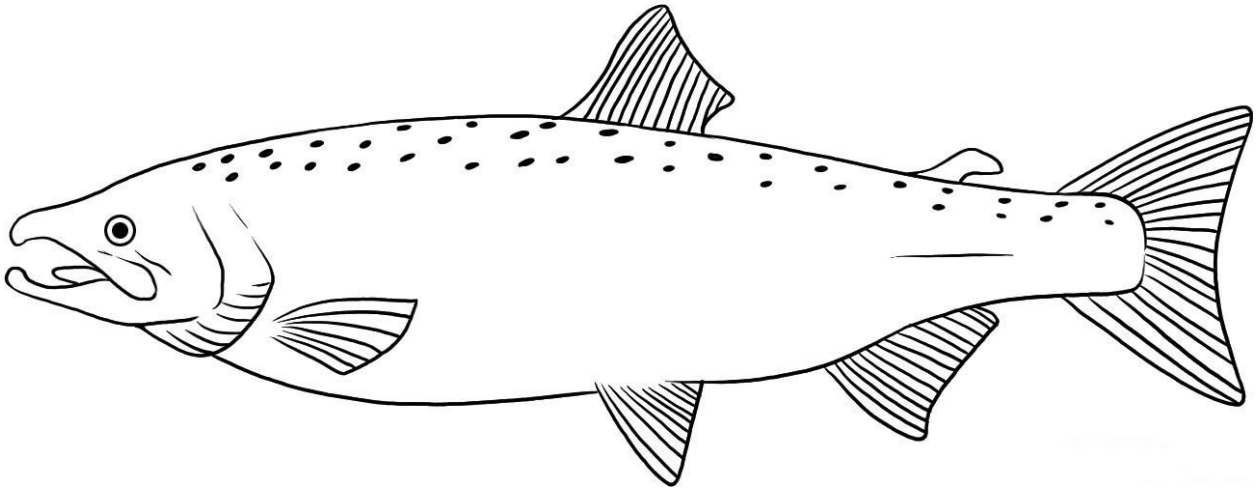
SOUTH PUGET SOUND
Salmon
ENHANCEMENT
GROUP

SALMON SCIENCE JOURNAL



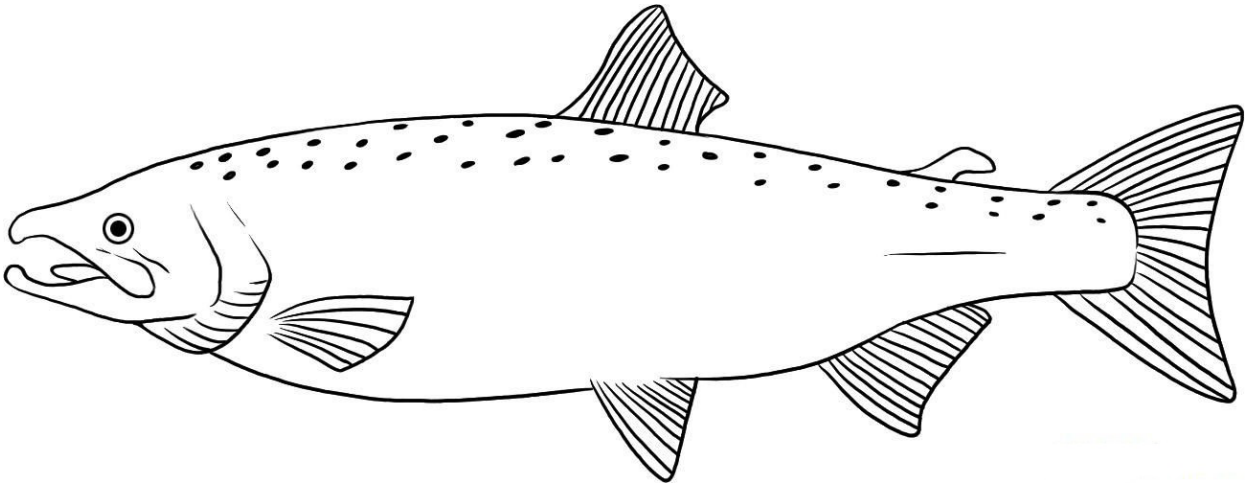
This science journal belongs to:

