A Brief History of the Lower Snake River Compensation Plan Hatchery Program for Spring & Summer Chinook Salmon

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Abstract

The Lower Snake River Compensation Plan (LSRCP) hatchery program for anadromous fish was designed to replace lost adult salmon & steelhead caused as a consequence of construction and operation of four hydroelectric dams on the Lower Snake River in Washington. For spring/summer Chinook salmon, an adult return goal back to the project area, post harvest below the project area of 58,700 was established. It was anticipated that after the hatcheries were built and achieved full production that some 176,100 adults would be caught in commercial fisheries and 58,700 in recreational fisheries below the project area. Other than assuming that enough broodstock would return to the hatcheries to perpetuate further generations, no other beneficial use for retuning adults was identified in the plan. Congress authorized the U.S. Army Corps of Engineers to build six hatcheries in 1976 capable of producing 6.75 million smolts. The hatcheries were distributed in the Snake River Basin to reflect a desire to mitigate for the estimated losses "in kind and in place". Construction of the first facility was completed in 1980 and the last facility was completed in 1991. Since the program was authorized three factors have impacted the LSRCP program. First, the smolt to adult survival rate has been less than expected. Second, Snake River spring/summer Chinook were listed as threatened under the Endangered Species Act. The need to reduce harvest rates in mainstem fisheries to protect natural-origin fish resulted in a much higher proportion of the annual runs to escape mainstem fisheries and return to the project area than expected at the time the program was authorized. Third, states and tribes through the U.S. v. Oregon court stipulated Fishery Management Plan have established specific hatchery production agreements between the states, tribes and federal government. This agreement has substantially diversified the spring Chinook hatchery program by adding new off station releases sites and stocks designed to meet short term conservation objectives. The presentations by the LSRCP cooperators over the next three days will review the successes and challenges we have faced over the last 20-30 years implementing the LSRCP spring/summer Chinook program.

Introduction[1]

The Lower Snake River Compensation Plan (LSRCP) for anadromous fish was designed to replace lost adult salmon & steelhead caused as a consequence of construction and operation of four hydroelectric dams on the Lower Snake River in Washington. Specifically the plan is to

> *"….. provide the number of salmon and steelhead trout needed in the Snake River system to help maintain commercial and sport fisheries for anadromous species on a sustaining basis in the Columbia River system and Pacific Ocean" (NMFS & BSF&W 1972 pg 14)*

The LSRCP was authorized by the Water Resources Development Act of 1976, Public Law 94-587. The Act implementing the LSRCP simply states;

> *"…Fish and Wildlife Compensation Plan for the Lower Snake River, Washington and Idaho, substantially in accordance with a report on file with the Chief of Engineers, at an estimated cost of $58,400,000."*

The "report on file with the Chief of Engineers" referred to in the Act is the Special Report, Lower Snake River Fish and Wildlife Compensation Plan, Lower Snake River, Washington and Idaho, June 1975 (US Army Corps of Engineers 1975 (COE)).

The four lower Snake River projects (dams, power plants, and locks) were authorized by P.L. 74, 79th Congress, in March 1945, but no funds for construction were authorized. Congressional authorization absent funding set up a major political battle in the Northwest between those advocating for construction and those opposed. A history of this political battle can be found in (Petersen and Reed 1994 and Petersen 1995). Highlights of the struggle included:

- In 1950 the COE requested $2 million for funding construction of Ice Harbor Dam. The request was denied because of concerns over fish, runaway government spending, the cost in relation to other options for generating power, and the proposition that such new projects should be undertaken by a consortium of government and private capital.

- In 1953 President Truman requested $5 million for construction in his final year as president, but after newly elected President Eisenhower was inaugurated he cut the funding stating that there would be "no new starts on dams". He cited a need to curb federal spending and cost share with states and private enterprise for his decision to eliminating funding in the project.

- The deadlock over construction was broken in 1955 when Senator Warren Magnuson of Washington "slipped" $1.0 million into an omnibus spending bill for construction, and once construction had started, there was no stopping future appropriations.

[1] This paper draws liberally from a history written on the LSRCP program by Herrig in 1990.

