

FISH FACILITIES

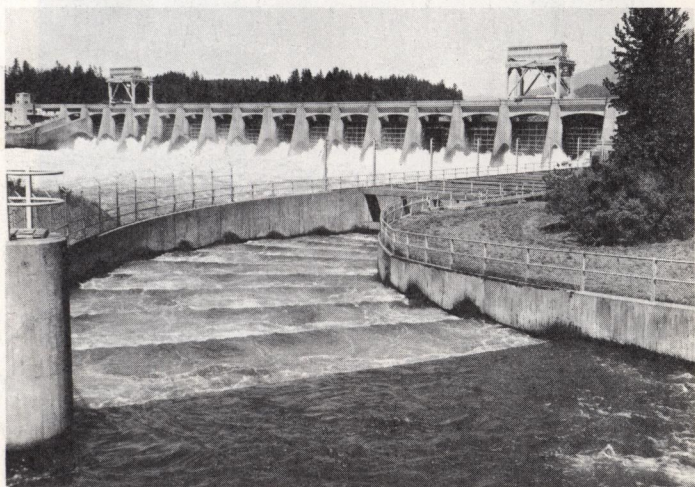
on the Lower

COLUMBIA and SNAKE

RIVERS

at

Corps of Engineers' Projects



BONNEVILLE DAM FISH LADDER



FISHERIES RESEARCH

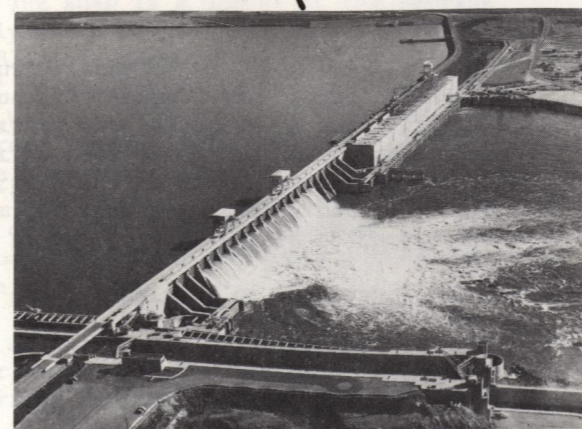
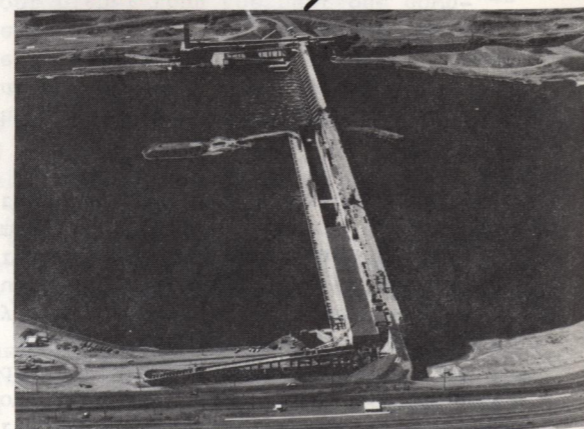
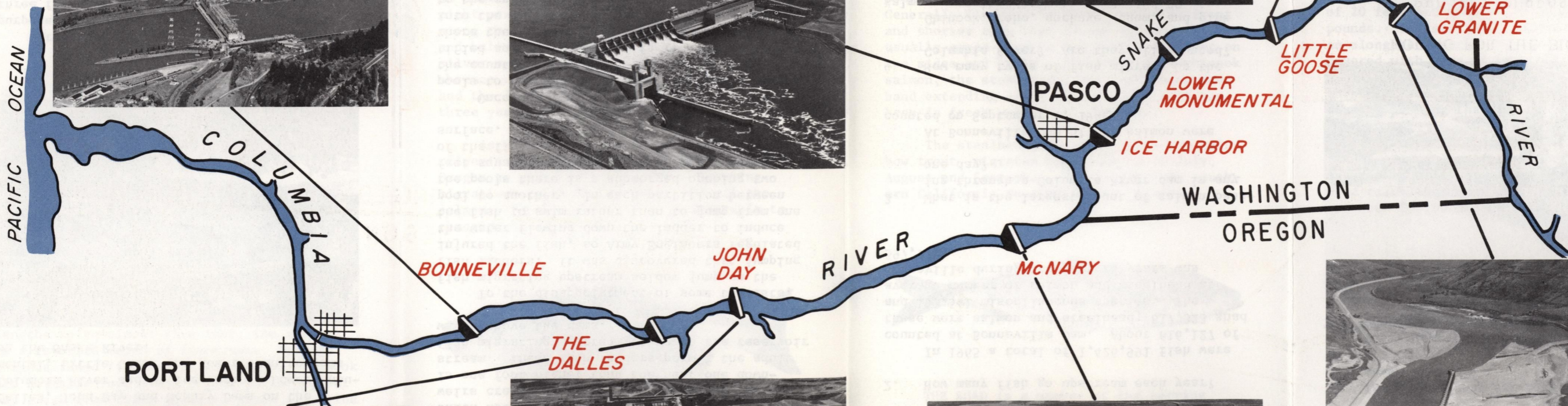
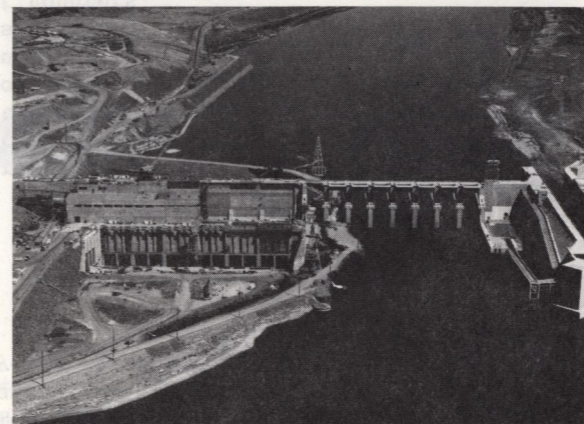
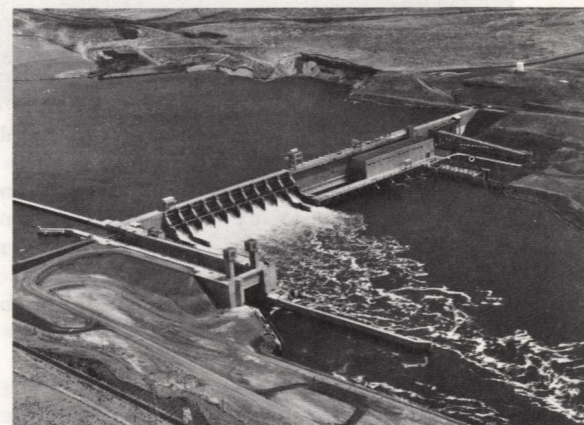
Through its fisheries engineering research program, the Corps of Engineers obtains engineering and biological information which enables it to design, construct and operate fish facilities at the dams efficiently and economically.

