

FISH PASSAGE CENTER

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MEMORANDUM

TO: Cindy LeFleur (WDFW)

FROM: Michele DeHart

DATE: April 12, 2011

RE: Adult spring Chinook timing at Bonneville Dam and environmental factors from March 15 – April 15

In response to your request, the Fish Passage Center staff has expanded on a previous analysis on spring Chinook adult timing at Bonneville Dam (BON) and environmental conditions. The original memo was posted to the FPC website on April 11, 2011 and included linear regression analyses of environmental conditions (Mar. 15-Apr. 1) and adult spring Chinook passage timing at BON from 1994-2010. We have expanded on this original analysis by using a different time period for the environmental conditions. For this expanded analysis, we used the period of Mar. 15-Apr. 15 to describe environmental conditions. The estimated 10% passage date for adult spring Chinook was kept as the response variable. Furthermore, we are providing the environmental data for 2011 (Mar. 15-Apr. 11), which may provide insight into the timing of the 2011 spring Chinook return.

- So far, the average temperature below BON in 2011 is 43.7 °F (Mar. 15-Apr. 11). Compared to the Mar. 15-Apr. 15 temperatures from previous years, the 2011 temperature (Mar. 15-Apr 11) is the second lowest and is close to what was seen in 2009, which had the second latest 10% passage date among the years we analyzed.
- Incorporating April temperatures did not change the significant relationship between temperature (Mar. 15-Apr. 15) and the 10% passage date for adult spring Chinook at Bonneville Dam. Later 10% passage dates are associated with lower average temperatures during these times.

- Incorporating April temperatures did not change the results of the linear regression analysis of average flow (Mar. 15-Apr. 15) and 10% passage date. There is still no significant relationship between average outflow (Mar. 15-Apr. 15) and the 10% passage date.

Methods and Results:

Fish Passage Center (FPC) staff reviewed the adult count data for spring Chinook adults at Bonneville Dam (BON) over a 17 year period (1994-2010). For this analysis, we relied on the historical count start date of March 15th. Therefore, any Chinook passing BON before March 15th were not included in this analysis. From March 15th to May 31st, any adult Chinook passing BON are considered spring Chinook. From these counts, we estimated the 10% passage date for each of the return years analyzed. Spring Chinook jacks were included in this analysis. The 10% passage dates were then converted to Julian Dates (i.e., day of the year) for linear regression analyses.

In addition to adult count data, FPC staff also collected temperature data for the period of March 15th to May 31st for each of the return years we analyzed. For this portion of the analysis, we relied on temperature data that were collected at the Warrendale Total Dissolved Gas gauge, which is found approximately 6 miles downstream of BON. Temperature data from the Warrendale gauge were only available from 1994 to 2010 and only consistently through April 15th. Flow data from BON were also collected over the same periods of time. In order to describe the temperatures and flow conditions that spring Chinook might encounter in the beginning of the run, we estimated an average temperature and average flow from March 15th to April 15th. All of the estimates of 10% passage date and each of the environmental variables can be found in Table 1.

The relationship between 10% passage date (Julian) and each of these environmental variables was investigated using linear regression analyses. Linear regression analysis revealed a significant relationship between average temperature (Mar. 15-Apr. 15) and 10% passage date ($p = 0.016$) (Figure 1). Later 10% passage dates were associated with lower average temperatures during the period of March 15th and April 15th. There was no significant relationship between average flow (Mar. 15-Apr. 15) and 10% passage date ($p = 0.68$) (Figure 2).

Table 1. Estimated 10% passage date for spring Chinook at Bonneville Dam from 1994 to 2010. Average temperature and average flow are for the period of March 15th to April 15th of each year.

