Use of River Diversions for Coastal Restoration

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The Water Institute of the Gulf

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ERDC

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US Army Corps of Engineers
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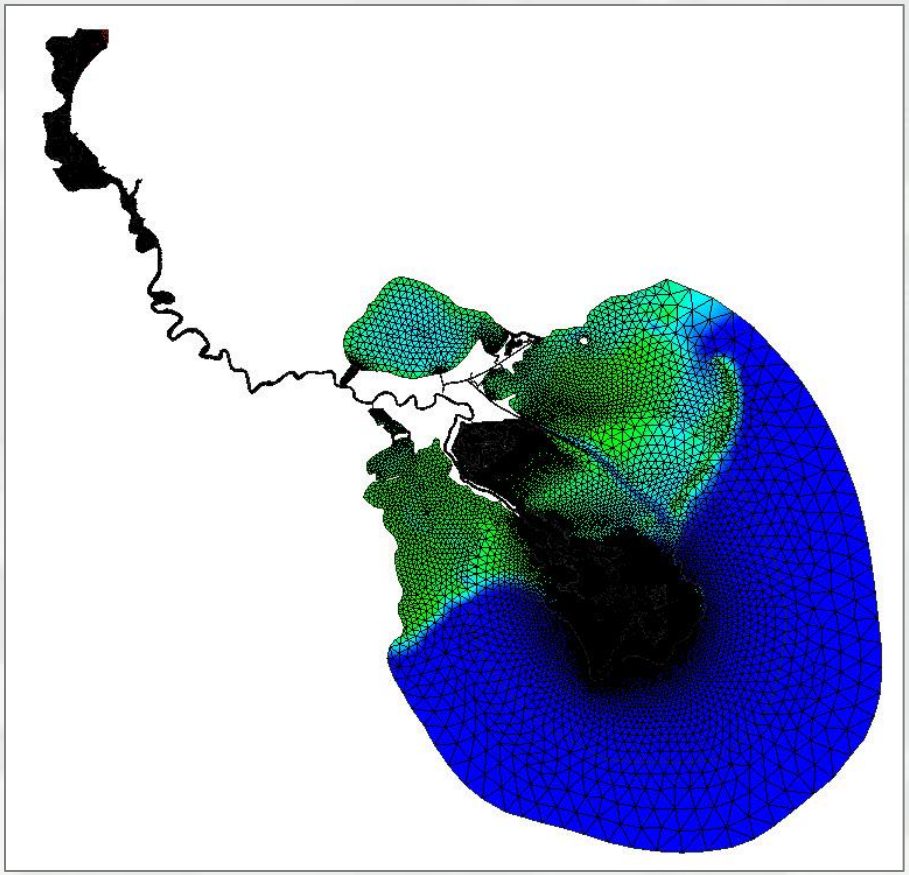
AdH Domain

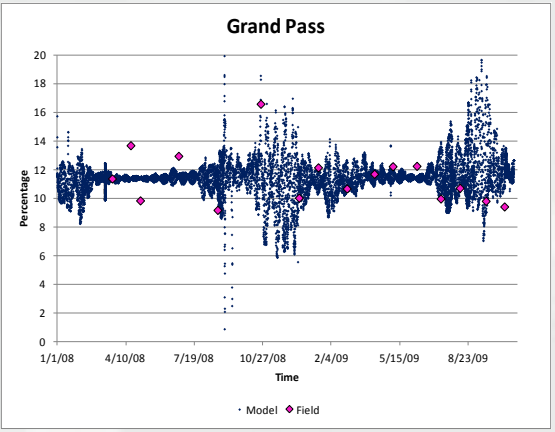


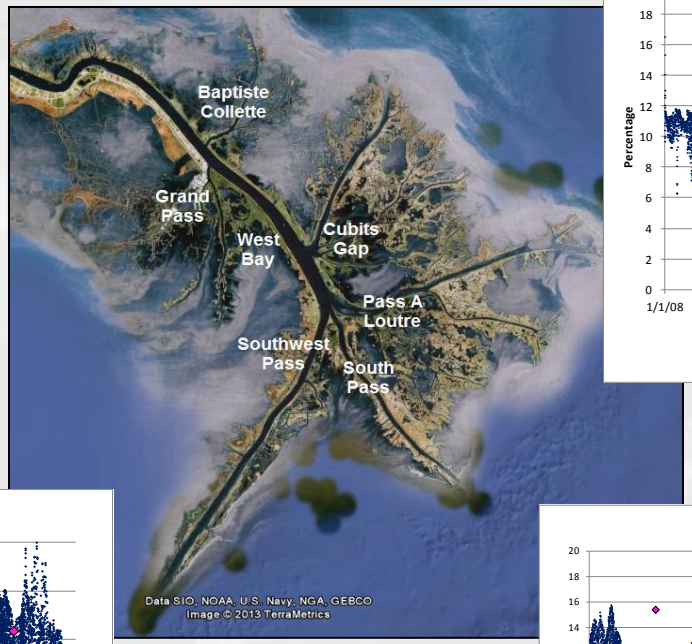
Full Domain extends from Old River Control Structure to the Gulf

