



FISH PASSAGE CENTER

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MEMORANDUM

TO: Bill Tweit, WDFW

Michele DeHart

FROM: Michele DeHart

DATE: December 15, 2003

RE: Juvenile Fish Passage in the Lower Columbia River in August – Washington Stocks

In response to your request of December 10, 2003, the Fish Passage Center staff summarized the following population estimates of juvenile salmon passing the lower Columbia River in August. The following juvenile population estimates are computed by dividing the Smolt Monitoring Program passage indices by the fish guidance efficiency at each project. In addition, the December 5, 2003 memorandum provided to Larry Cassidy, NPCC, is attached. We utilized available PIT tag data on fish originating in Washington, plus the smolt trap data from the Klickitat River monitoring by the Yakama Indian Nation. This trap is located near the mouth of the Klickitat River. This trap data shows that Klickitat River fall chinook are passing through Bonneville pool and dam in August. The Klickitat is an example of a stock that is recognized in the NPCC Mainstem Amendments to the Fish and Wildlife Program, “that cannot or are not effectively transported”.

- The following summary shows that significant juvenile salmonid passage occurs in August in the lower Columbia River and that a large proportion of the passage is comprised of stocks originating in Washington State tributaries. Reducing the spill for fish passage protection in August will have a significant impact on Washington State stocks, and in particular the Hanford Reach fall chinook. Spill is effective in decreasing the proportion of daily passage that is subjected to direct turbine mortality and indirect mortality in the forebay and tailrace of projects including passage delay.
- In 2003 we estimated over 1 million subyearling chinook passed McNary Dam during August, while we estimated 700,000 and 600,000 subyearling chinook at John Day and Bonneville dams respectively (Tables 1 – 3). Over the past twelve years the estimated population size at McNary Dam in August has been as high as 2.6 million, while the maximum was 3.5 million and 1.75 million subyearlings for John Day and Bonneville dams during the month.

**Table 1. Subyearling Population Index*
at McNary Dam for August, 1992 – 2003.**

| Year | 8/1 to 8/15 | 8/16 to 8/31 |
|-------------|--------------------|---------------------|
| 2003 | 949,944 | 139,482 |
| 2002 | 771,437 | 550,113 |
| 2001 | 788,990 | 361,316 |
| 2000 | 1,168,668 | 304,032 |
| 1999 | 744,671 | 472,097 |
| 1998 | 523,606 | 172,724 |
| 1997 | 1,980,147 | 652,587 |
| 1996 | 1,193,721 | 404,474 |
| 1995 | 195,242 | 157,361 |
| 1994 | 77,023 | 43,518 |
| 1993 | 639,800 | 144,708 |
| 1992 | 138,145 | 47,032 |

*Index uses 1:1 spill effectiveness and FGE of 0.62

**Table 2. Subyearling Population Index*
at John Day Dam for August, 1992 – 2003.**

| Year | 8/1 to 8/15 | 8/16 to 8/31 |
|---------------|--------------------|---------------------|
| 2003 | 610,319 | 91,859 |
| 2002 | 272,588 | 292,038 |
| 2001 | 2,527,969 | 992,422 |
| 2000 | 558,516 | 100,281 |
| 1999 | 484,269 | 286,828 |
| 1998 | 428,528 | 67,978 |
| **1997 | 187,731 | 122,541 |
| 1996 | 368,966 | 355,009 |
| 1995 | 119,263 | 76,619 |
| 1994 | 183,653 | 114,391 |
| 1993 | 403,856 | 399,813 |
| 1992 | 419,741 | 121,128 |

