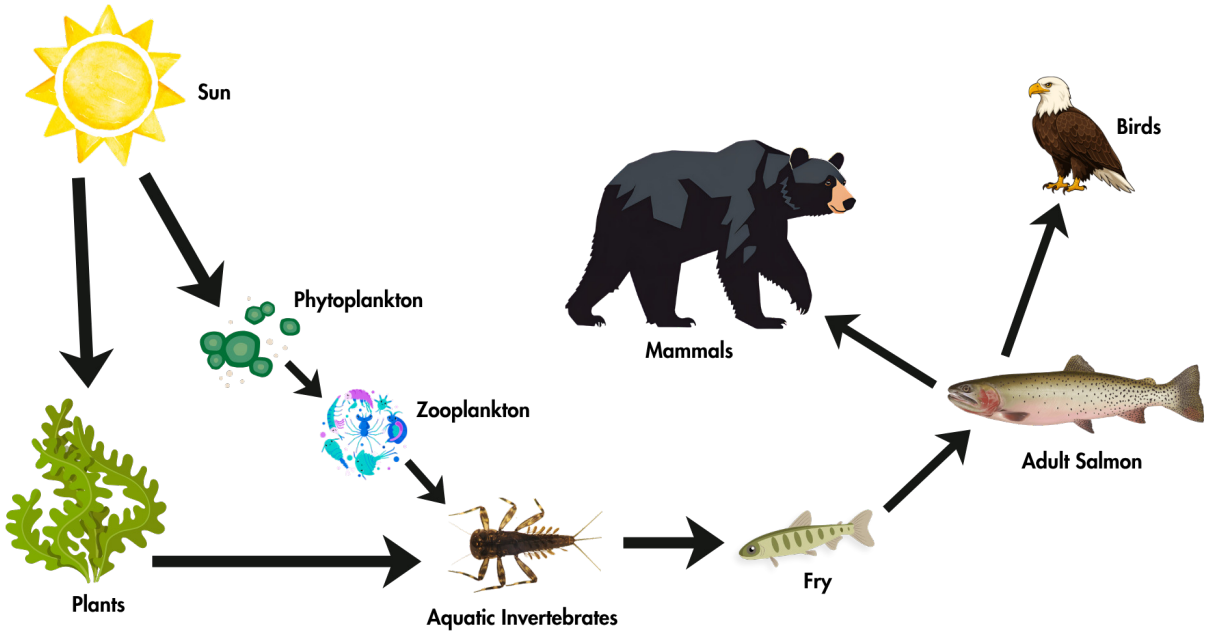
Pollution Watchdogs

Aquatic invertebrates can provide early warning signs of problems in a stream. Biologists study these organisms to assess overall stream health. Some species are highly sensitive to pollution and cannot survive in poor water conditions. Changes in their populations can signal shifts in water quality.

The **Water Quality Clues** handout on the next page highlights invertebrates that are very sensitive to pollution, as well as those that are moderately sensitive. Species that are tolerant of pollution can survive in both clean and degraded streams.

Stream Food Chain

Aquatic invertebrates play an important role in a stream's food chain. All food chains start with energy from the sun. Plants like algae use sunlight to grow, and small insects such as mayflies feed on these plants. In turn, small animals like salmon fry eat the mayflies, and larger animals such as eagles and otters prey on the salmon.



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Water Quality Clues

An identification guide to aquatic invertebrates and their sensitivity to pollution.

Pollution Intolerant



Stonefly Nymph



Mayfly Nymph



Caddisfly Larva



Riffle Beetle Larva

Somewhat Intolerant



Scud



Planaria



Aquatic Beetle



Aquatic Sow Bug



Cranefly Larva



Damselfly Larva



Dragonfly Larva

Pollution Tolerant



Blackfly Larva



Leech



Water Mite



Midge Larva



Aquatic Worm

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Station C: Stream Survey

Learning Outcome:

Students will learn about stream habitats and water quality requirements for salmon in a stream.

Before You Go:

Have students review stream survey terminology. Salmon need special places to live in to be healthy. Students should know these characteristics. Each description corresponds to an activity on the Student Worksheet.

During this Station students will:

- Review habitat needs: food, water, shelter, space.
- Use tools such as a stopwatch, depth sticks, tape measure, worksheets…
- Complete a Stream Survey worksheet as a group.
- Measure, observe, record, and use webbing loops to show redd space.
- Conclude if Hurry Creek is suitable for different salmon species.



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Vocabulary

Knowing this vocabulary will help students complete the Stream Survey activity.