_____

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

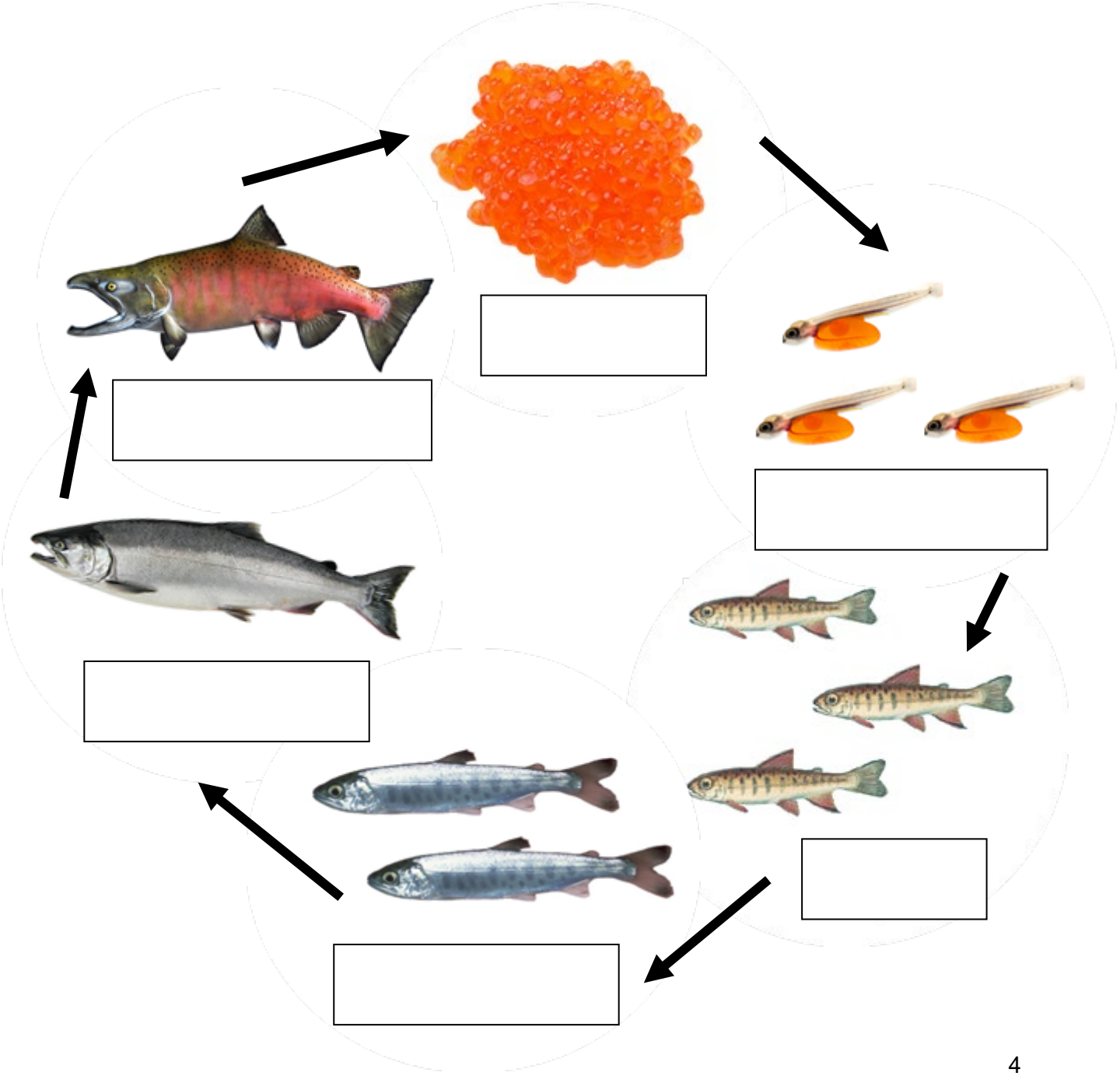


By: _____

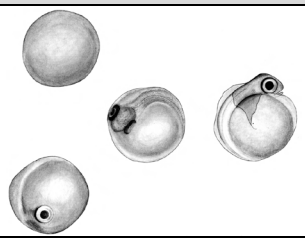
What are the 6 stages of the salmon life cycle?