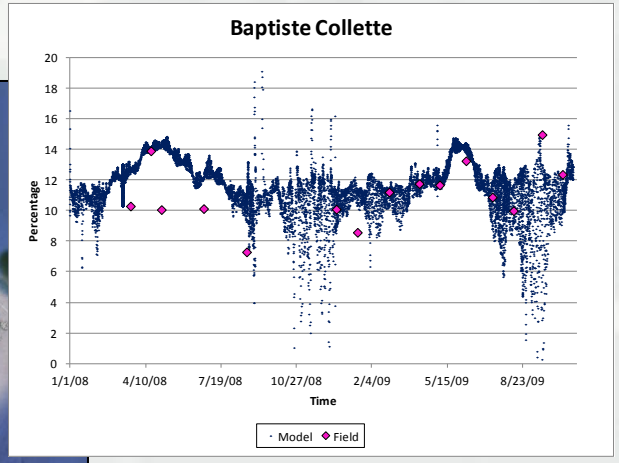
Model performance specs:

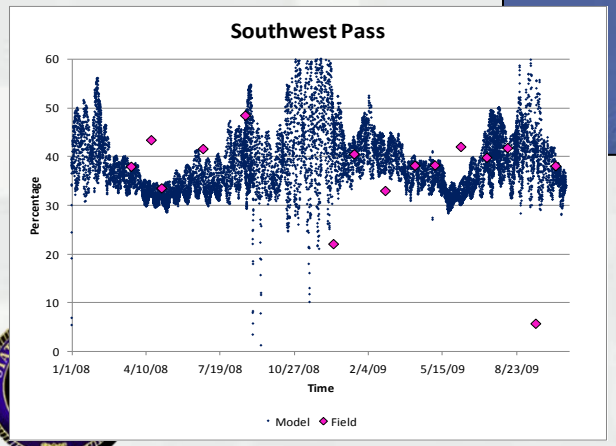
- 241126 nodes
- 471809 elements
- 512 processors
- ~15 days/hour

