



Missouri River Flood Recovery and RSM Omaha District

RSM and EWN Workshop

Portland OR

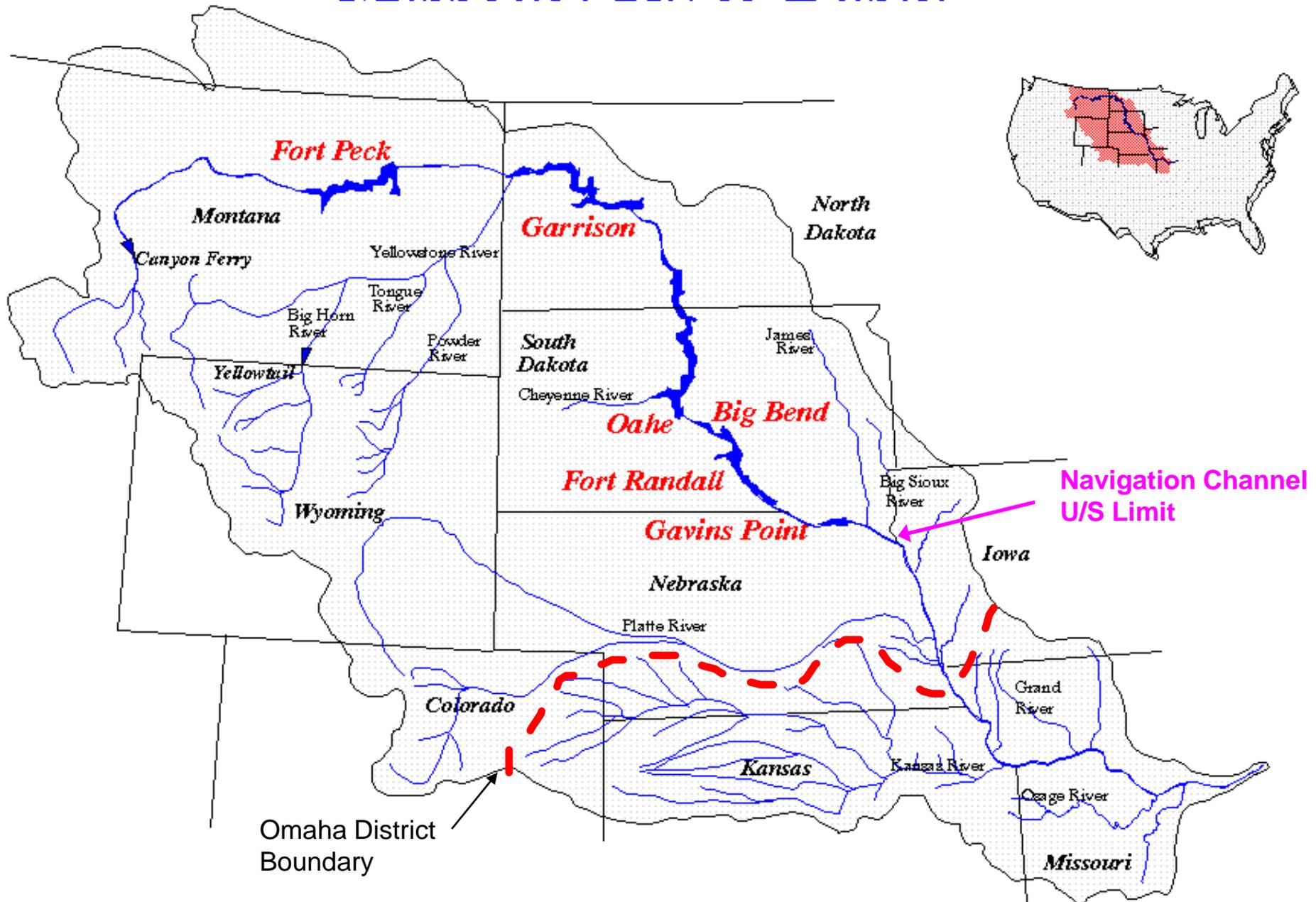
Aug 2012

Paul Boyd / Dan Pridal

RSM and EWN in Omaha District

- EWN meshes with Missouri River Recovery Program objectives
- Missouri River 2003 BiOp - create both emergent sandbar habitat (ESH) and shallow water habitat (SWH)
- Missouri River - Self sustaining navigation channel from Sioux City to St Louis (738 RM) with rock structures, without locks or annual dredging
- Unprecedented 2011 flood event created many sediment management needs

