Bounty of the Sea: The Salmon in Oregon

**Grades:** Adapted Activities for K-HS  
**Subjects:** Oregon History, Geography, Economics, Social Studies  
**Suggested Time Allotment:** Varies by grade level, 1-3 class periods

**Lesson Background:**

*Salmonid* fishes can be found in subarctic waters worldwide. However, for more than a century, “salmon” have been virtually synonymous with the Pacific Northwest. In fact, the Chinook salmon is the official State Fish of Oregon. Lessons on salmon are a good way of integrating science learning into a unit on the social and economic history of the state.

At the time of first Euro-American settlement, the salmon fisheries of the Pacific Northwest seemed literally inexhaustible. Millions of fish averaging thirty pounds and more made the annual spawning run up Oregon’s numerous coastal rivers. They were an important food resource for both Native Americans and the pioneer settlers. In fact, the fish were so abundant that people often kept only the choicest cuts of meat and threw the rest away. Many thousands were caught every year, but for a while it seemed as if all the people in Oregon would never be able to eat enough salmon to put even a dent in the overall population of the fish. But, by the 1860s, new inventions and improvements in food canning technology suddenly made it possible for Oregon fishermen to preserve their catch and transport it for sale to markets around the globe.

**Elementary Class Activity**

Group Brainstorming: SALTWATER VS. FRESHWATER HABITATS

1. Begin by telling the class you would like to have a group brainstorm of all the different places that water can be found in nature. As students share their ideas, write the words on the board. Make sure the list includes “river,” “stream,” and “ocean” – if these are not suggested by a student, after awhile the teacher should suggest them and write them on the board along with students’ choices.

2. After the list has grown to include ten or fifteen items, tell the class that you would now like to think about different *kinds* of water. Does anyone in class know the difference between *fresh water* and *salt water*? Of the bodies of water listed on the board, which are salty and which are fresh? Discuss. You might want to re-arrange the list into a chart on the board.
3. Now tell the class it is time to think of different kinds of animals that live in water. But, let’s also remember that not all kinds of animals live in all kinds of water. In fact, most kinds of animals prefer to live in either salt water or fresh water—moving between the two types of water would kill many types of animals. Many children in class will have visited a pet fish store at one time or another: remind them that these stores usually have different sections for pet animals kept in fresh water (such as goldfish and frogs) and pets kept in salt water (such as clownfish and corals). Can the class think of some other animals that live mostly in fresh water? How about some animals that live mostly in salt water? List these on the board.

4. Sooner or later, the discussion should turn to fish. The key here is to get the class thinking about different kinds of fish and their habitat preferences. In trying to decide whether ‘fish’ fits in the ‘freshwater’ or ‘salt water’ category, astute observers will note that some fish prefer to live in one kind of water, while other kinds like to live in the other. The teacher may steer the conversation by noting that a ‘shark’ or a ‘tuna’ are fish that always live in salt water, in the ocean. On the other hand, a ‘largemouth bass’ or a ‘catfish’ live inland, in bodies of fresh water. It depends on the fish!

5. In Oregon, we have a remarkable kind of native fish called the salmon. One of the things that makes the salmon so special is that it can and does live in both fresh water and salt water. As we have just been discussing: not many fish or other animals can do that!

6. At this point you may segue into a lesson on the basic lifecycle and natural history of the salmon. Many such lesson plans are available online. One excellent choice is National Geographic’s ‘Pacific Salmon’ lesson plan for K-2 classrooms.

7. As part of your salmon unit, you may wish to show to the class some old photographs and illustrations from Historic Oregon Newspapers, such as those here and here and here, in order to impress upon them that the salmon has been important to the economy and culture of Oregon for a long time.

**Middle School Class Activity**

**BASIC CHEMISTRY OF SALTWATER AND FRESHWATER**

You may wish to read as a class the 1911 Medford Mail article, ‘Uncle Sam Studies Traits of Salmon.’ This story details some of the earliest scientific experiments investigating the salmon lifecycle. Note that this is the very beginning of ‘fish tagging’—a practice still carried on by fisheries biologists in Oregon today. What does the class think of the experimental methods used by the 1911 scientists? Do their conclusions seem valid? You can use the library or internet to ‘check’ the findings of the 1911 scientists against the latest information from contemporary salmon researchers.

Learners who are old enough to handle simple laboratory equipment can explore in more depth the chemistry of seawater.

Explain to the class that the difference between sea water and fresh water is that sea water contains many more dissolved minerals and salts—not simply table salt (pure NaCl), but a number of chemical
ions as well (see below.) These dissolve invisibly in sea water, but you can still smell them and, most importantly, taste them. A glass of ice-cold sea water will not quench your thirst, because it is full of these salts and minerals.

Chemical Composition of Sea Salt – From Wikipedia

Sea salt is primarily composed of the following ions, listed in order of descending abundance by weight:

- **Chloride** (Cl\(^-\)) 55.03%
- **Sodium** (Na\(^+\)) 30.59%
- **Sulfate** (SO\(_4^{2-}\)) 7.68%
- **Magnesium** (Mg\(^{2+}\)) 3.68%
- **Calcium** (Ca\(^{2+}\)) 1.18%
- **Potassium** (K\(^+\)) 1.11%
- **Bicarbonate** (HCO\(_3^-\)) 0.41%
- **Bromide** (Br\(^-\)) 0.19%
- **Borate** (BO\(_3^{3-}\)) 0.08%
- **Strontium** (Sr\(^{2+}\)) 0.04%
- Everything else 0.01%

Although the salinity of sea water varies worldwide, the relative proportions of its constituent ions remain constant.

