

FY13 RSM IPR

Omaha District, Integration of Advanced Sediment Tools in HEC-RAS Paul Boyd, NWO / Stanford Gibson, HEC

Description/Challenges

- Current sediment transport models are limited by runtime and reservoir routing issues
- new tools needed to handle large regional models
- Multi-district and lab effort to support development
- Effectively model sediment routing through reservoirs
- Reduce runtime to increase model size
- Add capability for bank erosion (follow on from FY12 NWK RSM effort)

Objectives

MRRP FY12: \$75k, FY13: \$40k
RSM FY13: \$20k



BLUF: Development of advanced tools for sediment modeling in HEC-RAS allows creating large watershed sized river/reservoir models with increased detail, efficiency, accuracy.

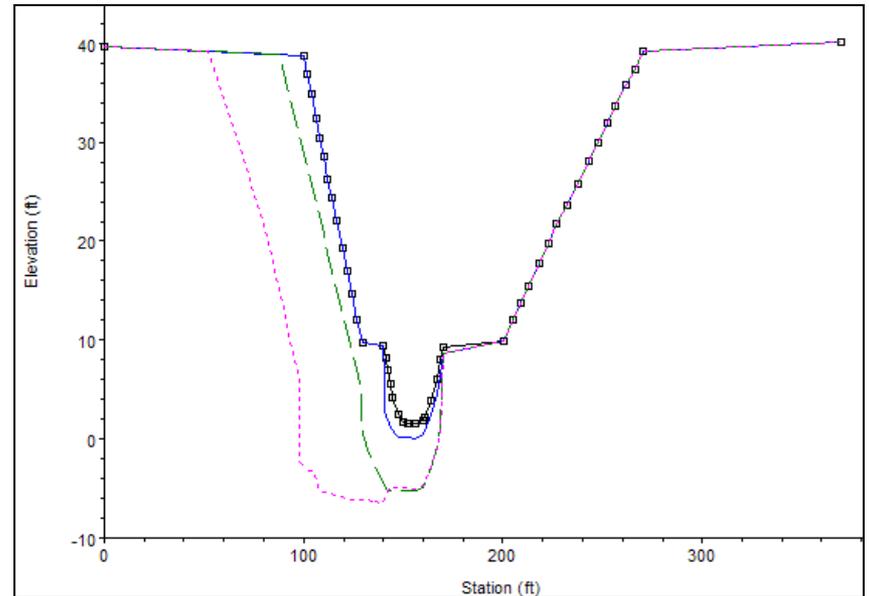
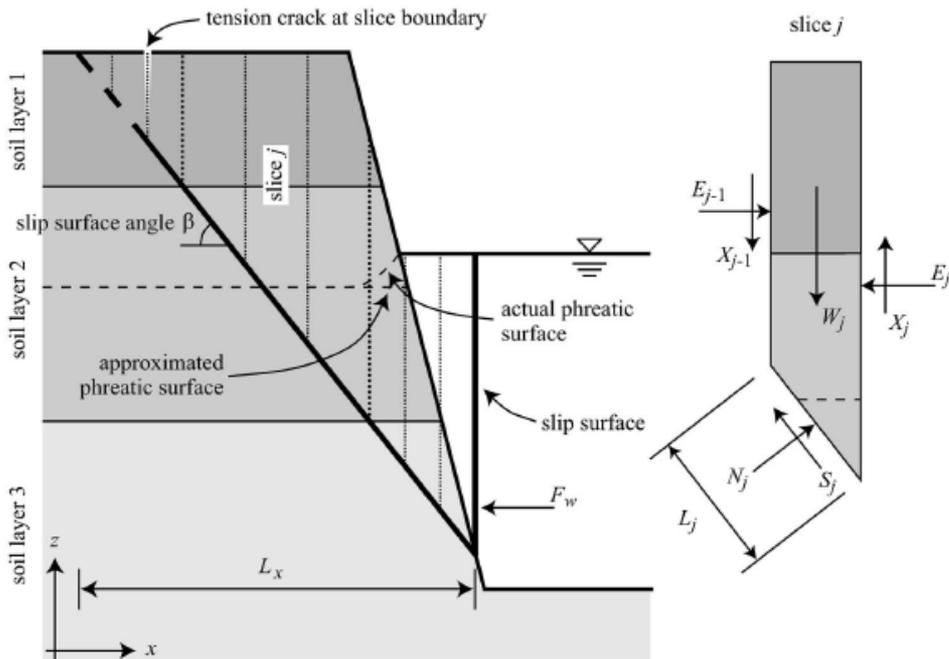
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Approach

