



FISH PASSAGE CENTER

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MEMORANDUM

TO: Scott Levy, Bluefish.org
FROM: FPC Staff
DATE: September 15, 2008
RE: Response to Data Request

You recently requested that the Fish Passage Center address two data requests. The first request specifically requested that we review the Fish Passage Center's data for information relative to the efficiency of Removable Spillway Weirs (RSWs).

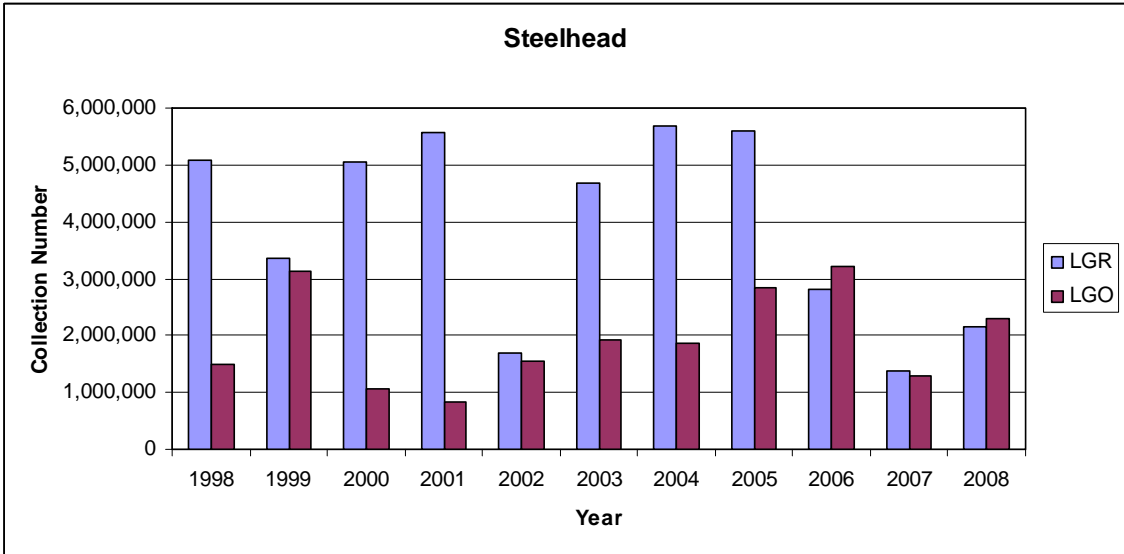
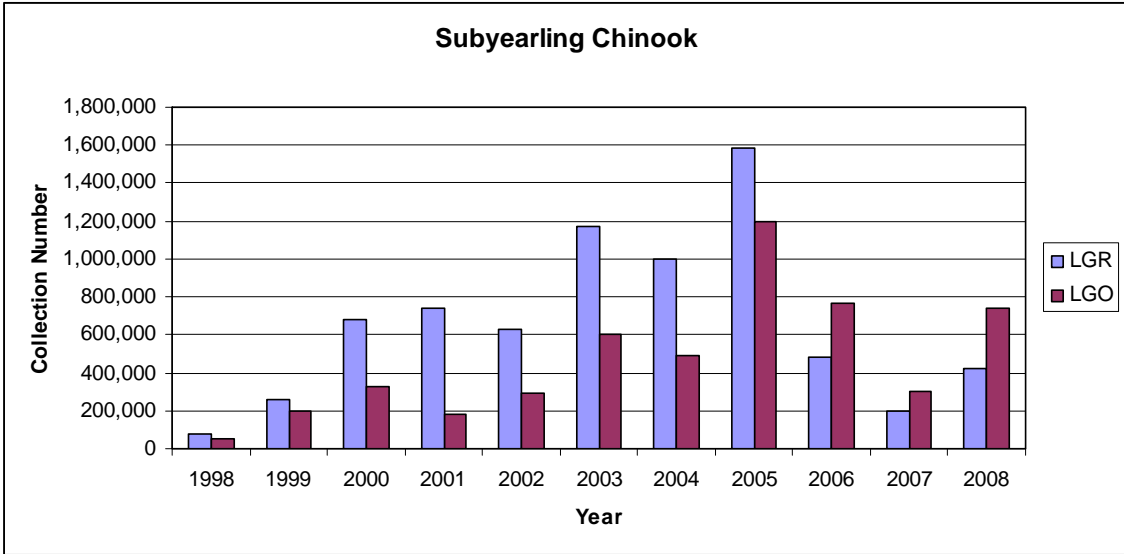
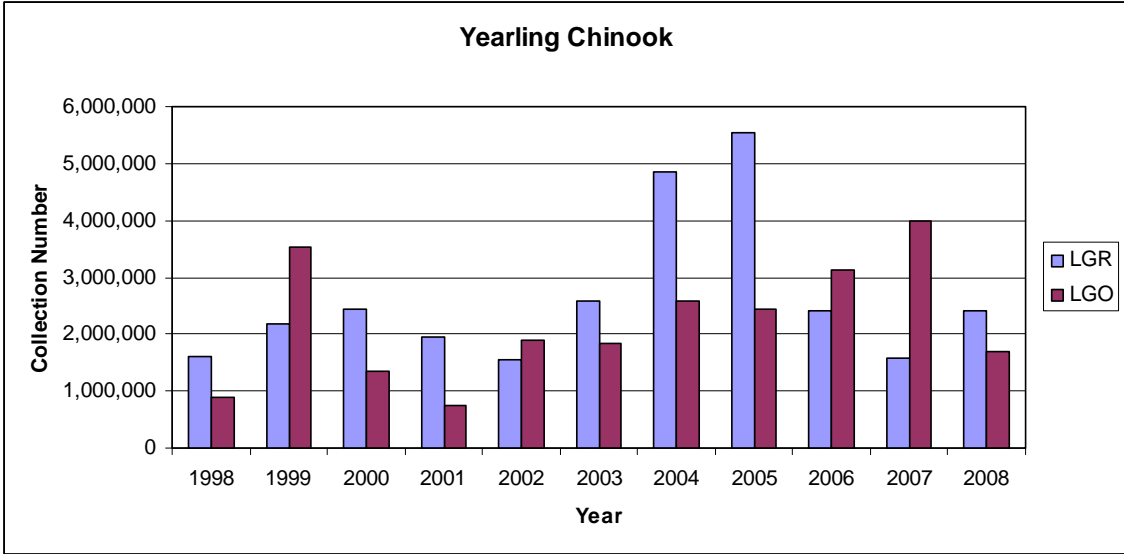
“From what I am hearing, it appears that there is no evidence to support the Federal Action Agency statement in the May 5, 2008 "Issues Summary"”

