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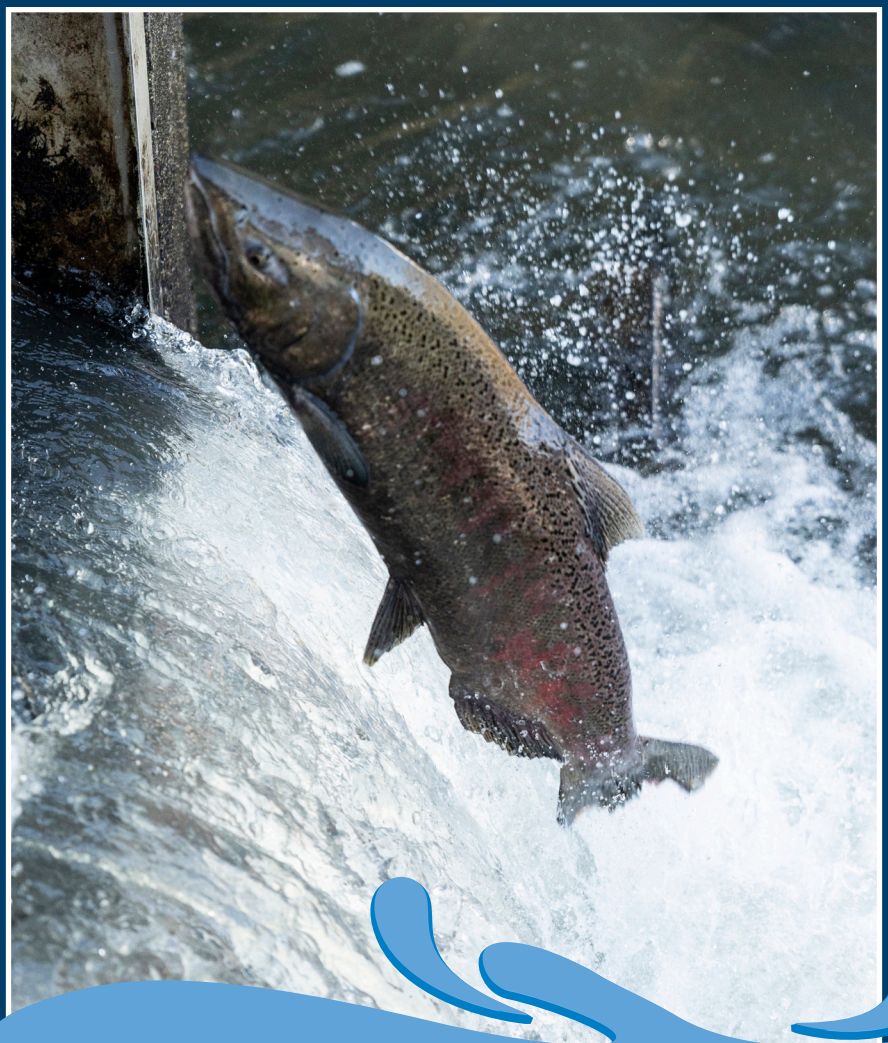
# Salmon Splashbook



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# ABOUT

## *THE MOKELUMNE RIVER FISH HATCHERY*

**The Mokelumne River Fish Hatchery** (hatchery) is managed and operated by the **California Department of Fish and Wildlife. East Bay Municipal Utility District** (EBMUD) built the facility to help replace salmon and steelhead spawning habitat that was no longer accessible after Camanche Dam was built.