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.

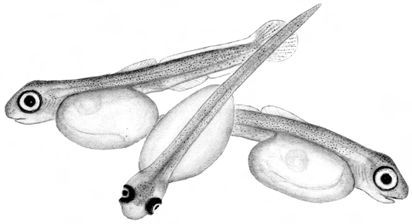


EGG



In the fall, salmon start their lives as eggs buried in _____ 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 _____. Eggs need _____, _____, and _____ water to survive.

ALEVIN

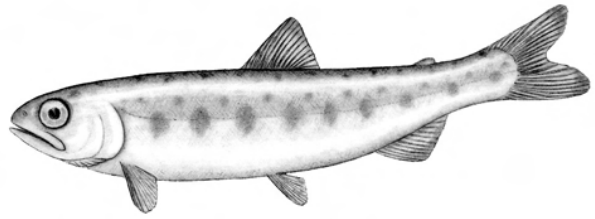


After a few months, the eggs hatch into _____. The alevins stay in their gravel nest until they've used up all of the nutrients in their _____ and they're now strong enough to swim and inflate their _____ by taking a gulp of air at the water surface.

FRY

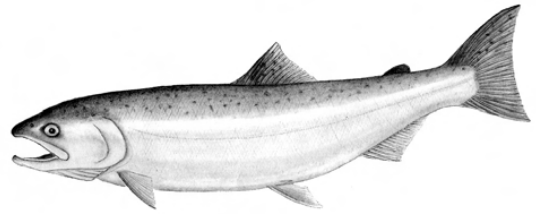
Once the alevin absorb their yolk sac, they get hungry. They are now _____. They leave their gravel nest in search of food. Fry love to eat insects like _____, _____, and _____. Fry have _____ marks that camouflage them in the stream from predators.

SMOLT



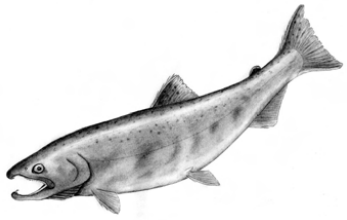
In the spring, the fry lose their camouflage color and turn silver. They are now _____! They migrate downstream through many obstacles to reach the _____, where freshwater mixes with saltwater.

ADULT



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

SPAWNER



As _____, salmon return to their _____ stream—the same stream where they were born. They navigate home by using their sense of _____ and following Earth's _____ field like a compass. After they lay their _____, they die. Their carcasses provide _____ for the _____.

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**

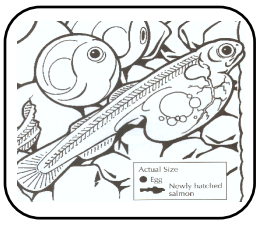
They need _____ water. Our aquarium will be kept at _____ degrees Fahrenheit.

They need _____ water. Our aquarium will need to have the water _____ and _____ once a week.

They need _____ water. Our aquarium will have a _____.

They need _____. Our aquarium will have a _____.

Name: _____



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).

1

Date the eggs were spawned: _____

Date the eggs were delivered: _____

Number of days at the hatchery: _____

2

To find the amount of TUs the eggs received while at the hatchery:

Temperature at the hatchery: _____

— 32 deg. F

Equals: _____

Multiplied by the days at the hatchery: x _____

Equals the amount of TUs the eggs have accumulated by arrival: _____

3

To find the amount of TUs left until hatching:

	Lower	Upper	Average
Thermal Units needed to hatch:	870	1000	935
Minus the amount of TUs the eggs had accumulated by arrival:	— _____	— _____	— _____
Equals Thermal Units left until hatching:	_____	_____	_____

4

To find the amount of TUs the eggs will receive each day:

Average temperature in the aquarium: _____

— 32 deg. F

Equals the amount of TUs the eggs receive each day: _____

5

To estimate hatch time:

	Lower	Upper	Average
Thermal Units (TUs) left until hatching:	_____	_____	_____
Divided by the TUs the eggs receive each day:	÷ _____	÷ _____	÷ _____
Equals # of days left until the eggs hatch:	_____	_____	_____

6

Use a calendar to count the # of days for lower, upper, & average hatch dates.