*Index uses 1:1 spill effectiveness and FGE of 0.32

**Last year of airlift sampler, 1998 begins bypass sampler

**Table 3. Subyearling Population Index*
at Bonneville Dam for August, 1992 – 2003.**

| Year | 8/1 to 8/15 | 8/16 to 8/31 |
|-------------|--------------------|---------------------|
| 2003 | 471,679 | 142,946 |
| 2002 | 437,257 | 96,811 |
| 2001 | 1,137,382 | 603,279 |
| 2000 | 149,564 | 19,232 |
| 1999 | 514,089 | 177,589 |
| 1998 | 251,911 | 80,644 |
| 1997 | 647,556 | 220,178 |
| 1996 | 170,656 | 96,144 |
| 1995 | 284,978 | 123,844 |
| 1994 | 254,867 | 120,878 |
| 1993 | 423,111 | 244,289 |
| 1992 | 269,900 | 539,089 |

*Index uses 1:1 spill effectiveness and FGE of 0.09 for 1992 to 1999 and 0.28 for 2000 to 2003

- Present tagging programs do not allow a precise breakdown, by stock, of the population of subyearling chinook passing Lower Columbia River dams in August. Our analysis of the presence of various Washington stocks is based on PIT-tag passage data, hatchery release schedules, and tributary trap collections.
- PIT-tagged wild subyearling chinook from the Yakima Basin, Hanford Reach and Tucannon River have been detected at McNary, John Day, and Bonneville dams in August (Tables 4 – 6).
- PIT-tag subyearling chinook releases from Rock Island and Rocky Reach dams are a combination of hatchery and wild origin fish and provide some of the largest numbers of detections at Lower Columbia dams during August (Tables 4 – 6).
- PIT-tag detection data in the Lower River during August, indicate the presence of subyearling chinook released from Wells, Turtle Rock, Priest Rapids, Ringold, and Lyons Ferry hatcheries (Tables 4 – 6). In addition, PIT-tagged hatchery subyearling chinook from the Yakima Basin are also present during August. Of these hatcheries, Wells and Turtle Rock hatcheries tend to have later release schedules and later passage through the lower Columbia River.

Table 4. PIT tagged summer migrants of Washington origin detected at McNary Dam in August, 1997 – 2003.

| Group | Release site | Migration Year | First Half of August | Second Half of August | Total |
|----------------------------|---|--|-------------------------|-----------------------|-------|
| Wild Sub -Yearling Chinook | Chandler Dam & Yakima R | 1998 | 10 | 1 | 11 |
| | | 1999 | 37 | 18 | 55 |
| | | 2000 | 9 | 2 | 11 |
| | Hanford Reach | 1997 | 26 | 5 | 31 |
| | | 1999 | 16 | 2 | 18 |
| | | 2000 | 424 | 25 | 449 |
| | | 2001 | 231 | 52 | 283 |
| | | 2002 | 7 | | 7 |
| | Tucannon R | 1998 | 2 | | 2 |
| | | 2000 | 9 | 1 | 10 |
| | | 2001 | 7 | 6 | 13 |
| | | 2002 | 3 | 1 | 4 |
| | Mixture of Wild and Hatchery Sub – Yearling Chinook | Rock Island Dam | 1997 | 330 | 354 |
| 1998 | | | 367 | 99 | 466 |
| 1999 | | | 362 | 166 | 528 |
| 2000 | | | 483 | 251 | 734 |
| 2001 | | | 225 | 163 | 388 |
| 2002 | | | 544 | 336 | 880 |
| Rocky Reach Dam | | 2003 | 161 | 0 | 161 |
| | | 1998 | 88 | 8 | 96 |
| | | 1999 | 59 | 7 | 66 |
| | | 2000 | 54 | 2 | 56 |
| | | 2001 | 52 | 56 | 108 |
| | | 2002 | 131 | 10 | 141 |
| | | Hatchery Sub – Yearling Chinook ¹ | Chandler Dam & Yakima R | 1999 | 1 |
| Lyons Ferry H | 1999 | | 32 | 18 | 50 |
| | 2000 | | 2 | | 2 |
| | 2002 | | 15 | 3 | 18 |
| | 2003 | | 2 | | 2 |
| Priest Rapids H | 1997 | | 16 | 1 | 17 |
| | 1999 | | 5 | 2 | 7 |
| | 2000 | | 14 | | 14 |
| | 2001 | | 8 | 1 | 9 |
| Ringold H | 1997 | | 6 | | 6 |
| | 1998 | | 2 | | 2 |
| | 2000 | | 3 | | 3 |
| | 2001 | | 4 | 2 | 6 |
| Turtle Rock H | 1997 | | 205 | 75 | 280 |
| Wells H | 1997 | | 48 | 6 | 54 |
| | 1998 | | 16 | 1 | 17 |
| | 1999 | | 56 | 6 | 62 |
| | 2000 | | 118 | 6 | 124 |
| | 2001 | | 88 | 41 | 129 |
| | 2002 | 56 | 6 | 62 | |

