1D/2D Modeling of the Yolo Bypass
An Application of HEC-RAS 5.0

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Geometry Changes Over the Last Year

- Accounting for routing of Tisdale Weir Flows
- Fully incorporating flow momentum across Sacramento River
- Two dimensional representation of tidally influenced areas
- General improvements
## Boundary Conditions

<table>
<thead>
<tr>
<th>Boundary Condition</th>
<th>Source</th>
<th>Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sacramento River flow below Wilkins Slough</td>
<td>USGS 11390500</td>
<td>Gaged flow</td>
</tr>
<tr>
<td>Knight’s Landing Outfall Gates inflow</td>
<td>DWR A02945</td>
<td>Gaged flow</td>
</tr>
<tr>
<td>Feather River and Sutter Bypass flows</td>
<td>Based on USGS 11390500, 1142500; DWR A02930, A02945; Arcade Creek EMC02 gages</td>
<td>calculated</td>
</tr>
<tr>
<td>Natomas Cross Canal flow</td>
<td>Based on Arcade Creek EMC02 gage</td>
<td>calculated</td>
</tr>
<tr>
<td>Sacramento Weir flow</td>
<td>USGS 11426000</td>
<td>Gaged flow</td>
</tr>
<tr>
<td>Knight’s Landing Ridge Cut flow</td>
<td>DWR A02930</td>
<td>Gaged and calculated from A02976, A02945, A02930 gages</td>
</tr>
<tr>
<td>Cache Creek Settling Basin</td>
<td>USGS 11452500</td>
<td>Gaged flow</td>
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<tr>
<td>Willow Slough Bypass flow</td>
<td>Yolo Bypass Management Study</td>
<td>Calculated</td>
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<tr>
<td>Putah Creek flow</td>
<td>Yolo Bypass Management Study</td>
<td>Calculated</td>
</tr>
<tr>
<td>American River flow</td>
<td>USGS 11446500</td>
<td>Gaged flow</td>
</tr>
<tr>
<td>Steelhead Creek flow (Natomas East Main Drainage Canal)</td>
<td>Based on Arcade Creek EMC02 gage</td>
<td>calculated</td>
</tr>
<tr>
<td>Delta Cross Channel &amp; Georgianna Slough flows</td>
<td>Dayflow</td>
<td>DWR from gages and estimates</td>
</tr>
<tr>
<td>North Bay Aqueduct</td>
<td>Dayflow</td>
<td>DWR from gages and estimates</td>
</tr>
<tr>
<td>Rio Vista tidal stage</td>
<td>DWR B91212</td>
<td>Gaged stage</td>
</tr>
</tbody>
</table>
Fremont Weir During Flooding
Low Flow Calibration

• For initial low-flow Calibration, used time period of:
  • December 7, 2008 00:00 – December 10, 2008 00:00 (72 hours)
  • Flow is within banks
    • All changes to n values are within banks

• Sensitivity analysis to
  • time step
  • cell size
  • cross section spacing
  • processing cores used

Sacramento River at Grimes, CA
The image contains several graphs and a map. The graphs show stage (m) over time for different dates and locations, with lines indicating observed and computed values. The map appears to represent a geographical area with various waterways and points of interest. The graphs are labeled with dates and include terms such as 'FMA Plots - Cal Base.'
February 2009 Flood Calibration Method

- Diffusion Wave warm-up period before flood event
  - February 6, 2009 – February 11, 2009

- Then: Calibrated to:
  - February 11, 2009 – March 31, 2009
February 2009 Flood

- Spills from Tisdale Weir to Sutter Bypass

- No appreciable flows from Fremont Weir
  - Flow through the “Fish Ladder”

- No flows over/through Sacramento Weir

- Flows from Knight’s Landing majority of inflow
January 2010 Flood Calibration Method

• For initial warm-up at lower flows, using Diffusion Wave equations in 2D, used time period of:
  • January 06, 2010 00:00 – January 10, 2008 00:00 (96 hours)

• Ran Full Momentum Equations for time period:
  • February 10, 2010 – March 31, 2010

Sacramento River at Grimes, CA
January 2010 Flood

- Spills from Tisdale Weir to Sutter Bypass
- Overtopping of the Fremont Weir
- No flows over/through Sacramento Weir
- Knights Landing, Putah, Cache Creek Settling, western tribs
Internal Calibration

Gages

• Gages in 2D Areas:
  o 7 Gages
    • Used for Stage
    • Access Water Surface Elevations (WSE) from RAS Mapper

• Gages on 1D Reach Cross-Sections:
  o 13 Gages
    • Using Flow and Stage
    • Access WSE and Flow from DSS file created in RAS output
Current Method to Harvest Computed Data for Gage in 2D Area

- For each gage:
  - Right-click and produce plot for each point in the model domain
HaD to Py

A script to get HDF and DSS to (and from) Python

• Accesses RAS output
  o 2D Area-Points:
    • .p00.HDF files
  o 1D Cross-Sections:
    • .DSS file
• Accesses Observed or Other DSS data
  o .DSS files
• Compiles them into plots
• Generic
  o User needs to specify:
    • Output file
    • Observed Data file
    • Working Directory
Thank You

Funding by the Stephen D. Bechtel, Jr. Foundation in part of the Delta Solutions Program at The Center for Watershed Sciences University of California – Davis and by Yolo County