

NOAA's "Low Flow" Transport Operations Proposal

Request for ISAB Review by NOAA Fisheries

February 25, 2010

Background

The Independent Scientific Advisory Board (ISAB) recommended, in their Snake River Spill-Transport Review (ISAB 2008-5), that "whenever river conditions allow during the late April-May period, a strategy allowing for concurrent transportation and spill is prudent."

Consistent with that recommendation, the federal Action Agencies (U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, and Bonneville Power Administration) have operated the Snake River collector projects (Lower Granite, Little Goose, and Lower Monumental dams) during 2006-2009 in accordance with court-ordered spring spill/transport operations. This operation has resulted in considerably fewer fish being transported during the spring migration period than has occurred in past years with similar seasonal flows. 2007 was a low flow year in which seasonal spring flows averaged about 61 kcfs (see Figure 1). Adult returns from juveniles out-migrating in 2007 (which are incomplete as not all 2-salt steelhead and no 3-salt steelhead or 3 or 4-salt spring summer Chinook salmon have returned to Lower Granite Dam) indicate that while the Transport to Inriver Migrant (T:M) ratio were less than in previous years with similar flows, they were, nonetheless, still positive and substantial (NWFSC 2010; FPC 2010) – especially so in May for wild Chinook and steelhead (NWFSC 2010 - Appendix A, Figures A10 and A32; Appendix B, Figures B10 and B32).

In addition to the available SAR information we have considered potential negative impacts to other species and the potential benefits of recently installed fish passage structures to the survival of future in-river migrants. We have considered potential impacts of slightly increased (3-5%) wandering/straying rates of transported SR steelhead into Mid-Columbia steelhead habitat. We have considered concerns regarding the effects of transport on SR sockeye salmon and Pacific lamprey, but are unaware of any credible scientific data currently available that can be used to evaluate whether or not transport is detrimental to these species, or that would indicate the magnitude of impact. We have also considered whether or not ESUs/populations are covered by "safety-net" hatcheries and the relative strengths and listing status of the various species.

Based on our consideration of the available information, we conclude that continuing the court ordered spill/transport operations in low-flow years like 2007 would result in substantial losses (in terms of adult returns) of wild SR steelhead and spring/summer Chinook salmon relative to maximum transport operations under these environmental conditions. The likely impacts to wild Snake River steelhead and spring/summer Chinook populations from continuing court-ordered spill/transport operations in a low flow year exceed the likely or potential impacts of maximum transport operations to the other species considered above.

NOAA Fisheries acknowledges it would be desirable to obtain additional information on the performance of recently installed passage structures in a low flow year, but believes that the risk is not justified if flows will be similar to those of 2007. NOAA Fisheries believes that it would be prudent to forego the spread-the-risk spill transport operations when expected river flows are forecasted to be ≤ 65 kcfs at Lower Granite Dam¹ and instead maximize transport (provide no voluntary spill) at the Snake River collector projects (beginning no later than May 1 at LGR, May 5 at LGS, and May 8 at LMN and ending when fall Chinook salmon outnumber spring migrants for three consecutive days²). Spill operations at the other mainstem projects would be unaffected by the spill/transport operations for the Snake River collector projects.

Question for the ISAB

Taking into account the ISAB's 2008 recommendation "*whenever river conditions allow during the late April-May period, a strategy allowing for concurrent transportation and spill is prudent,*" NOAA Fisheries looked at the data from the 2007 low-flow year and determined that if flow conditions in 2010 were similar to 2007 (i.e., ≤ 65 kcfs), it would not be "prudent" to continue spilling water in May at the three collector projects as in 2007.

Question: Has NOAA Fisheries correctly interpreted the ISAB's recommendation? If not, please further explain your reasoning in the 2008 recommendation.