I predict the eggs will hatch between _____ and _____.

The average date the eggs may hatch is _____.

#3: Salmon Species

What are the 5 species of Pacific Salmon?

_____

(king) the king all fingers

_____

(silver) you wear silver on your ring finger

_____

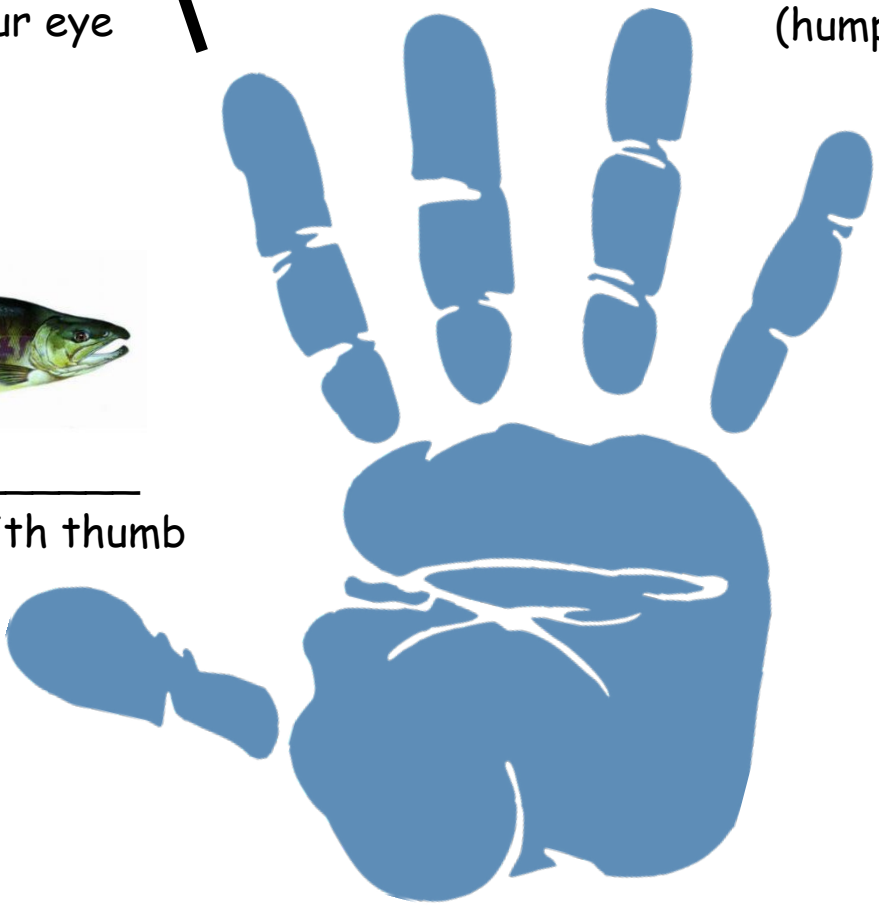
(red) the finger you use to point to your eye

_____

(humpback) like your pinky finger

_____

(dog) rhymes with thumb



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	
Sockeye Salmon (red) *Oncorhynchus nerka*	4-8 lbs	25-33"	3-6 years	
Coho Salmon (silver) *Oncorhynchus kisutch*	6-15 lbs	24-38"	3 years	
Chum Salmon (dog) *Oncorhynchus keta*	9-15 lbs	25-40"	3-5 years	
Chinook Salmon (king) *Oncorhynchus tshawytscha*	10-24 lbs	36-58"	3-7 years	

Make a salmon species bookmark!

Pick your favorite species of salmon:

- Chum
- Sockeye
- Chinook
- Coho
- Pink

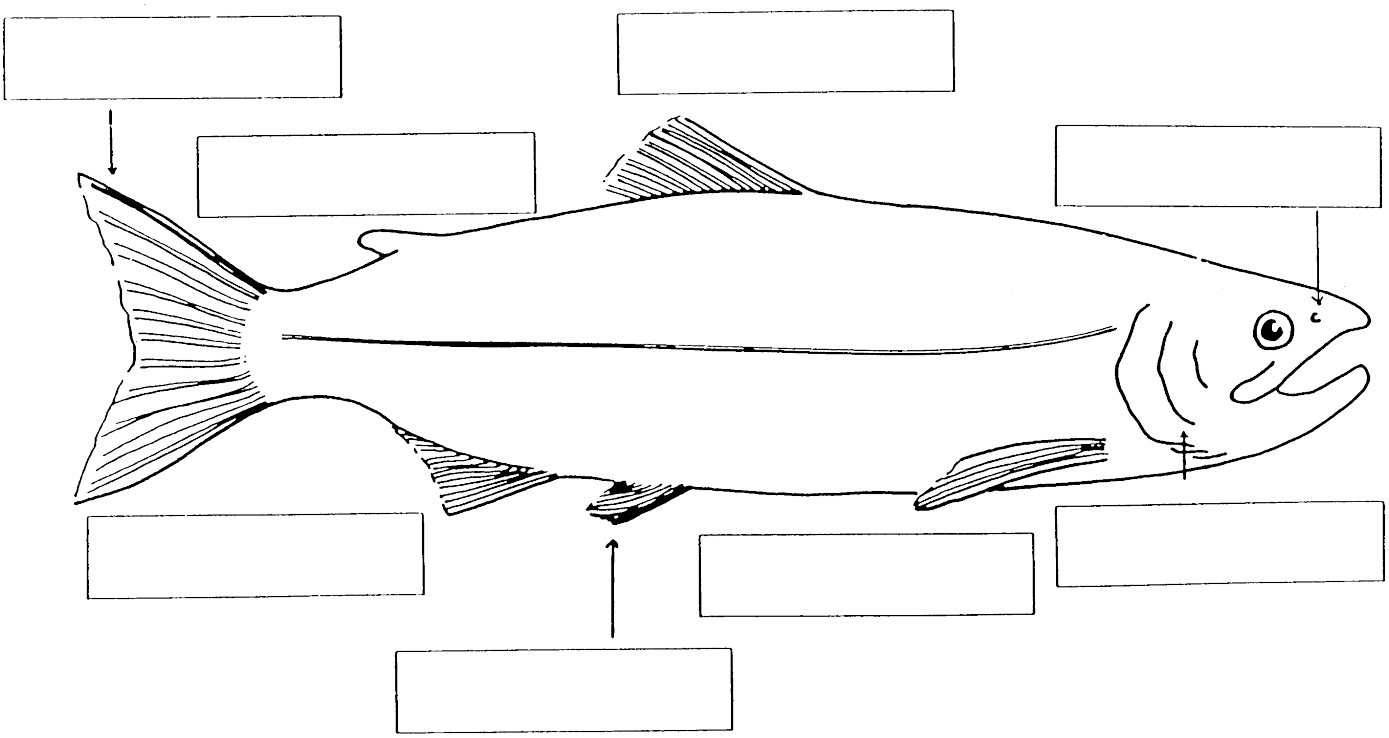
Think about what you see in your mind's eye when you picture your favorite species of salmon in the wild.

