



FISH PASSAGE CENTER

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TO: Rob Lothrop, CRITFC

Michele DeHart

FROM: Michele DeHart

DATE: August 13, 2007

RE: 2006 Spring Chinook survival and outmigration conditions in relation to predicted high SAR's

In response to your request, the FPC staff summarized results from the FPC 2006 Annual Report as follows.

Spring migrating Chinook experienced improved passage conditions when compared to recent years. Higher flows and twenty four hour spill resulted in relatively high survivals when compared to previous years. Improved spill and delay of the start of smolt transportation resulted in a reduction of the proportion of smolts transported.

Runoff volume was 107% of average for the Columbia River above The Dalles and 113% of average for the Snake River above Lower Granite. 2006 was the highest run off volume and flow year in the Snake River since 1999 and 2002 in the Columbia River. Biological Opinion reservoir elevations targets were met on April 10 at Hungry Horse, Libby, Dworshak, Brownlee and Grand Coulee projects. Biological Opinion flow objectives were met and exceeded for the spring migration period benefiting spring Chinook (Table 1).

Table 1. Spring and summer Biological Opinion flow objectives and average seasonal flows in 2006 at Lower Granite, McNary and Priest Rapids.

| | 2006 | | | |
|---------------|-----------------------|----------------|-----------------------|----------------|
| | Spring Flow Objective | Spring Average | Summer Flow Objective | Summer Average |
| Lower Granite | 100 | 125.3 | 54.5 | 37.6 |
| McNary | 260 | 325.4 | 200 | 166.5 |
| Priest Rapids | 135 | 191.3 | Na | Na |

Spill for fish passage was affected by the interaction of several factors. Spill for fish passage was improved in 2006 over past years as a result of a 2005 federal court order that increased spring spill at Little Goose and Bonneville Dam to 24 hours per day and continued summer spill at the same levels that occurred in 2005. At the same time hydropower project equipment problems at The Dalles caused reductions in spill while unit outages and other problems at John Day and Lower Granite limited the hydraulic capacity of the projects which resulted in increased spill as river flows increased.

Survivals in 2006 for Yearling Chinook through the hydrosystem were relatively high compared to other recent years. The FPC analyzed Snake River basin yearling Chinook released from trap sites and emigrating to Lower Monumental Dam; 2006 survival estimates for these spring Chinook were the highest documented in recent years at 61.0% (Table 2). The estimated proportion of yearling Chinook that were “destined for transportation” during 2006 (61.1% and 57.9% for hatchery and wild fish respectively) was similar to 2002 and 2003 (Table 3). In addition, the court ordered spill for summer months contributed to higher survival rates for summer migrants.

Table 2. Combined PIT-tagged hatchery and wild yearling Chinook survival in the reach Lower Granite Dam tailrace to Bonneville Dam tailrace (FPC).

| | Reach Survival by year | | | | | |
|------------------|------------------------|-------------|-------------|-------------|-------------|-------------|
| Migr Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
| Survival | 0.262 | 0.568 | 0.546 | 0.374 | 0.477 | 0.610 |
| Std error | 0.032 | 0.115 | 0.106 | 0.088 | 0.080 | 0.087 |

Table 3. Estimated probability of yearling Chinook being transported for out-migrants originating above Lower Granite Dam (from FPC 2006 Annual Report).

| | Estimated Proportion Transported by year | | | | | |
|-----------------------------|------------------------------------------|-------------|-------------|-------------|-------------|-----------------------|
| Migr Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
| Transport Proportion | 0.980 | 0.683 | 0.629 | 0.870 | 0.92 | 0.611 (H) 0.579(W) |

NOAA found similar high survival estimates for 2006 stating, “Mean estimated survival for yearling Chinook salmon from Lower Granite Dam tailrace to Bonneville Dam tailrace was 61.1% in 2006, the highest since survival estimates to Bonneville Dam tailrace became possible from PIT-tag data in 1999.” (August 30, 2006 NOAA technical Memorandum, Table 4).

