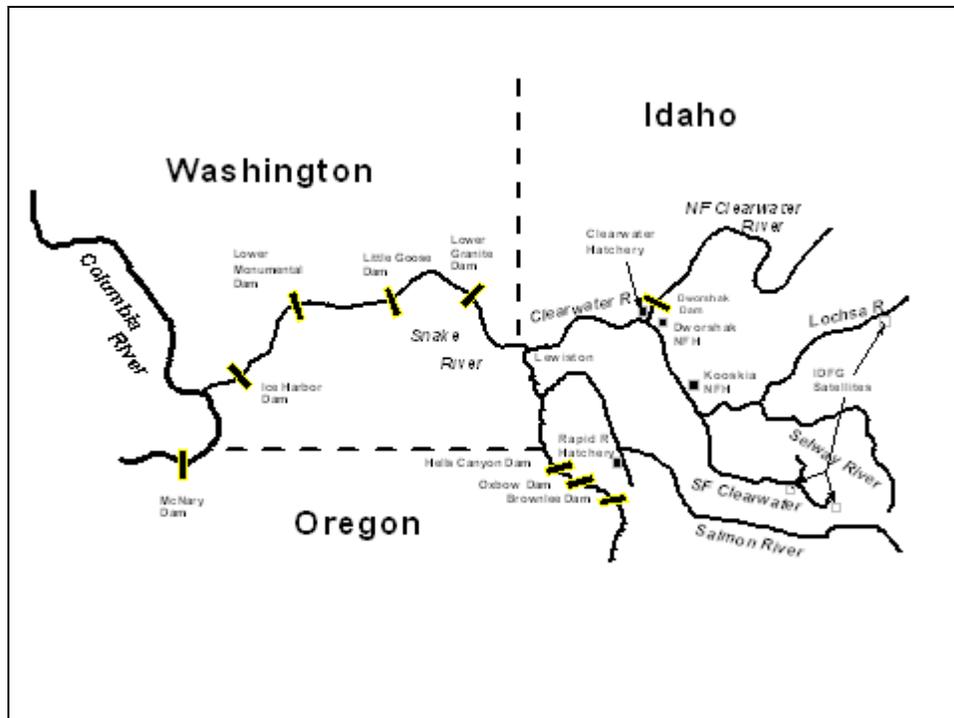


Spring Chinook Salmon, Dworshak National Fish Hatchery Clearwater River, Idaho

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Introduction – Dworshak National Fish Hatchery (NFH) is located at the confluence of the main stem and North Fork Clearwater rivers in North-central Idaho (see map above). The Clearwater is a tributary to the Snake River and enters the Snake at Lewiston, Idaho approximately 40 miles downstream of the hatchery. Lower Granite Dam is the first lower Snake River dam that fish released from Dworshak NFH encounter and is located approximately 70 miles downstream of the hatchery.

Facility Description – Dworshak NFH was originally built in 1969 to mitigate for steelhead lost from the construction and operation of Dworshak Dam and Reservoir on the North Fork Clearwater River. In 1982 the hatchery was expanded to include spring Chinook salmon as part of the LSRCP to mitigate for fish loss associated with development of the lower Snake River hydrosystem. Thirty raceways were built to rear approximately 1.4 million spring Chinook smolts, which is what was estimated to meet the adult return goal.

Program Goals – The adult return goal for the Dworshak program is 9,135 spring Chinook to the project area above Lower Granite Dam. This was after an expected harvest of 36,500 in the

ocean, Columbia River and Lower Snake River sport, tribal and commercial fisheries. The original production goal of 1.4 million smolts was changed in 1996 to 1.05 million smolts due to a change in rearing density.

Management Objectives – Given the location on the main stem of the Clearwater River the primary objective for the Dworshak spring Chinook program is to provide for lost sport and tribal fishing opportunities in the Lower Clearwater River. Other objectives are to return adequate broodstock to meet production needs, to minimize impacts to natural populations in the Clearwater and downstream migration corridor, and to assist other production programs in the Clearwater basin.

Monitoring and Evaluation Objectives – There are several M&E objectives for the spring Chinook program including: Evaluating the effectiveness of the program so it can be managed adaptively; Determining the total adult return to assess if the program is meeting its mitigation goals; To document and communicate the program's success at meeting its program and management goals; and coordination of hatchery production and research, monitoring, and evaluation activities.