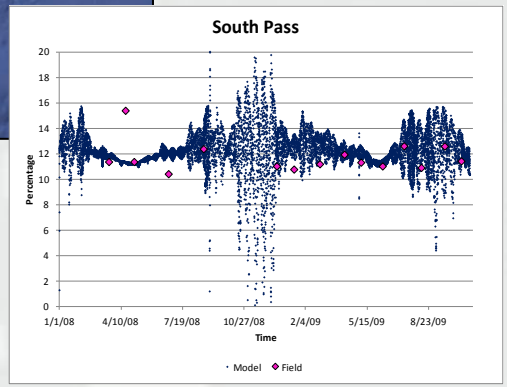
ADH-SEDLIB: Hydro Validation



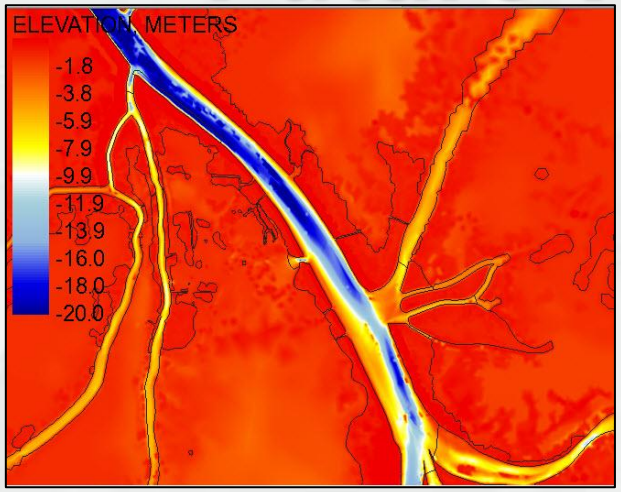




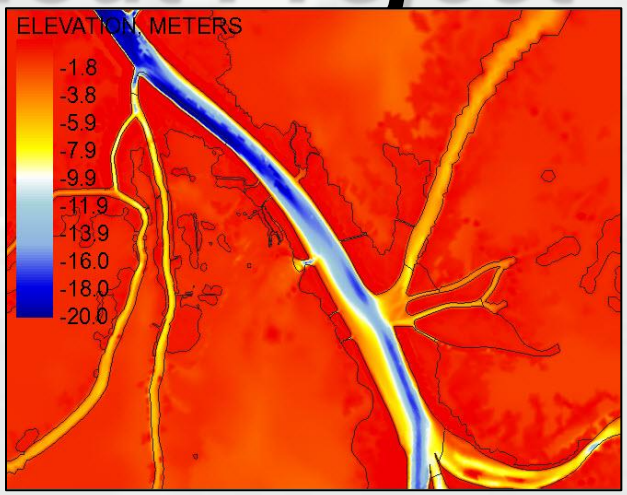




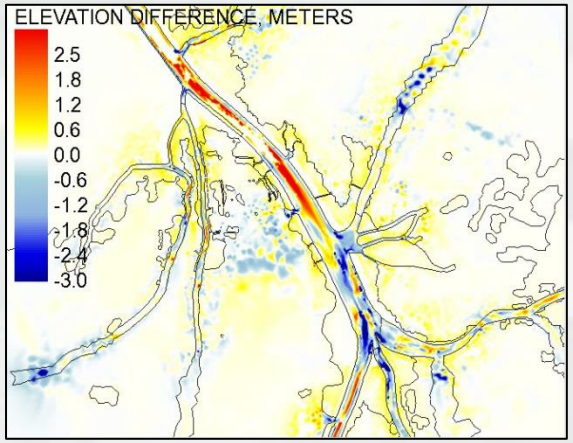
Future Without Project



Existing @ end of run



FWOP @ end of run



FWOP minus Existing

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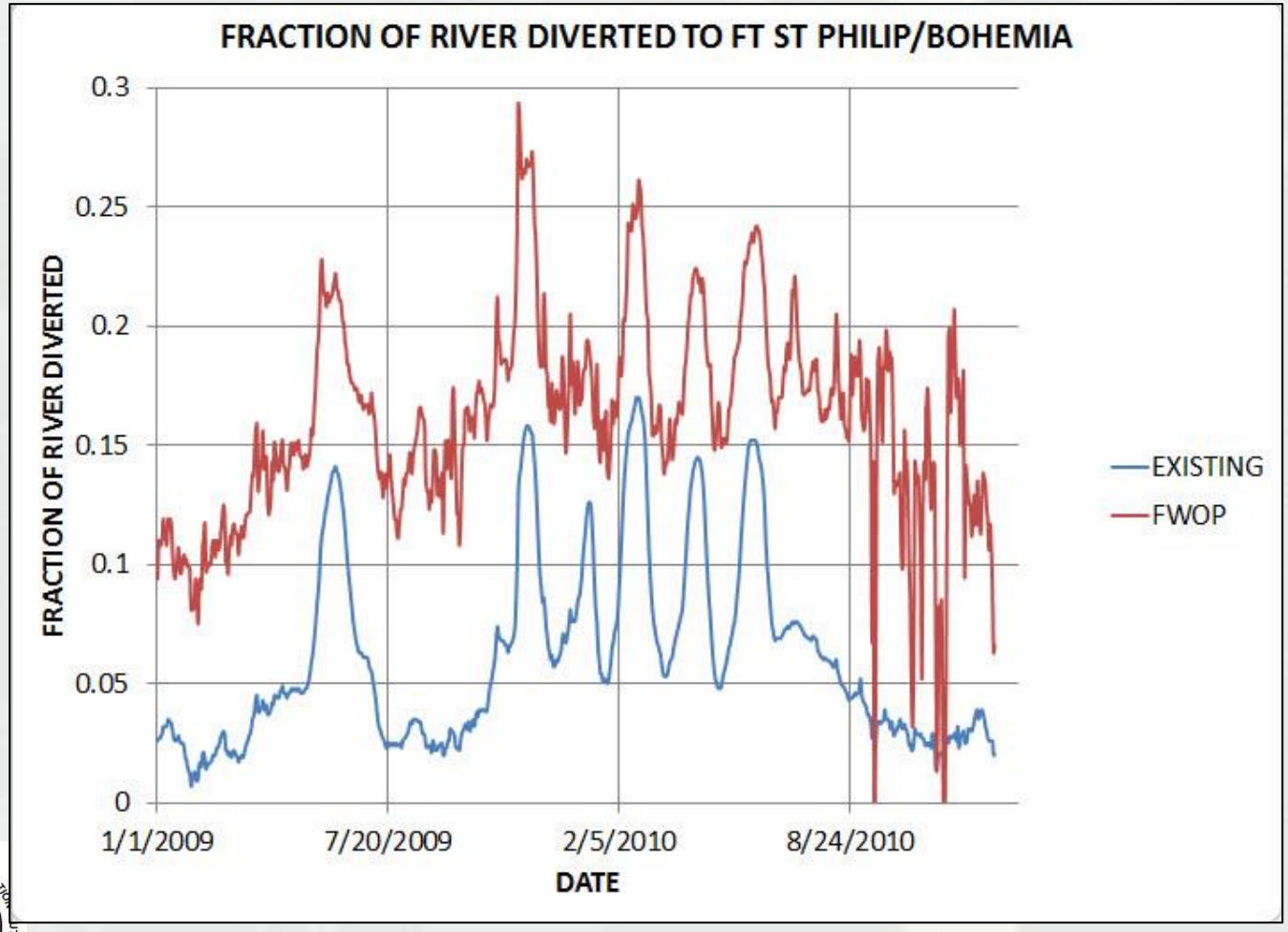
Future Without Project