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

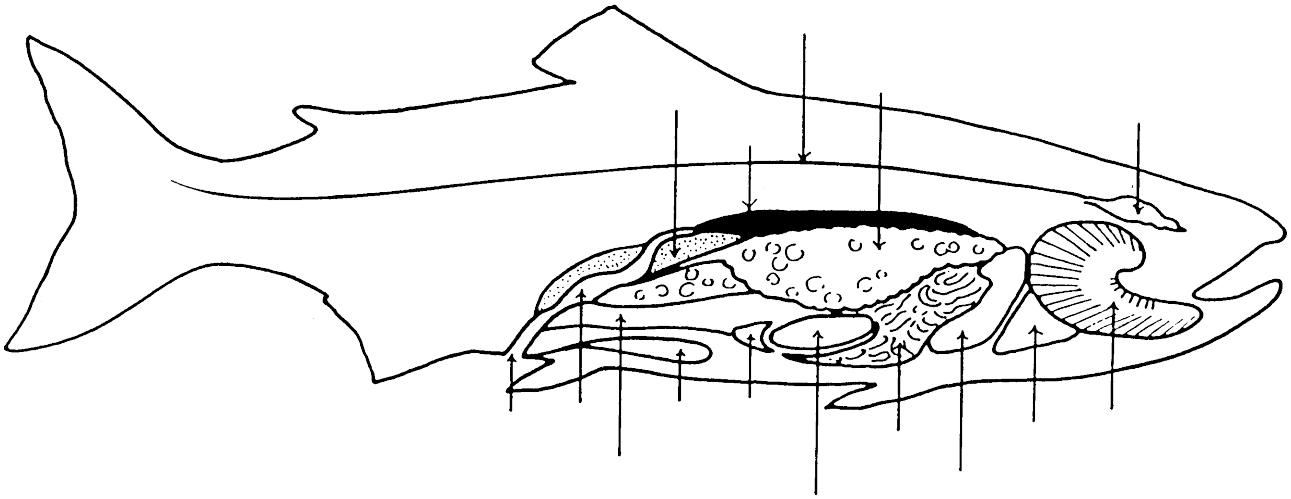
Nostrils – let salmon smell water

Mouth – let salmon eat

Gill Cover – protects gills and sends water to gills

Lateral Line – detects movement of water and other fish

Label the internal anatomy of a salmon:



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

UNIT #5: Salmon Habitat and Water Quality

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 _____ streams and lakes.

Then they swim downstream into an _____, where freshwater and saltwater mix.

Then they travel even further out into the _____ saltwater to grow big before returning home to the freshwater again.

What else makes for good salmon habitat?

