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U.S. ARMY CORPS OF ENGINEERS
NORTHWESTERN DIVISION

CONGRESSIONAL MEETING on
IMPEDIMENTS TO RETURNING ADULT SALMON
COLUMBIA RIVER BASIN
Pendleton, Oregon
February 21, 2006

Introduction

Members of Congress and distinguished guests, I am pleased to provide information on U.S. Army Corps of Engineers (Corps) activities for Columbia River Basin salmon and steelhead stocks listed under the Endangered Species Act. We appreciate the continued support of Congress and the Northwest delegation for salmon protection and recovery. This public hearing today is important, as it gives us a chance to consider all that we have accomplished over the decades.

The hydro system has long been recognized as an appropriate area for focusing efforts to improve salmon survival. But it is just one part of the life-cycle and, frankly, we have made so much progress that further improvements at the dams for adult and juvenile fish will be measured in small increments of survival gains. We need to keep working on the hydro corridor, but it also makes sense to look at whether the same kind of investment in the other Hs—habitat, hatchery, and harvest—could bring bigger dividends. Recovery will continue to be an All-H focus, and it's appropriate to be thinking hard about where we can do better and make the most gains.

The Corps and Bureau of Reclamation operate the Federal Columbia River Power System (FCRPS) dams in concert with Bonneville Power Administration which markets power produced at the dams. I would like to note that we work in partnership with the other Federal agencies in the region, and with a variety of technical and policy input from Tribes, States, and others; salmon protection and recovery is very much a regional effort.

Adult Passage

Adult fish ladders at the dams have been very successful at allowing returning fish to swim past the dams. All of the lower Columbia and Snake dams have at least one adult fish ladder. Over the years we have made improvements to the ladders and through research on adult passage we know that survival on a per project basis is about 98 percent for each "evolutionarily significant unit," or ESU, of listed salmon and steelhead migrating through the Corps Columbia and Snake River dams. NOAA Fisheries concluded in the 2004 biological opinion on hydrosystem operations that "adult survival through the FCRPS is similar to survival under unimpounded conditions in the Snake and Columbia Rivers."

The Corps and our partners in the region need to focus attention on four areas: 1) providing adequate operation and maintenance of existing dam passage facilities; 2) addressing and accounting for adult fallback through the dams in hydro operations; 3) considering the potential

effects of hydro system passage on adult spawning success; and, 4) monitoring and managing predation by marine mammals.

Our operation and maintenance of adult facilities at the dams is reasonably straightforward and uncomplicated. Continued progress means maintaining certain features at the dams for adult passage systems, such as auxiliary water supply systems for the fishways. What is complex is that the systems are aging, and competing demands of a constrained budget makes it increasingly difficult to perform the needed operation and maintenance. Continued funding for operation and maintenance along with the Bonneville Power Administration shared costs will be essential to further progress of salmon protection and recovery.

In recent years, technology for monitoring adult passage has improved and allowed us to better monitor adult passage patterns, timing and other behavior at the dams. And we are able to make operational adjustments at several dams to better optimize conditions for adult migration. For example, we now have adult Passive Integrated Transponder, or PIT, monitoring capability at Bonneville, McNary, Ice Harbor and Lower Granite dams.

One concern we are addressing is "fallback," where adult fish travel back through the dam after exiting the ladder above the dam. We know that fish can "fall back" over spillways, through juvenile passage systems, or through turbines at the dams. The rates of fallback vary among species, individual dams and with operating conditions. This is normal behavior for fish moving through the Columbia River, that is, fish move up and down various reaches before returning to natal streams or hatchery of origin. However, it is important to minimize any adverse effects of downstream passage at the dams. Fallback through turbines can cause high mortality, whereas fallback over spillways is relatively benign. As an example, The Dalles Dam has an ice and trash sluiceway at the powerhouse, but no juvenile fish bypass facility. Operation of the sluiceway can be an important strategy for fallback. Based on analysis of available data, we are currently working with the region to determine the advisability of continuing to operate the sluiceway late in the adult passage season (through November) in view of steelhead passage at that time of year. Although there is a tradeoff in energy opportunity cost with water that goes through the sluiceway, there is potentially a significant benefit in terms of fallback survival.