The four dam & locks projects took almost 20 years to complete. The lower-most dam, Ice Harbor, was completed in 1961; moving upstream, Lower Monumental was completed in 1969, Little Goose was completed in 1970 and Lower Granite was completed in 1975. Each dam is approximately 100 feet high. These dams create a total of approximately 140 miles of reservoir from about 10 miles above the mouth of the Snake River to its confluence with the Clearwater River. The series of locks allow for barge traffic to travel inland to Lewiston Idaho.

In 1959, four years after the initial appropriation for construction of Ice Harbor Dam &Locks, the U.S. Fish and Wildlife Service (Service) started to evaluate the impact of these hydroelectric projects on fish and wildlife resources. The limited engineering and biological data available at the time resulted in the Service making only general recommendations regarding fish passage and artificial propagation. In 1966, some seven years into developing recommendations on a by-project basis the COE District Engineer in Walla Walla requested that the Service produce a single report, rather than four separate reports, that would cover all the Lower Snake River projects, including the yet to be constructed Lower Granite Dam and Locks.

Over the next 6 years, the Service, National Marine Fisheries Service (NMFS) and the state wildlife agencies of Oregon, Washington, and Idaho collaborated to evaluate the effects of the four projects. A final Fish and Wildlife Coordination Act Report was produced by the NMFS and the Service in September 1972 and submitted to the COE.

The COE questioned several of 1972 report's findings and it was not until 1975 that these issues were resolved and the COE submitted its final report to Congress. By September 1976 the COE had finalized an Environmental Impact Assessment of the LSRCP and in that year Congress authorized the COE to design and construct the LSRCP "substantially in accordance" with their June 1975 Special Report.

LSRCP Goal

Specific mitigation goals for the LSRCP were established in a three step process. First the adult escapement that occurred prior to construction of the four dams was estimated. Second an estimate was made of the reduction in adult escapement (loss) caused by construction and operation of the dams (e.g. direct mortality of smolt). Last, a catch to escapement ratio was used to estimate the future production that was forgone in commercial and recreational fisheries as result of the reduced spawning escapement and habitat loss. Assuming that the fisheries below the project area would continue to be prosecuted into the future as they had in the past, LSRCP adult return goals were expressed in terms of the adult escapement back to, or above the project area. Other than recognizing that the escapements back to the project area would be used for hatchery broodstock, no other specific priorities or goals were established in the enabling legislation or supporting documents regarding how these fish might used.

For spring Chinook salmon the escapement above Lower Granite Dam prior to construction of these dams was estimated at 122,200 adults. Based on a 15% mortality rate for smolts transiting

each of the four dams (48% total mortality), the expected reduction in adults subsequently returning to the area above Lower Granite Dam was 58,700. This number established the LSRCP escapement mitigation goal back to the project area. This reduction in natural spawning escapement was estimated to result in a reduction in the coast wide commercial/tribal harvest of 176,100 adults, and a reduction in the recreational fishery harvest of 58,700 adults below the project area. In summary the total number of adults that was expected to be produced was 293,500.

Component	Number of Adults
Escapement above Lower Granite Dam	58,700
Commercial Harvest (below project area)	176,100
Recreational Harvest (below project area)	58,700
Total	293,500

Hatchery Development Plan

Historical distribution and abundance data were used by a hatchery subcommittee of the Columbia Basin Fisheries Technical Committee to recommend release sites for the future hatcheries (Tollefson 1974). Table 1 outlines the recommended distribution of returning LSRCP produced adult spring Chinook salmon by state and river basin.

Once the adult return goals were established the subcommittee calculated the number of smolts that would have to be released to achieve the desired adult run size. The model made assumptions about each life history stage of the fish, including eggs per female, survival of eggs to smolt, and survival of smolt to returning adult (after passing thru fisheries below the project area). The most important and difficult part was the smolt-to-returning adult rate, because this part is highly variable and subject to many uncontrollable natural factors.

Cowley et al. (1987) did a literature search of the methods used by the CBFTC to estimate the smolt-to-adult rates and determined that the rate was based on historical returns to the Idaho Power facility operated by the Idaho Department of Fish and Game at Rapid River.

Table 1. Recommended distribution of returning LSRCP produced adult spring/summer Chinook salmon.