_____

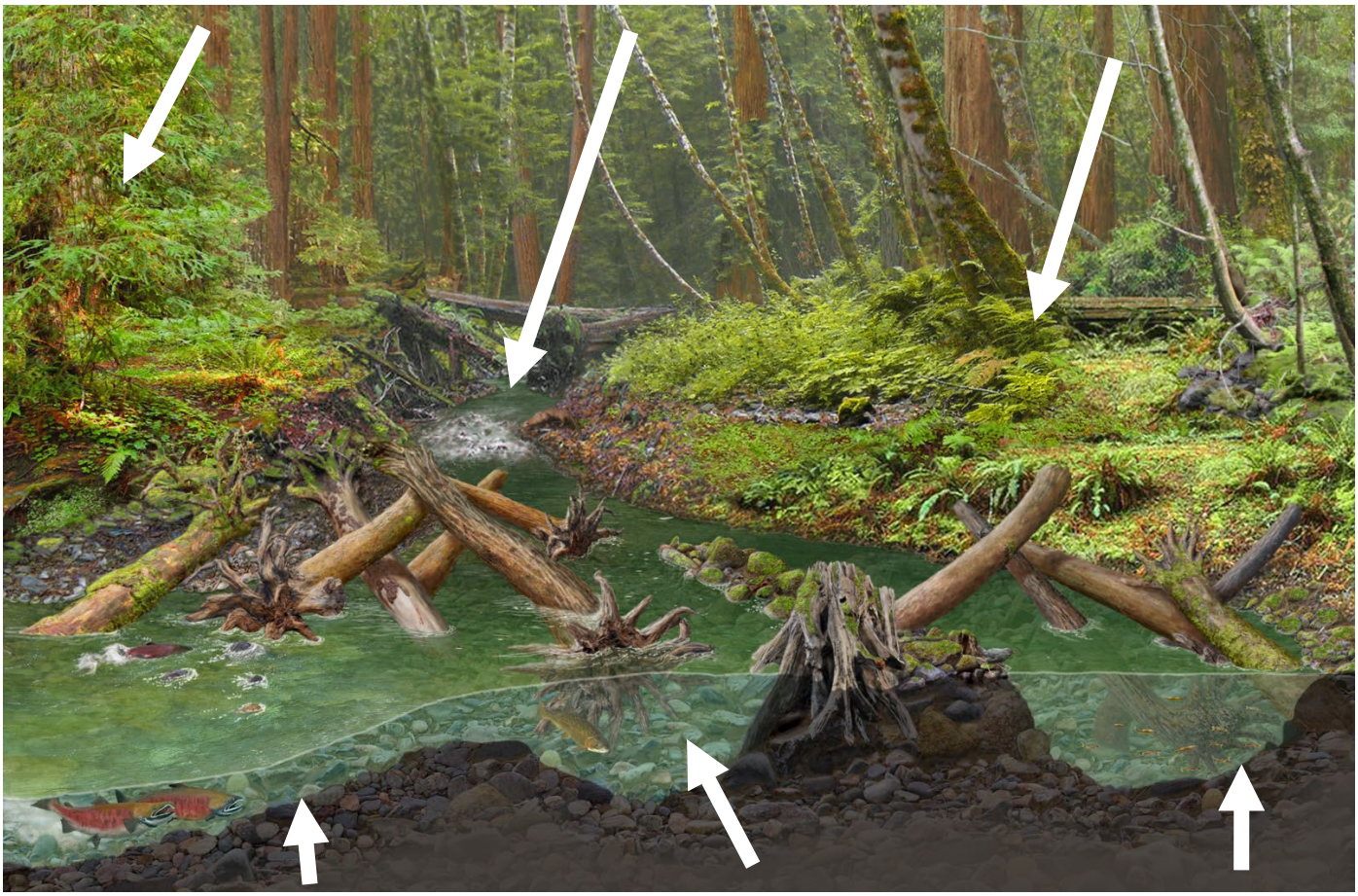
shade the river and keep the water cold

_____

over rocks put more oxygen into the water

_____

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



_____

for the redd isn't too big to move and not so small it smothers the eggs

_____

provide a resting place for fish to take a break from swimming

Dead _____

fall into the river and provide shelter for fish

What are the 3 Cs of salmon habitat?

Salmon need water that is

C_____,

C_____, and

C_____.

_____ water can hold more oxygen than warm water because the molecules are denser. Salmon pull that oxygen out of the water with their gills.

_____ water is important because pollutants and trash can injure or kill salmon. What things might be considered pollution in a stream?

_____ _____

_____ _____

_____ _____

_____ 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		7-12 °C	4-6 °C	13-17 °C	<4 °C or >17 °C
Dissolved Oxygen: Spawners		>8 ppm	5-8 ppm	3-4 ppm	0-2 ppm
Dissolved Oxygen: Eggs & Alevin		>11 ppm	8-11 ppm	6-7 ppm	0-5 ppm
Turbidity		0 JTU	1-40 JTU	41-100 JTU	>100 JTU
Phosphate		0-1 ppm	2 ppm	3 ppm	>3 ppm
Nitrate		<2 ppm	2.5 ppm	5 ppm	20 ppm
pH		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.

__ Shade

__ Lots of trees

__ Beaver dams

__ Places to hide

__ Meandering, curvy stream

__ Consistent water

__ Boulders

__ Lots of gravel

__ Big logs in the river

__ Food (water bugs)

__ Deep pools

__ Riffles for oxygen in the water

__ Cold water

__ Clear water

__ Side channels

__ No garbage in the stream

__ No poop or fertilizer near the stream

__ No invasive plants

__ No culverts

__ No man-made dams

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

Total Stream Habitat Score: _____

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?