Consistent with the 2004 biological opinion we are evaluating spawning success of adults to better understand the role of hydrosystem passage and other environmental conditions that may affect spawning success. A study is continuing for spring Chinook in the South Fork of the Salmon River. Results to date indicate that fish on the spawning grounds have adequate energy reserves to successfully spawn. Research is also continuing on adult straying – a behavior in which fish migrate into rivers and streams which are not of their natal origin – and in developing solutions to technological and logistical challenges for accurately assessing straying.

Pinnipeds

In 2004, for the first time, a sea lion entered the adult passage fishways, either in search of fish or just exploring. For many years sea lions have been swimming nearly 140 miles up the Columbia River to Bonneville Dam, during the spring migration of salmon, steelhead and other anadromous fish. Generally arriving in mid- to late-February, the predominantly male California sea lions eat to gain weight and energy in preparation for the spring mating season in Southern California in late May and June. The amount of fish eaten by sea lions has increased every year

since studies were undertaken by the Corps, from 0.4 percent (1,010 fish) of the total spring salmon run in 2002, to 3.4 percent in 2005 (2,920 fish). Corps staff observations estimated that some 50 to 60 fish were eaten per day by the sea lions near the dam in 2005.

But in 2004 the new behavior surfaced and by 2005 a few of these animals had learned to find and enter the fish ladders at Bonneville Dam. We are working with the National Marine Fisheries Service and Oregon and Washington departments of fish and wildlife to address this new challenge. We are using a variety of harassment techniques that have worked elsewhere (above water pyrotechnics, underwater acoustics, rubber bullets, rubber tipped arrows, and others) and this year we're installing Sea Lion Exclusion Devices, or SLEDs. The SLEDs consist of individual gates at the entrances to the dam fishways that will exclude pinnipeds but allow fish passage. Each gate is between 10 and 15 feet wide and 30 to 36 feet tall, and weighs over 10,000 pounds. They are designed to withstand fatigue, hydraulic loads and sea lion impact. We will continue to work with our Federal and State partners to address the sea lion issue.