Broodstock Genetics – Lewiston Dam, which was located on the Clearwater River above Lewiston from 1929 to 1972 extirpated the historic spring Chinook run in the Clearwater River. Therefore when the spring Chinook program was started at Dworshak fish were obtained from a number of sources including: Little White Salmon (1983 & 85), Leavenworth (1983 & 86), and Rapid River (1987 - 88) hatcheries. Since 1989 we have primarily utilized fish returning to Dworshak as the brood source, with the exception of 1995 when a third of the production was from Kooskia NFH returns. It was the extirpation and subsequent reintroduction of non-endemic stock that prompted not listing Clearwater spring Chinook salmon as threatened or endangered under ESA.

Broodstock Characteristics – On average the adults that return to Dworshak NFH have the following characteristics: a 50:50 ratio of adult males to females, approximately 65% of returning Chinook are 2-ocean, and the average size of a 2-ocean adult is 29 inches (740 mm). Spring Chinook arrive in the Clearwater in May and will continue to come into the hatchery until August, they are held until spawning, which takes place in late August to early September. The average pre-spawn mortality from 1995-2010 was 3.1% (range 1.6 – 6.0%).

Juvenile Performance – Incubation and rearing lasts approximately 20 months, followed by direct release from the hatchery into the North Fork Clearwater River in late March. Eyed egg-to-smolt survival from 1998-2009 averaged 83.2% (range 66.6 – 97.8%) and smolt-to-Lower Granite Dam survival from 1998-2009 averaged 79.6% (range 69.1 - 85.3%) based on SURPH model estimates.

Results - For the remainder of the paper results will be provided only for the last 12 to 16 years, depending on whether it's Brood Year or Return Year data. Earlier data were reported on in the last LSRCP review (Burge and Jones 1998), also in the 1980's the returns were low when the program was building and then during the mid-1990's Chinook returns throughout the basin were depressed.

Smolt Releases – Dworshak generally meets, or is close to, its release goal of 1.05 million smolts, **Figure 1**. The exception was 2001, when too few adults returned in 1999 to meet brood needs and there were no extra eggs in the basin to backfill the program.

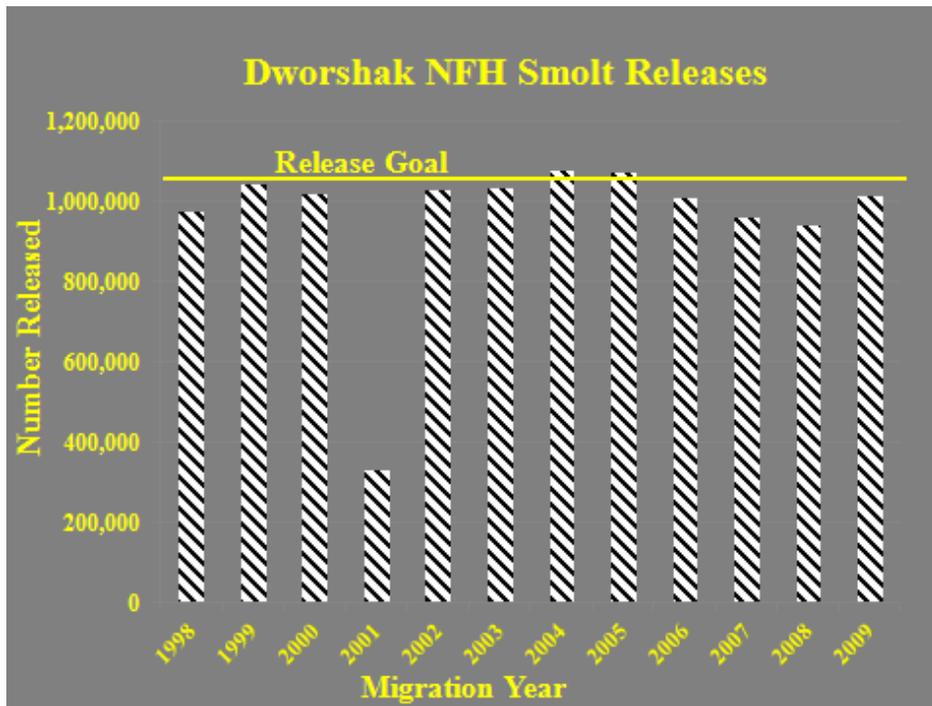


Figure 1. Dworshak NFH spring Chinook salmon releases, 1998 – 2009, the release goal of 1.05 million is indicated by the horizontal line.

