Birds Point New Madrid
Floodway activation:
Geomorphic thresholds and
landscape modification

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Outline

• Floodway overview
• Floodway activation
• Landscape response at two inflow points and within the floodway
• Geomorphic thresholds
• Infrastructure response
• Remediation
• Conclusions


Mississippi River Flood 2011 forces Obion River to flow backwards
Taken 5-8-11 on the day of the record setting crest at Caruthersville, MO. This is on the Tennessee side of the MS River between Caruthersville, MO and Dyersburg, TN on Interstate 55 where the Obion River flows into the Mississippi River.

http://www.youtube.com/watch?v=b4Z2cauy00k
Landsat TM 5 natural color images indicating Turbid waters within the floodway and after water recession

Breach at Inflow and Outflow Crevasse # 1 at Big Oak State Park

Levee Cross-Section at Big Oak State Park

Formation of the scour hole

Scour Hole Development at Big Oak State Park

http://www.youtube.com/watch?v=ceF-jCTQk0&feature=relmfu

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Grooves and potholes developed during water inflow into the floodway

Gravel bars

Fine sand deposits on northwest edge of scour hole

Asphalt fragments and rip-up clasts

Breached levee section, levee core exposed

Scour zone and stripped agricultural fields (note former plow surfaces exposed)

Breach at Inflow and Outflow crevasse # 1 at Big Oak State Park

(a) Levee breach complex (Mississippi River is 800 m to the SW of the levee breach). Cross-section A-A' is a typical cross section of the current-ripple morphology, parallel to the primary SE water flow. Cross-section B-B' is a typical secondary current-ripple field indicating an almost ESE-WNW flow direction.
Londoño & Hart, 2013. J. Hydrology

LiDAR derived DEM of the mainline levee breach in the fuseplug near Cairo, IL. (a) Extent of the breach section along with terrain elevation changes post inundation and dewatering (b) Net deposition and erosion DEM of (c) Current ripple fields located south of the main scour zone, and east of the main levee system depicted by both Google Earth™ and LiDAR imagery.

Landscape Response at O'Bryan's Ridge

Damages to Infrastructure

Scour and deposition concentrated along the edges of O'Bryan's Ridge

Grain silos under wind & wave action

Damages, June 10/11
Flooded fields near Co. Road 506

Damages, June 10/11

Water marks

Heavy structural damage on local church

Landscape Remediation

Sediment removal into scour hole Oct 15/11

Remediation at Big Oak State Park, Oct-2011
Conclusions

- Regionally extensive landscape modifications within the floodway occurred, and these geomorphic impacts on the landscape are visible and impacted the area economically.
- Rushing floodwaters overcame the shear strength of the agricultural fields and underlying soil causing major rilling and scour.
- This study indicates that two of the major geomorphic thresholds were exceeded. Flood waters rushing through constrained channels created erosional scours in the immediate vicinity of the breached sections and natural topographic highs.

Conclusions

- The activation of the New Madrid Floodway is an important event in regional history, and it will continue to affect and inform regional public policy regarding flood protection, agricultural practices and insurance.