¹ Research PIT tagged fish released for dam-specific survival studies are excluded.

Table 5. PIT tagged summer migrants of Washington origin detected at John Day Dam in August, 1997 – 2003.

| Group | Release site | Migration Year | First Half of August | Second Half of August | Total | |
|---|--|-------------------------|----------------------|-----------------------|-------|----|
| Wild Sub – Yearling Chinook | Chandler Dam & Yakima R | 1998 | 10 | | 10 | |
| | | 1999 | 16 | 8 | 24 | |
| | | 2000 | 10 | | 10 | |
| | Hanford Reach | 1998 | 4 | | 4 | |
| | | 1999 | 24 | 11 | 35 | |
| | | 2000 | 196 | 7 | 203 | |
| | | 2001 | 388 | 173 | 561 | |
| | Tucannon River | 2002 | 2 | 1 | 3 | |
| | | 1998 | 4 | | 4 | |
| | | 2000 | 4 | | 4 | |
| | | 2001 | 4 | 13 | 17 | |
| Mixture of Wild and Hatchery Sub – Yearling Chinook | Chandler Dam & Yakima R | 2001 | 8 | 2 | 10 | |
| | Rock Island Dam | 1997 | 1 | 5 | 6 | |
| | | 1998 | 142 | 27 | 169 | |
| | | 1999 | 97 | 65 | 162 | |
| | | 2000 | 100 | 41 | 141 | |
| | | 2001 | 85 | 188 | 273 | |
| | | 2002 | 88 | 123 | 211 | |
| | Rocky Reach Dam | 2003 | 35 | 0 | 35 | |
| | | 1998 | 19 | 7 | 26 | |
| | | 1999 | 4 | 1 | 5 | |
| | | 2000 | 18 | 0 | 18 | |
| | | 2001 | 14 | 42 | 56 | |
| | | | 2002 | 33 | 5 | 38 |
| | Hatchery Sub – Yearling Chinook ¹ | Chandler Dam & Yakima R | 1999 | 3 | | 3 |
| 2001 | | | 8 | 7 | 15 | |
| Lyons Ferry Hatchery | | 1999 | 9 | 6 | 15 | |
| | | 2000 | 1 | | 1 | |
| | | 2002 | 8 | 2 | 10 | |
| Priest Rapid Hatchery | | 2003 | 1 | | 1 | |
| | | 1998 | 2 | | 2 | |
| | | 1999 | 4 | 3 | 7 | |
| | | 2000 | 17 | | 17 | |
| Ringold Hatchery | | 2001 | 137 | 39 | 176 | |
| | | 1998 | 12 | | 12 | |
| | | 1999 | 5 | 1 | 6 | |
| | | 2000 | 2 | | 2 | |
| Wells Hatchery | | 2001 | 146 | 30 | 176 | |
| | | 1998 | 6 | | 6 | |
| | | 1999 | 25 | 2 | 27 | |
| | | 2000 | 44 | 3 | 47 | |
| | | 2001 | 55 | 68 | 123 | |
| | | 2002 | 9 | 2 | 11 | |

¹ Research PIT tagged fish released for dam-specific survival studies are excluded.