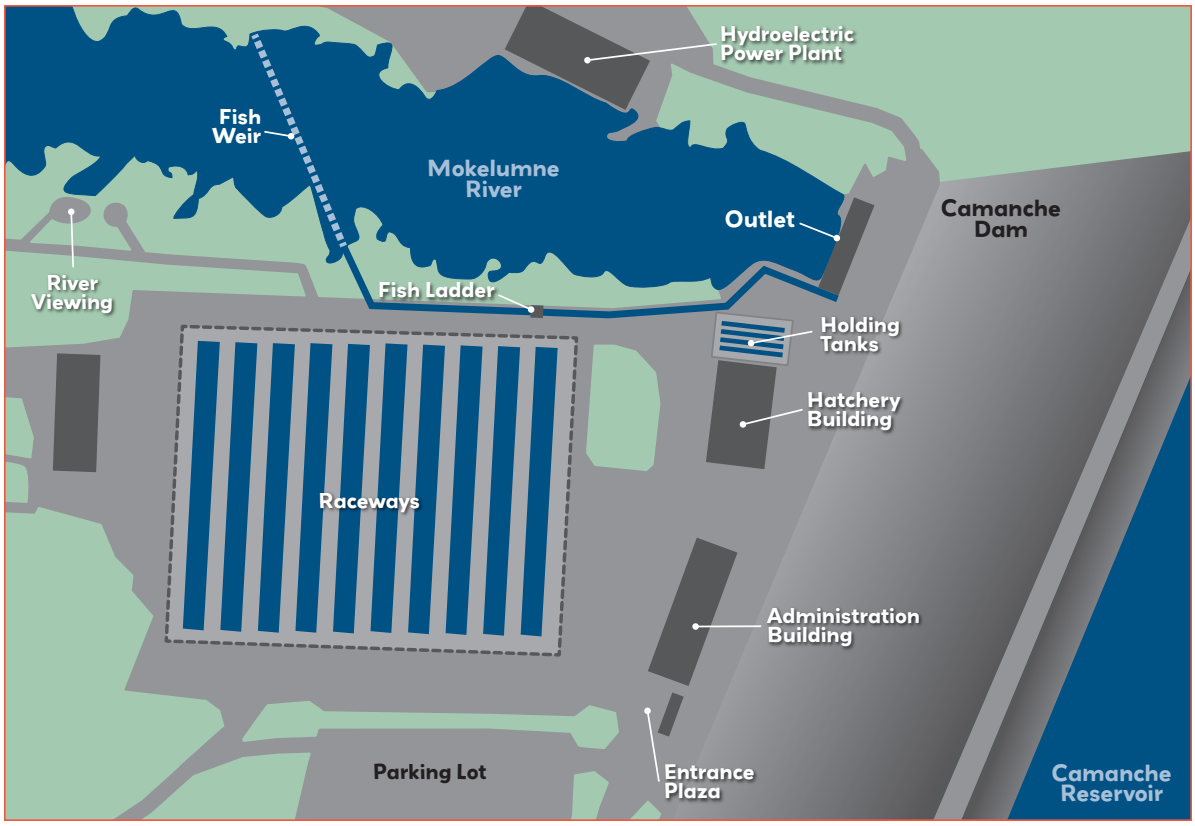
Our cooperative goals are to maintain viable salmon and steelhead runs; and preserve and protect the Mokelumne River.

The hatchery produces millions of fish and is designed for reliability, efficiency and flexibility of operation.

Salmon and steelhead begin to migrate in the fall, swimming up the Mokelumne River from the Pacific Ocean to spawn in the river or enter the hatchery. The hatchery staff carefully collect eggs and tend them until they hatch. Young fish are reared in the hatchery and released into the wild to begin their migration to the ocean.

Depending on the month that you visit, you could find big fish, eggs, tiny fry, fingerlings and yearlings ready for release to the river.

**Take a tour of the Mokelumne River Fish Hatchery and write down what you notice and learn at each stop:**



# WHAT IS A SALMON?

We see two types of fish at the Mokelumne River Fish Hatchery, Chinook salmon and steelhead trout. These are both **anadromous** [*uh*-**nad**-*ruh*-m*uh*s], which means they hatch in fresh water, mature in the ocean, then migrate back to the stream they were born to lay their eggs, but they have very different life cycles.

The salmon return to the Mokelumne River in the fall. Most return at three years old, some at two, four or five. Chinook reproduce in a single event and then die. Most of their offspring migrate to the ocean within six months of hatching.

Steelhead return to the Mokelumne River from fall through spring, most are two or three years old. Their reproduction is similar to the Chinook, except they can survive spawning to reproduce again. Their offspring live one to two years in freshwater before migrating to the ocean.

