

## Introduction:

Salmon populations have been in decline since settlers took over the river valleys once inhabited by Native Americans. Dam building in the late 1800s and into the 1900s solidified the decline of the salmon by creating dams that blocked passage to massive amounts of habitat and their original spawning grounds. Salmon are a unique species in that they are anadromous. When dams are constructed, salmon not only lose their habitat, but juvenile salmon moving downstream can die from the turbines and stress the dams cause. Not all salmon decline is attributed to dams though, pollution of waterways, and overfishing as also major factors in the salmon dilemma. 4, 15, 18



Ice Harbor Dam on the Snake River, 6

Grand Coulee Dam, 16

Chief Joseph Dam, 3

## Dams

There are over 79000 dams in the Army Corps of Engineers National Inventory of Dams in the United States; over 400 of those dams are located in the 250,000 square mile Columbia River Basin, including some of the largest, such as Grand Coulee. The dams provide low cost electricity, flood control, irrigation, navigation aids and recreation. There are 18 dams, 14 of them hydroelectric on the main stem of the Columbia, and overall the basin generates 21 million kilowatts of power. Salmon migrating upstream have thousands of miles of habitat blocked off thanks to the Chief Joseph Dam on the Columbia, and the Hells Canyon Dam on the Snake River. Chief Joseph Dam blocks over 1100 miles of Columbia River habitat alone. 4,5,11

# The Effect of Dams on Salmon Migrations and Populations

The purpose of this poster is to demonstrate the effects dams have on wild salmon populations, especially in heavily effected areas such as the Pacific Northwest.

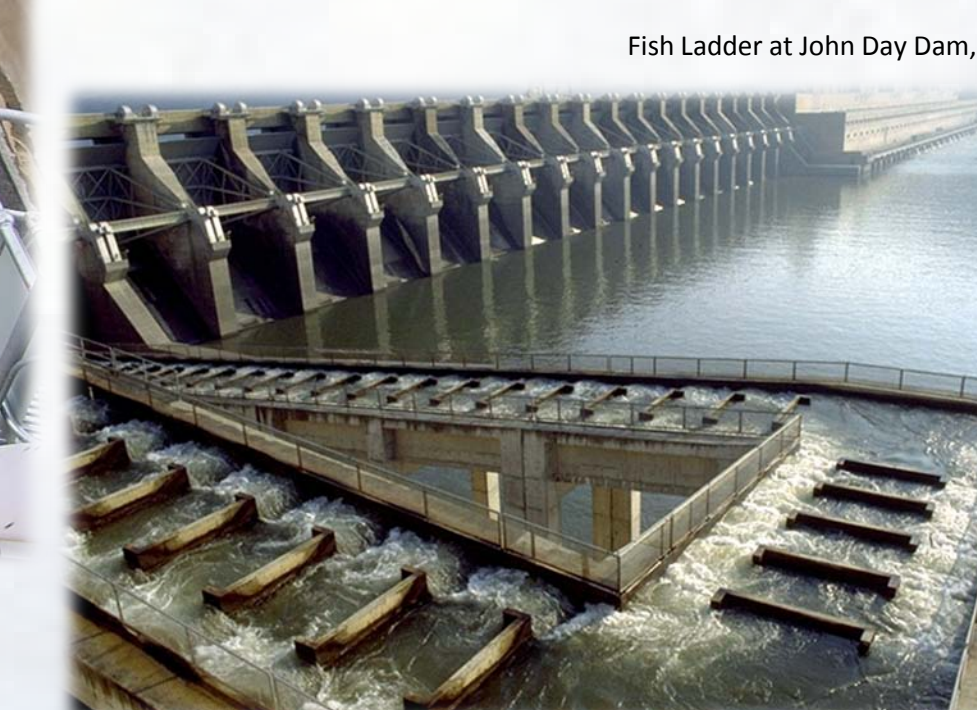
## What are dams doing to the salmon?

When the salmon are born, they stay in their home stream or river anywhere from six months to three years; from that point they begin their journey to the ocean where they will live their adult life. This is where the problems begin.