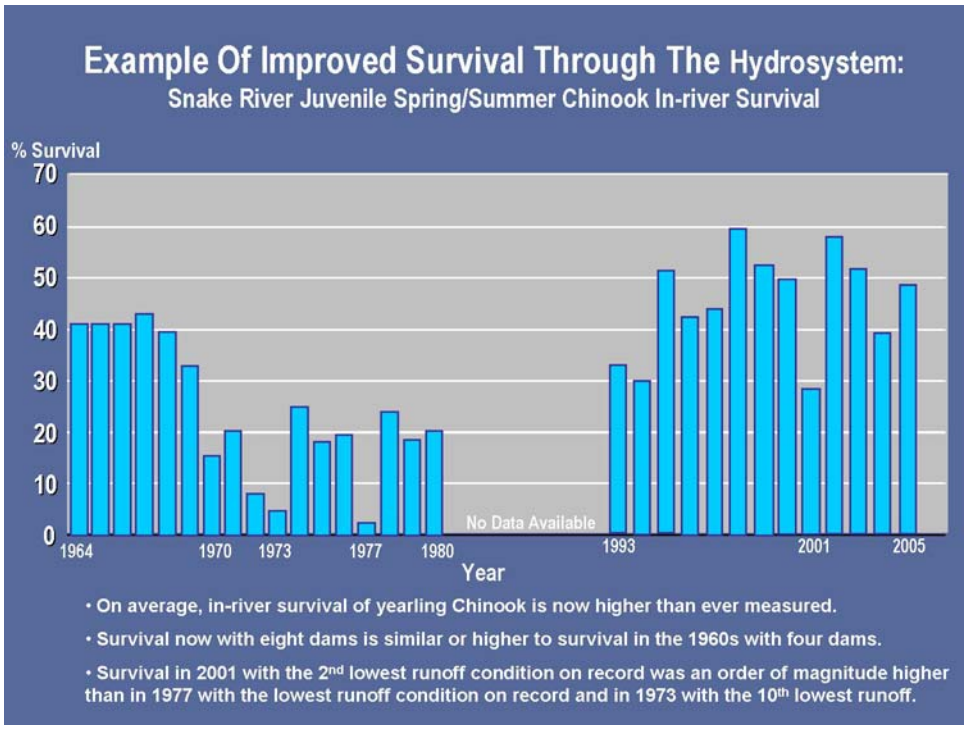
Juvenile Passage

While the focus of this public meeting is "impediments to adult survival," it is important to give a sense for the success we have had with getting the juvenile fish through the dams and reservoirs on their downstream migration. It may not always be obvious when we give due thanks to ocean conditions for delivering healthy adult runs, that the first step in getting a good return is to get an abundance of juvenile salmon and steelhead to the ocean.

Over the past several decades, juvenile survival past the dams has improved dramatically. NOAA Fisheries data (see bar chart) indicates that in-river spring/summer Chinook survival has improved to the point that it is now comparable to that of the 1960s when there were only four dams in the lower Columbia and Snake rivers. And in 2005, we were able to get encouraging preliminary information on subyearling fall Chinook survival.

Juvenile fish migrate past the dams by several routes: through the turbines, through juvenile bypass systems, through spillways, or by collection and transport in barges or trucks. Turbine passage is often considered to be the least desirable juvenile bypass route, with a survival rate of 85 to 95 percent. Bypass systems and spill are meant to divert fish away from the turbines. Bypass and spill survivals of 95 to 99 percent have been demonstrated at many dams. Juvenile fish bypass systems at the Corps lower Columbia and Snake river dams guide fish away from turbines by means of submerged screens installed in front of the turbine intakes. As fish follow currents down toward the turbines, the screens guide the fish back up to bypass channels in the dam. The fish are then either bypassed back out to the river below the dam, or they may be loaded into barges or trucks for transport.

According to data from NOAA Fisheries, in-river survival through the eight dams for lower Snake River spring-summer Chinook migrants over the past several years ranges from 30 to 60 percent depending on water conditions and other factors.



The Corps has operated a juvenile fish transportation program since the 1970s, to reduce the number of dams and reservoirs juvenile fish have to negotiate in their migration to the ocean. Juvenile salmon and steelhead collected in the bypass systems at four lower Snake and Columbia river dams (Lower Granite, Little Goose, Lower Monumental and McNary) can be transferred into specially designed barges and trucks for transport past the remaining dams to a release point three to five miles downstream of Bonneville Dam. The survival rate for transported fish is about 98 percent to point of release, although ongoing research will better determine any delayed effects after the fish are released back into the river and if these effects can be minimized.

Recent efforts have focused on surface oriented passage for juvenile fish. Most juvenile salmon tend to stay in the upper 10 to 20 feet of the water column as they migrate downstream to the ocean. When approaching the dams, juvenile fish need to dive to depths of 50 to 60 feet to find passage routes such as a spillway opening or a juvenile bypass channel. For several years, engineers and biologists have been pursuing new technologies that would provide more surface-oriented, less stressful, passage routes for juvenile fish.

One of the new surface passage technologies is a removable spillway weir (RSW), or "fish slide," that fits inside a dam spillway and allows juvenile fish to pass near the water surface under lower accelerations and lower pressures. It has the potential to improve juvenile fish survival, save money, and improve water quality (by reducing gas supersaturation). As water is spilled through the weir, juvenile salmon and steelhead are carried over a raised spillway crest, similar to a waterslide. In tests of a prototype installed at Lower Granite Dam on the Snake River, juvenile fish that used the slide survived at similar or better rates than through a conventional spillway – about 94 to 98 percent survival depending on test conditions – and had reduced delay above the dam so that they were less susceptible to predators. While the slide attracted about the same number of fish, only about one-fifth as much water was spilled. A fish slide installed at Ice Harbor Dam in early 2005 delivered good test results that year with 97-99 percent survival.