## Draw a line between the fish structure and it's function:

| Structure | Function |
|---|---|
| Eye | To smell (to find their way home) |
| Nostril | Used to detect movement and vibrations in the water around them |
| Gills | To see |
| Fins | To breathe |
| Lateral line | To move and balance in the water |

## Salmon Anatomy

Label the following parts of the salmon: Eye, Nostril, Mouth, Gills, Lateral line

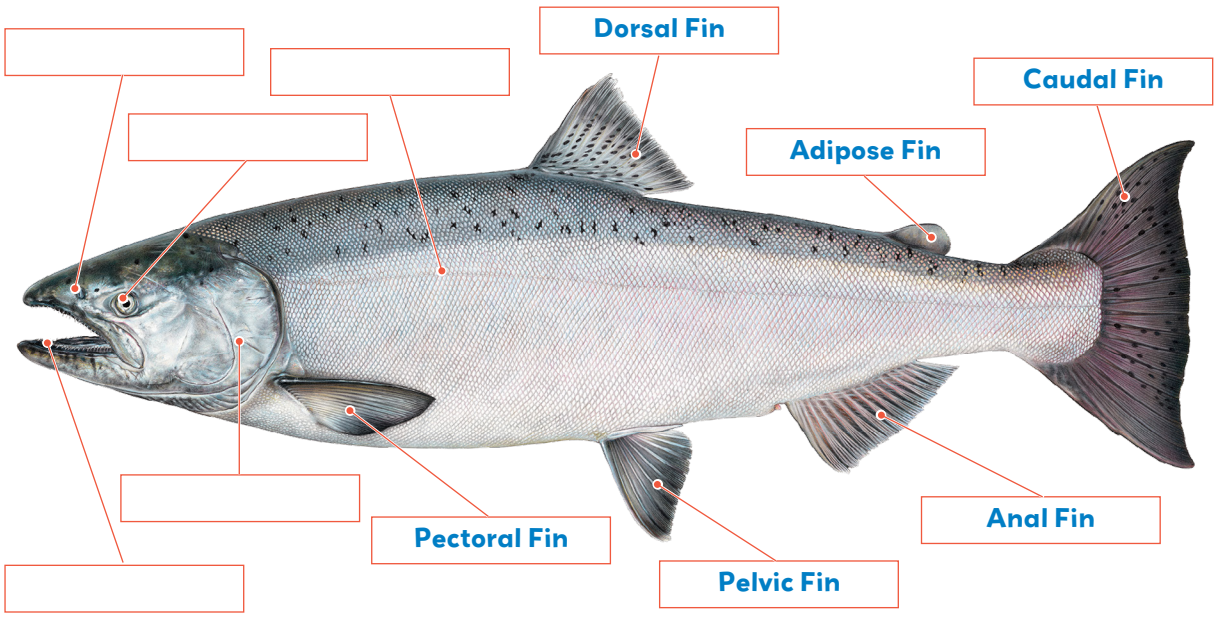



*Illustration provided by: Stewardship Through Education*

# VOCABULARY

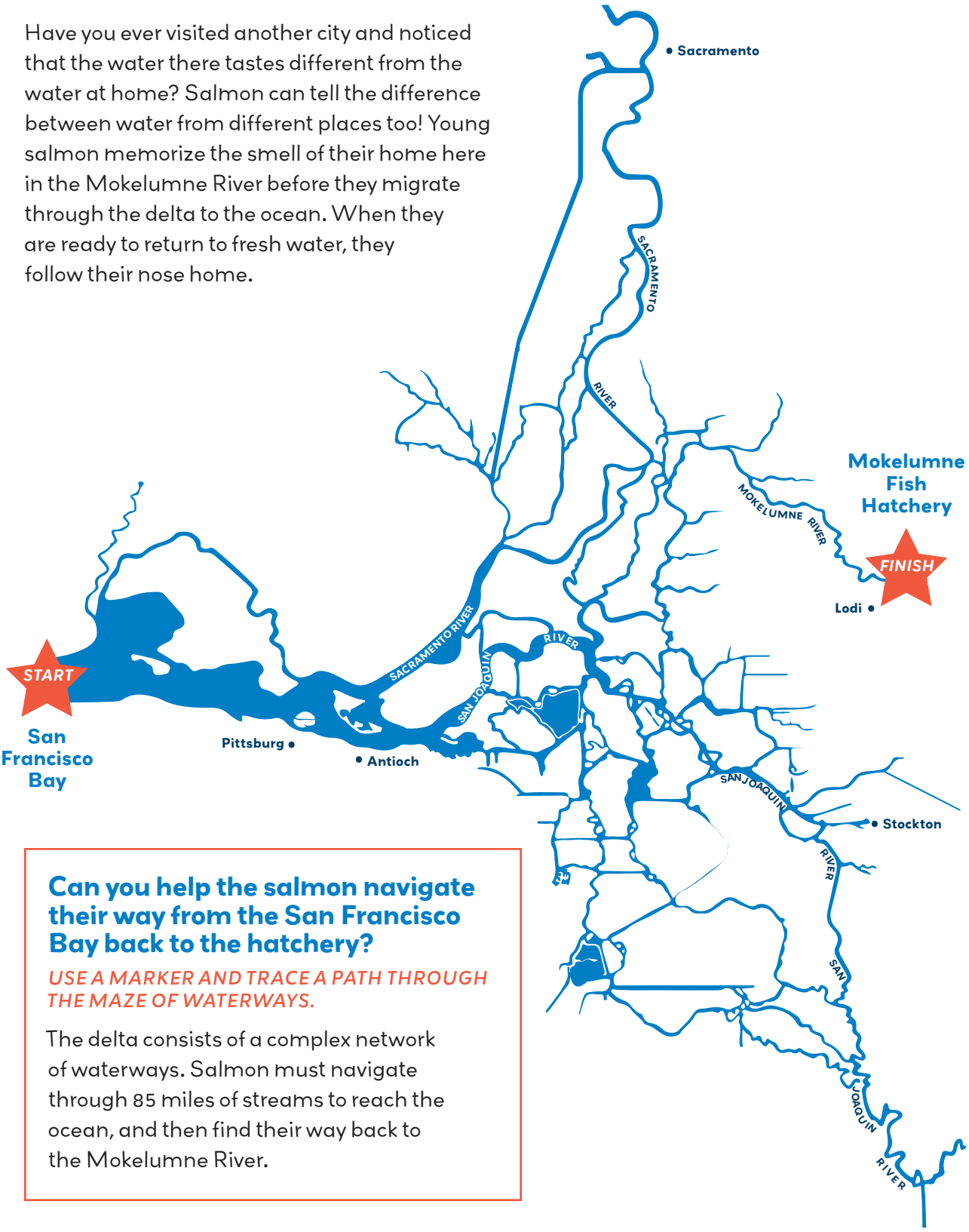
**Define the following vocabulary words as they relate to salmon and the hatchery.**

| | |
|---|---|
| Adipose fin | |
| Alevin | |
| Eggs | |
| Fry | |
| Habitat | |
| Hatchery | |
| Ladder | |
| Redd | |
| Smolt | |
| Spawning | |
| Tagging | |
| Weir | |

# MIGRATION

## *SALMON FOLLOW THEIR SENSES*

Have you ever visited another city and noticed that the water there tastes different from the water at home? Salmon can tell the difference between water from different places too! Young salmon memorize the smell of their home here in the Mokelumne River before they migrate through the delta to the ocean. When they are ready to return to fresh water, they follow their nose home.




### Can you help the salmon navigate their way from the San Francisco Bay back to the hatchery?

*USE A MARKER AND TRACE A PATH THROUGH THE MAZE OF WATERWAYS.*

The delta consists of a complex network of waterways. Salmon must navigate through 85 miles of streams to reach the ocean, and then find their way back to the Mokelumne River.

# THINK LIKE A SCIENTIST

*DOCUMENT YOUR THOUGHTS*

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**Write down your thoughts about migration as you think about the difficult journey the salmon take.**

I notice:

- _____
- _____
- _____

It reminds me of:

- _____
- _____
- _____

I wonder:

- _____
- _____
- _____

**Did you know?**

When salmon live in the ocean, they eat a lot to store up fat.

This fat is the "fuel" they need to get to their spawning grounds.

Once salmon enter freshwater, they stop eating.

A salmon is a lot like a car taking a long trip on one tank of gas.

If anything delays the salmon, they may use up their fuel too soon – and not have enough to make it home.

