Juvenile Salmonid Survival and Migration in the San Joaquin River Restoration Area During Flood Operations, Spring 2011

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Study Area

- San Joaquin River Restoration Area
  - Friant Dam to Merced Confluence
- Interim Flows
  - To Collect data to inform settlement actions, including fish reintroduction
- 2011 Flood Operations
  - Majority of Friant Release routed down the Chowchilla Bypass
Study Goals

• Characterize fish movement rates, route selection, and survival rates through the Restoration Area
• Investigate areas of potential losses due to predation and entrainment for further study
• Provide management direction for reintroduction implementation based on results

Methods

• Acoustic Telemetry
  – 29 Vemco© 180 kHz stationary receivers deployed throughout the restoration area at key locations
    • Above and below mine pits, at decision points for fish migration
    • Read Range = 75 m radius
    • Dual receiver stations to determine detection probability and survival by location
  – Feather River Fall Run Chinook salmon
    • 1200 fish (200 acoustic tagged) released at two locations on April 21, 2011
    • All fish coded wire tagged for long-term ID
Methods (cont.)

• Acoustic Telemetry Release locations
  • Below Friant Dam
  • San Mateo Crossing
    – Below Chowchilla Bypass
  – Release Groups
    • ~600 coded wire tagged fish
      +96 acoustic tagged fish
    – 4 acoustic tagged fish from each location held in the hatchery for tag life study

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Friant 1A</td>
<td>17.06</td>
<td>124.42</td>
<td>0:02:20</td>
</tr>
<tr>
<td>Friant 1B</td>
<td>19.608</td>
<td>120.72</td>
<td>0:02:56</td>
</tr>
<tr>
<td>San Mateo 2A</td>
<td>19.7966</td>
<td>122.52</td>
<td>0:02:36</td>
</tr>
<tr>
<td>San Mateo 2B</td>
<td>19.355</td>
<td>121.5</td>
<td>0:02:12</td>
</tr>
</tbody>
</table>

Fish Size needed for Surgery = 13.0g (5% of body weight)
Tag Burden = 3.28 – 3.81% by tag group
- 2 receivers at Lost Lake
- One above mine pits
- 2 below first set of mine pits
Receiver locations –downstream of Hwy 41 to upstream of Chowchilla Bypass

- One between 2nd and 3rd set of mine pits (Scout Island)
- Two between 3rd and 4th set of mine pits (Pashayan)
- Two at Gravelly Ford (upstream of Chowchilla Bypass)

Receiver locations –Chowchilla Bypass to Mendota Pool

- 2 below the bifurcation structure in the River
- 1 six miles down the Chowchilla
- 1 above columbia canal
- 2 in the Mendota Pool
- 2 at the James Bypass
- 1 downstream of Mendota Pool
Receiver locations – Sand Slough area
-2 at Sand Slough -2 in Eastside Bypass at Washington Rd.

Receiver locations – East Side and Mariposa bypasses
-1 in the Mariposa Bypass 2 in the ESB below the Mariposa
Receiver Locations – end of Restoration Area

- 2 at the Confluence of the Merced and the San Joaquin

Results – Migration Routes

- Friant Release
  - 4 Options
  - Preferred Route
Results – Migration Routes

– San Mateo Release
  • 2 options
  • Preferred Route

Results

• Discharge during the study
Results

- Temperature during the study

Results – Movement Rates

Movement Rate by Release

<table>
<thead>
<tr>
<th>Release Group</th>
<th>n</th>
<th>Average</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tract</td>
<td>349</td>
<td>0.37</td>
<td>0.04</td>
</tr>
<tr>
<td>San Mateo</td>
<td>341</td>
<td>0.54</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Note: n = number of detections

Movement Rate by Reach

<table>
<thead>
<tr>
<th>Reach</th>
<th>n</th>
<th>Average</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reach 1</td>
<td>116</td>
<td>1.33</td>
<td>0.99</td>
</tr>
<tr>
<td>Reach 2</td>
<td>82</td>
<td>0.44</td>
<td>0.41</td>
</tr>
<tr>
<td>Chualilla</td>
<td>49</td>
<td>0.53</td>
<td>0.26</td>
</tr>
<tr>
<td>Eastside</td>
<td>101</td>
<td>1.02</td>
<td>0.59</td>
</tr>
<tr>
<td>Reach 4</td>
<td>28</td>
<td>1.81</td>
<td>0.55</td>
</tr>
<tr>
<td>Reach 5</td>
<td>75</td>
<td>0.94</td>
<td>0.45</td>
</tr>
</tbody>
</table>
Results - Survival

Survival Estimates and standard error for acoustic tagged juvenile Chinook salmon in the San Joaquin River Restoration Area, Spring 2011.

<table>
<thead>
<tr>
<th>Release Group</th>
<th>Survival Location</th>
<th>Estimate of Survival</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friant (RM 265)</td>
<td>Hwy 99 (RM 234)</td>
<td>0.78</td>
<td>0.02</td>
</tr>
<tr>
<td>Friant (RM 265)</td>
<td>Hills Ferry Barrier (RM 118)</td>
<td>0.55</td>
<td>0.04</td>
</tr>
<tr>
<td>San Mateo (RM 212)</td>
<td>Mendota Pool (RM 205)</td>
<td>0.46</td>
<td>0.05</td>
</tr>
<tr>
<td>San Mateo (RM 212)</td>
<td>Below Mendota Pool (RM 204)</td>
<td>0.31</td>
<td>0.06</td>
</tr>
<tr>
<td>San Mateo (RM 212)</td>
<td>Hills Ferry Barrier (RM 118)</td>
<td>0.27</td>
<td>0.08</td>
</tr>
</tbody>
</table>
2012 Proposal

• Releasing BY 2010 Merced Fall Run
  – First Group on a pulse of ~300-~500 cfs (Late March)
  – Second Group on a pulse from ~500 - ~1,000 cfs (Early April)
  – All fish will be CWT, PIT tagged, and 100 acoustic tagged

• Releasing YOY Feather River fall-run
  – ~100 below Friant
  – ~ 100 at downstream "connected River" (probably reach 5)

• Receivers expanded to San Joaquin Mainstem upstream to the Stanislaus – connect to USBR 6-year steelhead acoustic study.

• Coordinate with USBR PIT tag feasibility study and planned flow pulses