Missouri River Basin



RSM FY12 IPR

Omaha District, RSM Opportunities in Flood Recovery, Dan Pridal/Paul Boyd

Description

- The 2011 Missouri River flood resulted in overbank flows from Mid-June through Mid-September
- Maximum dam discharge reached 160,000 cfs at 5 of 6 mainstem dams (previous max \approx 70k)
- Discharge mostly confined to channel in the reservoir reach with the aid of temporary levees
- Within Navigation Channel reach, flows inundated federal levees for prolonged period
- Levee breaches of multiple federal levees resulted in extensive flooding (mainly between Omaha and KC)
- High discharges redistributed sediment within the system
- Large amounts of sediment were left on farm fields, deposited in the navigation channel

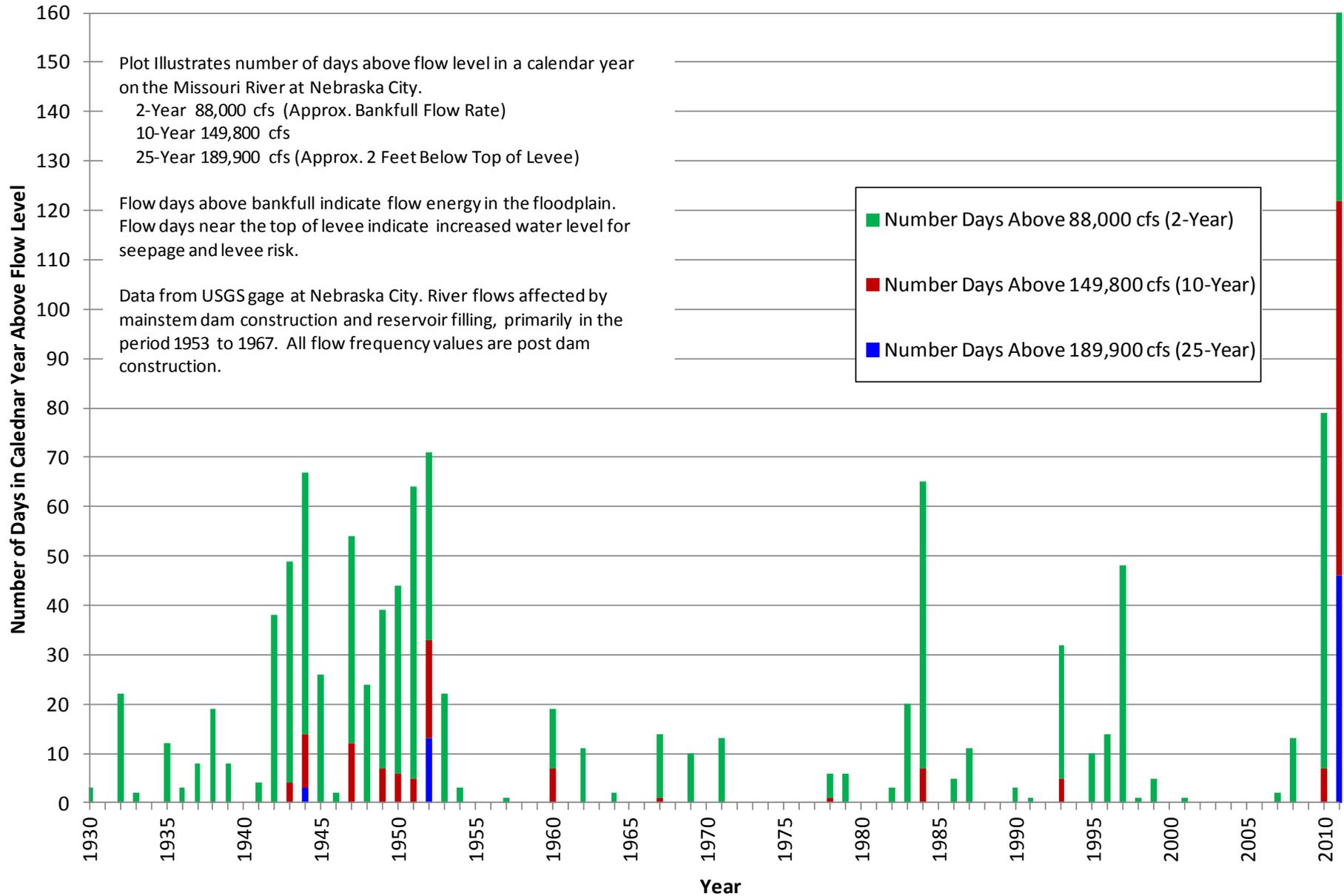


Challenges

- Rebuilding Flood Protection Infrastructure
 - ▶ Hamburg Bend Levee and Decatur Bridge
- Restoring Mainstem Dam System Capacity
 - ▶ Garrison and Oahe Dam Spillways
- Opening the Navigation Channel
 - ▶ Infrastructure Assessment and Decatur Bend Channel
- Managing the Return of Sediment to the River
 - ▶ Developing Emergency Permits for In-Channel Sediment Disposal



Nebraska City Days Above Flow Value By Year



Winnebago Bend, Post-Flood



Hamburg Bend Chute Levee

Goals/Issues to Address

- Missouri River erosion in Upper Hamburg Bend Chute, which encroached on the toe of the Federal levee
- Reconstruction and protection of the levee toe required

RSM Integrated Solution

- To prevent further damage to levee, a rock revetment was added at the failure point
- 40,000 tons of riprap placed to create fill area, dredge backfill. Also dredge to create seepage berm
- Initial dredging from point bar, additional dredging done to create backwater for shallow water habitat



BLUF: Dredging of backwater for shallow water habitat provides fill for repair at less cost as other sources while supporting habitat creation for the MRRP

Decatur Bridge Repair

Goals/Issues to Address

- Bridge abutment toe eroded during flood
- Repair of bridge abutment required significant fill material
- Repair needs to minimize damage in future floods

RSM Integrated Solution

- USACE worked with Iowa Dept Natural Resources, IA DOT to develop plan to armor abutment and create habitat ponds
- Flood deposition impacted SWH/wetlands nearby in Tieville Bend
- Dredged material used to build control structures and bank stabilization near bridge abutment
- Project restored depth to SWH / wetlands, increasing function at lower cost than other borrow material sources



BLUF: State of Iowa adds wetland habitat at similar cost to other sediment sources