- Implementation of ARS-USDA Bank Stability and toe Erosion model in HEC-RAS



Deliverables

- HEC-RAS v.4.2 – Fall 2013
- BSTEM User Manual – Fall 2012
- BSTEM Technical Reference Manual – Aug 2013
- RSM Workshop Presentation, 21AUG2013

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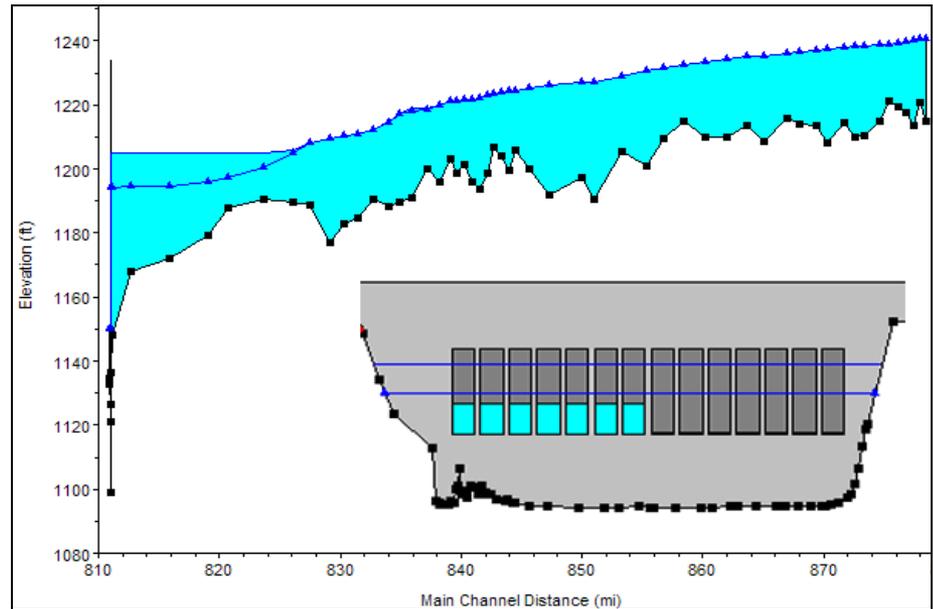
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Approach

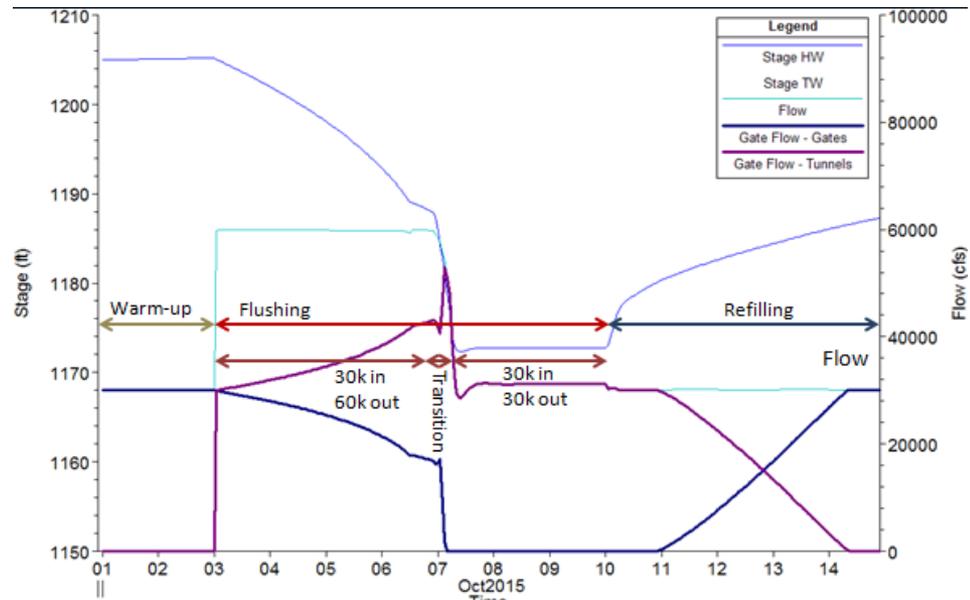
- Implement unsteady sediment transport in HEC-RAS including operational rules.