Since 2000, there have been significant improvements that should translate to increases in survival across the salmon life cycle, including: The Corps has installed removable spillway weirs (RSW) at Lower Granite, Ice Harbor, and recently at Lower Monumental dams on the Snake River. These RSWs have proved to be effective at passing juvenile fish, reducing fish delays upstream of the dams, and, most importantly, increasing survival for these fish without breaching.

Do you disagree with my conclusion? I was hoping that we would be able to tease out something from available Fish Passage Center data.

Smolt Monitoring Program Data

There are limited ways that information regarding RSWs that could be teased out from the FPC monitoring data. Lower Granite Dam was the first site where a permanent RSW was installed. The graphs below compare monitoring data for the time period before and after the installation of the RSW at Lower Granite Dam in the spring of 2002 for yearling Chinook, subyearling Chinook and Steelhead.



The collection counts represent the sampled fish numbers divided by the sample rate. If more fish were to pass Lower Granite Dam in spill or RSWs, then the collection at the next downstream project would increase. However, when looking at the graphs, one has to be careful to interpret the passage relative to the flow and spill that took place in any given year, as well as the project operations and the research study operations that were in place. For example, high flow and spill occurred in 1999, while in 2002 high spill levels occurred at Lower Granite Dam because a turbine unit was not operating during the season, and in 2005 there was no planned spring spill due to low flows. Other years also have variations and these operations can affect the changes observed in the relative proportion of migrants observed at each project.

What is evident in the collection data is that when spill makes up a large proportion of the flow at Lower Granite Dam, the collection numbers at Little Goose increase as more fish are passing Lower Granite Dam without being transported such as occurred in 2007. Given the variation of natural and project operations that occurred in the historic record, there is no clear information from the FPC monitoring data that can be used to show that more fish pass the projects with the use of RSWs.