Return Year	10% Passage Date	10% Passage Date (Julian)	Average Temperature (°F)	Average Flow (Kcfs)
1994	11-Apr	101	46.9	140.2
1995	9-Apr	99	47.3	180.3
1996	19-Apr	110	46.1	301.2
1997	12-Apr	102	45.5	310.5
1998	10-Apr	100	47.2	185.9
1999	18-Apr	108	45.0	259.7
2000	10-Apr	101	46.6	213.4
2001	5-Apr	95	45.3	124.8
2002	16-Apr	106	44.4	153.7
2003	3-Apr	93	47.3	186.0
2004	17-Apr	108	47.9	155.9
2005	23-Apr	113	45.7	138.7
2006	2-May	122	45.2	216.6
2007	20-Apr	110	45.4	245.0
2008	21-Apr	112	44.4	149.6
2009	29-Apr	119	43.5	169.5
2010	16-Apr	106	46.3	113.3
2011 [†]	N/A	N/A	43.7	276.2

[†] The temperature and flow data for 2011 are for the Mar. 15-Apr. 11 period.

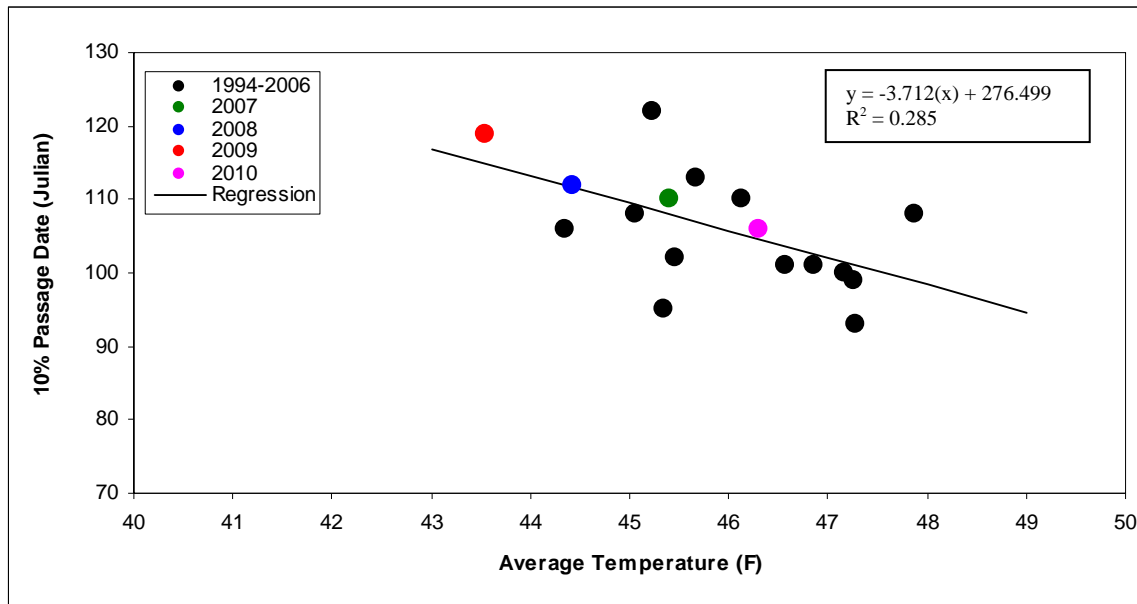


Figure 1. Linear regression of average temperature (°F) at the Warrendale TDG monitor (Mar. 15-Apr. 15) and estimated 10% passage date for spring Chinook adults at BON.