Adult Returns – **Figure 2** shows the adult returns to the Dworshak NFH rack (top graph), the project area above Lower Granite Dam (middle graph), and to the mouth of the Columbia River (bottom graph). These data include fish collected and estimated harvest in all fisheries, but do not include the un-harvested and un-collected fish that remained in the river, so they are a conservative estimate of total return. As displayed we typically return enough to meet brood needs (except for 1999 as mentioned above). However, we rarely meet the LSRCP project area goal of 9,135 and have never come close to meeting total return goal of 45,635.

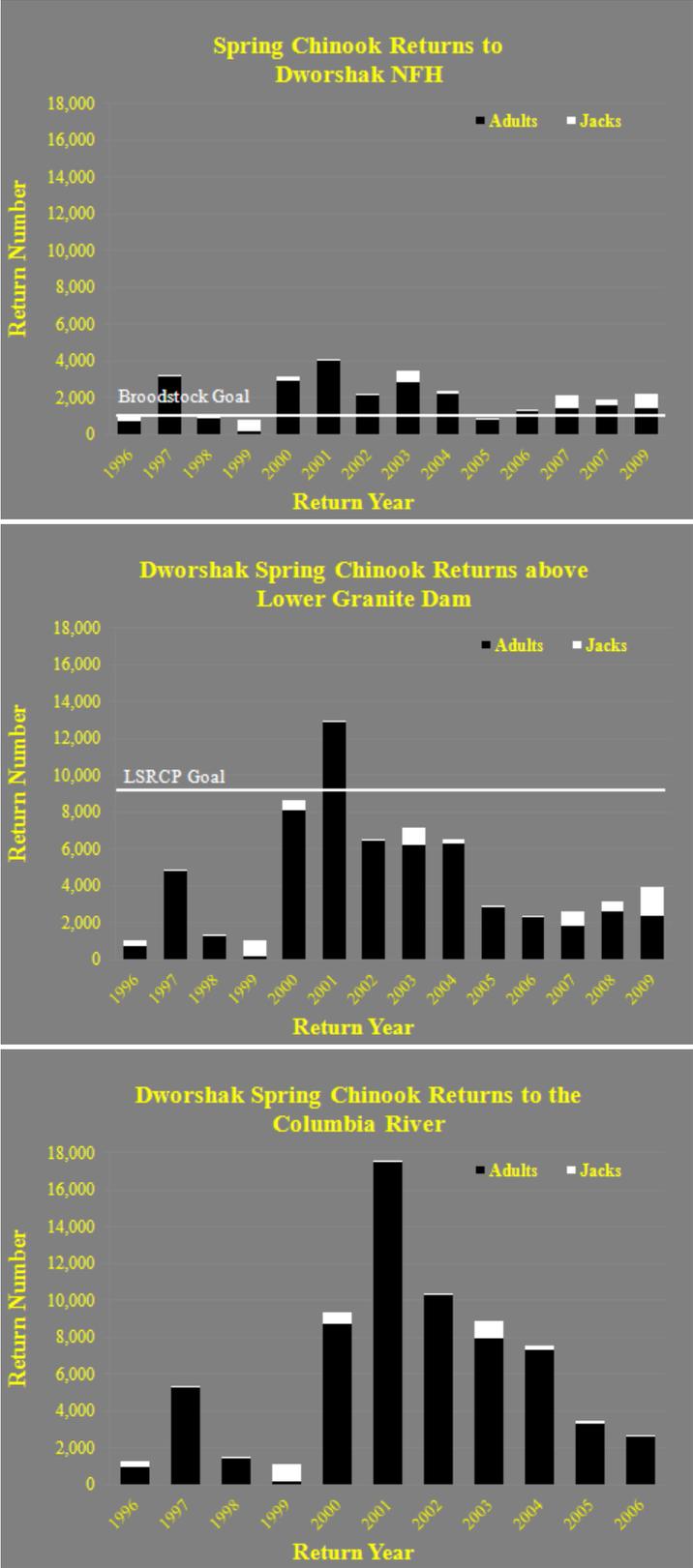


Figure 2. Adult returns to the Dworshak NFH rack (top), the project area above Lower Granite Dam (middle), and to the mouth of the Columbia River (upper), 1996-2009.

