Living Dinosaurs

Background Information on the Fraser River:

The Fraser River was named after Simon Fraser (1776-1862) who explored the river in 1808 on behalf of the North West Company in search of a navigable route for fur trading. Simon Fraser believed that he was traveling on the Columbia River to its ocean outlet. It was another explorer, David Thompson, who later named the river after Simon Fraser.

First Nations people had lived along the Fraser River for thousands of years before Simon Fraser's arrival. Some of the archaeologists estimate up to 9000 years before. (A site under the Alex Fraser Bridge has been dated back that far).

The Fraser River starts as a trickle at Mount Robson (Headwaters) and ends in the Strait of Georgia in the Pacific Ocean. There are many tributaries that add water to the Fraser, including the Thompson River (22% of the total water flow).

The Fraser River is 1 375 kilometers long. If it was stretched out across Canada, it would span the distance between Vancouver and Regina, Saskatchewan. The Fraser River is the fifth largest river in Canada. It is less than 15 000 years old.

The characteristics and landscapes of the Fraser River change from the beginning of its journey to its end. As you exit the Headwaters and enter the Upper Basin region, the river's sediment load increases creating more turbulent waters with the water appearing grey or brown in colour. The river then passes through the Drylands with low vegetation as a result of little rainfall and hot temperatures. In the Canyon, the river is squeezed between the Coast and the Cascade mountain ranges increasing the speed and creating many impressive rapids.

The point at which the fresh water of the Fraser River meets the salty water of the Pacific Ocean is called the estuary, (also sometimes called "between land" by the First Nations people because as the tides ebb and flow, the estuary changes from land that is covered with water to dry land). Other estuaries include the mouths of great rivers such as the Amazon, the Nile and the Mississippi.

The Fraser River Estuary is as rich in its biodiversity as it is an ideal habitat for many organisms. A habitat can be defined as a place where an organism can get food, water and shelter. The major habitat types along the Fraser River include: brackish and freshwater marshes, salt marshes, tidal flats, sloughs, and flood-plain forests among others.

The Fraser River watershed is also home to 60% of BC's population, approximately 2.7 million people. S watershed is an area of land that drains all the water into one main river. The Fraser River watershed is also called a drainage basin, since it collects so much water and drains such a large area (25% of BC's area).

White Sturgeon:

White Sturgeon (Acipencer transmontanus)

White sturgeon are a primitive species of fish dating back to the time of the dinosaurs. Proof of their existence can be seen as in the fossil record as far back as 200 million years. Sturgeon have bony plates, similar to those found on dinosaurs, on their back and sides that they use as protective armor. They are grey to pale brown on their backs and pale grey to white on their bellies. The white sturgeon has a skeleton made up of cartilage rather than bone, unlike most other species of fish, leading scientists to believe that their ancestors were a type of prehistoric shark. In addition, their tail is similar in appearance to the tail of a shark. Barbels hang under the sturgeon's snout and help it to detect food. They have a protrusible mouth that is used to suck up food along the river bottom. Their mouth has no teeth, just strong gums.

Small white sturgeon feed on clams, mussels, shrimp, crayfish, insect larvae, aquatic worms, and fish eggs. At a larger size, they prey on fish such as eulachon and salmon.

White sturgeon can grow very large reaching lengths of over 6 meters and can weigh as much as 800 kilograms. They are the largest freshwater fish in North America.

Mature white sturgeon adults gather to spawn during spring and early summer and they migrate to fast flowing water. The females lay many small sticky eggs which adhere to rocky substrate. The females and males will release both their eggs and their milt (the sperm and seminal fluid) at the same time, a method of reproduction known as broadcast spawning. Larger females can release up to 4 million eggs and unlike many salmon species that spawn once and die, white sturgeon can spawn many times throughout their life. White sturgeon eggs are small and black in colour. Eggs hatch into larvae with a yolk sac, which is eventually absorbed. After about a month's time, the larvae metamorphose into juvenile sturgeon. Juvenile sturgeon reach sexual maturity between 15 and 30 years of age. Adult white sturgeon can live up to 150 years in age.