Summary of 2007 Operations, River Flows, and Transport Rates

In 2007, Snake River flows at Lower Granite Dam averaged 61 kcfs during the spring migration season, 24 kcfs lower than the 85 kcfs spring flow objectives (Figure 1). Spill operations at the three Snake River collector projects in 2007 were targeted at 20 kcfs – 24 hours per day (LGR), 30% of daily flows – 24 hours per day (LGS), and "gas cap" resulting in spill volumes between 15 and 30 kcfs – 24 hours per day (LMN). These spill operations in a low flow year resulted in relatively high spill levels compared to other recent years. For example, the Fish Passage Center estimated that the average seasonal spill levels were nearly 38% in the LGR to McNary Dam Reach in 2007 (estimated using FPC 2010, table 7). As a consequence, far fewer fish (17-47%) were collected and transported (Table 1) and more fish migrated in-river than in previous years – especially compared to those characterized as low flow years.

¹ Expected seasonal flows are initially based on the April final forecast (available in early April), but will be updated in-season using either the May early-bird forecast (available in late April) or the May final forecast (available in early May).

² The actual start of summer spill will be initiated when subyearling Chinook exceed 50% of the collection for a 3-day period for each Snake River project after June 1.

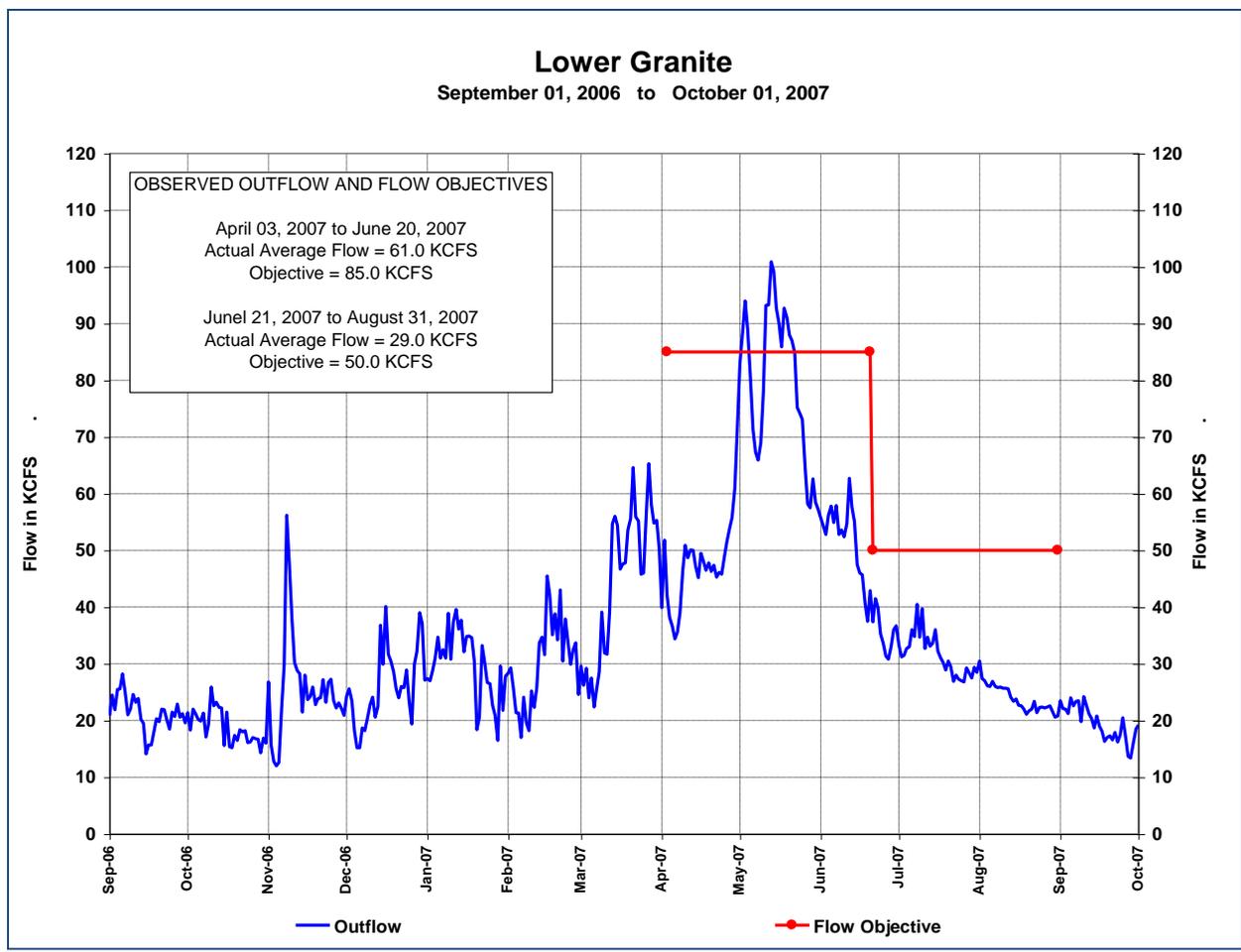


Figure 1. Observed outflows and flow objectives at Lower Granite Dam (2007 Water Year). Source: Presentation by Cathy Hlebechuk (COE) to Technical Management Team 2007 Year End Review – Nov. 28, 2007).

Table 1. Estimated percentage of juvenile Snake River steelhead and spring/summer Chinook salmon (wild and hatchery) transported in 2007.

| Species | NWFSC Estimate (NWFSC 2010 – Table 1) | FPC Estimate (FPC 2010 – Table 4) |
|-----------------------------|------------------------------------------|--------------------------------------|
| Wild SR Steelhead | 41.1% | 43.7% |
| Hatchery SR Steelhead | 41.1% | 47.0% |
| Wild SR spr/sum Chinook | 24.8% | 16.8% |
| Hatchery SR spr/sum Chinook | 25.4% | 24.2% |

Summary of Smolt to Adult Return Information from 2007 Juvenile Migration

Northwest Fisheries Science Center Paper

