MEMORANDUM

TO: Ralph Steiner, IDFG

FROM: Brandon R. Chockley

DATE: January 13, 2016

RE: 2015 Rapid River Hatchery Report

The Fish Passage Center has been marking Chinook from the Rapid River Hatchery facility over the last several years as part of the Comparative Survival Study (CSS). The CSS is a multi-year program that estimates survival rates over different life stages for spring and summer Chinook produced in major hatcheries. We would like to share with you an update of some of the information we developed under the CSS for the Chinook used from the Rapid River Hatchery facility in 2015 as well as past years.

With the marking efforts over the past several years, data on the timing and migration speed from release to Lower Granite Dam are also available. In addition, as part of the CSS study, juvenile survival estimates are developed for the hydrosystem between Lower Granite and Bonneville dams, as well as survival to adulthood of different passage histories.

Table 1 provides estimates of minimum, median, and maximum travel times from each year’s release of spring Chinook from Rapid River Hatchery to Lower Granite Dam. Also provided are estimates of the 95% confidence limits around the estimated median travel time.
Table 1. Rapid River Hatchery Spring Chinook Travel Times to Lower Granite Dam

<table>
<thead>
<tr>
<th>Release Date</th>
<th>Migration Year</th>
<th>Travel Time (Days)†</th>
<th>95% Confidence Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Min</td>
<td>Med</td>
</tr>
<tr>
<td>17-Mar 1997</td>
<td>1.5</td>
<td>34.9</td>
<td>115.8</td>
</tr>
<tr>
<td>16-Mar 1998</td>
<td>n/a</td>
<td>19.5</td>
<td>60.0</td>
</tr>
<tr>
<td>18-Mar 1999</td>
<td>1.4</td>
<td>37.1</td>
<td>134.8</td>
</tr>
<tr>
<td>17-Mar 2000</td>
<td>5.5</td>
<td>30.2</td>
<td>63.1</td>
</tr>
<tr>
<td>15-Mar 2001</td>
<td>7.6</td>
<td>30.1</td>
<td>79.9</td>
</tr>
<tr>
<td>18-Mar 2002</td>
<td>4.2</td>
<td>30.7</td>
<td>70.2</td>
</tr>
<tr>
<td>17-Mar 2003</td>
<td>5.7</td>
<td>32.3</td>
<td>66.0</td>
</tr>
<tr>
<td>15-Mar 2004</td>
<td>8.3</td>
<td>33.6</td>
<td>68.3</td>
</tr>
<tr>
<td>15-Mar 2005</td>
<td>8.7</td>
<td>33.6</td>
<td>59.4</td>
</tr>
<tr>
<td>17-Mar 2006</td>
<td>3.7</td>
<td>26.2</td>
<td>131.7</td>
</tr>
<tr>
<td>15-Mar 2007</td>
<td>4.5</td>
<td>20.3</td>
<td>66.9</td>
</tr>
<tr>
<td>3/17,3/19 2008</td>
<td>5.0</td>
<td>25.6</td>
<td>65.0</td>
</tr>
<tr>
<td>16-Mar 2009</td>
<td>4.0</td>
<td>35.0</td>
<td>72.4</td>
</tr>
<tr>
<td>15-Mar 2010</td>
<td>4.9</td>
<td>28.1</td>
<td>63.2</td>
</tr>
<tr>
<td>15-Mar 2011</td>
<td>4.6</td>
<td>34.3</td>
<td>71.2</td>
</tr>
<tr>
<td>12-Mar 2012</td>
<td>2.3</td>
<td>25.2</td>
<td>64.2</td>
</tr>
<tr>
<td>12-Mar 2013</td>
<td>6.1</td>
<td>28.5</td>
<td>64.8</td>
</tr>
<tr>
<td>17-Mar 2014</td>
<td>4.5</td>
<td>23.3</td>
<td>63.1</td>
</tr>
<tr>
<td>17-May 2015</td>
<td>5.0</td>
<td>24.1</td>
<td>54.3</td>
</tr>
</tbody>
</table>

† Prior to MY 2000, travel times are based on the date of release and date of arrival at LGR. For MY 2000 and beyond, travel times are based on date of detection at the Rapid River Hatchery PIT-tag detection site (RPJ) and arrival at LGR.