- Juvenile salmon are faced with the task of swimming down stream, through the dams.
- Originally, the route downstream was going through the turbines. Going through the turbines killed many of the young salmon, and stunned many others, making them easy prey on the other side.
- Rivers are also used heavily for irrigation. Smaller rivers can dry up during the summer months which dry up salmon habitat and any salmon eggs that are in the sediments.
- Dams deprive rivers of their sediment load, which is what salmon depend on to lay their eggs, without adequate sized sediments, salmon either won't lay eggs, or will swim until they find a sufficient location.
- Migration times have been drastically increased for juveniles moving downstream. The two-three week journey now takes almost 2 months, or more. The reservoirs created from the impoundment of water slow the usually cold, fast flow and alter the temperature of the water. This make the young fish easy prey, and even stops the urge to migrate in some. 5, 8, 17, 18, 21



Fish Elevator in Australia, 10



Fish Ladder at John Day Dam, 7

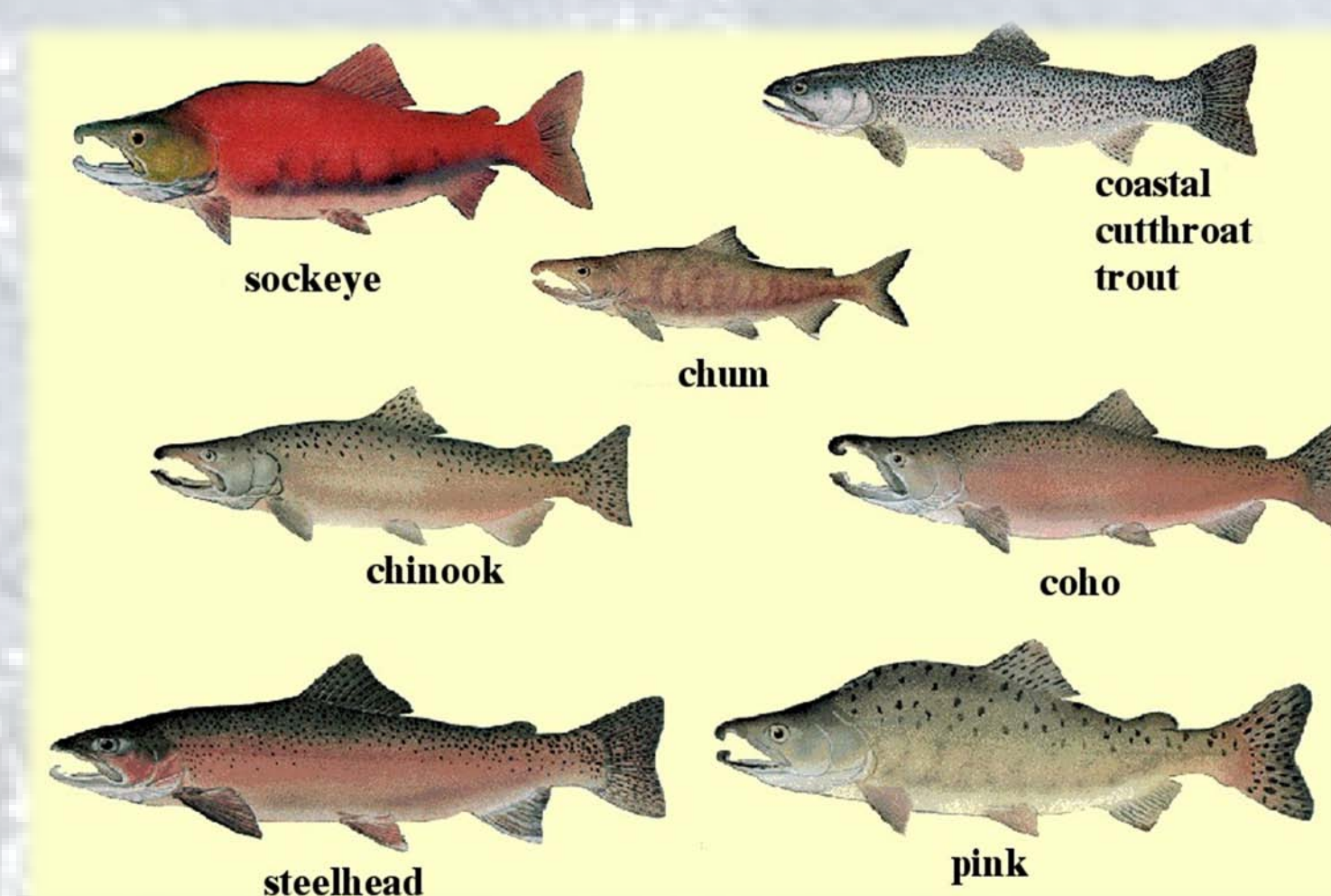
## What are dam operators doing to help fix the problem?