The NWFSC report (2010) analyzed patterns of SARs relative to in-season migration timing of smolts.³ SARs of juvenile fish transported at either LGR or LGS were compared to SARs of non-transport fish⁴ that migrated through the lower Snake and Columbia Rivers. In 2007, T:M ratios at LGR significantly exceeded 1.0 (and the adjusted standard⁵) for wild Chinook salmon starting in late April (for fish released at LGR) or early May (for fish released above LGR). Significant transport benefits continued throughout May for fish released at LGR, but were not statistically significant for fish released above LGR after about May 8 (NWFSC 2010, Figure 2). The T:M ratios of wild steelhead released both above and at LGR significantly exceeded both 1.0 (and the adjusted standard) throughout the entire migration season. Similar, though somewhat delayed, patterns of T:M ratios were observed for fish released at LGS (NWFSC 2010, Figures 6 and 8).

Close inspection of the weekly SAR estimates for wild spring/summer Chinook (NWFSC 2010 - Appendix A, Figure A10 and Appendix B, Figure B10) indicates that inriver SARs declined across the month of May for fish released above LGR, at LGR, or at LMN. Transport benefits (T:M ratios < 1.0 or the adjusted standard) consequently became substantial in early May at LGR, and as soon as transport began (second week of May) at LGS. For wild steelhead, SARs of inriver migrants released above LGR peaked from late April to mid-May; but were generally exceeded by transport SARs throughout the month of May. SARs of migrants released at LGR or LGS declined throughout May, and were also substantially exceeded by the SARs of transported fish throughout May (NWFSC 2010 - Appendix A, Figure A32 and Appendix B, Figure B32).

Fish Passage Center Memorandum

The Fish Passage Center Memorandum (2010) focuses primarily on critiquing the NWFSC's methodologies and makes a case that improving in-river conditions has led to improvement of in-river survival. It does not focus on the specific low flow conditions that are expected in 2010. It also presents annual estimates of T:M SAR ratios⁶ (adult returns from fish that were transported compared to inriver migrants released upstream of LGR that were not detected at the three Snake River collector projects) for 2007 consistent with the methodologies used in the

³ Adult returns of steelhead and spring/summer Chinook salmon from the 2007 outmigration are not yet complete.