Corps fisheries biologists conduct experiments to determine ways to improve the fish collection and passage, and aid small fingerlings on their way to the sea. The Corps of Engineers also finances fish research by other agencies and has constructed and now

maintains fish hatcheries on Columbia River tributaries which are operated by state agencies and Federal fishery agencies.

Other agencies actively engaged in fisheries research on the Lower Columbia and Snake Rivers are the Oregon State Game and Fish Commissions, the Washington State Departments of Fisheries and Game, and the U. S. Fish and Wildlife Service's Bureaus of Sport Fisheries and Wildlife and Commercial Fisheries.

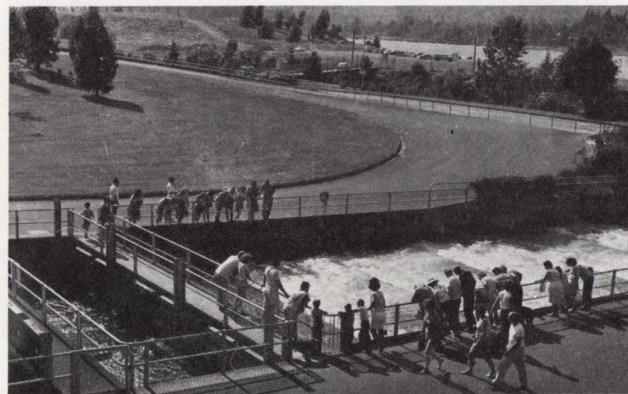




FISHWAYS

Anadromous fish such as salmon and steelhead spend a portion of their life at sea but must have access to their spawning grounds in the rivers and streams in order to complete their life cycle and perpetuate their kind.