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2 'Pool Stage' = Cross Sections:WS Elevation(Missouri River,Missouri,811.076
3 'RunTime' = Time:Hour of Simulation(Beginning of time step) Get Sim Value
4 !
5 !
6 Structure.Total Flow (Desired) = 60000 Set Operational Param
7 !
8 ! Start to fill after 11 total days of run time Comment
9 If ('RunTime' > 246) And ('Pool Stage' < 1205) Then
10     Structure.Total Flow (Desired) = 5000
11 Elseif ('RunTime' > 246) And ('Pool Stage' >= 1205) Then Branch (If/Else)
12     Structure.Total Flow (Desired) = 30000
13 End If
    
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- Allows complex, automatic, sediment reservoir modeling.
- Reservoirs can now be included as part of regional sediment system models



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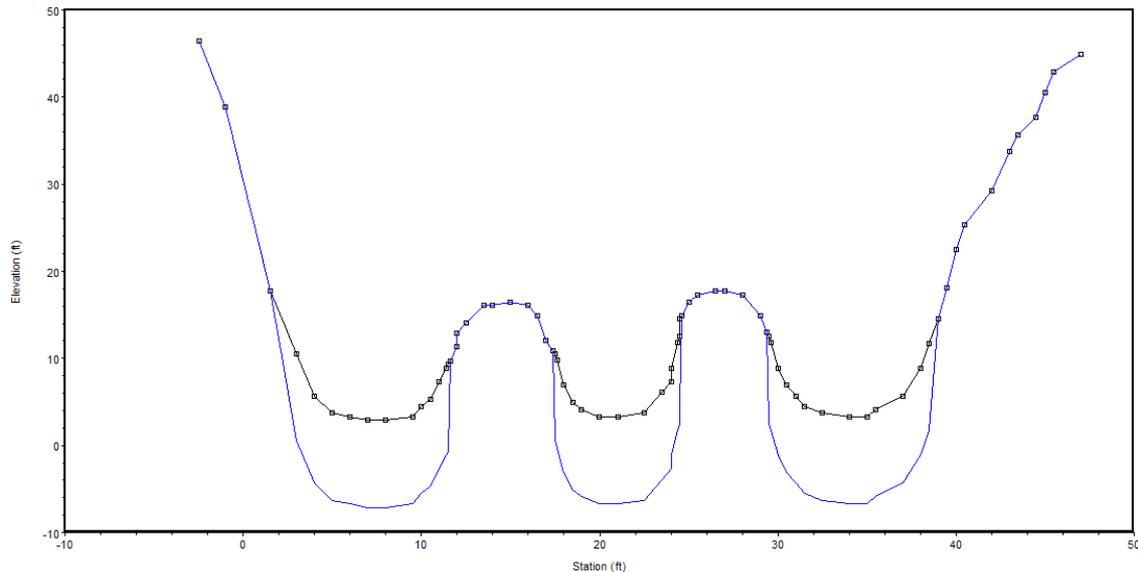
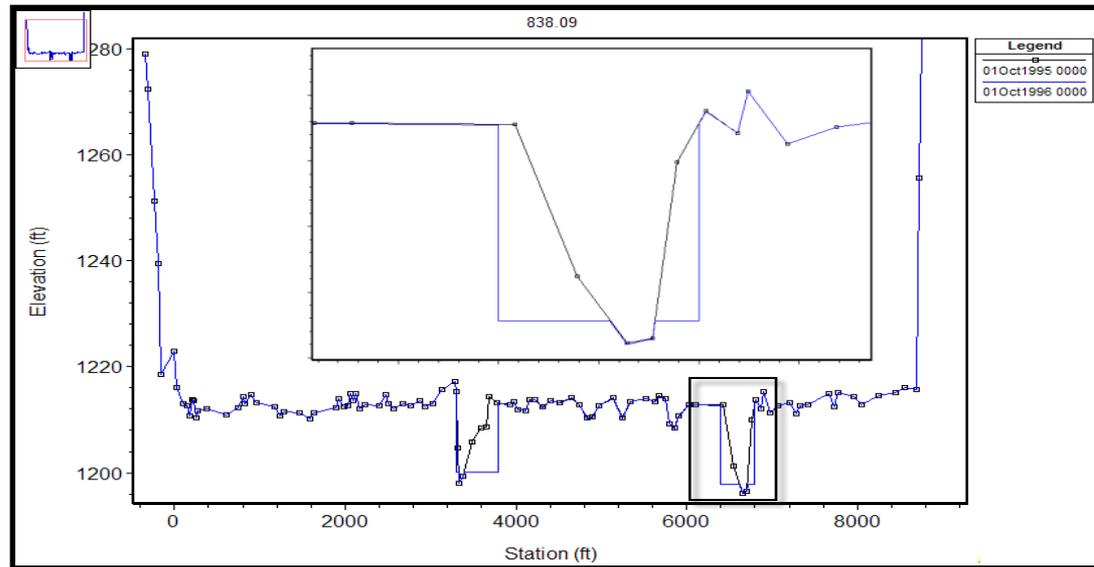
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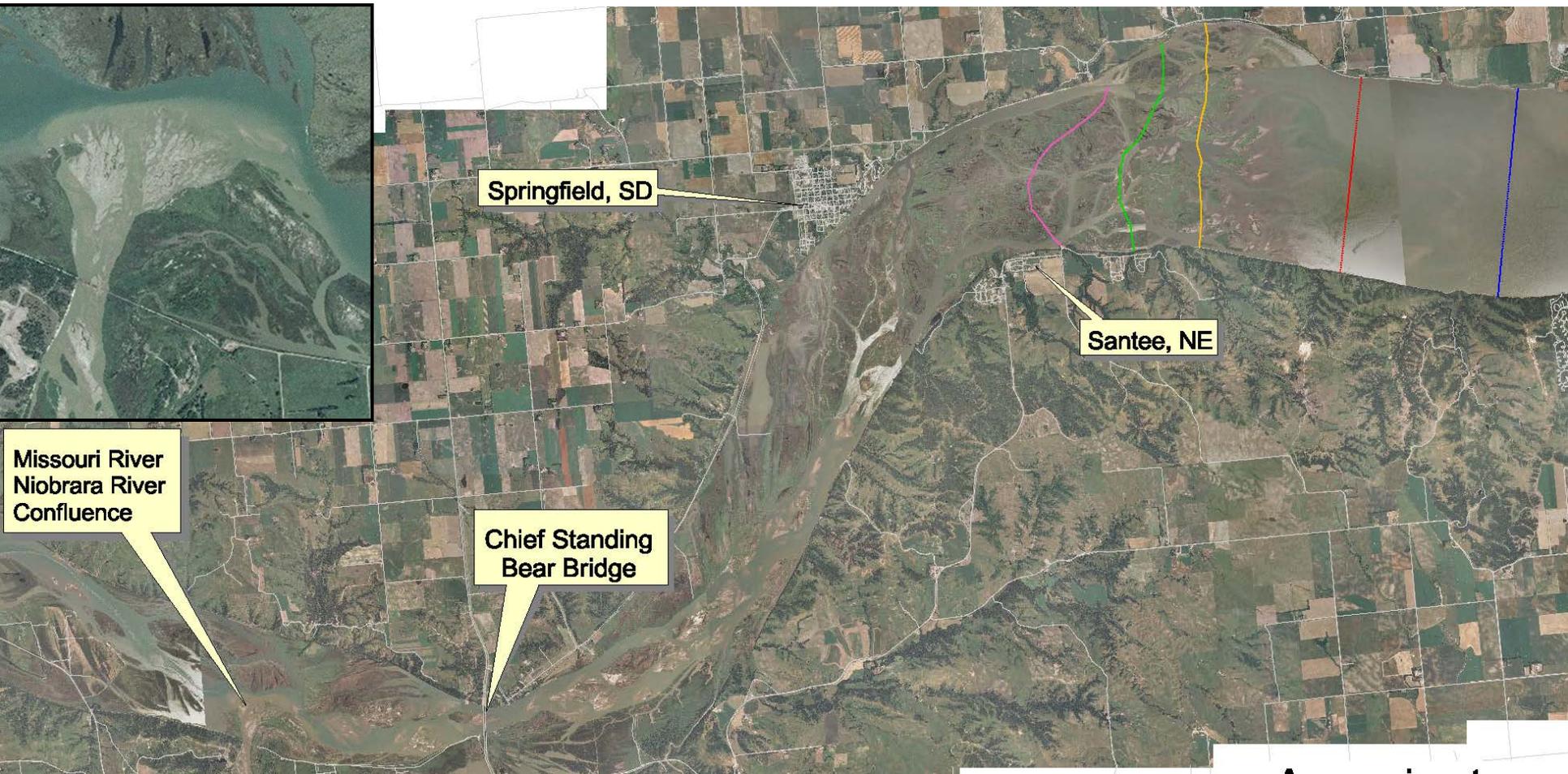
Approach

