

SALMON SCIENCE JOURNAL



This science journal belongs to:

Today, you become a scientist. What makes someone a scientist? Anyone who does science is a scientist! This Salmon Science Journal is your guide to doing salmon science. Scientists have used field journals for hundreds of years to record their experiments and observations of the natural world. We're going to learn about salmon and use science to figure out how we can help them. Let's get started!

Unit #1 Salmon Life Cycle





What are the 6 stages of the salmon life cycle?

All living things have a life cycle. Each stage of the life cycle is related to their needs and their habitat.

The stages in a salmon's life form a circle, but each stage has specific needs and is vulnerable to disruption of the stage before it.





In the fall, salmon start their lives as eggs buried in <u>GRAVEL</u> at the bottom of a freshwater stream. A female salmon can lay over 7,000 eggs! The female beats her tail in the gravel to make a nest, called a <u>REDD</u>. Eggs need <u>COLD</u>, <u>CLEAN</u>, and <u>CLEAR</u> water to survive.



After a few months, the eggs hatch into <u>ALEVIN</u>. The alevins stay in their gravel nest until they've used up all of the nutrients in their <u>YOLK SAC</u> and they're now strong enough to swim and inflate their <u>SWIM BLADDER</u> by taking a gulp of air at the water surface.



Once the alevin absorb their yolk sac, they get hungry. They are now <u>FRY</u>. They leave their gravel nest in search of food. Fry love to eat insects like <u>STONEFLIES</u>, <u>MAYFLIES</u>, and <u>CADDISFLIES</u>. Fry have <u>PARR</u> marks that camouflage them in the stream from predators.



In the spring, the fry lose their camouflage color and turn silver. They are now <u>SMOLTS</u>! They migrate downstream though many obstacles to reach the <u>ESTUARY</u>, where freshwater mixes with saltwater.



When the smolts are big enough, they leave the estuary and live in the <u>OCEAN</u>. It takes many years to grow big enough to become an <u>ADULT</u>. Salmon migrate to the ocean because the ocean has more <u>FOOD</u>. Some salmon swim 2,000 miles in search of cold water and nutrients.



As <u>SPAWNERS</u>, salmon return to their <u>NATAL</u> stream—the same stream where they were born. They navigate home by using their sense of <u>SMELL</u> and following Earth's <u>MAGNETIC</u> field like a compass. After they lay their <u>EGGS</u>, they die. Their carcasses provide <u>NUTRIENTS</u> for the <u>ECOSYSTEM</u>.

UNIT #2: Egg Delivery

Today your salmon eggs arrive!

What have we learned about what salmon eggs need to survive and how will we provide that for them in our classroom aquarium?

Use these words to fill in the blanks:

Cold	48	Filter
Clean	Tested	Darkness
Clear	Changed	Cover

They need <u>COLD</u> water. Our aquarium will be kept at <u>48</u> degrees Fahrenheit.

They need <u>CLEAN</u> water. Our aquarium will need to have the water <u>TESTED</u> and <u>CHANGED</u> once a week.

They need <u>CLEAR</u> water. Our aquarium will have a <u>FILTER</u>.

They need **DARKNESS**. Our aquarium will have a <u>COVER</u>.



WHEN WILL THE EGGS HATCH?

Chum Salmon eggs need between 870 and 1000 Accumulated Thermal Units (ATUs) to hatch. The average ATUs to hatch is 935. A Thermal Unit is the average temperature in degrees Fahrenheit minus 32 degrees (freezing).



I predict the eggs will hatch between <u>Jan 12</u> and <u>Jan 20</u>. The average date the eggs may hatch is <u>Jan 16</u>.

<u>#3: Salmon Species</u>

What are the 5 species of Pacific Salmon?