The FPC does not have data that can be used to address the statement that RSWs have increased survival without breaching. As you are aware, the RSW specific research studies thus far have only addressed juvenile survival at the project being studied. While it seems logical that improved juvenile survival may lead to better adult survival, the juvenile research studies that have been conducted have not considered survival over a river reach, and have occurred over few years and under varying environmental conditions. To confound matters, it would be difficult to address the role of RSWs in adult returns based on PIT tagged fish for other studies since, at the same time that the RSWs were installed in the Snake River, other modifications to the system such as the Court Ordered Spill Program were implemented. For instance, the Court Ordered modifications to the spill program, such as the addition of twenty four hour spill programs at both Little Goose and McNary dams, makes it impossible to attribute changes observed in juvenile and adult survival specifically to the installation of RSWs.

RSW Research

Attached is a spreadsheet summarizing the studies that have been conducted at Lower Granite, Ice Harbor and McNary dams through 2007 utilizing, radio tags, and PIT tags to test survival over the spillway and spillway passage Efficiency (SPE). The results of these studies are available in final reports or have been presented at annual meetings. There has been significant disagreement between the Corps of Engineers and the salmon managers regarding RSW testing and evaluation, including spill volumes to be evaluated and testing schedules and project priorities. NOAA Fisheries (NOAA), the Department of Energy Pacific Northwest National Laboratory (PNNL), and US Geological Survey (USGS) have conducted RSW tests under the Corps of Engineers AFEP program at Lower Granite Dam, Ice Harbor and McNary dams through 2007. From this spreadsheet you can see that the most extensive studies have been conducted at Lower Granite Dam. These are studies that are conducted in a system where not all variables can be controlled. For instance, in 2002 there was higher than expected spill that resulted in little survival data due to low sample size as a result of low collection numbers. In 2003, the RSW was compared to the 2000 Biological Opinion spill that was a 12 hour operation.

While the data showed a higher survival and passage for yearling chinook, it is difficult to attribute this to the RSW operation, or to the provision of 24 hour spill. No tests were conducted in 2004 and 2005. In 2006 the behavioral guidance structure was deployed and tests were conducted with yearling and subyearling Chinook and steelhead. The results suggested that more fish passed via the RSW, but again the results were somewhat difficult to interpret because of a turbine unit outage and the inability to use the normal spill patterns. RSW operation with spill 24 hours per day shows potential for reducing forebay delay compared with 12 hour spill to the gas cap operations. While juvenile survival may have improved at this project, it is unknown if this specific operation has had an effect on survival to adulthood since no specific studies have been conducted.

At Ice Harbor Dam research was conducted in 2005, 2006 and 2007. The results of 2005 studies at Ice Harbor comparing bulk spill without the RSW operating versus RSW operations indicated that survival, spillway passage efficiency, forebay delay and tailrace egress were all better under bulk spill conditions without the RSW operating than under RSW operations for yearling Chinook and steelhead. The 2003 final report on behavior and survival of radio tagged fish at Lower Granite conducted by USGS compared RSW spill with training spill for 24 hours per day against spill to the gas cap for 12 hours and no spill during the day. This comparison showed that RSW operation for 24 hours reduced delay in the forebay compared to no spill during daytime hours. However, 24 hour spill to the gas cap was not tested as part of this comparison.

In 2006 and 2007 passage behavior and survival of yearling Chinook and steelhead were tested at Ice Harbor Dam RSW utilizing radio tags. The passage behavior and survival of sub-yearling Chinook was evaluated at Ice Harbor Dam as well as the fish passage distribution and the fish passage conditions under various spill and flow conditions. The data suggest that reducing spill volume and operating RSWs at lower amounts reduces the proportion of fish passing the project over the spillway.

At McNary Dam tests were conducted in 2006 and 2007. The 2006 study only looked at steelhead survival under 2 spill patterns at 40% spill. The 2007 study again compared two spill patterns (one new) for the spring at 40% spill and at 40% and 60% spill treatments for subyearling Chinook. The new spill pattern yielded varied results for the spring migrants, while the 60% spill levels showed benefits in passage and survival over the 40% spill level.

In conclusion, our review of the RSW research data suggest that improvements to juvenile migrant passage and survival are project dependent. Too few years of data have been collected, and too few study evaluations have been implemented to generate significant information regarding the benefits of RSWs. The results of RSW studies to date indicate that:

- It does not appear that spill can be reduced with an RSW without reducing spill passage efficiency (SPE),
- RSW operation with spill 24 hours per day shows potential for reducing forebay delay compared with 12 hour spill to the gas cap operations.