- A number of other methods have been added to HEC-RAS to support regional sediment models and NWO/NWK RSM projects including:

- **Advanced Dredging Features**
- Regional transport functions
- **Multiple Erodible Channels**
- New Cohesive Methods
- Flushing/Dam Removal Features
- Sediment Diversions
- Regional Subsidence



Lewis and Clark Lake Delta Locations



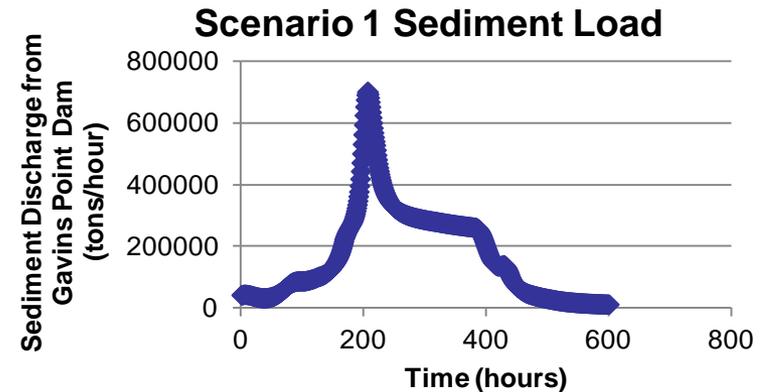
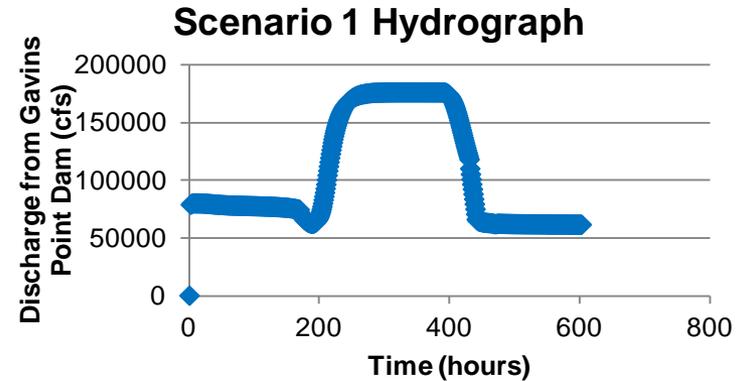
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Approach

- Case Study: Developing the Lewis and Clark Lake reservoir model
 - Modeling effort designed to determine if sand can be flushed from Lewis and Clark Lake to form Emergent Sandbar Habitat below dam.
 - 70 Mile reach from Ft. Randall Dam to Gavins Point Dam
 - HEC-RAS model to route sediment through reservoir and model drawdown flushing scenarios
 - 10 widely varying scenarios
 - 90 Mile downstream model to determine aggradation/degradation of channel due to flushing scenarios
 - Results useful to environmental restoration, O&M, and planning projects



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Accomplishments/Benefits/Lessons Learned

- New sediment tools in HEC-RAS v. 4.2 (2013) and v. 4.3 (2014-5)
- Unsteady sediment modeling improves reservoir modeling flexibility dramatically.
- Bank erosion modeling allows for better assessment of sediment inputs
- HEC-RAS can now run seamlessly through reservoir and connected river reaches

Opportunities to take action

- Use modeling package to increase the size of models, making them 'regional'
- Find datasets in districts to help test new tools
- Collaborate between districts to build models