1. A **pool** is deep, slow-moving water and provides a great rearing area for young salmon. It is also an excellent resting place for adult salmon.
2. A **riffle** has shallow, fast-moving water that bubbles at the surface. Salmon often spawns near riffles, so their eggs receive a steady flow of oxygen-rich water.
3. The **presence of salmon** is a good indicator of stream health, as they require clean water to survive.
4. Protective **cover** such as root wads, rocks, undercut banks, and streamside vegetation is important for salmon. This cover helps protect them from heat and predators.
5. A healthy **stream bottom** has a mix of rock sizes. Spawning salmon prefer rounded gravel. Too much sand or mud can smother eggs and alevin, while fry need larger rocks for shelter.
6. Stream **width** is measured to help describe its overall characteristics.
7. Stream **depth** includes both shallow riffles and deep pools and is an important measurement of habitat.
8. Water **temperature** should be between 3°C and 13°C. Salmon are cold-blooded, so their body temperature matches the surrounding water. Warmer water holds less oxygen, which can be harmful or even fatal to salmon.
9. Water **velocity** measures how fast water flows in a stream. Faster water stays cooler and carries more oxygen, while slower water warms up and holds less oxygen, making it harder for fish to breathe.
10. **pH** measures how acidic or basic the water is. A pH of 7 is neutral. Acidic water has a lower pH, closer to 0, like lemons or vinegar. Basic water has a higher pH, closer to 14, like soap or chlorine. Salmon prefers a pH between 6.5 – 8. Extreme acidity or basicity can harm aquatic life.
11. Water **clarity** indicates whether the water is clear, coloured, or muddy. Too much sediment can smother salmon eggs and make it difficult for fish to breathe.

Stream Survey - Student Worksheet

Good habitat is important for life in a stream. This stream survey will help you assess the stream health. Then you will know if this is a good home for salmon.

1. **WATER POLLUTION**: Record the types of pollution in this stream.
   - ❑ Sewage
   - ❑ Mud Slides
   - ❑ Animal Waste
   - ❑ Chemical Spill
   - ❑ Garbage

2. **PROTECTIVE COVER**: Record the kinds of cover for the salmon in your study area.
   - ❑ Logs
   - ❑ Rocks
   - ❑ Overhanging Vegetation

3. **WATER CLARITY**: Record the water clarity.
   - ❑ Clear
   - ❑ Coloured
   - ❑ Muddy

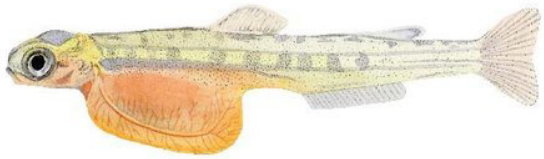
4. **STREAM BOTTOM**: Record the kinds of rocks.
   - ❑ Sand
   - ❑ Gravel
   - ❑ Cobble

5. **STREAM WIDTH**:
   The width of the stream is _____ cm.

6. **WATER TEMPERATURE**: Measure the water temperature in two places. Keep the thermometer in the water for 30 seconds at each place.

   In the shade: _____ °C. In the sun: _____ °C.

   Average temperature = shade + sun ÷ 2 = _____ °C.



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7. **WATER DEPTH**: Measure the depth of the water in 2 places across the stream.

   A shallow place _____ cm.

   A deep place _____ cm.

8. **WATER VELOCITY**: Mark off 3 meters along the stream bank. Drop a marker into the water at the starting point and record the time it takes to travel 3 meters. Do this 3 times.

   1st reading = _____ seconds.

   2nd reading = _____ seconds.

   3rd reading = _____ seconds.

   Total seconds = _____

   Average time = _____ total seconds ÷ 3 = _____ seconds.

   Velocity = 3 meters ÷ _____ average time = _____ m/s.

9. **WATER pH**: Measure the pH of the water.

   _____ pH.

10. Can you see any salmon fry?

    ❑ Yes ❑ No



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A Good Habitat – Student Worksheet

Use the stream survey results to complete this chart.

DATA	A GOOD HABITAT	HURRY CREEK HAS...
PROTECTIVE COVER	Has at least one of these: • Logs • Big Rocks • Undercut Bank • Overhanging Trees	❑ Yes ❑ No
STREAM BOTTOM	Salmon need: • Mostly gravel • Some large rocks • Not much sand/mud	❑ Yes ❑ No
WATER DEPTH	• Shallow riffles • Deep pools	❑ Yes ❑ No
WATER TEMPERATURE	Within this range: • 3°C - 13°C	❑ Yes ❑ No
WATER VELOCITY	• In a riffle 0.30 - 0.50 m/sec • In a pool 0.10 - 0.25 m/sec	❑ Yes ❑ No
WATER pH	Within this range: • 6.5-8	❑ Yes ❑ No
WATER CLARITY	Clear	❑ Yes ❑ No

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Additional Resources

Pre-Visit Introductory Activity

- I Notice, I Wonder, It Reminds Me Of… from the Beetles Project
    - We encourage reviewing the entire document, however, the field card starting on page 20 is a good summary of how to run this activity. This is an excellent strategy for honing student' observation skills. It can be used outside, with photographs or videos.

Station A: Hatchery Tour

- Salmon Anatomy and Dissection by Pacific Salmon Foundation
- Salmon Life Cycle Vocabulary by Pacific Salmon Foundation
- Salmonids in the Classroom Salmon Dissection Instructions if you can get an intact salmon to dissect or for further information for the virtual dissection

Station B: Aquatic Invertebrates

- Watch Mayfly nymphs hatch instantly from Stroud Water Research Center
- Aquatic Macroinvertebrates in Motion by Stroud Water Research Centre

Station C: Stream Survey

- Stormwater Activity Booklet from Utah State University
- Homemade Water Purifier – connects to gill activity. From Utah State University
- Water Pollution Graphing Activity from Utah State University
- Salmon Challenges game by SeaDoc Society
- Water Footprint Calculator
- River of Words International Youth Poetry and Art competition

General Post Visit Summary Activities

- Pacific Salmon Foundation Salmon School
- Road Salt and Salmon Project Stream Scientist Kits