We are also providing a table that presents the estimated 10%, 50%, and 90% passage dates of Rapid River yearling Chinook juveniles at Lower Granite Dam for each of the years of tagging (Table 2). Figure 1 is provided as an illustration of how the arrival timing of the 2015 smolt release compared to last year’s release, as well as the average of the most recent 10 years (2005–2014).

Table 2. Estimated 10%, 50%, and 90% passage dates of Rapid River Hatchery yearling Chinook at Lower Granite.

<table>
<thead>
<tr>
<th>Migration Year</th>
<th>Release Date(s)</th>
<th>10% Passage Date</th>
<th>50% Passage Date</th>
<th>90% Passage Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>17-Mar</td>
<td>24-Apr</td>
<td>7-May</td>
<td>20-May</td>
</tr>
<tr>
<td>1998</td>
<td>16-Mar</td>
<td>24-Apr</td>
<td>3-May</td>
<td>10-May</td>
</tr>
<tr>
<td>1999</td>
<td>18-Mar</td>
<td>26-Apr</td>
<td>9-May</td>
<td>22-May</td>
</tr>
<tr>
<td>2000</td>
<td>17-Mar</td>
<td>26-May</td>
<td>4-May</td>
<td>12-May</td>
</tr>
<tr>
<td>2001</td>
<td>15-Mar</td>
<td>27-Apr</td>
<td>30-Apr</td>
<td>14-May</td>
</tr>
<tr>
<td>2002</td>
<td>18-Mar</td>
<td>18-Apr</td>
<td>4-May</td>
<td>13-May</td>
</tr>
<tr>
<td>2003</td>
<td>17-Mar</td>
<td>22-Apr</td>
<td>3-May</td>
<td>16-May</td>
</tr>
<tr>
<td>2004</td>
<td>15-Mar</td>
<td>18-Apr</td>
<td>30-Apr</td>
<td>5-May</td>
</tr>
<tr>
<td>2005</td>
<td>15-Mar</td>
<td>27-Apr</td>
<td>5-May</td>
<td>9-May</td>
</tr>
<tr>
<td>2006</td>
<td>17-Mar</td>
<td>27-Apr</td>
<td>6-May</td>
<td>15-May</td>
</tr>
<tr>
<td>2007</td>
<td>15-Mar</td>
<td>28-Apr</td>
<td>4-May</td>
<td>12-May</td>
</tr>
<tr>
<td>2008</td>
<td>3/17,3/19</td>
<td>4-May</td>
<td>10-May</td>
<td>18-May</td>
</tr>
</tbody>
</table>
Table 2 (continued). Estimated 10%, 50%, and 90% passage dates of Rapid River Hatchery yearling Chinook at Lower Granite.

<table>
<thead>
<tr>
<th>Migration Year</th>
<th>Release Date(s)</th>
<th>10% Passage Date</th>
<th>50% Passage Date</th>
<th>90% Passage Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>16-Mar</td>
<td>25-Apr</td>
<td>13-May</td>
<td>20-May</td>
</tr>
<tr>
<td>2010</td>
<td>15-Mar</td>
<td>28-Apr</td>
<td>11-May</td>
<td>19-May</td>
</tr>
<tr>
<td>2011</td>
<td>15-Mar</td>
<td>2-May</td>
<td>11-May</td>
<td>16-May</td>
</tr>
<tr>
<td>2012</td>
<td>12-Mar</td>
<td>25-Apr</td>
<td>8-May</td>
<td>17-May</td>
</tr>
<tr>
<td>2013</td>
<td>12-Mar</td>
<td>2-May</td>
<td>9-May</td>
<td>13-May</td>
</tr>
<tr>
<td>2014</td>
<td>17-Mar</td>
<td>27-Apr</td>
<td>6-May</td>
<td>16-May</td>
</tr>
<tr>
<td>2015</td>
<td>17-Mar</td>
<td>26-Apr</td>
<td>6-May</td>
<td>11-May</td>
</tr>
</tbody>
</table>

Figure 1. Cumulative passage timing of Rapid River Hatchery yearling Chinook to Lower Granite Dam.