Adult Survival and Replacement – **Figure 3** indicates the total smolt-to-adult survival (SAS) to the mouth of the Columbia River and the smolt-to-adult return (SAR) to the project area for Dworshak Chinook. It was estimated that 0.87% was needed to meet the LSRCP goal to the project area, but 4.3% return would be needed to meet the total return goal. **Figure 4** displays the effectiveness of the Dworshak program relative to replacement (1.0). Progeny-to-parent ratio has been well above 1.0, averaging 8.2 to the project area and 10.1 overall from 1994 to 2003.

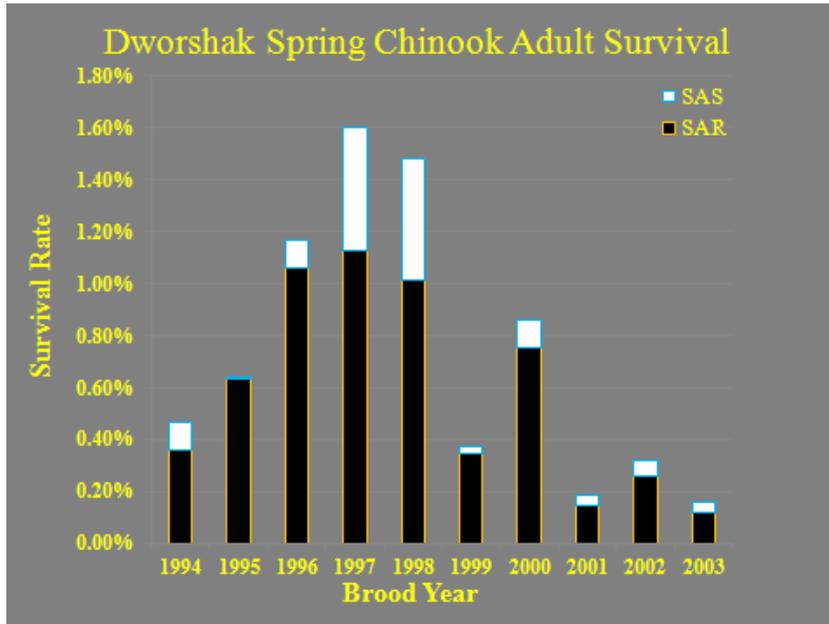


Figure 3. Smolt-to-adult survival to the Columbia River and smolt-to-adult return to above Lower Granite Dam for Dworshak NFH spring Chinook salmon, 1994-2003.

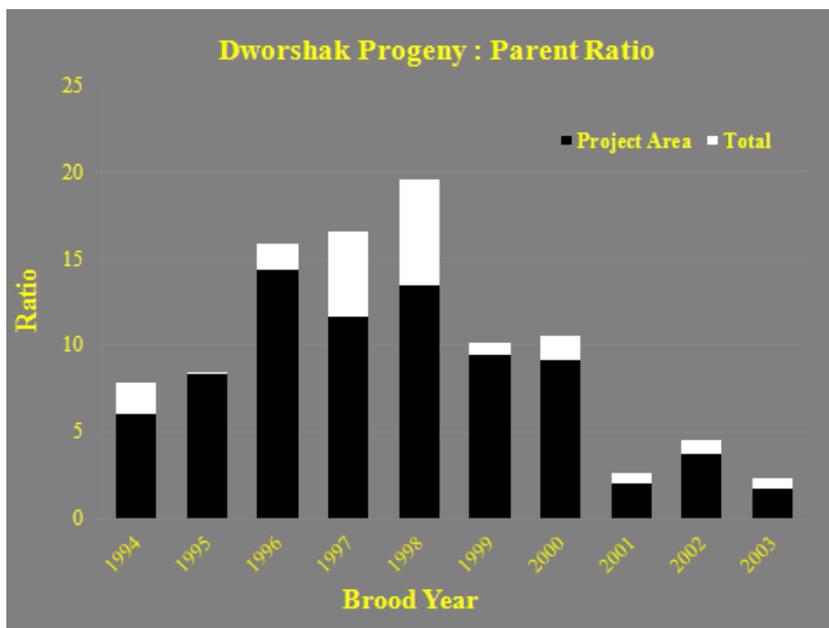


Figure 4. Progeny-to-parent ratio, total return and above Lower Granite Dam for Dworshak NFH spring Chinook salmon, 1994-2003.