At Bonneville Dam on the lower Columbia River, a Corner Collector has been retro-fitted at the Second Powerhouse to provide another type of surface passage system. Tests in 2004 and 2005 indicate a survival rate of nearly 100 percent for spring Chinook, steelhead and fall Chinook through the Corner Collector, and a 94 - 99 percent survival rate, depending on the species, through all passage routes combined at this dam. At The Dalles Dam, a spill wall was completed in 2004, designed to move juvenile fish more quickly and safely downstream once they passed through the spillways with a two to four percent survival improvement through the spillway.

RSWs or other surface passage systems are planned for all eight lower Columbia and Snake dams within the next several years. We expect to issue a contract for construction of an RSW at Lower Monumental Dam in the next month or two. We are in discussion with regional parties on the schedule for installation of an RSW at Little Goose Dam.

Avian Predation: Caspian Terns and Cormorants

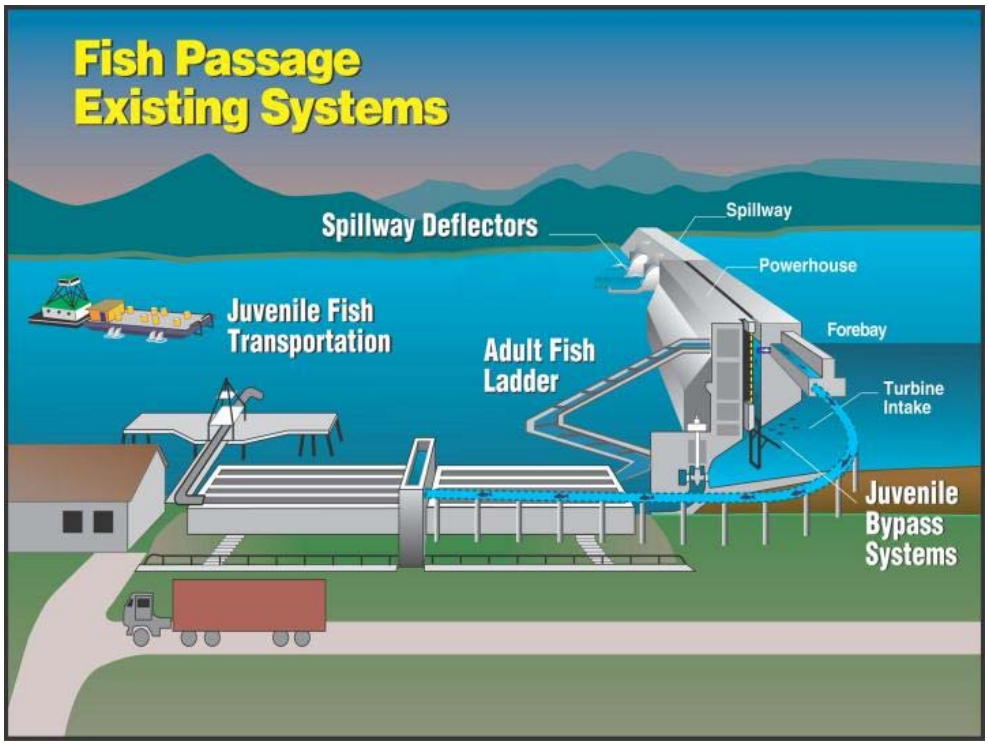
Caspian terns and cormorants consume large numbers of juvenile salmon and are a major cause of mortality of ESA-listed fish. The program to redistribute Caspian terns from Rice Island in the Columbia River Estuary to East Sand Island nearer to the ocean has yielded good results. The intent of the redistribution was to shift the terns' diets away from mostly salmon and toward a wider variety of fish. The Rice Island diet resulted in tern consumption of 15 million salmonids in 1999. In 2005, with the tern colony moved to East Sand, their juvenile salmonid consumption was about 3.6 million. A Tern Management Final Environmental Impact Statement jointly prepared by several agencies recommends that two-thirds of the Caspian terns be further redistributed in alternate sites in Washington, Oregon and California.