Figures 2 and 3 are provided below to illustrate the out-migration conditions that these spring migrants may have experienced in the Snake and Lower Columbia rivers. Figure 2 provides the total spring flow volume (April 3–June 20) for the Snake River (as measured at Ice Harbor), along with the average spring spill proportions at each of Lower Granite, Little Goose, Lower Monumental, and Ice Harbor dams, for each migration year. Figure 3 provides the total spring flow volume (April 10–June 30) for the Lower Columbia River (as measured at Bonneville), along with the average spring spill proportions at each of McNary, John Day, The Dalles, and Bonneville dams, for each migration year.
Figure 2. Total spring flow volume in the Snake River (at Ice Harbor Dam) and average spill proportion at Lower Granite, Little Goose, Lower Monumental, and Ice Harbor dams. Spring period in the Snake River is April 3–June 20.

Figure 3. Total spring flow volume in the Lower Columbia River (at Bonneville Dam) and average spill proportion at McNary, John Day, The Dalles, and Bonneville dams. Spring period in the Lower Columbia River is April 10–June 30.

Finally, Table 3 contains estimates calculated for Rapid River Hatchery Chinook by the CSS. The estimates provided include: (1) juvenile survival in the hydrosystem between Lower Granite and Bonneville dams, (2) the proportion of the juvenile population destined for transportation, and (3) the smolt-to-adult survival (SAR) for several passage categories. Those passage categories are SAR(T), SAR(C₀), and Weighted SAR_{LGR-to-LGR}, where SAR(T)
represents smolts transported from Lower Granite, Little Goose, or Lower Monumental Dam, SAR(C0) represents smolts migrating in-river (undetected at Snake River transportation collector sites), and SAR\textsubscript{LGR-to-LGR} is a weighted estimate that is obtained by taking the proportion of the total population of smolts (tagged and untagged) at Lower Granite Dam in each study category and multiplying by the respective study category’s SAR\textsubscript{LGR-to-LGR}. In effect, the weighted SAR\textsubscript{LGR-to-LGR} is the estimated SAR for the overall hatchery release (without jacks). The data presented in Table 3 were taken from various chapters and appendices of the 2015 CSS Annual Report, which can be downloaded from the FPC webpage [www.fpc.org/documents/CSS.html](http://www.fpc.org/documents/CSS.html). Figure 4 is a time series of the Weighted SAR\textsubscript{LGR-to-LGR} over the sixteen years of available data from Rapid River Hatchery.