Drainage	Washington	Oregon	Idaho
Tucannon	1,152		
Snake River at/above Hells Canyon Dam			1,200
Clearwater River			288
Grande Ronde River		5,856	
Imnaha River		3,216	
Salmon River			46,656
Small tributaries			288
Total by State	1,152	9,072	48,432
Program Total		58, 656	
Percent of Program	2.0%	15.5%	82.6%

Table 2. The Estimated hatchery production necessary to return the required number of adult spring Chinook salmon to meet LSRCP escapement goals, post harvest below project area (COE 1975).

Adult loss level for basing hatchery size (rounded)	**58,700**
Estimated smolt to adult survival rate back to Lower Granite Dam after harvest below project area	0.87%
Estimated number of smolts that would have to be produced	6,750,000
Target size of smolts in fish per pound	15
Target number of pounds of smolts to be produced	450,000
Estimated percent survival from eggs to smolt	70%
Estimated number of eggs needed	9,650,000

Table 3. Smolt production goals (in pounds) for the six LSRCP hatcheries that rear spring Chinook salmon, and dates of completion.

Hatchery (Operator)	Pounds of smolt	Satellite Facilities	Date of Completion
Lookingglass (ODFW)	69,600	Lookingglass Hatchery	November 1982
		Imnaha River	July 1989
Lyons Ferry (WDFW)	8,800	Lyons Ferry Hatchery	November 1983
		Tucannon Hatchery	November 1984
		Curl Lake	February 1985
Sawtooth (IDFG)	149,000	Sawtooth Hatchery	January 1985
		E.Fk. Salmon R.	November 1983
Dworshak (FWS)	70,000	Dworshak Remodel	November 1982
Clearwater (IDFG)	91,300	Clearwater Hatchery	December 1991
		Red River	November 1986
		Crooked River	May 1990
		Powell	August 1989
McCall (IDFG)	61,300	McCall Hatchery	September 1981
		South Fork Salmon River	July 1980

ODFW, Oregon Department of Fish and Wildlife ; WDFW, Washington Department of Fish and Wildlife; IDFG, Idaho Department of Fish and Wildlife; FWS, U.S. Fish and Wildlife Service

Funding the LSRCP

The Special Report states that "…Operations and maintenance would be funded through future appropriations to the U.S. Fish and Wildlife Service or National Marine Fisheries Service." In 1977 an agreement was signed by the COE, NMFS, and the Service stating that the Service would budget for and administer the operation and maintenance of the LSRCP Program.

When funding mitigation programs the COE must decide how to partition the flow of benefits of these dam & lock projects as a way to distribute cost. Electric power benefits were generally considered the largest benefit from COE dam projects in the Columbia Basin and the benefactors, the electric rate payers are required to pay that portion of the cost. Bonneville Power Administration (BPA) is the marketer of the generated power by these projects and was required to pay the share of costs commensurate with the benefits ascribed to power generation. Whatever benefits are ascribed to flood control, irrigation, transportation etc. are borne by the congress through annual appropriations to the COE. The Lower Snake River program is unique among mitigation programs in the Columbia basin because the COE determined that 100% of the benefits of these projects were for power generation. As such BPA pays all the costs.

From the LSRCP's beginning through FY 2001, the Service requested funding from congress each year through the President's Budget Request to Congress. Congressional appropriations were reimbursed to the treasury at the end of each fiscal year by BPA as well as capitalized construct costs of the LSRCP facilities. When the Service and BPA signed a direct funding agreement in July 2001 a new business oriented atmosphere developed that allows the Service and BPA to work in a business oriented manner to meet short and long term mitigation responsibilities.

Important Changes since the LSRCP was Authorized

Since 1976 when the LSRCP was authorized, many of the parameters and assumptions used to size the hatchery program and estimate the magnitude and flow of benefits have changed. These changes will become evident as during the presentations by our cooperators.

- The smolt to adult survival rate has been less than expected and this has resulted in fewer adults retuning than planned.
- The listing of spring Chinook under the Endangered Species Act has resulted in significant curtailment of commercial, recreational and tribal fisheries throughout the mainstem Columbia River. This has resulted in a higher percentage of the annual run returning to the project area than was expected.
- States and tribes through the U.S. v. Oregon court stipulated Fishery Management Plan have established specific hatchery production agreements. This agreement has substantially diversified the spring Chinook hatchery program by adding new off station

releases sites and stocks designed to meet short term conservation objectives, in partnership with the Northwest Power and Conservation Council' Fish and Wildlife program.

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