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# ABC'S OF THE RIPARIAN ECOSYSTEM

Today many kinds of salmon, and steelhead, are disappearing. Some have even been listed as endangered species. Salmon are in trouble mostly because their habitats are in trouble.

## Riparian habitats are the areas along the sides of rivers and streams. They are important for salmon in several ways:

**Shade & Water Temperature:** Trees and plants along the river keep the water cool by shading it. Salmon need this cool water to live and grow.

**Food Supply:** Insects that live in the riparian zone often fall into the river, becoming food for young salmon. This helps the salmon get the energy they need.

**Erosion Control and Water Quality:** The roots of the plants help keep the soil in place, which prevents mud from getting into the river and covering the rocks where salmon lay their eggs. The plants also help clean the water by filtering out pollution.

**Habitat and Refuge:** Riparian areas have plants and trees that hang over the water or have roots underwater, providing places for salmon to hide from predators and rest from strong currents.

**Guided Paths:** These habitats act like natural paths that help salmon find their way as they migrate.

## A riparian habitat includes abiotic, biotic and cultural elements.

**Abiotic elements:** any nonliving substance

**Biotic elements:** include any living or once-living thing

**Cultural elements:** anything made or added to an environment by humans

*VIEW THE WORDS BELOW AND DECIDE WHICH CATEGORY EACH FALLS IN ON THE NEXT PAGE.*

### Word bank

- ~~Rocks~~
- Garbage/Litter
- Fish
- Fences
- Rain
- Soil
- Buildings
- Mushrooms
- Bridges
- Water
- Insects
- Sun
- Reptiles
- Farms
- Dams
- Air
- Houses
- Oil
- Plants
- Trees
- Birds
- People
- Mud
- Gravel

| **A = Abiotic**<br>Any non-living part of the ecosystem | **B = Biotic**<br>Any living part of the ecosystem | **C = Cultural**<br>Anything made or added by humans |
|---|---|---|
| *Rocks* | | |
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# THINK LIKE A SCIENTIST

*OBSERVE AND MAKE A HYPOTHESIS*

## Location: Mokelumne River Fish Hatchery

Today you are a salmon scientist! Your mission is to use your observation skills and explore our river to determine if it is a good habitat for the salmon!

## Observations

*GATHER INFORMATION. WHAT DO YOU SEE?*

- ☐ Large woody debris
- ☐ Riparian Zone
- ☐ Animals
- ☐ Plants
- ☐ Gravel on the bottom of the stream
- ☐ Shade
- ☐ Cars
- ☐ Buildings
- ☐ Garbage
- ☐ Roads
- ☐ Moving water
- ☐ Erosion