To give positive assurance of the upstream passage of fish on the Columbia and Snake Rivers, the U. S. Corps of Engineers has constructed fishways at Bonneville, The Dalles, John Day and McNary Dams on the Columbia River and at Ice Harbor, Lower Monumental, Little Goose and Lower Granite Dams on the Snake River.



TOURISTS AT FISH LADDER

At Bonneville Dam, the first multiple-purpose project on the main stem Columbia, three fishways were constructed, each one consisting of a collecting system, a fish-ladder and fish locks. Bypasses were also provided for the downstream migration of fingerlings.

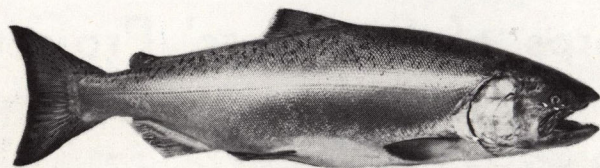
The Dalles, John Day, McNary, Ice Harbor and Lower Monumental Dams, each have two fish ladders and a powerhouse collection system. Little Goose and Lower Granite Dams have similar collection systems but a single ladder at these projects facilitates upstream passage.

All of the projects maintain fish counting stations.

Fish Facts

Several kinds of fish common to the Columbia River are salmon, steelhead trout, sturgeon, shad and lamprey. Together they comprise over 90 percent of the fish passing Bonneville Dam--the first downstream project on the river.

Five species of salmon native to the Columbia system are the chinook, the coho, the sockeye, the chum and the pink.



THE CHINOOK SALMON, also known as king, spring and tyee, is recognized as king of salmon. A robust, deep bodied fish with lengths up to almost five feet, the chinook is a favorite catch of fishermen. Average weights range from ten to 45 pounds. Chinook are normally four years old at maturity, but may range from three to seven years old. The chinook's back is greenish in color, fading to silver on the sides and belly. Profuse black spotting appears on the back, dorsal fin and both lobes of the tail. As with all Pacific salmon, spawning fish turn darker, especially the males, which are muddy dark red, almost black in color.

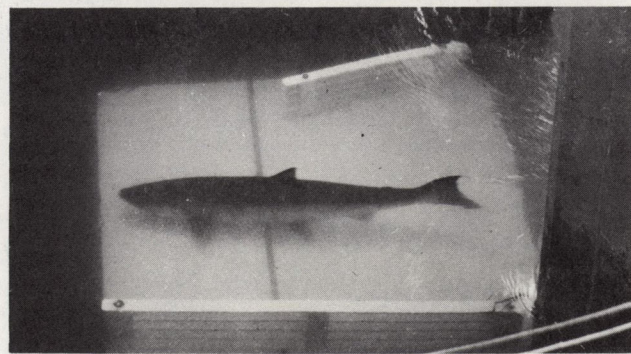
Although the large runs are in the Columbia River, the chinook salmon is found from central California to Alaska and across the Bering Sea to Japan. In general, two spawning migrations occur; one in the spring and the other--the largest--in the fall.

Migrating fish are attracted to the large flows of water coming from the powerhouse and on occasion the spillways. The numerous fishway entrance orifices are strategically located adjacent to these major water courses to take advantage of this natural reaction in the collection of the fish from the river. Once in the collection system, the fish move via transportation channels to the fish ladders.

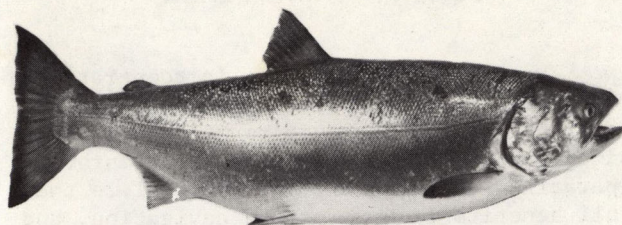
Each fish ladder essentially consists of an inclined flume from 24 to 40 feet wide in which are installed a series of weirs. These weirs create successive pools each of which is one foot higher than the next one downstream. These fish ladders permit the adult fish migrating upstream to reach the reservoir water above the dams.

To the disappointment of some tourists, fish migrating upstream seldom jump up the fish ladders. It was discovered that jumping injured the fish, so Army Engineers regulated the water flowing down the ladder to induce the fish to swim rather than to jump from one pool to another. In each partition between the pools there is a submerged opening two feet square through which a large proportion of the fish swim without even rising to the surface.