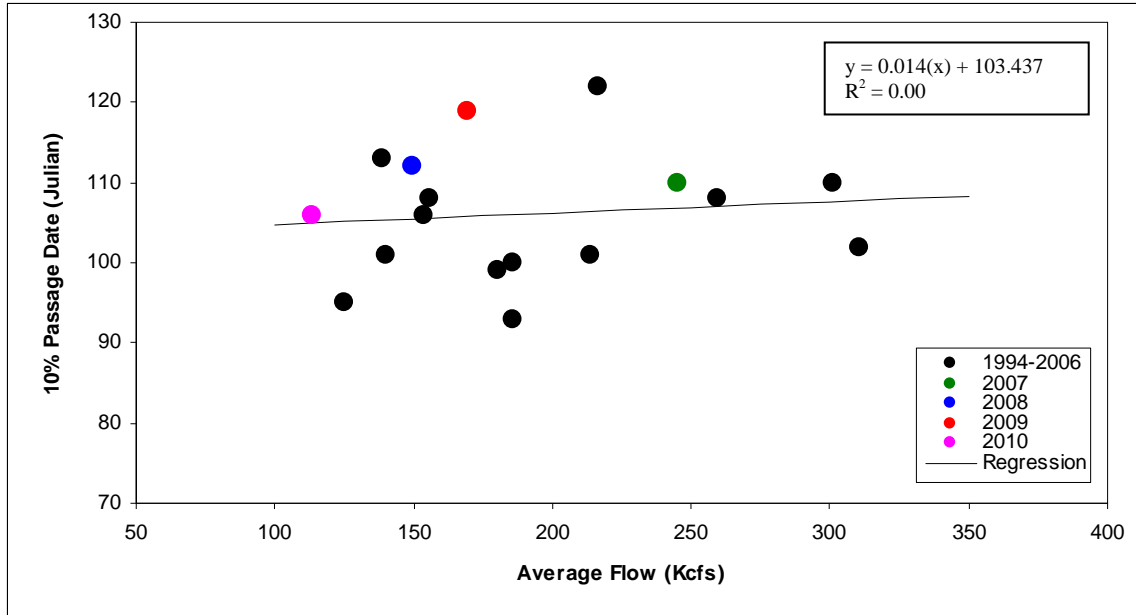


Figure 2. Linear regression of average flow (Kcfs) (Mar. 15-Apr. 15) and estimated 10% passage date for spring Chinook adults at BON.

2011 Conditions:

As of April 11, 2011, a total of 660 spring Chinook adults and 0 jacks have been counted at BON (based on historical start date of March 15th). This count represents approximately 3.5% of the 10-year average up to this date.

For the period of Mar. 15-Apr. 11, 2011, the average temperature at the Warrendale TDG monitor was 43.7 °F. When compared to the temperatures for the Mar. 15-Apr. 15 period for the historical years, the 2011 temperature (Mar. 15-Apr. 11) is the second lowest. Only 2009 had a lower temperature for the Mar. 15-Apr. 15 period. Coincidentally, with a 10% passage date of April 29, return year 2009 had the second latest 10% passage date among the years we analyzed. By April 11, 2009, the total spring Chinook adult count at BON was 993 (based on the historical start date of Mar. 15).



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DATA REQUEST FORM

Request Taken By: Brandon Chockley Date: 12-Apr-2011

Data Requested By:

Name: Cindy LeFleur (WDFW) Phone: _____
Address: _____ Fax: _____
Email: Cindy.LeFleur@dfo.wa.gov

Data Requested:

Expand on sp ch adult ^{timing} vs. Temp and flow
analysis from Apr. 11 to include April data.

Data Format: Hardcopy Text Excel
Delivery: Mail Email Fax Phone

Comments:

Used Mar 15-Apr 15 temps and flow. Warrandale monitor
not always collecting data after Apr 15. so cannot use
later date.

Data Compiled By: Brandon Chockley Date: 12-Apr-2011

Request # 31

Brandon Chockley

From: Le Fleur, Cindy (DFW) [Cindy.LeFleur@dfw.wa.gov]
Sent: Tuesday, April 12, 2011 12:43 PM
To: Michele Dehart; Brandon Chockley; Dave Benner
Subject: FW: Some room to breath
Attachments: 48-11.pdf

Michele,

Can you expand this analysis to include April? I would like to see April 1-15 and April 16-30 or maybe just the month of April versus flow – I thought when we had high flows we had late runs
thanks

From: Norman, Guy R (DFW)
Sent: Tuesday, April 12, 2011 9:32 AM
To: Ehlke, Robin D (DFW); John North; Le Fleur, Cindy (DFW)
Subject: FW: Some room to breath

FYI

From: NSIALIZ@aol.com [mailto:NSIALIZ@aol.com]
Sent: Monday, April 11, 2011 3:23 PM
To: stephen.h.williams@state.or.us; Norman, Guy R (DFW)
Subject: Some room to breath

There's still hope, I guess!