**BLUF:** NWP and HEC developed HEC-RAS sediment model of the only regular USACE reservoir flushing operation, calibrating the model to three years and adding new HEC-RAS features.

**Objectives**

- Calibrate a sediment model of the Fall Creek flush.

**Approach**

- Developed an HEC-RAS 5.0.3 model of three historic flushing events at Fall Creek, calibrating them to downstream concentration.

- Developed several different models utilizing different modeling approaches.
FY17 RSM IPR
Fall Creek Flush Model

**District/Other USACE PDT Members**
- Jim Crain - NWP
- Stanford Gibson - HEC
- Ilya Poluektov – NWO
- Jarrod Norton – NWP
- Chris Nygaard – NWP

**Stakeholders and Partners**
- Greg Taylor, NWP
- USGS

**Leveraging/Collaborative Opportunities**
Leveraging development of HEC-RAS from the Flood and Coastal R&D Program
FY17 RSM IPR: Fall Creek Flush Model
Classic Quasi-Unsteady Calibration

2012

2013 Quasi-Unsteady Calibration by Jim Crain

2014

Classic Quasi-Unsteady Calibration

Map of Fall Creek area showing water levels and model predictions for 2012, 2013, and 2014.
FY17 RSM IPR: Fall Creek Flush Model

New Feature: Internal Quasi Dam

DS Boundary = Reservoir Stage
FY17 RSM IPR: Fall Creek Flush Model

New Feature: Internal Quasi Dam

Concentration (mg/L)

New Feature: The Unsteady Model with “Rules”

Rule Operations

<table>
<thead>
<tr>
<th>Row</th>
<th>Operation</th>
<th>True Value</th>
<th>False Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Get the observed lake elevation</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>ObsLakeElev</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Get the lake elevation computed in the RAS model</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>SmLakeElev</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>Get the observed outflow from the Dam</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>ObsDamOutflow</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>7</td>
<td>Calculate a proposed gate flow adjustment scaled to the degree of ...</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>8</td>
<td>The constant cfs value was a rough guess. Adjustment encouraged.</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>9</td>
<td>A lower value produces less oscillations while too low a value will no...</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>10</td>
<td>PropGateFlowAdj = (SimLakeElev - ObsLakeElev) * (100)</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>11</td>
<td>Add the proposed gate flow adjustment to the desired gate flow to ...</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>12</td>
<td>PropGateFlow = ObsDamOutflow + PropGateFlowAdj</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>13</td>
<td>GateFlow (Desired) = PropGateFlow</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
FY17 RSM IPR: Fall Creek Flush Model

New Feature: The Unsteady Model with “Rules”
What is working? Ups? Success?

The quasi-unsteady models. Good calibration for all three flushing events.

What is not working? Downs? Issues?

Unsteady sediment in steep slopes and rapid drawdown → 5 day run time
→ 1D Finite Volume and Variable Time Step Features will improve the unsteady performance.
How is this project benefiting the USACE and Nation

The Fall Creek model can help evaluate future flush alternatives and demonstrates the viability of predictive 1D models of reservoir flushing events.

As the USACE imagines future sustainable sediment management alternatives (including flushing operations), a model of our only regular flush demonstrates the sort of predictive analyses that could support these alternatives.

Software developments to HEC-RAS targeted to improve flushing analysis will improve USACE predictions of proposed, sustainable, sediment solutions.