Salmon Vocabulary Word Search

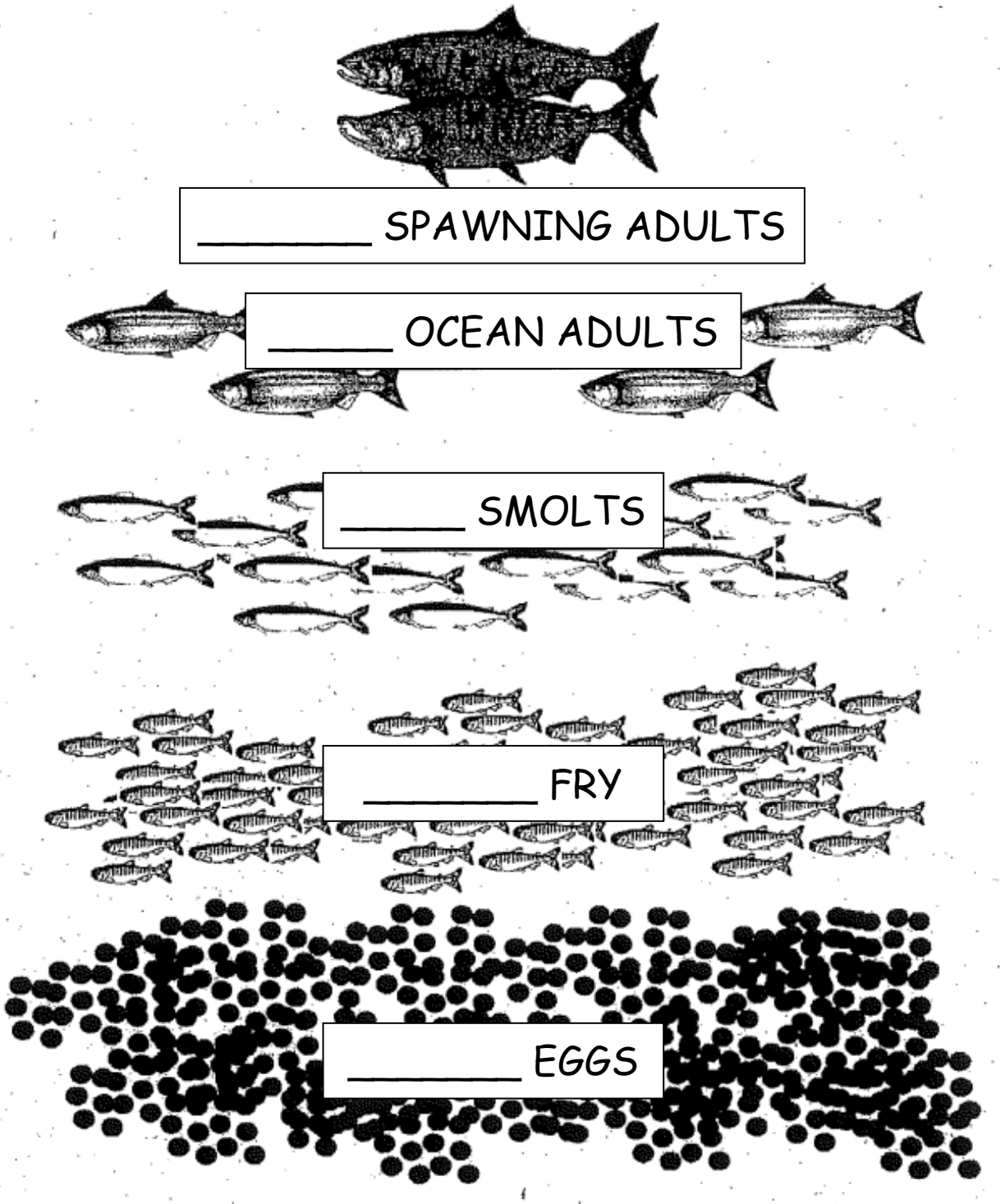
L S P G S E P I L S D M J Y M R I T
E R S O C K E Y E D Q N B O O K N D
Y R A U T S E I E Z I L I T R E F D
E R U T L U C R D L D E A V M H Y Y
H L V F T E P E P E C D I N E N P R
I R B E P T E J R O E D O R C L V N
J J T S G R P E S R L R M Y O P A X
Q C K G O R G Y P H I L E N H M D K
J L P S F N S J W V A A U N O A R Q
S T I S A T W J N Y D B V T W J C A
E O Q D E C R E D U M N I G A A J A
N W N M X O L L L S I H K T U N P X
L E T H Y R F T O V G V O A A F T S
V A B T L O M S T N R M U H C T R H
K O R Y F J I O Y R A E H I D N Y N
N O O V R C L M Y D T F D T P W M B
I Q I K A J O C A P E G S J E G G W
P M C Q R R X W Q K O O N I H C B U

Adult
Alevin
Chinook
Chum
Coho
Culture
Ecosystem
Egg
Endangered
Environment
Erosion
Estuary
Fertilize
Fry
Habitat
Larva
Migrate
Pink
Pollutant
Predator
Redd
Smolt
Sockeye
Spawner
Species

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?



Why are salmon important in Washington State?

Cultural Importance:

Salmon _____ the native tribes.

Salmon are part of important tribal _____.

Ecological Importance:

Salmon feed other animals like _____, _____, and _____.

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

Economic Importance:

_____ salmon fishing provides many jobs and food for people in Washington.

_____ salmon fishing brings money into small towns that fishermen visit on their fishing trips.

How are salmon connected to your local community?

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