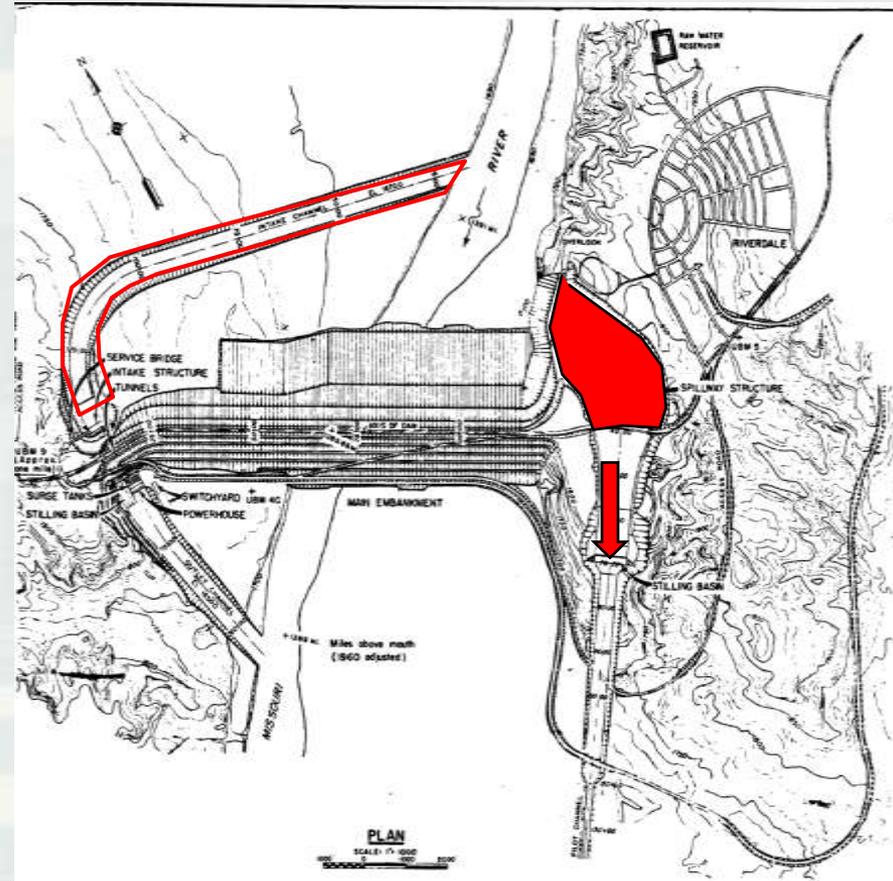
Garrison Dam Spillway

Goals/Issues to Address

- Current spillway capacity reduced by 7-10%
- Additional 100,000 CY deposited during flood
- Spillway bank stabilization removed in 1960's
- Ogee weir loses 22% spillway capacity with maximum sediment deposition
- Impact to bubblers / stoplogs / gates

RSM Integrated Solution

- Disposal of 900,000 CY from spillway proposed in submerged pilot channel to powerhouse. Reduce/eliminate loss of cold water during drought – ND sued USACE over issue in 2005
- Also proposed in blown-out channel below spillway to create wetland habitat and backwater
- Both options much less expensive than upland and provide fisheries habitat benefits



BLUF: Placement of dredge material in in-lake channel or downstream spillway channel provides aquatic habitat value and is significantly less expensive than upland disposal

Oahe Dam Spillway

Goals/Issues to Address

- 166,000 CY of sediment deposited in front of spillway gates
- Prevents maintenance and repair of stoplogs/gates/bubblers
- Limited areas available for disposal

RSM Integrated Solution

- Upstream site considered for close disposal and wetland creation in ponds
- Downstream site would aid in slowing erosive headcut near spillway channel
- In-lake disposal would reduce costs and increase safety
- Water quality concerns from state of SD prevented in-lake disposal
- Upstream site selected due to cost, safety, and habitat creation.