## Other Observations

_____

_____

_____

_____

_____

_____

## Hypothesis

*BASED ON YOUR OBSERVATIONS DO YOU THINK THIS STREAM WILL BE A HEALTHY HABITAT FOR SALMON?*

☐ Yes ☐ No

*EXPLAIN WHY OR WHY NOT.*

_____

_____

_____

_____

_____

_____

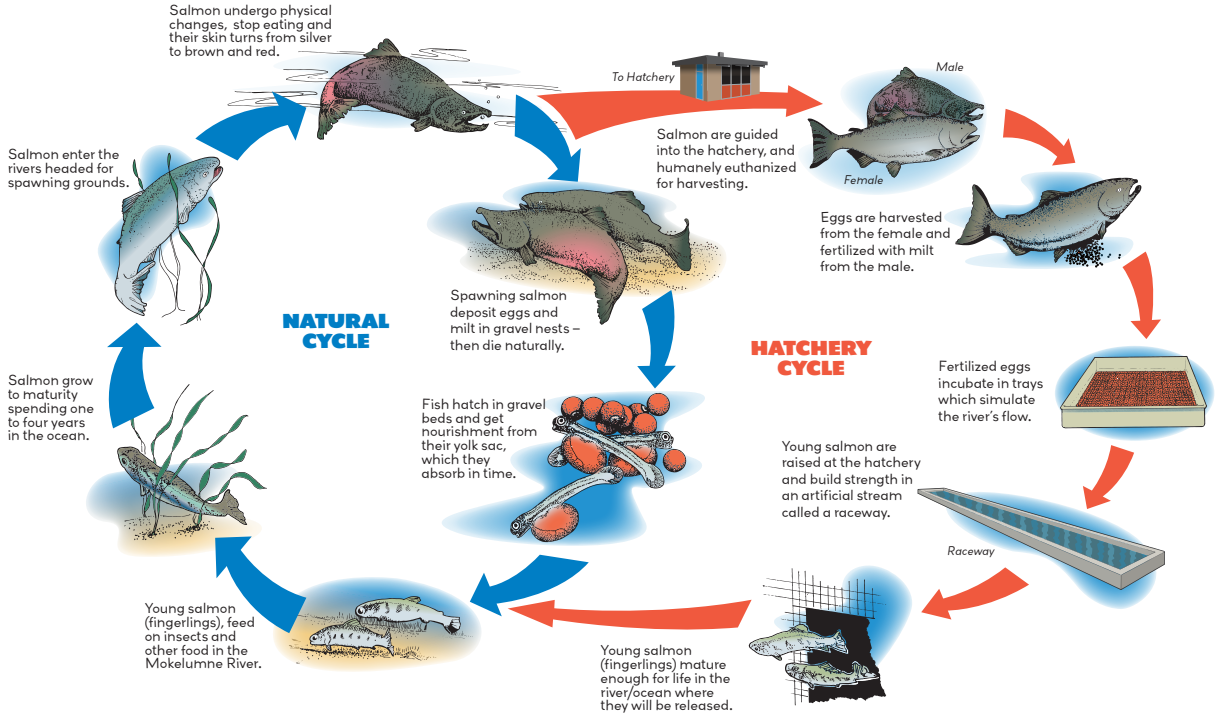
## How long do salmon live in streams?
## What do they eat?
## Who eats them?
## Where do they go in the ocean and how long do they stay there?
## How many survive to adulthood?

These are some of the questions that scientists try to answer. When we know what the salmon need, we can help them better.

One way we learn about salmon is by **tagging** them. Some hatchery fish are given coded wire tags. A special machine is used to put a tag in the fish's snout. When the fish is caught as an adult, the tag is removed and read under a microscope. The pattern of lines on the tag tells when and where the fish was released.

Salmon also get "check-ups" by scientists using special live traps called **screw traps**. These traps (which look like space capsules) are placed in rivers to catch passing salmon. Scientists study the salmon and then return them to the water. Ocean and estuary "check-ups" are done using nets that trail behind boats.

### Life cycle of a salmon



# HOW MANY FISH RETURN?

**Subtract numbers as you go to get your final number**

*A FEMALE SALMON DEPOSITS 5,000 EGGS IN A REDD (NEST)* — 5,000

- 500 eggs were not fertilized — − _____ = _____
- 60 eggs were washed out of the gravel when a fisherman walked through the river — − _____ = _____
- Mud from a construction site eroded into the river and suffocated 1,000 eggs — − _____ = _____

*THE EGGS HATCH AND THE ALEVINS EMERGE*

- 300 alevins died because they were very weak — − _____ = _____

*THE ALEVINS DEVELOP INTO FRY*

- 500 fry were eaten by other fish in the stream — − _____ = _____
- Birds ate 41 fry — − _____ = _____

*THE FRY PROGRESS INTO SMOLTS*

- 260 smolts died going through a turbine from a power plant — − _____ = _____
- 556 smolts were eaten by birds — − _____ = _____

*THE SMOLTS BECOME ADULT SALMON*

- In the ocean, bigger fish ate 1,500 adult salmon — − _____ = _____
- Seals ate 95 adult salmon — − _____ = _____