- Dams in service today are required to have fish passage in order to get relicensed for operation. Obviously this is not possible for all dams so hatcheries are created to mitigate the lost salmon
- Fish ladders are a common and effective tool for mature salmon migrating upstream
- Juvenile bypass systems are also being installed so that the young salmon wont go through the turbines, rather they will flow into the bypass and then into the spillway
- Fish elevators are used to carry fish over taller dams. Fish gather in a collection bin and are then raised over the dam. 21

The deep reservoirs resist temperature fluctuations more than the natural rivers do. Salmon thrive in temperatures below 68 degrees, but above 77 degrees can kill them. A study displayed this phenomenon on four dams in Washington and Oregon. The resulting measurements were that in the summer, temperatures were unseasonably cold, and in the winter, they were warm, which caused the fish stress. Such temperature fluctuations can cause development problems in juveniles. 1

## Atlantic Salmon

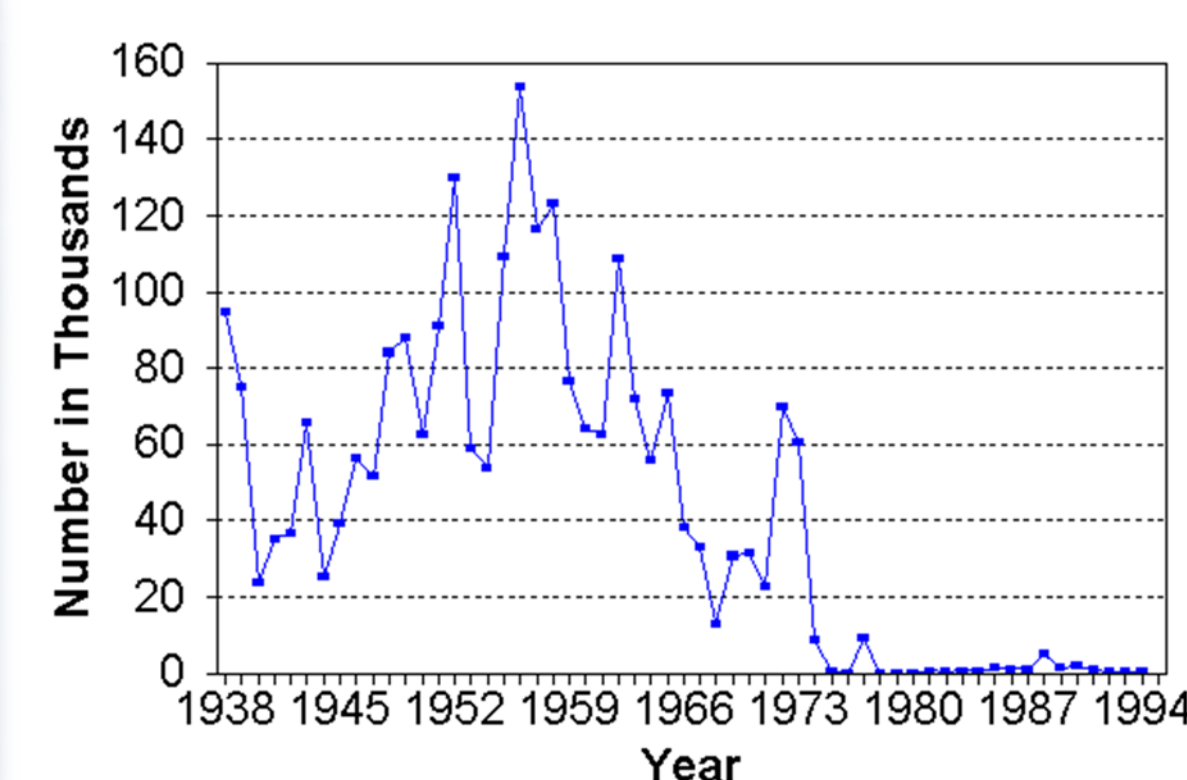
There is only one species that lives on the east coast, *Salmo salar*. Their historic habitat was any river north of the Hudson river, however currently only 11 rivers in Maine support wild salmon populations. Some land locked runs have evolved to be non-migratory. They were listed under the Endangered Species Act in 2000, and all 11 wild salmon rivers have ESA protections. 2



## Pacific Salmon

There are 5 varieties of salmon found in the Pacific Northwest: the Sockeye, the Chum, the Chinook, the Coho, and the Pink. Of these species, 27 runs are listed as endangered, and many more as threatened. These salmon, are born in rivers, and anytime after six months make their journey to the ocean where they live their adult lives. They end their life by swimming the hundreds or thousands of miles back up to their home stream. 19

Columbia River Spring Chinook Catch



## Conclusion:

Salmon rates across the country have been in decline due to various reasons, dams being only one major factor. With protections in place for the salmon, some runs have seen record numbers in recent years, such as the Spring Chinook with 326,176 which is the highest recorded level since the dam was built. While Atlantic and the Pacific salmon populations are still endangered, protections are being enacted to help them in many ways, such as the installation of fish ladders. The salmon may never make a solid comeback until dams are removed, as was the case in Maine with the removal of the Edwards Dam on the Kennebec River. 9, 12, 20