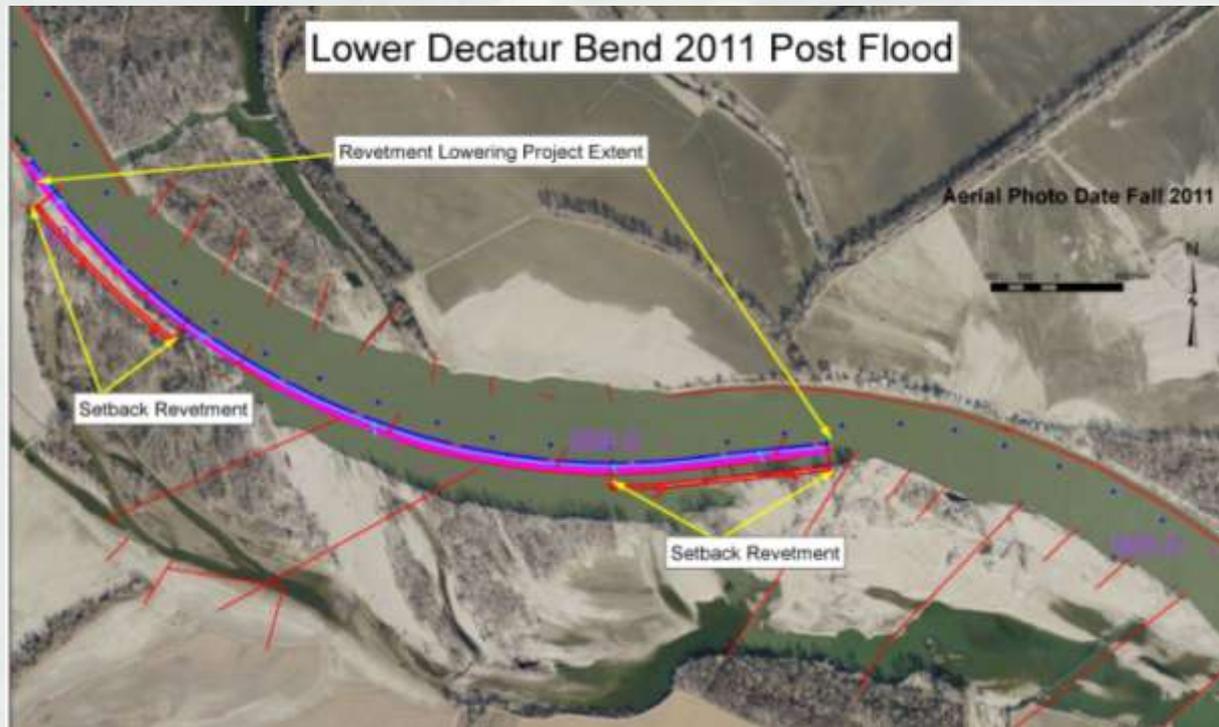
Infrastructure Assessment and Lower Decatur Bend

Goals/Issues to Address

- 2011 Flood damaged the previously constructed project and associated habitat
- Failure over-widened channel area with shoaling in section of the navigation channel
- Habitat poor quality due to depth
- Impact to adjacent lands

RSM Integrated Solution

- Repair navigation revetment
- Install 3 to 5 new structures to reduce off channel depth
- No dredging unless rock structures do not mobilize bar



**BLUF: Proposed new / repair of rock structures without dredging.
If needed, will mobilize dredge and spoil in shallow habitat zone.**

Emergency Authorizations for Sediment Return to Missouri River

Goals/Issues to Address

- Sediment deposits from flood waters left up to six feet of sand on farm fields, parking lots, and recreational areas
- Many requests to push sand back into river
- Regulatory permitting is often a slow process, requests made to remove sand before 2012 growing season

RSM Integrated Solution

- Used sediment data to estimate bed load on Missouri River below Sioux City to determine a safe maximum daily load to enter the river, developed an Emergency Authorization permit to allow 10,000 CY per application
- Applications approved by phone to allow for immediate start of work
- Permits monitored to prevent geographic or temporal 'hot spots' of high sediment input
- Regional General Permit developed from this work for up to 100,000 CY
- Program use has been minimal – large volumes of sand re-enter the river without permitting



BLUF: Plan to monitor and distribute sediment input prevents localized aggradation problems, emergency permits show flexibility and create goodwill with stakeholders

RSM FY12 IPR

Omaha District, Missouri River Flood Recovery and RSM

District PDT Members

- Paul M. Boyd, P.E. Hydrologic Engineering
- Dan Pridal, P.E. Hydrologic Engineering
- John Remus, P.E. Hydrologic Engineering
- Matt Wray, Regulatory
- Greg Mellema, P.E. Operations
- Norma Jean Schrader, Programs

Stakeholders and Partners

- Doug Chafa, IDNR, Decatur Bridge
- NE Regulatory Office, USACE
- ND Water Commission
- ND, SD, NE, and IA natural resources agencies
- US Fish and Wildlife Service
- National Park Service

Leveraging/Collaborative Opportunities

- All projects discussed are funded either fully or in-part by Disaster Recovery Appropriations Act (DRAA) funding starting 23DEC2011
- Missouri River Recovery Program has gained habitat estimated at \$5M to otherwise construct
- States of ND, SD, and IA have all had direct habitat construction benefits

Milestones/Deliverables

- | | |
|-----------------------------------|------|
| • Flood Recovery Draft Fact Sheet | 100% |
| • Flood Recovery Final Fact Sheet | 25% |
| • Selection of Project Memo | 100% |
| • Draft Report on Flood Recovery | 25% |
| • RSM Workshop Presentation | 100% |
| • FY13/14 RSM Coordination | 100% |



Questions ?