Table 6. PIT tagged summer migrants of Washington origin detected at Bonneville Dam in August, 1997 - 2003.

| Group | Release site | Migration Year | First Half of August | Second Half of August | Total |
|---|--|---------------------------------|----------------------|-----------------------|-------|
| Wild Sub – Yearling Chinook | Chandler Dam & Yakima R | 1998 | 2 | 1 | 3 |
| | | 1999 | 2 | 2 | 4 |
| | Hanford Reach | 1997 | 4 | 4 | 8 |
| | | 1998 | 1 | | 1 |
| | | 1999 | 3 | 2 | 5 |
| | | 2000 | 21 | 2 | 23 |
| | | 2001 | 47 | 33 | 80 |
| | Tucannon R | 2001 | | 3 | 3 |
| 2002 | | 1 | | 1 | |
| Mixture of Wild and Hatchery Sub – Yearling Chinook | Chandler Dam & Yakima R | 2001 | 2 | 2 | 4 |
| | | 1997 | 23 | 19 | 42 |
| | Rock Island Dam | 1998 | 24 | 4 | 28 |
| | | 1999 | 30 | 11 | 41 |
| | | 2000 | 8 | 3 | 11 |
| | | 2001 | 5 | 19 | 24 |
| | | 2002 | 8 | 13 | 21 |
| | | 2003 | 5 | 0 | 5 |
| | Rocky Reach Dam | 1999 | 1 | 0 | 1 |
| | | 2000 | 3 | 0 | 3 |
| | | 2001 | 1 | 4 | 5 |
| | | 2002 | 2 | 3 | 5 |
| | Hatchery Sub – Yearling Chinook ¹ | Big White Salmon H ² | 2001 | | 121 |
| Chandler Dam | | 2001 | 1 | 2 | 3 |
| Lyons Ferry H | | 1999 | 6 | 1 | 7 |
| | | 2002 | 3 | | 3 |
| Priest Rapids H | | 1997 | 1 | 1 | 2 |
| | | 2000 | 1 | | 1 |
| | | 2001 | 20 | 4 | 24 |
| Ringold H | | 1998 | 1 | 1 | 2 |
| | | 1999 | 1 | | 1 |
| | | 2001 | 22 | 2 | 24 |
| Turtle Rock H | | 1997 | 14 | 4 | 18 |
| Wells H | | 1997 | 2 | 1 | 3 |
| | | 1998 | 2 | | 2 |
| | | 1999 | 12 | 1 | 13 |
| | | 2000 | 5 | 1 | 6 |
| | 2001 | 8 | 13 | 21 | |

¹ Research PIT tagged fish released for dam-specific survival studies are excluded.

² Big White Salmon H release is thinning release of Carson spring chinook stock on May 2, 2001, at 100 fish per pound.

- Washington Department of Fish and Wildlife estimated Hanford Reach fry production between 13 and 23 million for the years 1999 to 2003. This is larger than the combined hatchery releases of subyearling chinook from all Washington hatcheries above McNary Dam in the Mid-Columbia (Table 7). Because Hanford Reach PIT-tagging is limited to large-early migrant fish, we would expect a greater presence of Hanford Reach fish in the Lower Columbia in August than PIT-tag detections indicate.

Table 7. Estimated Hanford Reach subyearling chinook fry production compared to hatchery releases in the Hanford Reach and Yakima River (in millions).

| Emergence Year | | | | | |
|-------------------|------|------|------|------|------|
| | 2003 | 2002 | 2001 | 2000 | 1999 |
| Hanford Fry | 23.5 | 16.5 | 19.6 | 13.8 | 13.4 |
| Hatchery Releases | 10.6 | 8.4 | 10.8 | 10.7 | 7.6 |

- In 2001, due to low flows, which slowed the migration, we saw greater numbers of detections of yearling chinook, steelhead, coho, and sockeye in August than any other year (Tables 8 – 10).

Table 8. PIT tagged spring migrants of Washington origin detected at McNary Dam in August , 1997 - 2003.

| Group | Release site | Migration Year | First Half of August | Second Half of August | Total |
|--|---------------|----------------|----------------------|-----------------------|-------|
| Yearling Hatchery Chinook ¹ | Leavenworth H | 2003 | 1 | | 1 |
| Coho | Leavenworth H | 2000 | 4 | 1 | 5 |
| | | 2001 | 1 | 1 | 2 |
| | Winthrop H | 2000 | 4 | 1 | 5 |
| | | 2001 | 5 | | 5 |

¹ Research PIT tagged fish released for dam-specific survival studies are excluded.