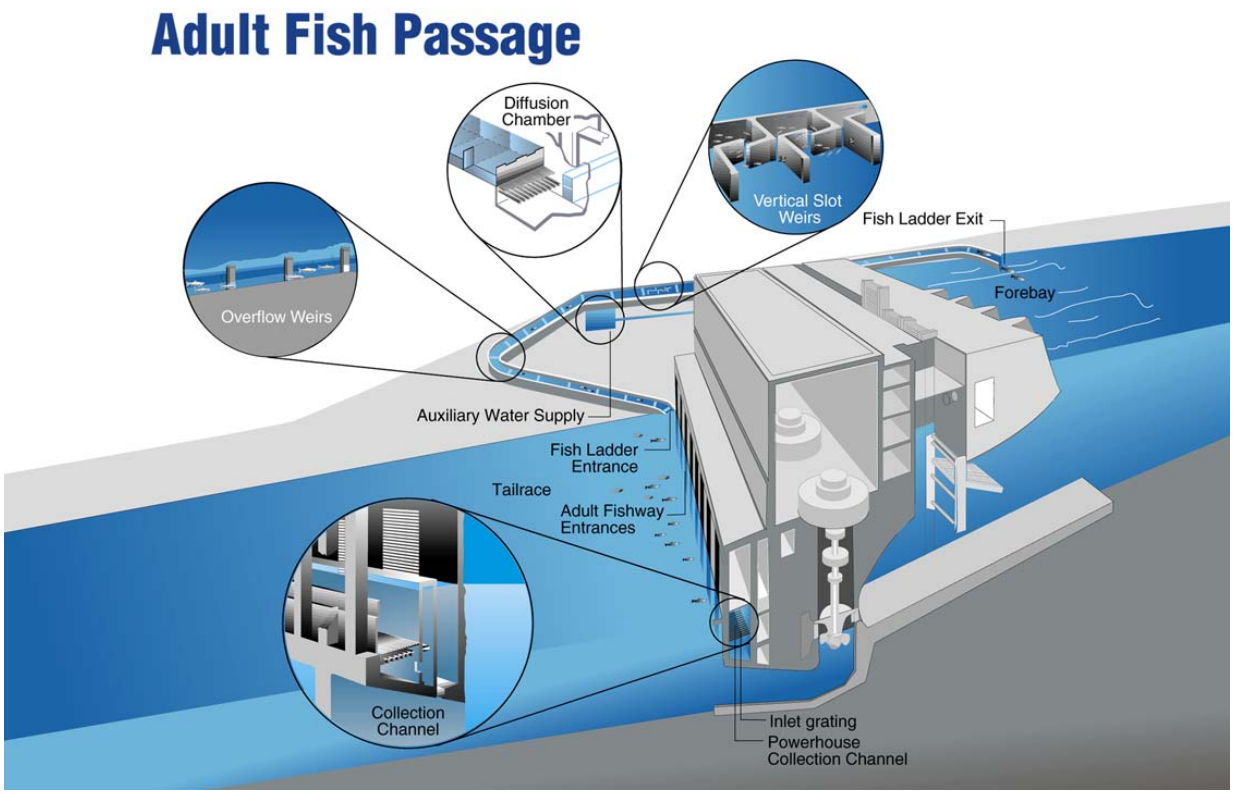
The agencies are now considering management actions to address a greatly increased population of double-crested cormorants in the Columbia River estuary. The population increased from around 100 birds in 1989 to about 12,500 breeding pairs in 2005 nesting on East Sand Island. Although salmonids make up only about 5 percent of their diet, the cormorants consumed an estimated 6.4 million of these juvenile fish in 2005.