Once the fish have moved through the pools to the top of the dam they pass through the counting station where they are identified and their passage is recorded. From there they pass through the fishway exits into the reservoir to continue their migration to the spawning grounds.

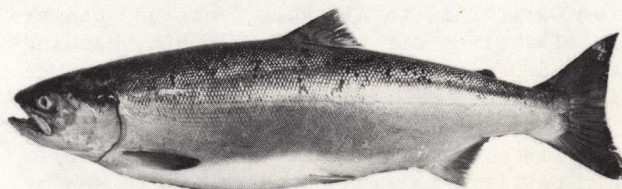


FISH OVER COUNTING BOARD



THE COHO SALMON, also known as silver, is smaller than the chinook averaging about eight pounds in weight. It is metallic blue along the back, fading to silver on the sides and belly. Often confused with chinook, silver salmon are distinguished by the absence of black spotting on the dorsal fin and the lower lobe of the tail. Coho are three years old at maturity.

As wide ranging as the chinook, the silver is predominantly seen from southern Oregon to southeastern Alaska. Spawning migrations occur in the fall. Of all the salmon, the silver is the most adaptable to changing conditions.



THE SOCKEYE SALMON, also known as blue-back and kokanee (landlocked), is a medium sized salmon weighing up to four pounds. Its back is green-blue with silver sides and belly. It has no black spotting. Columbia River sockeye are normally four years old at maturity.

Spawning only in streams having lakes at the headwaters, the sockeye is common from the Columbia River north to northern Alaska. It normally migrates up the Columbia in June and July.

QUESTIONS AND ANSWERS

1. How far upriver do the fish go to spawn?

Up the Columbia River to Chief Joseph Dam 545 miles from the river's mouth, into Canada via the Okanogan River system, up the Snake River to Hell's Canyon Dam and into the headwaters of such major Snake River tributaries as the Clearwater, Grand Ronde, Salmon and Imnaha Rivers.

2. How many fish go upstream each year?

In 1965 a total of 1,426,991 fish were counted at Bonneville Dam. About 616,127 of these were salmon and steelhead; 617,323 shad and 193,541 miscellaneous species. The average number of salmon and steelhead at Bonneville during the past 28 years was 597,779.

3. What is the largest count of salmon passing through a Columbia River dam in any one day?

At Bonneville Dam 51,082 salmon were counted on September 9, 1942.

4. How many types of fish migrate up the Columbia River? Are they all counted?

Chinook, coho, sockeye, chum, and pink salmon; steelhead trout; shad; and 30 miscellaneous species of fish pass over the dams. They are all counted.

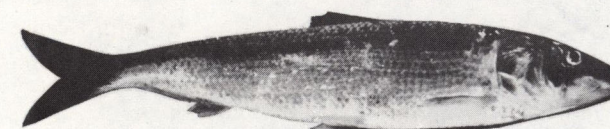
5. Exactly how are the fish counted?

All of the fish pass over a white counting board located at each fish ladder. This board is placed in a narrow opening through which all of the fish must pass. The water on top of the board is shallow enough to allow the counters, who are trained in fish identification, to observe and classify the passing fish. Women, incidentally, make the best counters.



THE STEELHEAD TROUT is much smaller than most salmon, averaging from seven to nine pounds and up to three feet nine inches long. Generally its head is more rounded in front and shorter than that of the salmon. It is usually green-blue on the back and silver on the sides and belly. Spotted like a chinook salmon, the steelhead trout also has a red band extending along its side after it has been in fresh water for some time.

The steelhead, which is a sea-run rainbow trout, migrates most heavily in July, August and September. It ranges from southern California to southeastern Alaska.



THE SHAD is a member of the herring family which was introduced to the West Coast in 1871. It appeared in the Columbia River in about 1876. Native to the Atlantic Coast, the shad weighs an average of two to six pounds and rarely exceeds 30 inches in length. It has a single spineless dorsal fin and a forked tail, and the body is deep and compressed with five or six round black spots on the sides. The back is bluish and the sides and belly are silvery white.

An anadromous fish, the shad enters fresh water to spawn, with the largest migration occurring in July. On the Pacific Coast the shad is common from San Diego to Alaska.