Straying – **Figure 5** presents the overall stray rates for Dworshak Chinook from 1996 to 2006. Straying is defined here as anything that is captured outside the normal migration route and includes jacks and adults. The data is further broken down into four categories, above and below McNary in the Columbia River, and above and below Lower Granite in the Snake River. Strays above Lower Granite Dam are typically fish captured above Dworshak NFH. Stray rates for 1996 – 1999 averaged 13.8%, whereas from 2000 – 2006 they averaged 2.3%, this significant drop is attributed to two changes in the production program for fish released in 1998. First was a change in size of release from 12-14 fish/pound to ~20 fish/pound and the second change was time of release, we began releasing fish 2 weeks earlier, from April 11 to March 28, based on results from a time of release study (Jones and Burge 2002).

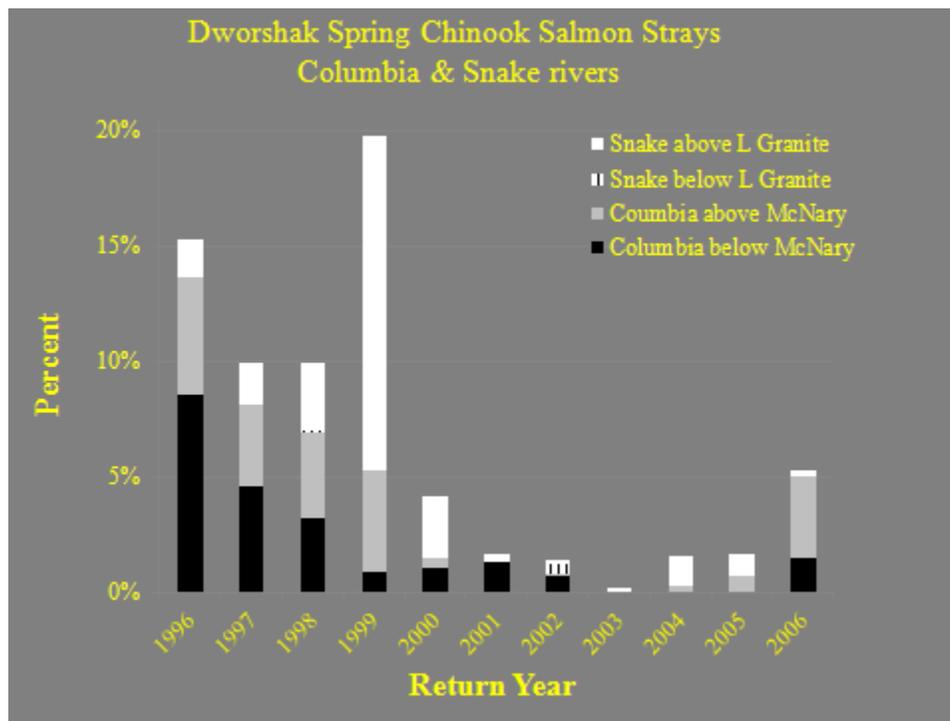


Figure 5. Stray rates for Dworshak NFH spring Chinook salmon in the Columbia and Snake rivers, 1996 - 2006.

Fish Health – Dworshak began segregation and culling of high Bacterial Kidney Disease (BKD) Chinook in the late 1980s and this has proven very successful at reducing losses to BKD. Currently to help control BKD all females spawned are tested for BKD using ELISA. Also eggs from each female are tested and those with an ELISA Optical Density greater than 0.25 are culled. Females are injected with erythromycin prior to spawning and juveniles are monitored by ELISA. Due to this aggressive BKD program we have not seen any high ELISA values in juveniles for the last 8 years and only 1 low value in the last 5 years. Occasional outbreaks of other diseases do occur and are treated appropriately.