*THE ADULTS BEGIN TO SPAWN*

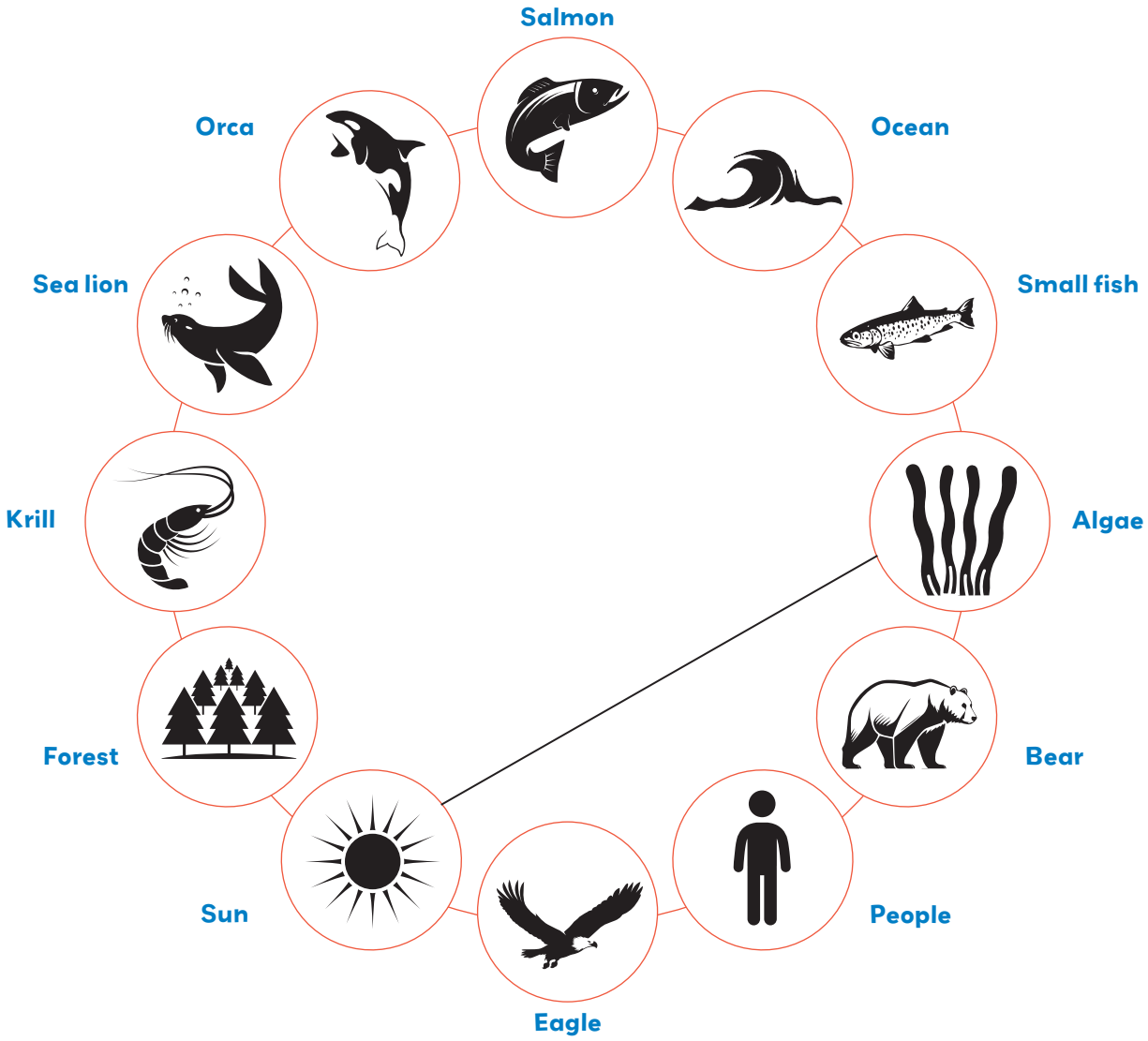
- Beaver dams blocked 180 salmon from swimming upstream — − _____

*HOW MANY SALMON RETURNED?* = _____

# WHO NEEDS WHO?

## Food webs show us how life is all connected.

*DRAW LINES AND ARROWS BETWEEN THINGS THAT NEED ONE OR THE OTHER TO SURVIVE!*




What happens if you remove salmon from the web? _____

_____

What about the sun? _____

_____

What can humans do to keep the web intact?_____

_____

*Answers on page 13*

# MY SALMON STORY

**From the point of view of the salmon, write a story about its journey to the ocean and back to the hatchery. What happens to your fish? What new adventures did it have?**

## Answers to Who needs who (from page 11)

- Sun provides energy to algae through photosynthesis.
- Algae is a primary producer and is eaten by krill and small fish.
- Krill is a primary consumer and is eaten by small fish and salmon.
- Small fish serve as prey for salmon, eagle, and sea lions.
- Salmon is the key species, providing food for bears, eagles, orcas, humans and sea lions.
- Sea lions are predators of small fish and salmon and are prey for orcas.
- Orcas are apex predators and typically not preyed upon.
- Bears and eagles both consume salmon.
- Humans consume salmon.