RSM 2012
Missouri River Flood Recovery and RSM
Paul Boyd / Dan Pridal
Omaha District Corps of Engineers



Additional Photos





- Hamburg Bend Chute Levee Repair

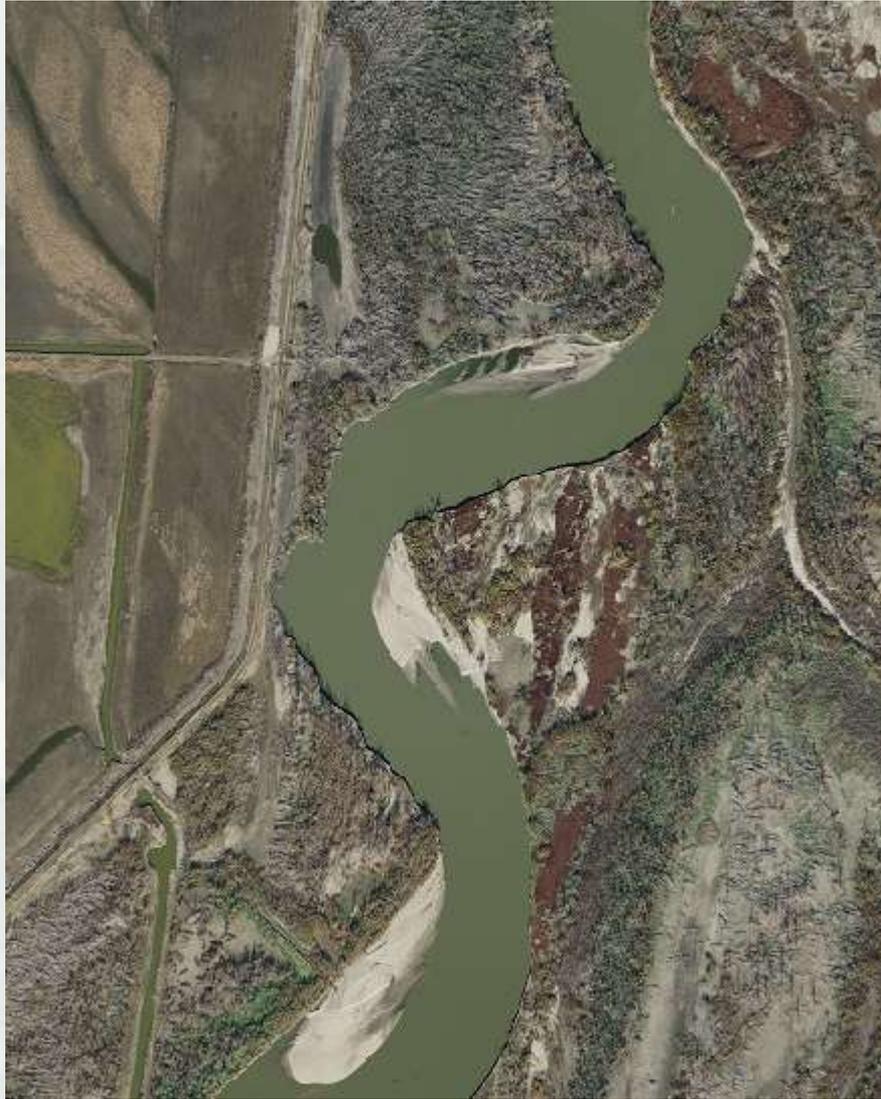




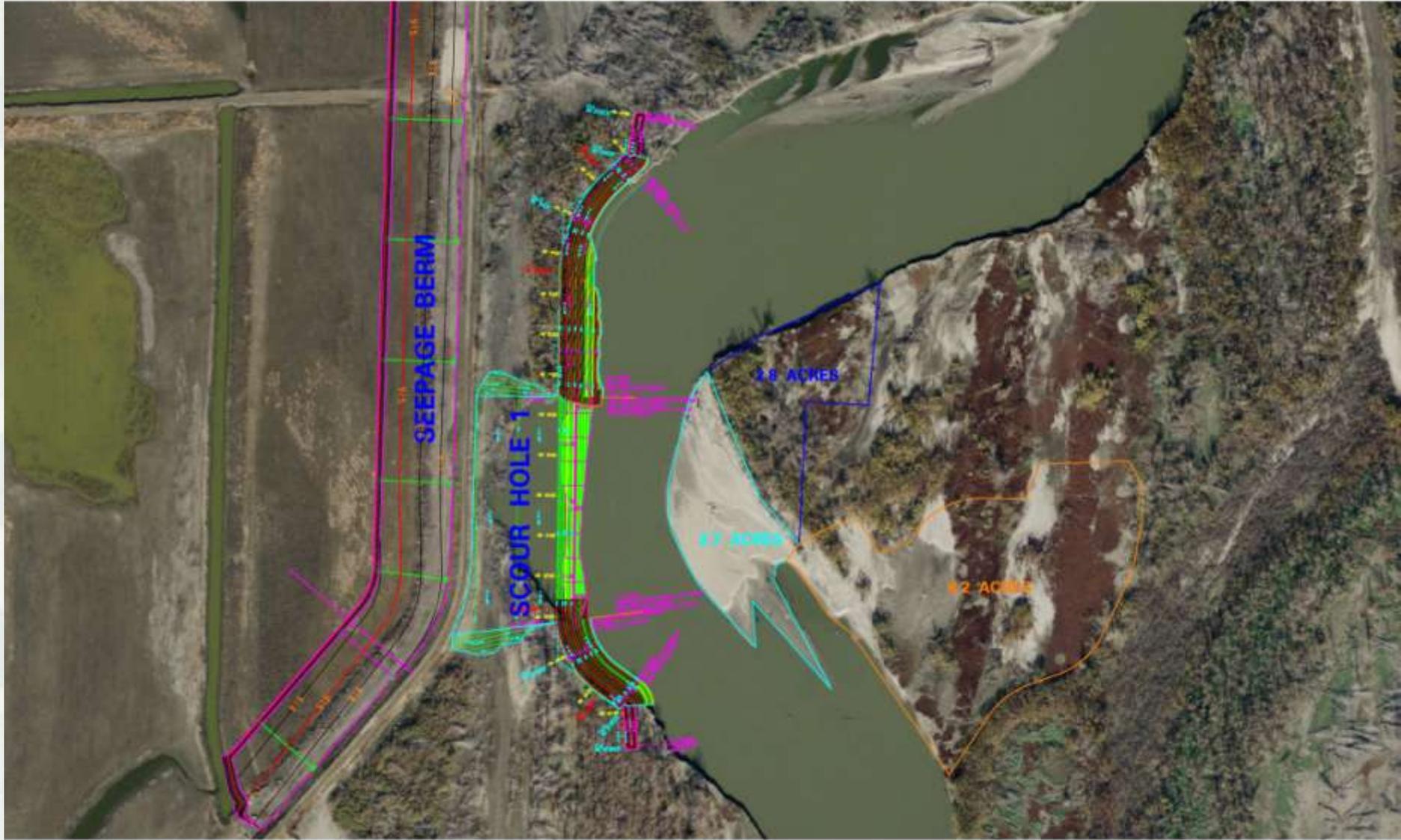
•2 May 2012

•Scour fill
•7 May 2012





•BUILDING STRONG®



Garrison Spillway



BUILDING STRONG®



Desoto Bend near Blair, NE

(example of area where sediment is mechanically returned to the river post-flood)