6. What is the reason for counting fish?

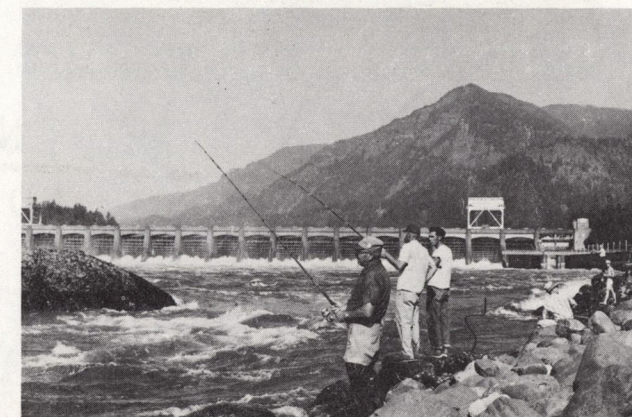
The number of each type of fish that passes through the counting station is recorded. This census is an inventory of the fish resource on which wise conservation is based.

7. How do the fingerlings or juvenile fish get downstream?

Through the spillway gates, the powerhouse turbines, and other water passages.

8. Is it true that salmon die after they spawn?

Yes. However, steelhead trout do not. They may spawn more than once.

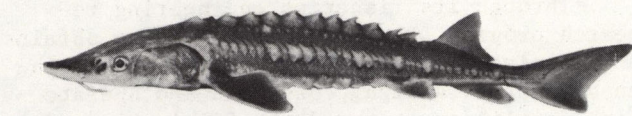


HOPING FOR THE BIG ONE

PROJECT PURPOSES

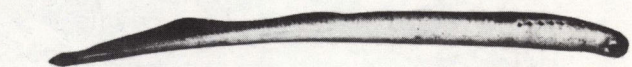
The primary authorized purposes of all these projects are navigation and power generation. John Day Dam also provides some flood control. In addition to facilities for those purposes, measures to prevent damage or loss to fish and wildlife populations represent a major cost item in the construction of these projects.

Corps of Engineers' planning for conservation, development, and use of water resources always includes consideration of fish and wildlife resources.



THE WHITE STURGEON, largest freshwater fish in the Columbia River, reaches lengths of 20 feet and weights in excess of 1,200 pounds. It is a long, narrow-bodied fish with an elongated snout. The head and back are covered with rows of bony plates. Dark gray in color, the sturgeon has remained relatively unchanged since its ancient origin. Few are counted passing the dams.

The sturgeon seldom spawns before reaching an age of 15 years. A bottom feeder, it apparently will eat almost anything available. Some reach ages over 80. Sturgeon range from northern California to Alaska.



THE LAMPREY is not a true fish since it lacks jaws and paired fins. The mouth is circular and designed for grasping and sucking. It has a long eel-like body up to 30 inches or so in length, and is dark brown to almost bluish black. In salt water it is parasitic, attaching itself to various fish.

It normally ascends the Columbia River in greatest numbers in July and August. The lamprey is often erroneously called an eel or lamprey eel. Lampreys are highly esteemed as food in Europe. They are the primary food of the sturgeon in the Columbia River.

FISHERY IMPROVEMENT

The Corps of Engineers, in cooperation with state and Federal fishery agencies, is constantly striving to improve the Columbia River fishery through research and improved operating techniques so man may realize the full benefits from power and navigation, and at the same time continue to enjoy the river's recreation capability and valuable fish resources.

WHY MAINTAIN FISH RUNS?

The fisheries resources of the Columbia River have long been recognized as valuable for recreation and commercial purposes. Sports fishing on the Columbia and its tributaries grows in popularity with residents and tourists each year, while commercial fishing--especially for salmon--is an important regional industry.

It may be surprising to some that most of the salmon produced in the Columbia Basin are actually harvested in the Pacific Ocean from California to Alaska. Sport and commercial fisheries off British Columbia, Washington and Oregon account for the preponderance of the catch.

Since the dams on the Columbia River form barriers to fish on their way to sea or to their spawning grounds upstream, the Corps of Engineers has provided fish ladders and other fish facilities to enable the fish to pass.

These facilities in addition to supplemental fish hatcheries have maintained, and in some cases have improved, the fish runs. In this way the survival of this important resource is protected.

Prepared by:

*U.S. Army Engineer District, Portland
628 Pittock Block
Portland, Oregon 97205*