Harvest – Harvest was examined by area, above and below Bonneville Dam in the Columbia River (**Figures 6**) and in the Snake River (**Figure 7**) and in the Clearwater River (**Figure 8**). All graphs show the same pattern of peak harvest in 2001.

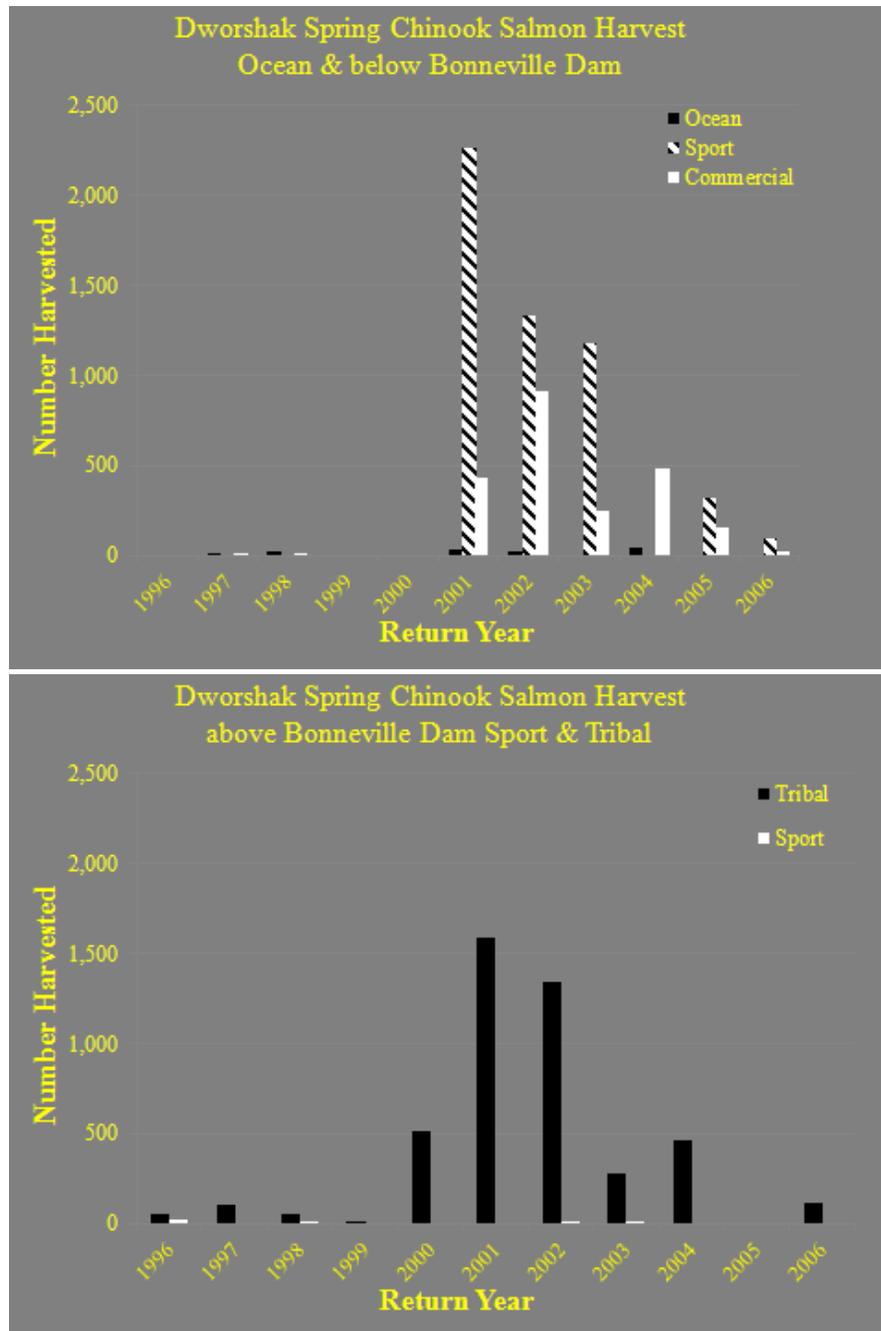


Figure 6. Harvest of Dworshak NFH spring Chinook salmon in the ocean and below Bonneville Dam (upper graph) and above Bonneville Dam (lower graph), 1996-2006.