Table 4. Combined PIT-tagged hatchery and wild yearling Chinook survival in the reach Lower Granite Dam tailrace to Bonneville Dam tailrace (from August 30, 2006 NOAA technical Memorandum).

| | Reach Survival by year | | | | | |
|------------------|------------------------|-------------|-------------|-------------|-------------|-------------|
| Migr Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |
| Survival | 0.279 | 0.578 | 0.532 | 0.395 | 0.577 | 0.611 |
| Std error | 0.016 | 0.06 | 0.023 | 0.05 | 0.069 | 0.018 |

Given the high reach survivals in 2006, it may be that increased spill volumes coupled with high flows could result in higher SAR's for in-river migrants. Figure 1 shows flow and the cumulative passage for each species in 2006. The month of May was significant for all species. Nearly 25% of subyearling Chinook passed Lower Granite during May. Coho, yearling Chinook, steelhead and sockeye were also present in large numbers during May.

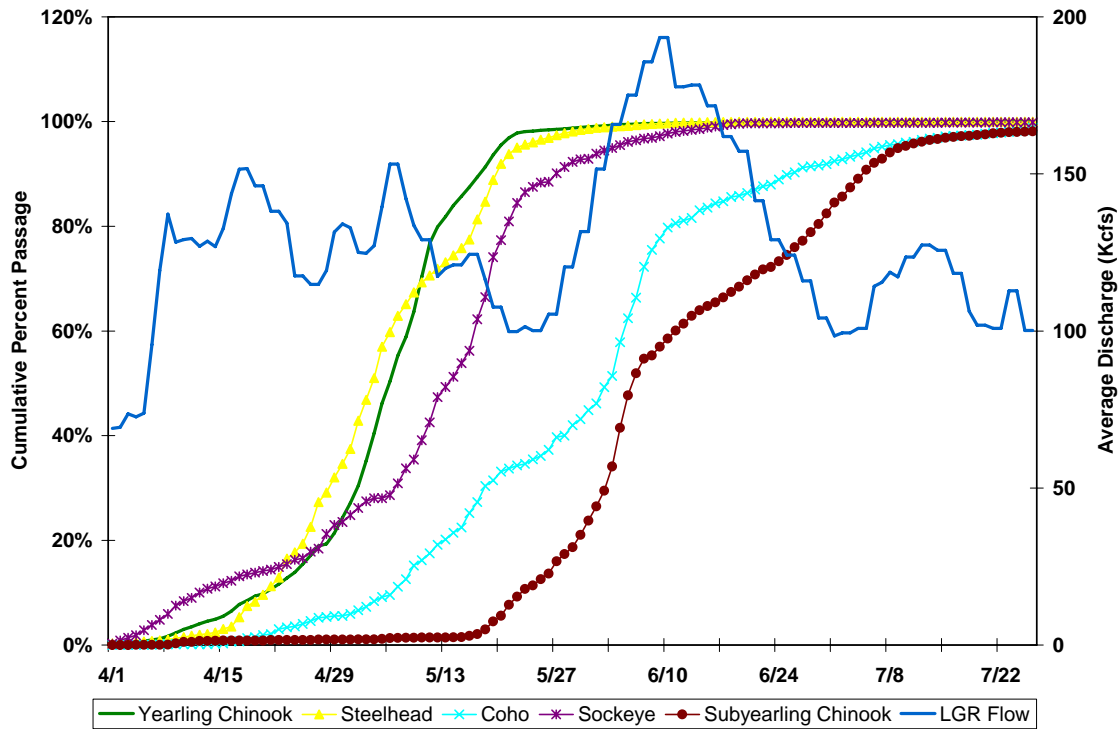


Figure 1. Cumulative passage timing at Lower Granite Dam in 2006 for all species of migrant juvenile salmonids using passage indices.