⁴ Within season analysis of SAR information requires that fish detected passing the collector projects be used to define the in-river migrant (M) group. Thus, these results are not directly comparable to seasonal averages using undetected fish (FPC 2010 analysis) because detected fish often have lower SARs than undetected fish. The NWFSC (2010) report attempted to correct for this difference by calculating an alternative "standard" for comparing SARs of transported and in-river migrating groups.

⁵ The 1.0 standard was adjusted upward to account for the higher SAR rates typically observed for undetected fish compared to those detected in the juvenile bypass systems at the Snake River collector projects.

⁶ Comparative Survival Study uses TIR (Transport vs Inriver Migrant) as its nomenclature.

Comparative Survival Studies. The annual T:M SAR ratio in 2007 was 1.15 for wild Chinook and 2.86 for wild steelhead.⁷

Management Conclusions from SAR Information

Based on the historic and 2007 SAR information presented by NWFSC and FPC, NOAA Fisheries believes that several conclusions can be drawn that are important for future spill / transport operations in low flow years. It is apparent that both Transport and In-river Migrant SARs (and the resultant T:M SAR ratios) vary across the migration season. Thus, average seasonal estimates of T:M SAR ratios do not provide sufficient information for designing flexible spill/transport operations aimed at balancing risks to, and increasing adult returns of, wild Chinook and steelhead. Also, it is clear that in low flow conditions such as 2007, SARs of wild transported fish, especially in May, are significantly and substantially higher than SARs of wild inriver migrants (either undetected fish, those released upstream of LGR, or those released at LGR or LGS).

NOAA Fisheries believes that improvements made to the FCRPS mainstem projects since 2007 (see section below) are not sufficient to improve in-river survival under low flow conditions to the extent necessary to substantially offset the observed pattern in T:M SAR ratios. Repeating the 2007 spill/transport operation in future low flow year places too great a risk on the wild SR steelhead and spring/summer Chinook populations as they would likely result in substantially fewer adults returning to the Snake River basin in subsequent years.

Other Considerations:

Other Species: MCR Steelhead, SR Sockeye Salmon, Pacific Lamprey

The ISAB rightly noted in their Snake River Spill/transport Review that other species may be, or are likely to be, affected by these operations. Transported SR steelhead typically wander/stray 3-5% more than adults that migrated in-river as juveniles (NOAA Fisheries 2008a and FPC 2010). These fish are often found in areas inhabited by Mid-Columbia River steelhead where they could interbreed and potentially affect the genetic integrity of some MCR steelhead populations. It has been hypothesized that transport negatively affects SR sockeye salmon. There is also some analysis which indicates that transportation rate has little influence of adult returns. However, as noted by the ISAB (2008), the data is presently insufficient to directly test T:M SAR relationships for SR sockeye salmon.⁸ Pacific lamprey – which are unlisted, though an important species of concern – could be negatively affected by spill/transport operations either directly (mortalities of transported lamprey or increased mortalities passing dams without spill) or indirectly (removing migrating salmon and steelhead through transport could increase mortalities from avian or fish predators). However, the likely magnitude of these impacts is unknown.

⁷ Adult returns of steelhead and spring/summer Chinook salmon from the 2007 outmigration are not yet complete.

⁸ A transport study for SR sockeye salmon has been planned for 2010 and will likely be supported again in 2011.

These considerations, along with information regarding the relative strengths of these ESUs / populations, whether or not they are covered by “safety-net” hatchery programs, and their ESA-listing status, are all important factors that NOAA Fisheries has considered in weighing risks and likely trade-offs between ESUs.