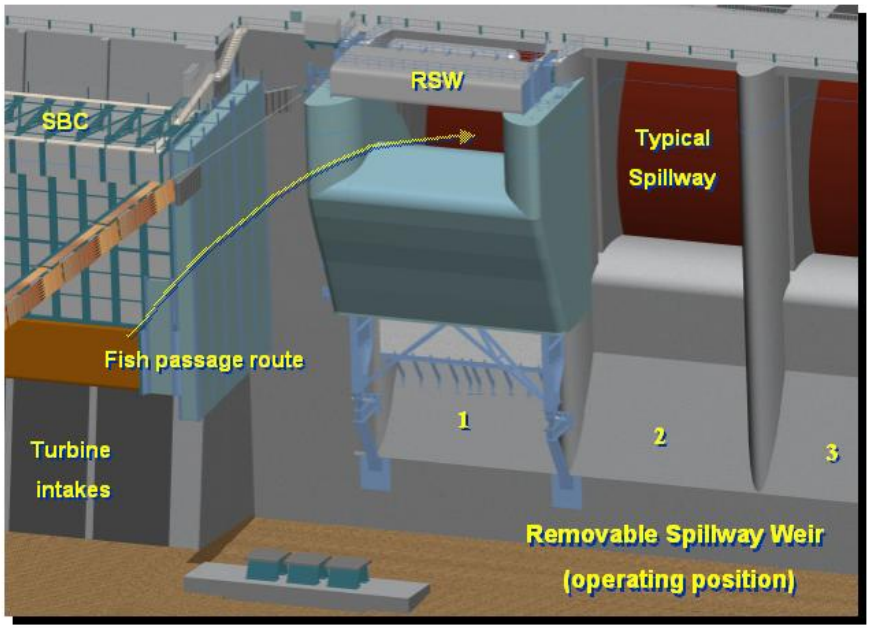
Summary

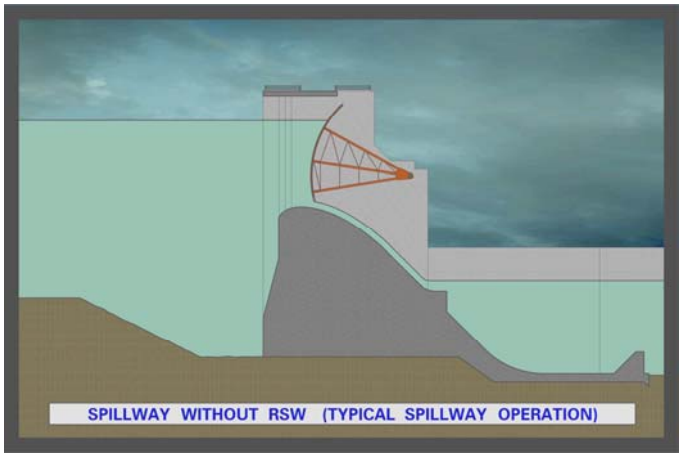
By the time the first large dams were built in the Columbia River Basin in the 1930s and 40s, harvest and hatcheries had already taken a toll on historic salmon populations. The dams, mining, logging, agriculture and other pressures of population growth were an added assault. Today I appreciate being able to tell you that we have made good progress at the dams. We have a plan in place for installing surface bypass technology at all lower Columbia and Snake river dams over the next several years. We will continue predation control efforts, and we have an ongoing habitat restoration program in the estuary.

The current life-cycle approach to salmon recovery, with a region-wide effort to address habitat, hatcheries, harvest and hydropower impacts, is the best approach for bringing these fish back to sustainability. The Corps will continue to do its part, and to work with you and the Congress and with the region to find the best balance and provide the best results.


Fish Passage
Existing Systems
Spillway Deflectors
Spillway
Powerhouse
Juvenile Fish
Transportation
Adult Fish
Ladder
Forebay
Turbine
Intake
Juvenile
Bypass
Systems


Adult Fish Passage
Diffusion
Chamber
Vertical Slot
Weirs
Fish Ladder Exit
Overflow Weirs
Forebay
Auxiliary Water Supply
Fish Ladder
Entrance
Tailrace
Adult Fishway
Entrances
Collection
Channel
Inlet grating
Powerhouse
Collection Channel


RSW
SBC
Typical
Spillway
Fish passage route
1
2
3
Turbine
intakes
Removable Spillway Weir
(operating position)


SPILLWAY WITHOUT RSW (TYPICAL SPILLWAY OPERATION)


SPILLWAY WITH RSW DEPLOYED (OPERATING POSITION)