White sturgeon are found in three watersheds in North America: The Fraser, Columbia and Sacramento. The Fraser River is the only river in the world where white sturgeon still spawn on their own, without the assistance from hatchery facilities. However, their numbers have greatly declined in the past 100 years, so they are now listed as endangered with COSEWIC (Committee on the Status of Endangered Wildlife in Canada). Historic over-fishing of sturgeon on the Fraser River, especially for their quality meat and roe, has exhausted white sturgeon populations. Human impacts have altered white sturgeon habitats and have negatively affected their ability to survive and reproduce. Such impacts include: river drainage projects, dyking, gravel removal from side river channels, and hydroelectric dam construction on Fraser River tributaries.

Program Overview:

White sturgeon are a primitive species of fish dating back to the time of the dinosaurs. Proof of their existence can be seen as far back as 200 million years in the fossil record. They are the largest freshwater fish in North America. The Fraser River is the only river in the world where white sturgeon still spawn on their own, without the assistance from hatchery facilities. However, their numbers have greatly declined in the past 100 years, so they are now listed as endangered. By examining their life cycle and talking about the white sturgeon we hope to teach individuals how we can help these incredible fish.) Students explore the life cycle and habitat of the elusive white sturgeon through real specimens and a fun felt storyboard. Students also learn how people's actions can impact sturgeon in the Fraser River, fostering a sense of responsibility to the local environment.

This 90-minute program begins outside where students can see for themselves some of the different activities happening along the river.

Program Objectives

- To introduce the unique characteristics of the white sturgeon.
- To understand the importance of the Fraser River habitat to the white sturgeon.
- To learn about the anatomy and lifecycle of the white sturgeon.
- To discover some of the threats to the white sturgeon.
- To explore contributing factors to the endangerment of species.
- To investigate plans to protect current white sturgeon populations and to conserve the species.

Helpful Vocabulary

Barbels: a fleshy filament growing from the mouth or snout of a fish.
Conservation: preservation, protection, or restoration of the natural environment, natural ecosystems, vegetation, and wildlife.
Dredging: clean out the bed of (a harbor, river, or other area of water) by scooping out mud, weeds, and rubbish with a dredge.
Dyke: an embankment for controlling or holding back the waters of the sea or a river
Ecosystem: a biological community of interacting organisms and their physical environment.
Endangered: (of a species) seriously at risk of extinction.
Estuary: the tidal mouth of a large river, where the tide meets the stream.
Extinct: (of a species, family, or other larger group) having no living members.

Fry: (also referred to as the juvenile) the stage in a sturgeon's life before adulthood
Habitat: the natural home or environment of an animal, plant, or other organism.
Larvae: is the active immature form of the fish, hatched from the egg, that differs greatly from the adult
Milt: the semen of a male fish.
Population: all the inhabitants of a particular area.
Predator: an animal that naturally preys on others
Prey: an animal that is hunted and killed by another for food.
Scutes: a thickened horny or bony plate
Spawn: (of a fish) release or deposit eggs
Tributary: a river or stream flowing into a larger river or lake.
Watershed: an area or ridge of land that separates waters flowing to different rivers, basins, or seas.
Yolk Sac: a membranous sac containing yolk attached to the larvae of some fish.

In-Class Activities:

Here are some ideas to help prepare your class for the program, and to continue the learning back in the classroom.

Pre-Visit:

1. Get to know white sturgeon through a little math. The largest white sturgeon caught on record was 610 cm long, weighed 816 kg (1799 lb), and was an estimated 104 years old. How many of your students would it take to match this big fish?
    a. Use a scale or approximate guesses to work out how many students in the class it would take to weigh as much as this sturgeon.
    b. Use a measuring tape or measured length of string and see how many students it takes to span the length.
    c. Write down everyone's age and see how many students combined it would take to be as old as this sturgeon.
2. If you can find it, read *Tale of a Great White Fish: A Sturgeon Story, by Maggie de Vries and Renne Benoit*. This beautifully illustrated story takes the reader through this sturgeon's long life, and through the history of the area, as she witnesses all the changes to her habitat starting before the gold rush. Note: in the story, this sturgeon lives to be 177. There is no confirmed case of a white sturgeon living that long, but there is still much we don't know about these fish, so perhaps one did live that long.
3. Sturgeon evolved 245 to 208 million years ago, during the Triassic period. There are currently 27 different species of sturgeon on the planet, and they range widely in size, habitats and diet. The critically endangered Syr Darya shovelnose sturgeon, found in freshwaters in Kazakhstan, Tajikistan and Uzbekistan, is only about 30 cm long. The largest sturgeon is the beluga, found in the saltwaters of the Caspian and Black seas, can grow over 7 meters long. If you want to see what some of the other current sturgeon look like, see link (a). Remember, though, that these sturgeon have all been drawn the same size. We know that they are all very different sizes.
   This family of fish have seen a lot of changes in their millions of years of existence. Compare and contrast their lives from when they first evolved, to now, by making two drawings, each with a sturgeon in the foreground. The first should show a sturgeon in the Triassic era, with Triassic plants and animals in the background. Use video (b) to reference some of the other animals that were alive at that time. Then, draw a white sturgeon in the Fraser River today, with the Vancouver Metro Area in the background (including buildings and industry and people, etc.) and modern animals on the land and in the river.
    a. https://i.pinimg.com/originals/d5/47/1f/d5471f2d54add52644d13e022d5a395d.jpg
    b. https://www.youtube.com/watch?v=lHVndCaFthk

Post-Visit:

1. White sturgeon are starting to recover, but they are far from being a healthy population again. Practice your persuasive writing skills by composing a letter to an organization or group of people that are harming white sturgeon, or aren't helping white sturgeon enough. You could write to imaginary organizations, or you could do some research and find real groups polluting the river, developing riverbanks, or otherwise harming white sturgeon habitats. If you write to a real organization, consider actually mailing your letters!

2. White sturgeon were first put in danger by the overfishing of the European colonizers of the 1800s. Continue learning about the challenge of overfishing with this online simulation. In this game (a), players control a fishing vessel trying to catch the most fish possible, while leaving the fish populations in the ocean healthy. This is made more challenging by the presence of other boats, with varying fishing strategies. Read through the game instructions to get an idea of how the simulation works. After students play, discuss what strategies worked best for catching the most fish, for keeping the ocean healthy, for achieving both at once.
   If you'd like to learn more about sustainable fishing in general, try these two videos. The first, (b), was put out by the Monterey Bay Aquarium, and describes how a consumer can differentiate sustainable and unsustainable fish. At one point it mentions some American grocery stores, but the rest of the video is universal. The other, (c), is from the Marine Stewardship Council, describing the three criteria a commercial fisher would need to become part of their program. Both videos are short and animated.
   a. https://www.ecoocean.de/
   b. https://www.youtube.com/watch?v=6ps0truARKs
   c. https://www.youtube.com/watch?time_continue=2&v=qEE3iUIbm7U&feature=emb_title
3. If you've become hooked on this amazing fish, check out the Fraser River Sturgeon Conservation Society. They are doing amazing work, and have their own FRSCS Sturgeon Education Program you can participate in.
   a. https://www.frasersturgeon.com/
4. In the program, we touched on sturgeon caviar, but didn't get a chance to talk very long about it. Below are two videos to help explore this topic a bit further. The first (a) is a short, silly video, showing kids trying caviar for the first time. The second (b) is a 13-minute video all about a sustainable caviar farm in Italy. Viewers get a tour of the facility, meet some sturgeon, see caviar being harvested (warning, there is a brief moment where we see the eggs being taken out of a dead sturgeon), learn about how caviar is prepared and then tasted. To help make the viewing more active, ask students to take notes during the video, and then turn their notes into a tri-fold brochure all about farmed caviar. Their brochure should include things like: what caviar is, how it's farmed, how to keep it sustainable, and how the sturgeon are cared for. Alternatively, if they disagree with the idea that the sturgeon are being cared for, or that farmed caviar is sustainable at all, they could make their brochure about the dangers of the caviar industry, including argued critiques and information about what sturgeon actually need to live healthy lives.
   a. https://www.youtube.com/watch?v=4cNcDXuMvAA
   b. https://www.youtube.com/watch?v=yqX5jVGW8-M