# WATERSHED CAREERS

## HOW TO BECOME A WILDLIFE TECHNICIAN

*Dani recommends gaining diverse experience through seasonal jobs and volunteer opportunities. This approach helps students learn different skills and build networks in the field. Dani's education in biology and zoo and conservation science was essential, but hands-on experience has also been crucial. She advises being willing to travel and try various jobs to find a true passion.*

Dani, a **Fishery/Wildlife Technician**, grew up in Oregon. Spending much time hiking and fishing, sparked her interest in wildlife. She pursued degrees in biology, and zoo and conservation science in college. As a wildlife technician, Dani's duties change with the seasons: in fall and winter, she supports the fisheries program on the river; in spring and summer, she conducts bird surveys and writes reports.

Dani loves fieldwork, whether it's hiking to find frogs or kayaking to locate salmon nests. Her most exciting fieldwork recently has been monitoring the bald eagle, osprey, and golden eagle nests around the watershed. The most challenging part of her job is navigating permits and regulations to protect endangered species. Her work ensures the health of the watershed for both wildlife and the local community.

## HOW TO BECOME A HYDROGRAPHER

*Get involved! Volunteer and internship programs are excellent ways to start. Jessica studied geology in college and emphasizes the importance of hands-on experience. Enjoying the process of working with and learning new technological tools and programs will help you in the field. So, explore opportunities and start your journey in hydrography!*

Meet Jessica, a **Hydrographer** who loves working outdoors and exploring nature. With a geology degree, she specializes in assessing the Mokelumne River's conditions. Equipped with sonar, stream gages, and GPS, she gathers and records data on water depth, currents, and more. Her role involves measuring water flow by wading or kayaking, as well as inspecting dams for safety. Jessica's work is vital for tracking water levels, issuing flood warnings, and ensuring river health for salmon and other wildlife. The toughest part of her job is handling extreme weather conditions. Her efforts are crucial for maintaining safe and balanced water systems, benefiting both the environment and the community.

Meet James, a **Fish Biologist**. His love for fish started when he was a kid, fishing with his dad. Wanting to help salmon, he studied biology, ecology, and fisheries in college. He started his career working in fisheries science by conducting studies on salmon. His job changes with the seasons: in the fall, he monitors adult salmon migration by checking video footage and counting salmon nests; in winter and spring, he tracks young salmon heading to the ocean using floating traps in the river; and in summer, he works on projects to restore their habitats.

James' favorite part of the job is being on the river and seeing fish every day. The most challenging part is figuring out what salmon need, and unfortunately, they can't directly communicate their needs. To do this, his team designs studies and research to understand their needs. His work helps restore salmon in the Mokelumne River, which is great for the environment and the local community.

Josh is also a **Fish Biologist**. He has always loved the environment and being outdoors, which led him to study marine biology at UC Santa Cruz. He spent five years as a fisheries technician studying salmonids prior to his current position.

Josh's workdays vary from being knee-deep in the river conducting salmon population surveys or in the office organizing data and writing reports on his findings. Currently, his main focus is monitoring young salmon migrating to the ocean using traps to count them. Josh enjoys being outside and supporting fish and the environment. The most challenging part of his job is balancing the needs of various people and organizations that depend on the watershed, but he finds it rewarding to help keep the ecosystem healthy.

## HOW TO BECOME A FISH BIOLOGIST

***To become a fish biologist like James and Josh, you need to study science and be curious about nature. Taking classes focused more on biology, ecology and chemistry is beneficial. They recommend volunteering with local fish and wildlife organizations. While jobs in the fisheries and wildlife fields can be fun and very rewarding, they can also be difficult. Volunteering is a great opportunity to experience the day-to-day activities of this career.***

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# NOTES

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