Table 3. Rapid River Hatchery Spring Chinook Survivals from CSS

<table>
<thead>
<tr>
<th>Release Date</th>
<th>Migration Year</th>
<th>Juvenile Survival (LGR-BON)</th>
<th>Proportion Transported</th>
<th>TIR</th>
<th>SAR(T) %</th>
<th>SAR(C0) %</th>
<th>Weighted SAR\textsubscript{LGR-to-LGR} %</th>
</tr>
</thead>
<tbody>
<tr>
<td>17-Mar 1997</td>
<td>0.33</td>
<td>0.54</td>
<td>1.73</td>
<td>0.79</td>
<td>0.45</td>
<td>0.65</td>
<td></td>
</tr>
<tr>
<td>16-Mar 1998</td>
<td>0.59</td>
<td>0.86</td>
<td>1.66</td>
<td>2.00</td>
<td>1.20</td>
<td>1.88</td>
<td></td>
</tr>
<tr>
<td>18-Mar 1999</td>
<td>0.57</td>
<td>0.80</td>
<td>1.28</td>
<td>3.04</td>
<td>2.37</td>
<td>2.91</td>
<td></td>
</tr>
<tr>
<td>17-Mar 2000</td>
<td>0.58</td>
<td>0.68</td>
<td>1.32</td>
<td>2.10</td>
<td>1.59</td>
<td>1.94</td>
<td></td>
</tr>
<tr>
<td>15-Mar 2001</td>
<td>0.33</td>
<td>0.97</td>
<td>21.70</td>
<td>1.08</td>
<td>0.05\textsuperscript{A}</td>
<td>1.06</td>
<td></td>
</tr>
<tr>
<td>18-Mar 2002</td>
<td>0.71</td>
<td>0.67</td>
<td>1.51</td>
<td>1.01</td>
<td>0.67</td>
<td>0.90</td>
<td></td>
</tr>
<tr>
<td>17-Mar 2003</td>
<td>0.66</td>
<td>0.55</td>
<td>1.07</td>
<td>0.25</td>
<td>0.23</td>
<td>0.24</td>
<td></td>
</tr>
<tr>
<td>15-Mar 2004</td>
<td>0.35</td>
<td>0.89</td>
<td>1.57</td>
<td>0.36</td>
<td>0.23</td>
<td>0.34</td>
<td></td>
</tr>
<tr>
<td>15-Mar 2005</td>
<td>0.54</td>
<td>0.87</td>
<td>2.36</td>
<td>0.27</td>
<td>0.12\textsuperscript{B}</td>
<td>0.25</td>
<td></td>
</tr>
<tr>
<td>17-Mar 2006\textsuperscript{C}</td>
<td>0.55</td>
<td>0.71</td>
<td>1.35</td>
<td>0.57</td>
<td>0.42</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>15-Mar 2007\textsuperscript{C}</td>
<td>0.63</td>
<td>0.35</td>
<td>1.77</td>
<td>0.45</td>
<td>0.25</td>
<td>0.34</td>
<td></td>
</tr>
<tr>
<td>3\textsuperscript{17,3/19} 2008\textsuperscript{C}</td>
<td>0.55</td>
<td>0.59</td>
<td>1.52</td>
<td>1.47</td>
<td>0.97</td>
<td>1.30</td>
<td></td>
</tr>
<tr>
<td>16-Mar 2009\textsuperscript{C}</td>
<td>0.71</td>
<td>0.44</td>
<td>2.08</td>
<td>1.40</td>
<td>0.68</td>
<td>1.03</td>
<td></td>
</tr>
<tr>
<td>15-Mar 2010\textsuperscript{C}</td>
<td>0.71</td>
<td>0.23</td>
<td>1.33</td>
<td>0.57</td>
<td>0.43</td>
<td>0.48</td>
<td></td>
</tr>
<tr>
<td>15-Mar 2011\textsuperscript{C}</td>
<td>0.61</td>
<td>0.51</td>
<td>1.47</td>
<td>0.33</td>
<td>0.23</td>
<td>0.28</td>
<td></td>
</tr>
<tr>
<td>12-Mar 2012\textsuperscript{C}</td>
<td>0.79</td>
<td>0.42</td>
<td>0.94</td>
<td>0.86</td>
<td>0.92</td>
<td>0.83</td>
<td></td>
</tr>
<tr>
<td>12-Mar 2013\textsuperscript{C, D}</td>
<td>0.90</td>
<td>0.39</td>
<td>1.14</td>
<td>1.37</td>
<td>1.20</td>
<td>1.21</td>
<td></td>
</tr>
<tr>
<td>17-Mar 2014\textsuperscript{B}</td>
<td>0.72</td>
<td>0.47</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\textsuperscript{A} Assumed SAR(C0) same as SAR(C1) for 2001.
\textsuperscript{B} In-river SAR is combination of groups C\textsubscript{1} and C\textsubscript{0}.
\textsuperscript{C} Estimates for migration years 2006 through 2013 reflect use of new methodology developed for random pre-assignment of “monitor mode” and “return-to-river mode” operations. See 2015 CSS Annual Report for details.
\textsuperscript{D} Migration year 2013 is incomplete with Age 2-salt adult returns through 9/14/2015.
\textsuperscript{B} No adult returns analyzed to date, only juvenile metrics are available.
Figure 4. Weighted SAR\textsubscript{LGR-to-LGR} for Rapid River Hatchery spring Chinook releases (1997–2013). Migration year 2013 is incomplete with Age 2-salt adult returns through 9/14/2015.

We hope that the information we have provided regarding the use and application of information from the marked groups over the last several years is of some use to you. If you would like any additional information regarding these releases please feel free to contact us.

c: Pete Hassemer, IDFG
   Bill Tweit, WDFW
   Jay Hesse, Nez Perce
   Tom Rien, ODFW
   Howard Schaller, USFWS
   FPAC