Figure 7 demonstrates the low harvest of Dworshak Chinook in the mainstem Snake River. Also the reader should note that **Figure 8** has a different y axis scale to show the successful harvest of Dworshak Chinook in the main project area of the Clearwater River. For each year beginning in 1997 (excluding 1999) there has been a sport fishing season for Dworshak spring Chinook salmon in the Clearwater River.

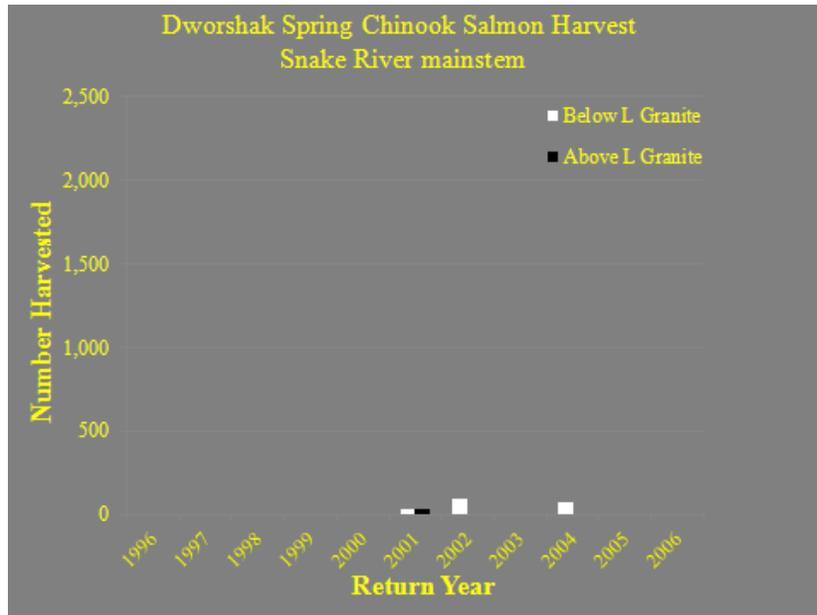


Figure 7. Harvest of Dworshak spring Chinook salmon in the mainstem Snake River, 1996-2006.

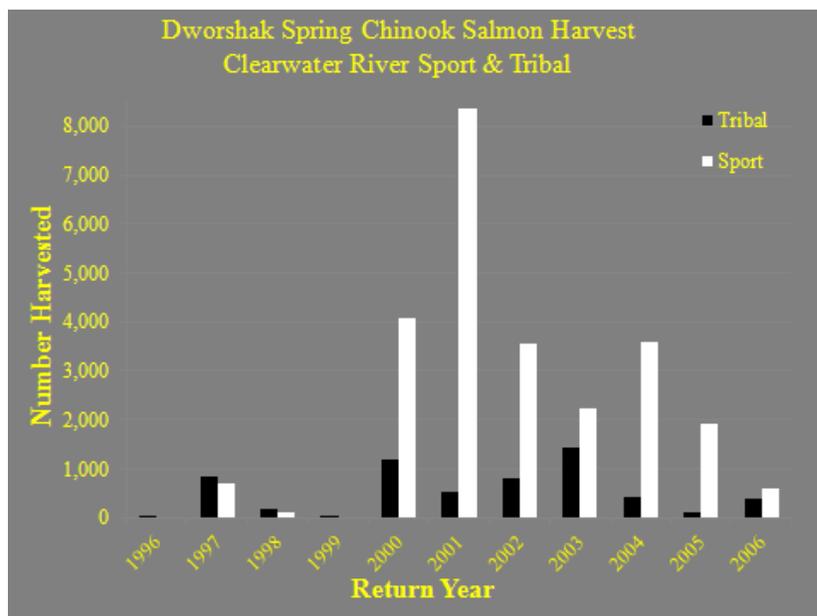


Figure 8. Harvest of Dworshak spring Chinook salmon in the Clearwater River, 1996-2006.

Angler effort is displayed in **Figure 9** and it mirrors the Chinook harvested graph in **Figure 8**. It should be noted that this also includes spring Chinook returning to other Clearwater facilities.