Configuration Changes: Surface Passage Structures Installed at LGS (2009), LMN (2008), and John Day Dam (2008) and Spill Wall at The Dalles (2010)

It is also true that the federal Action Agencies have made several fish passage improvements since 2007 which are expected to increase juvenile dam passage survival and could also slightly decrease delayed mortality of in-river migrants by reducing travel times through the mainstem migration corridor by many hours. These include the Adjustable Spillway Weir at Little Goose Dam, the Removable Spillway Weir at Lower Monumental Dam, two Temporary Spillway Weirs at John Day Dam, and the Spillway Wall in the tailrace of The Dalles Dam. NOAA agreed (NOAA Fisheries 2008b) with the federal Action Agencies (2007, Appendix B, Section B.2.1.2.2) that the likely survival improvement for juvenile yearling Chinook salmon and steelhead and from these structures would be about 1%, 2 to 4%, 1-4%, and 4%, respectively. It is unreasonable to think that these structures would fundamentally alter the T:M SAR ratios observed for outmigrants in 2007.

NOAA Fisheries' Conclusions

Based on the T:M SAR ratios from the 2007 outmigration, NOAA Fisheries concludes maximum transport operations are warranted in low flow years to protect wild SR steelhead and spring/summer Chinook salmon from likely, and substantial decreases in overall adult returns, even though other species - populations of MCR steelhead, SR sockeye, and Pacific lamprey may be negatively impacted to some unknown, degree. NOAA Fisheries further concludes that maximum transport operations should be confined to May, when the SARs of transported juveniles consistently return at higher rates than inriver migrants released at or above Lower Granite Dam.

NOAA Fisheries' Proposed Low Flow (≤ 65 kcfs at LGR) Operation

NOAA Fisheries proposes that an alternative spill/transport operation to the court-ordered operations for the Snake River collector projects in low flow years (≤ 65 kcfs at Lower Granite Dam).⁹ Normal spill operations would begin in early April consistent with the court-ordered operations at the three Snake River collector projects. Maximum transport operations (no spill and transportation of all smolts collected) would begin no later than May 1 at Lower Granite Dam, May 5 at Little Goose Dam, and May 8 at Lower Monumental Dam and continue for the duration of the spring migration period (until sub-yearling Chinook outnumber spring migrants

⁹ Expected seasonal flows are initially based on the April final forecast (available in early April), but will be updated in-season using either the May early-bird forecast (available in late April) or the May final forecast (available in early May).

for three consecutive days¹⁰ - which typically occurs in early June). After this time, court-ordered summer spill operations would begin for migrating juvenile SR fall Chinook salmon. TMT could recommend that maximum transport operations begin earlier than May 1 (or May 5 at LGS, or May 8 at LMN) based on in-season environmental and fish passage information.

Citations

Fish Passage Center (FPC). 2010. "Review of the NOAA Transportation analyses and potential effects of reducing spill for fish passage in May and beginning the transportation program earlier in the spring and supporting analyses." February 9, 2010 Memorandum.

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NOAA Fisheries – Northwest Regional Office (NOAA Fisheries). 2008b. Endangered Species Act Section 7(a)(2) Consultation Biological Opinion And Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation: Consultation on Remand for Operation of the Federal Columbia River Power System, 11 Bureau of Reclamation Projects in the Columbia Basin and ESA Section 10(a)(1)(A) Permit for Juvenile Fish Transportation Program (Revised and reissued pursuant to court order, *NWF v. NMFS*, Civ. No. CV 01-640-RE (D. Oregon). May 5, 2008.

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U.S. Army Corps of Engineers, Bonneville Power Administration, and U.S. Bureau of Reclamation (federal Action Agencies). 2007. Biological Assessment for Effects of Federal Columbia River Power System and Mainstem Effects of Other Tributary Actions on Anadromous Salmonid Species Listed Under the Endangered Species Act. August 2007.

¹⁰ The actual start of summer spill will be initiated when subyearling Chinook exceed 50% of the collection for a 3-day period for each Snake River project after June 1.