Table 9. PIT tagged spring migrants of Washington origin detected at John Day Dam in August, 1997 – 2003.

| Group | Release site | Migration Year | First Half of August | Second Half of August | Total |
|--|-------------------------|----------------|----------------------|-----------------------|-------|
| Wild Yearling Chinook | Yakima R | 2001 | | 1 | 1 |
| Hatchery Yearling Chinook ¹ | Easton AP (Yakima) | 2001 | | 1 | 1 |
| | Leavenworth H | 2001 | 1 | | 1 |
| Coho | Leavenworth H | 2001 | 74 | 34 | 108 |
| | | 2003 | 1 | | 1 |
| | Winthrop H | 2000 | 3 | 1 | 4 |
| | | 2001 | 17 | 7 | 24 |
| | Yakima R | 2000 | 1 | | 1 |
| | Natches R (Yakima) | 2001 | 43 | 10 | 53 |
| | Chandler Dam & Yakima R | 2001 | 12 | 3 | 15 |
| Sockeye | Rocky Reach Dam | 1998 | | 1 | 1 |
| | | 2001 | 1 | 1 | 2 |
| Steelhead | Rock Island Dam | 2001 | 2 | 2 | 4 |
| | Rocky Reach Dam | 2001 | | 1 | 1 |
| | Wells H | 2003 | 1 | | 1 |

¹ Research PIT tagged fish released for dam-specific survival studies are excluded.

Table 10. PIT tagged spring migrants of Washington origin detected at Bonneville Dam in August, 1997 – 2003.

| Group | Release site | Migration Year | First Half of August | Second Half of August | Total |
|--|----------------------|----------------|----------------------|-----------------------|-------|
| Hatchery Yearling Chinook ¹ | Carson H | 2001 | | 1 | 1 |
| | Rapid River H | 1997 | 1 | | 1 |
| | | 1999 | 1 | | 1 |
| Coho | Leavenworth H | 2001 | 6 | 3 | 9 |
| | Natches R & Yakima R | 2001 | 6 | 3 | 9 |

¹ Research PIT tagged fish released for dam-specific survival studies are excluded.

- Based on Klickitat River Trap collections from June 1 to September 15, more than 10% of the subyearling chinook trap collections occurred between July 20 and August 20 (Table 11). Fish passing between those dates would likely be passing Bonneville Dam during the month of August. Hatchery releases in the Klickitat Basin exceeded 4 million fish in 2003, so that Klickitat River releases likely make up a sizeable portion of the run passing Bonneville Dam in August.

Table 11. Collection of fall chinook or unknown race chinook from the Klickitat River Trap (river mile 6) comparing collection from July 20 to August 20 to total collection from June 1 to September 15.

| Migration Year | Collection June 1 to September 15 | Collection July 20 to August 20 |
|-----------------------|--|--|
| 2000 | 17,270 | 5,625 |
| 1999 | 61,961 | 6,461 |
| 1998 | 32,428 | 4,307 |
| 1997 | 14,118 | 442 |
| 1996 | 14,107 | 1,507 |

- Median Travel Time of subyearling chinook from McNary Dam to Bonneville Dam was estimated to average 8.0 days during August for the years 1997 to 2003 (Table 12). These travel times would likely be longer without spill at John Day and The Dalles and Bonneville dams.

Table 12. Travel Times for subyearling chinook detected at McNary Dam in August, 1997 – 2003.

| Migration Year | N | Median Travel Time (in days) |
|-----------------------|----------|-------------------------------------|
| 2003 | 7 | 7.4 |
| 2002 | 62 | 9.6 |
| 2001 | 49 | 13.2 |
| 2000 | 9 | 9.4 |
| 1999 | 40 | 5.0 |
| 1998 | 84 | 6.4 |
| 1997 | 40 | 5.0 |