

HOOKS & LADDERS (adapted from Project WILD Aquatic)

STUDENTS MIMIC THE LIFECYCLE OF A PACIFIC SALMON IN AN OBSTACLE COURSE

6th Grade NGSS Correlations:

- [MS-LS1-4](#): Use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively.
- [MS-LS1-5](#): Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.
- [MS-ESS3-3](#): Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

Pre-Trip Activities:

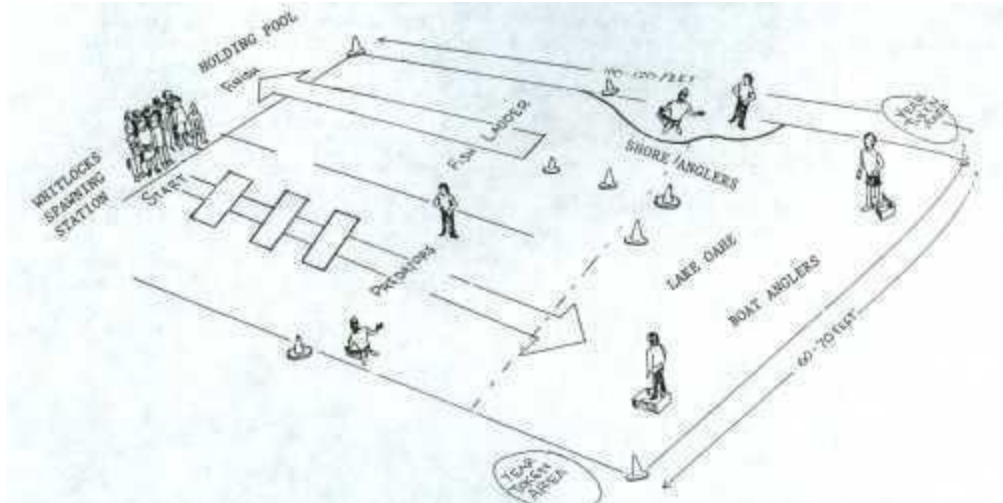
- Watch [The Life Cycle of the Pacific Salmon \(5:20\)](#)
- Play '[Salmon Challenges](#)' choosing Chinook as your species

Materials:

- Lifecycle of a pacific salmon poster
- Jump Rope
- Ropes/other 'stream' markers
- 5 poly dot markers
- 150+ tokens
- Hula hoops
- Pool noodles
- Small tarp

Set Up:

- All materials to be sanitized prior and post activity
- Set up the large playing field as shown in the diagram below



Background:

Pacific Salmon species are anadromous, meaning they start their life in freshwater, move to salt water while they grow big and strong, and then come back to the fresh water stream where they were born to reproduce and die. Salmon start their life as an egg, which is laid in air-filled riffles in the river or stream (areas with white, choppy water on top). After a few months the eggs hatch into alevin, which burrow under the shallow gravel and hide while feeding on an egg-sac still attached to their stomach. Finally, when the egg-sac disappears, the small salmon are called fry and can begin their long journey through life.

Fry might spend about 6 months hanging around the pools of slow-moving water where they were born before they are ready to start migrating to the ocean. They head downstream toward the ocean, facing many obstacles along the way. When they finally get to the estuary (the place where the salty ocean water mixes with the fresh water from the river) they hang out for another few months and become smolts. During this time their body starts to change so they can live in the salty ocean water without causing the salmon any harm. Once they are fully ready, they head out into the ocean, where they are considered adult salmon.

Once out in the ocean, salmon will spend anywhere from 2-7 years swimming around, growing big and strong from eating tiny shrimp called krill. These krill are the reason that salmon meat is pink—they're also the same reason that a flamingo is pink! During these years, the salmon can swim all the way to Japan and back.

When the salmon decide it is time to mate and reproduce, they use their sense of smell to find their way back to the estuary at the end of the river they were born. This time they don't spend several months in the estuary adapting to the new, fresh water. Once they enter the estuary as a spawning adult they stop eating, and their only mission is to get as close to the spot where they were born as possible to reproduce.

Once they have made it back to the same place that they were born, female salmon dig a hole with their caudal fin (butt-fin) and lay their eggs. This nest is called a redd. Once the nest is laid, a male salmon swims by and fertilizes the eggs, and then the female uses her fin to cover the eggs back up. The male and female salmon stay near the nest until they die (remember, they haven't eaten since they entered the stream). By dying near their eggs, the parents are providing nutrients to the ecosystem that will help the plants, insects, and small fish the salmon will eat once they hatch as fry. They make sure that the baby salmon will have the food they need to grow big and strong and make it all the way to the ocean.

Activity:

- All students and staff must sanitize/wash their hands prior to activity
- Take the students around the playing field, explaining the game and assigning them roles at the same time. The roles are as follows:
 - Two staff/teacher are the turbine team. They will operate the jump rope which represents the turbines in hydroelectric dams. Students must run through the turbine without getting hit, one at a time (two if the turbine is large enough for them to run through 6 feet apart).
 - Choose four to six students to be predatory wildlife/fishermen. All predators must stand on a poly dot marker and cannot step off it during the game. Predators "catch" salmon by tapping them with a pool noodle. Be sure to tell students not to smack others with the noodle, or ever hit above the neck.
 - At the start of the game two students will be predators will be below the turbines.
 - Two students will be humans in fishing boats in the open ocean.
 - Two students are bears in the upstream portion of the course, "catching" salmon.

- o All remaining students are salmon. If at any point a salmon “dies” they must exit the game and stand on the sidelines next to the cone representing the area where they “died” (turbine, downstream, open ocean, upstream).
- Begin the activity with all the salmon in the spawning ground. The salmon then start their journey downstream. The first major hazard is the turbines at the dam. (*At most dams there are escape weirs to guide migrating salmon past the turbines.*) A salmon dies if it is hit by the turbine (jump rope). The turbine operators may change the speed at which they swing the jump rope.
- Once past the turbines, the salmon must get past some predatory wildlife.
- Once in the open ocean, the salmon can be caught by fishing boats. The salmon must move back and forth across the ocean area in order to gather four tokens. Each token represents one year of growth.
- Once the four tokens are gathered, the salmon can begin upstream. The salmon must get past the remaining predators to the fish ladder (3 hula hoops) and hop through the hula hoops to the other side.
- Once past the ladder, the salmon faces the broad jump waterfall, representing one of the natural barriers the salmon must face going upstream. Be sure the jumping distance is challenging but realistic. Staff will monitor the jump. If the salmon fails to jump the entire breadth of the waterfall, it must return to the bottom of the fish ladder and come through again.
- The activity ends when all players are either out or have reached the spawning ground.

Wrap Up/Discussion:

- Was the survival-mortality ratio of salmon in the game realistic for salmon?
- How did the students feel throughout the activity? Do salmon have a difficult life?
- Where did most of the salmon die?
- Where did the least number of salmon die?
- What would happen if all the eggs deposited made the journey successfully?

Post-trip Activities:

- Split students into two groups, giving them each a copy of [“Salmon with genes changed to grow faster will be on U.S. dinner tables”](#) (NewsELA). Assign each group as either the affirmative team (pro topic) or negative team (against topic) and have students develop a civil debate for each side to be held in your classroom. ([LS3.B](#), [MS-LS1-4](#))

- Have students research the different types of plants and animals in the San Joaquin River that are ultimately affected by the life cycle of a salmon and how their populations may change without the presence of salmon. ([MS-LS2-2](#), LS2.A)