Pacific Salmon Fact Chart

Species Name (Common and Scientific)	Weight	Length	Spawning Age	Interesting Fact
Pink Salmon (humpy) Oncorhynchus gorbuscha	2-5 lbs	20-30"	2 years	Smallest salmon; only return every other year; pink flesh - only spend 2 years in ocean
Sockeye Salmon (red) Oncorhynchus nerka	4-8 lbs	25-33"	3-6 years	Fry rear in lakes not streams; look like chili peppers (green head, red body)
Coho Salmon (silver) Oncorhynchus kisutch	6-15 lbs	24-38"	3 years	Spend 1 year in freshwater in fry life stage; biggest, gnarliest hooked nose
Chum Salmon (dog) Oncorhynchus keta	9-15 lbs	25-40"	3-5 years	Spend a few weeks in freshwater in fry life stage; big dog teeth
Chinook Salmon (king) Oncorhynchus tshawytscha	10-24 Ibs	36-58"	3-7 years	Largest of the Pacific salmon species (record was 96 lbs)

Make a salmon species bookmark!

Pick your favorite species of salmon:

- Chum
- Sockeye
- Chinook
- Coho
- Pink

Think about what you see in your mind's eye when you picture your favorite species of salmon in the wild.

Make a bookmark using the template on the right:

- Write the common and scientific name of your salmon.
- Draw your salmon.



UNIT #4: Salmon Form & Function

Label the external anatomy of a salmon:



Fins - help salmon turn and balance

- Pectoral Fin
- Pelvic Fin
- Anal Fin
- Dorsal Fin

Adipose Fin - no known purpose

Tail (**Caudal Fin**) – moves salmon forward

Eyes - let salmon see

Nostrils - let salmon smell water

Mouth - let salmon eat

Gill Cover – protects gills and sends water to gills

Lateral Line - detects movement of water and other fish



Spinal Cord - transmits information to/from the brain

Swim bladder - helps fish float

Kidney - removes waste from blood, produces urine, aid in osmoregulation (the control of substances like salt in body fluids compared to liquids outside the fish)

Vent - where waste, eggs, and milt are excreted

Urinary Bladder - stores urine

Liver – stores and distributes essential nutrients, maintains blood sugar **Intestines** – absorbs nutrients into blood, regulates metabolism

Ovary (female) - produces eggs

Testes (male) - produces milt

Spleen - produces white blood cells, stores emergency blood

Stomach - digests food

Pyloric Caeca - digests food, absorbs nutrients into the blood

Heart - circulates blood

Gills - extract air from water

Brain - control center of the nervous sy

<u>UNIT #5: Salmon Habitat and</u> <u>Water Quality</u>

Every creature on Earth has a home they live in. Beavers build dams with sticks to live in. Bees lives in hives. Wolves dig dens in the ground. These homes are their habitat.

Salmon live in the water. Water is their habitat. Without water, salmon would die.

What are the 3 habitats that salmon live in throughout their lives?

Salmon begin their life in <u>FRESHWATER</u> streams and lakes.

Then they swim downstream into an **ESTUARY** where freshwater and saltwater mix.

Then they travel even further out into the <u>OCEAN</u> saltwater to grow big before returning home to the freshwater again.

What else makes for good salmon habitat?

<u>TREES</u> shade the river and keep the water cold

<u>RIFFLES</u> over

rocks put more oxygen into the water

TREE ROOTS

hold soil in the riverbank so it doesn't wash into the water and smother fish



<u>GRAVEL</u> for the redd isn't too big to move and not so small it smothers the eggs <u>POOLS</u> provide a resting place for fish to take a break from swimming Dead <u>TREES</u> fall into the river and provide shelter for fish

What are the 3 Cs of salmon habitat?

Salmon need water that is

C<u>OLD</u>

CLEAN, and

CLEAR.

<u>COLD</u> water can hold more oxygen than warm water because the molecules are denser. Salmon pull that oxygen out of the water with their gills.

<u>CLEAN</u> water is important because pollutants and trash can injure or kill salmon. What things might be considered pollution in a stream?

• Car soap

- <u>Pet/Farm Poop</u>
- Oil from car leaks Heavy metals
- <u>Fertilizers</u>
- <u>Pesticides</u>
- <u>Heavy metals</u>
 <u>from burning</u>
 <u>fossil fuels that</u>

<u>enter the</u> <u>atmosphere and</u> <u>end up in water</u>

<u>CLEAR</u> water allows salmon to breathe without being smothered. Just like smoke makes it hard for us to breathe, dirt in the water clogs salmon's gills so they can't breathe.