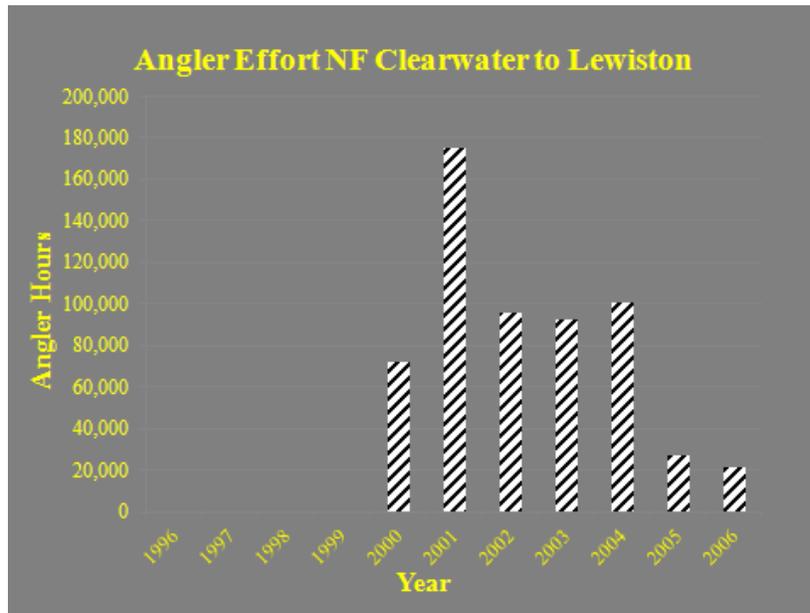


Figure 9. Spring Chinook salmon sport angling effort from Lewiston, Idaho into the North Fork Clearwater River, 2000-2006.

Dworshak spring Chinook salmon provide a major boost to the economy as shown in the table below. These data are from a USFWS study completed in 2010 and were compiled from a number sources including: Economic Effects From Columbia River Basin Anadromous Salmonid Fish Production, NWPC Independent Economic Analysis Board 2005; Status Report: Columbia River Fish Runs and Fisheries 2005; 2006 National Survey of Fishing, Hunting, and Wildlife - Associated Recreation, USFWS, 2007; and Sportfishing in America, American Sportfishing Association, 2008.

Dworshak NFH Spring Chinook Release Year 2006 Economic Impact	
Commercial	
Dock Sales	\$72,817
Job Income	\$207,051
Recreational	
Angling Retail	\$2,399,946
Angling Days	31,842
Industrial	\$3,817,704
Job Income	\$1,210,315
Federal Tax	\$170,472
State and Local Tax	\$152,734
Total	\$8,031,039

Summary – The Dworshak spring Chinook salmon program has essentially eliminated losses to BKD as a result of the BKD culling program. Changing size and time of release significantly reduced straying. While the Dworshak Chinook program rarely meets its project area adult return goal and has never come close to achieving the downriver harvest goal, it has provided a sport fishery in 13 out of the last 14 years and a tribal fishery in 21 out of the last 24 years.

HSRG and HRT Recommendations -The Hatchery Scientific Review Group (HSRG) recommended that all salmon production programs in the Clearwater basin be coordinated. This is something all the co-managers have been working on, and since 2004 we have developed a Clearwater Basin Annual Operating Plan that includes all fish production in the basin. Starting in 2009 there have been weekly conference calls during the spring Chinook run to update managers and coordinate fish collection, harvest allocations, and improve communication. A fully coordinated program will take time, but the co-managers are moving in that direction. They also recommended continuing our successful BKD culling program; this is something we do not plan to stop. Lastly they recommended that Dworshak improve the water supply to address disease and temperature issues at the hatchery. This is something all the co-managers endorse and the funding agencies, the U.S. Corps of Engineers and LSRCP, are investigating options.

The Hatchery Review Team (HRT) also advocated improving the water supply issue mentioned above. Additionally the HRT suggested maintaining a locally adapted stock and while Dworshak strives to maintain this the co-managers all agree that since this is not a conservation program maintaining a full program is also a priority and may occasionally require backfilling from other in-basin facilities. The HRT recommended continuing efforts to improve the facility, as well as the assessment, tagging, and documentation of the program, this is something we concur with and we will always strive for improvement of the program.

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