For relatively low cost, it is easy to test the differences between fresh and salt water in the classroom. Science suppliers and pet fish stores sell crystallized sea salt mix (about $15-18 for a '50 gallon mix' bag; it should last a teacher many years of this lesson) and a simple device known as a 'plastic swing-arm hydrometer' (about $8-10) that is used to measure the specific gravity and/or salinity of a water sample (two ways of measuring ‘saltiness.’)

With these supplies, you can have the students convert fresh water to seawater. Divide the class into 4-6 collaborative groups. Each group should be given a cup of the salt mix, a teaspoon, and a container of freshwater (i.e. from the tap)—just make sure water containers are large enough to dip the hydrometer. Water samples should be lukewarm (between 65 and 85 degrees Fahrenheit) in order to get accurate measurements from the hydrometers. Teacher should first give class instruction on taking a proper hydrometer use and reading (instructions will come with the instrument; it is easy). Then, have each group take a specific gravity/salinity reading of their freshwater samples. Have them record this number. Next, have them add a small amount of salt mix to their water samples (try more or less just a teaspoon.
first), then take and record another specific gravity reading. Have them keep adding salt to their water samples until they have achieved the average specific gravity/salinity of actual ocean water: that is, a specific gravity of between 1.020 and 1.025 (this ‘ideal range’ will probably be clearly marked on the hydrometer itself). You can make it a contest to see which group can be first to mix up a perfect batch of “sea water” without going over and making it “too salty” (i.e. specific gravity >1.025.) Activity will be easiest if each group has its own hydrometer to work with, but all groups can also share one hydrometer, if necessary.

The lesson may be further expanded if the teacher obtains testers for other water chemistry parameters, such as alkalinity, carbonate hardness, and pH—these are widely available from science suppliers and pet fish stores as ‘dip-strip’ tests that are particularly clean, easy-to-use, and safe in the classroom. Again, these are relatively inexpensive. Have students test and compare freshwater and mixed ‘seawater’ samples: which readings change when salt is added to water? How much? Which properties if any remain unchanged between the salt water and fresh water samples?

In Science classrooms or others doing extensive units of Life Science, this activity can be used as a ‘hands-on’ segue to lessons in the reproductive biology and bio-chemistry of anadromous fishes. Many such are available online. See especially Oregon State University’s ‘Salmon In The Classroom’ resource.

If your school is located near the Oregon coast, an interesting follow-up activity would be to use hydrometer(s) and water tests to take readings of ‘wild’ water samples collected at the beach, at the mouth of a coastal river, and at an inland creek or pond. Compare and contrast the chemical properties of water samples drawn from these various sources.

**High School Class Activity**

**GUIDED READING & RESEARCH**

For background on the early development of the salmon fishing and canning industry in Oregon, assign the class the following two articles to read:

“Value of Our Salmon Fisheries,” Salem Willamette Farmer, September 27, 1873

1900 Portland Oregonian feature article, ‘Now Comes the Salmon’

Questions: Where were Oregon’s earliest salmon canneries located? What were the racial and cultural demographics of the people who worked in the canneries? Were some workers treated differently than others? Who and why? What were the quantities of fish that were being caught and canned? What methods were used to catch them? What was the cash value of the catch in 1873? Where was the product (canned or salted fish) being sold? What major changes had occurred in the fishing and canning industry by the time of the 1900 article?

Next, the Teacher can guide the lesson to focus more closely on the impact of salmon fishing and canning on a representative Oregon community. For example, Astoria was one of the riverfront cities in
Oregon where a major salmon canning industry developed and flourished during the second half of the nineteenth century. Students can be assigned research of the Daily Astorian newspapers of this period. (Below are two excellent Astorian articles you might choose to have the whole class read together.)

1890 Astorian article, ‘The Salmon Industry—A Brief Sketch of the Business From Its Inception’:
http://oregonnews.uoregon.edu/lccn/sn96061150/1890-07-26/ed-1/seq-3/

1888 Astorian article about early OR salmon regulation policy:

Questions to guide their reading and research: When did the first salmon cannery open in Astoria? How many canneries were in operation ten years later? Who owned these businesses? How many people did they employ? What were the racial and cultural demographics of the people who worked in the canneries? What were the quantities of fish that were being caught and canned? How well was the product received in the worldwide marketplace? How did the editors of the newspaper and the citizens of Astoria view the local socio-economic effects of the fish canning industry? How much did they think about its long-term consequences?

Special attention can be given to the year 1885, the peak year for salmon canning on the Columbia River (579,000 cases produced). The catch would fluctuate wildly over the next few decades before falling into a period of steady decline after 1925. In addition to the pressures of overfishing, the salmon’s riparian breeding grounds had suffered damage due to the agricultural, mining, logging, and public sanitation practices of the time. Many factors were contributing to the decline of the salmon even before the construction of big hydroelectric dams on many of the Northwest’s rivers began in 1938.

By the time of the dawning of the 20th century, we find the beginnings of what might be called a ‘conservation ethos’ or early form of environmental consciousness. Expert scientists and ordinary people alike began to be concerned about the long-term sustainability of the salmon fisheries. In addition to pressure on the salmon population exerted by the commercial fishing industry, other factors began to emerge: the widespread disposal of sawdust and mining waste in rivers, the construction of dams, even predation by sea lions were now regarded as threats to the salmon.

Below are some articles that a Teacher may use in order to bring to light the first emergence of the “environmental” mode of thinking, which has grown to have much currency in contemporary Oregon, and indeed on the global stage.

1900 Portland Oregonian feature article, ‘Cradling The Chinook’

‘Plan To Blow Up Sea Lions,’ Coos Bay Times, June 18, 1914

‘Fish Supply Is Dwindling Fast,’ Klamath Falls Evening Herald, September 12, 1919

‘Game Conservation’, Klamath Falls Evening Herald, January 28, 1922