Water Quality Testing Results

Fill in the test results as you watch the lead scientist test the water in the stream. Circle the rating to find out if the test results are healthy for salmon.

Test	Result	Excellent	Good	Okay	Unhealthy
Temperature	6.6	7-12 °C	4-6 °C	13-17 °C	<4 °C or >17 °C
Dissolved Oxygen: Spawners	>8	>8 ppm	5-8 ppm	3-4 ppm	0-2 ppm
Dissolved Oxygen: Eggs & Alevin	>8	>11 ppm	8-11 ppm	6-7 ppm	0-5 ppm
Turbidity	40	o jtu 🄇	1-40 JTU	41-100 JTU	>100 JTU
Phosphate	0.5	0-1 ppm	2 ppm	3 ppm	>3 ppm
Nitrate	2.5	<2 ppm	2.5 ppm	5 ppm	20 ppm
рН	7.0	6.5-8.2	5-6.5 or 8.2-9	4-5 or 9-11	<4 or >11

What is JTU?

JTU stands for Jackson Turbidity Units. The scientist who created the test was named Jackson.

What is PPM?

PPM stands for parts per million. For example, if your test best matched 2ppm on the chart, that means that in every 1 million molecules in your water sample, 2 of those molecules are phosphate. Nitrate and dissolved oxygen are also measured in ppm.

Fill out a stream habitat survey sheet!

Mark an X next to each habitat feature that you observe at your stream.

X Shade	X Lots of gravel	X Side channels	
X Lots of trees	\underline{X} Big logs in the river	\underline{X} No garbage in the	
Beaver dams	X Food (water bugs)	stream	
X Places to hide	X Deep pools	 X No poop or fertilizer near the stream X No invasive plants No culverts 	
X Meandering, curvy	X Riffles for oxygen		
stream	in the water		
X Consistent water	X Cold water		
Boulders	X Clear water		

Count up how many items you marked at X next to and write that number below.

Total Stream Habitat Score: <u>17</u>

Is it healthy for salmon?: Excellent (16-20) Good (11-15) Fair (6-10) Poor (0-5)

What would you change to make this stream better? Replace culvert with bridge or bigger culvert.



UNIT #6: Salmon Survival

A female chum salmon lays about 3,000 eggs. A female Chinook salmon can lay up to 7,000 eggs. Salmon go out to the ocean to grow big so that they can lay more eggs. The more eggs they lay, the better chance that some of them will survive. Out of 3,000 eggs, only a few survive. Let's look at how many salmon survive at each life stage and what causes death at each stage.

How many salmon survive each life stage?



22

Why are salmon important in Washington State?

Cultural Importance:

Salmon <u>FEED</u> the native tribes.

Salmon are part of important tribal CULTURE

Ecological Importance:

Salmon feed other animals like <u>BEARS</u>, <u>EAGLES</u>, and <u>ORCA</u> <u>WHALES</u>.

Salmon carcasses bring marine-derived <u>NUTRIENTS</u> to trees. Trees are what our homes are made of. So in one sense, salmon help build our homes.

Economic Importance:

<u>COMMERCIAL</u> salmon fishing provides many jobs and food for people in Washington.

<u>RECREATIONAL</u> salmon fishing brings money into small towns that fishermen visit on their fishing trips.

How are salmon connected to your local community?

- 1. Nisqually Indian Tribe; Skokimish Indian Tribe; Squaxin Island Tribe
- 2. McKernan Hatchery; Minter Creek Hatchery
- 3. Orca whales

What's one thing we can do to help salmon?

- 1. Plant trees to shade streams; Keep old forests alive.
- 2. Don't leave trash in or near streams.
- 3. Pick up dog poop.
- 4. Don't overuse fertilizers or pesticides.
- 5. Don't dump chemicals down storm drains. Only rain down the drain!
- 6. Don't build rock dams in streams.
- 7. Fix old culverts that are too small or high for salmon to swim through.
- 8. Reconnect streams to wetlands to provide shelter during floods for salmon.
- 9. Don't take more fish than we need when fishing.
- 10. Wash our cars on grass instead of pavement so soap can filter through grass instead of running down the pavement into storm drains