You asked in your request to comment on the Federal Action Agency statement. With the data at hand and the variability observed in the system due to the implementation of additional strategies

for spill passage, it is difficult to address the statement regarding overall RSW effectiveness versus breaching.

The second request that you made to the Fish Passage Center was to obtain information relative to the percentage of salmonids that pass the projects via navigation lockages.

“A few days ago I spoke with Joe Saxon with the ACOE Walla Walla District regarding lockage mortality of salmonids. (I have yet to hear back from Portland District). He spoke with his fishery people and replied that "From all indications, it appears that fish passage through NWW locks is insignificant." Surprisingly, they claimed this was true of all ACOE lockages but I let them know about the lockage mortality at Ballard Locks in which ACOE's Rebecca Jahns managed a project for an interim solution.

At any rate, I am writing to you to ask what is the percentage of "undetected" salmon. It seems to me that at least some of these undetected fish travel via lockages. If "undetected" is small and the part of lockage passed fish is a small percentage of this, then indeed lockage mortality could be considered as insignificant.”

There is no doubt that some fish pass a project via the navigation locks. In looking into your request there was little specific data that we could find addressing the quantification of “insignificant”. We did find two COE funded studies where the percentage of fish passing the Bonneville Dam through the navigation lock in these studies was quantified. We should caution directly applying this information to other projects, since Bonneville Dam does have two powerhouses and the data presented here is only relative to those fish passing the Bonneville project via powerhouse 1. The percentage of radio tagged juvenile Chinook and steelhead passing the Bonneville Dam in 2002 and 2004 included estimates of navigation lock passage. In 2002, of the juvenile Chinook salmon from the study that passed the first powerhouse, 4% passed via the navigation lock. In 2004, of the juvenile salmon from the study that passed the first powerhouse, 1% of the Chinook and 3% of the steelhead passed via the navigation lock.

Since there were few research studies that we found directly quantifying the percentage of juveniles migrating past a project via the navigation lock, we also considered the proportion of water that passes via a project through the lock as a function of the total amount of water past the project.

Amount of water per lockage 0.031 Kaf

	Daily Lockage Volume (Kaf)	Percent Lockage Volume to Daily project Volume at 50 Kcfs (%)	Percent Lockage Volume to Daily project Volume at 100 Kcfs (%)	Percent Lockage Volume to Daily project Volume at 150 Kcfs (%)	Percent Lockage Volume to Daily project Volume at 200 Kcfs (%)
5 Lockages Per day	0.155	0.2	0.1	0.1	0.0
10 Lockages Per day	0.310	0.3	0.2	0.1	0.1
15 Lockages Per day	0.465	0.5	0.2	0.2	0.1
20 Lockages Per day	0.620	0.6	0.3	0.2	0.2
25 Lockages Per day	0.775	0.8	0.4	0.3	0.2
30 Lockages Per day	0.930	0.9	0.5	0.3	0.2

	Percent Lockage Volume to Daily project Volume at 250 Kcfs (%)	Percent Lockage Volume to Daily project Volume at 300 Kcfs (%)	Percent Lockage Volume to Daily project Volume at 350 Kcfs (%)
	0.0	0.0	0.0
	0.1	0.1	0.0
	0.1	0.1	0.1
	0.1	0.1	0.1
	0.2	0.1	0.1
	0.2	0.2	0.1

The above table shows the range of the volume of water used in lockages based on river flow and the number of lockages that occur. The table shows that, depending on daily flow volume, lockages would make up approximately 0.1 to 0.9 percent of daily project flow.

In conclusion, we have not found information to quantify the impact of dam lock operations on juvenile salmonid passage mortality. We were able to assess the potential percentage of water passing through the locks and the possible range of fish passing through the locks.



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DATA REQUEST FORM

Request Taken By: Margaret Filardo Date: May 20, 2008
July 10, 2008

Data Requested By:
Name: Scott Levy Phone: _____
Address: Blue fish .org Fax: _____
Email: redfish@bluefish.org

Data Requested: RSW
① Review ^{as evidence} data relative to Federal Action Agency Statement
in May 5, 2008 "Issues Summary." Review if any
adult data of fish that passed RSW as juveniles.
② Percentage of "undetected" salmon pass projects
via lockages