June 2010



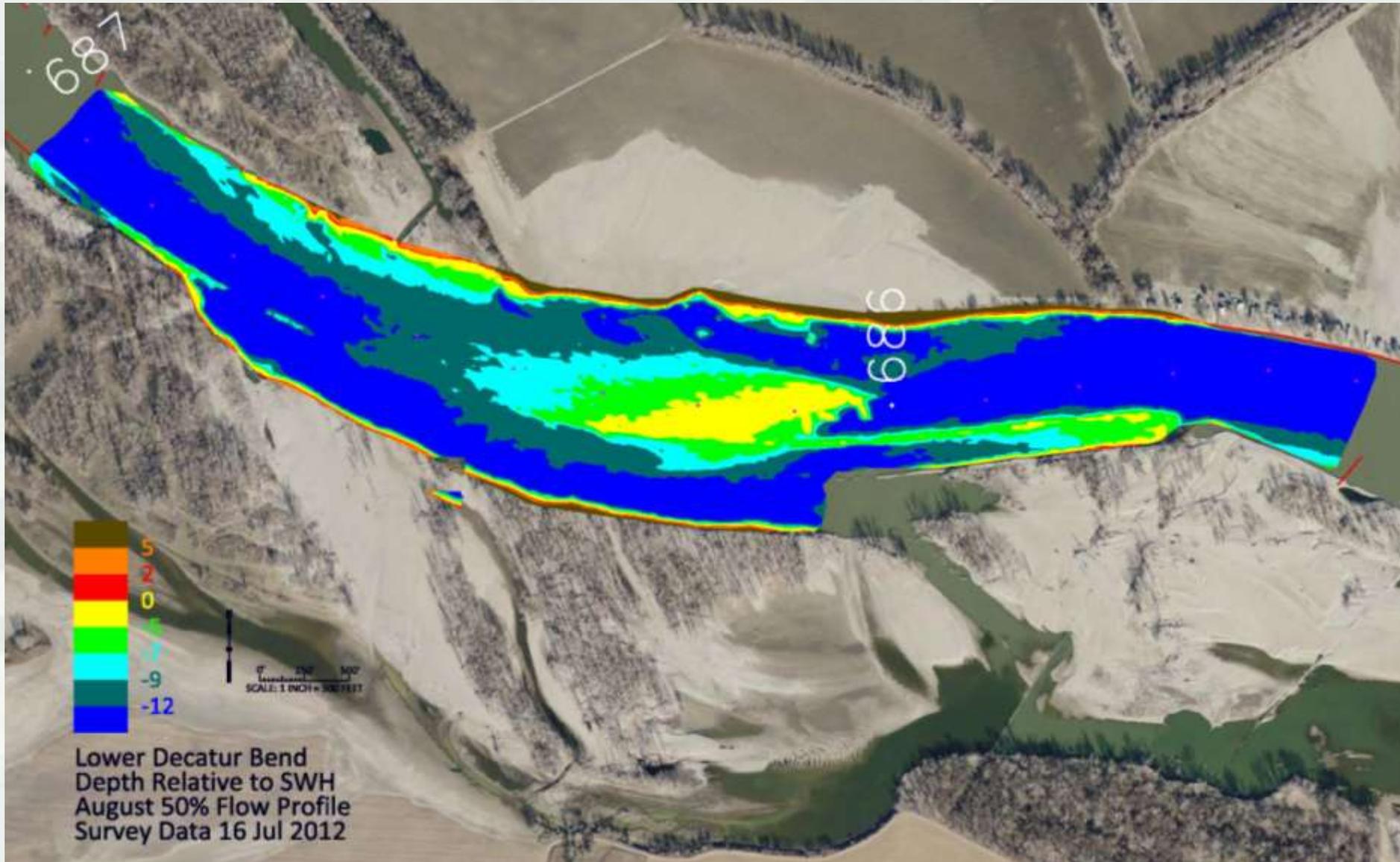
July 2011



October 2011



Lower Decatur Depth



Lower Decatur Bend
Depth Relative to SWH
August 50% Flow Profile
Survey Data 16 Jul 2012