Much larger flow fraction diverted at Ft St Philip / Bohemia

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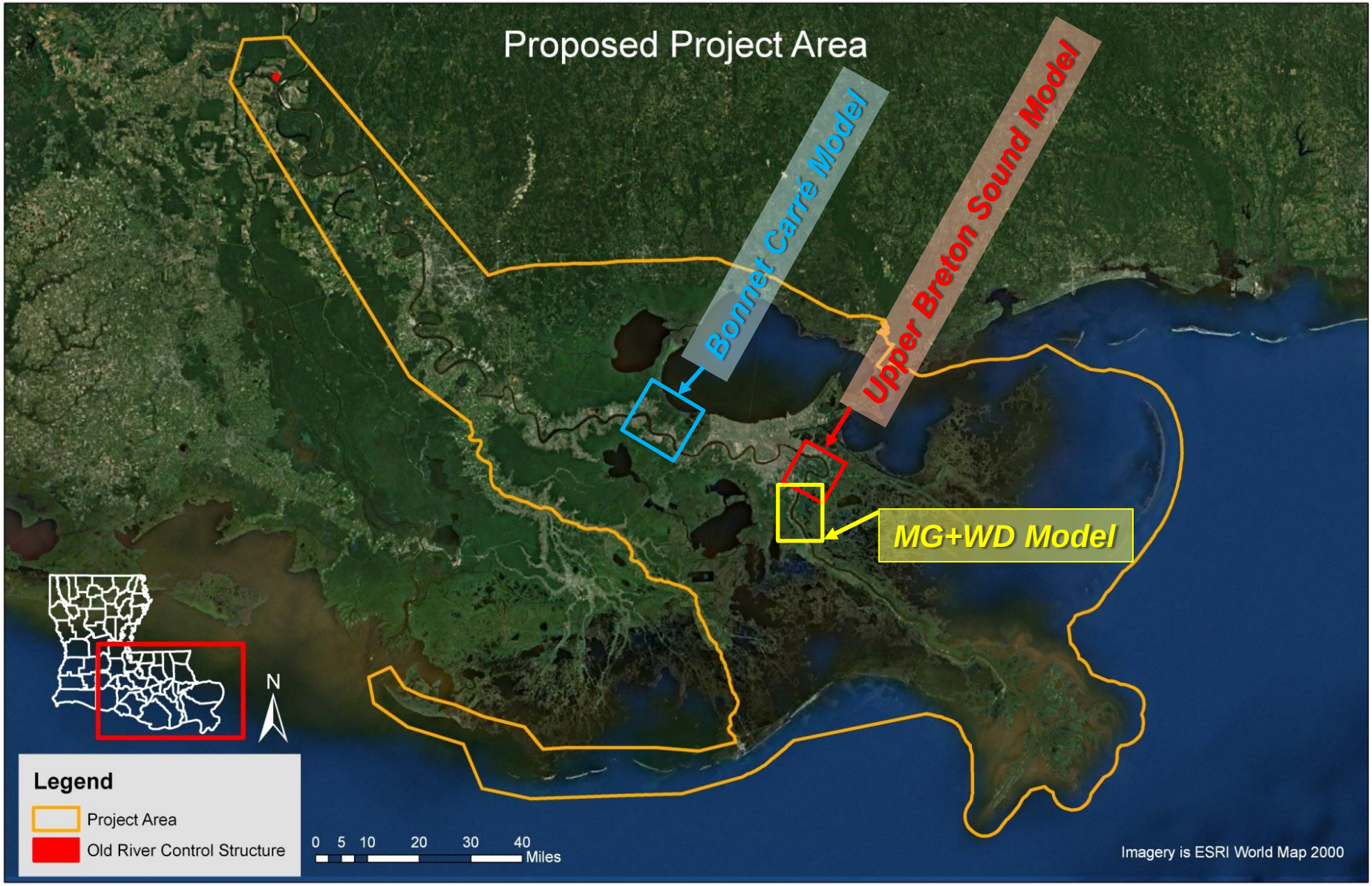
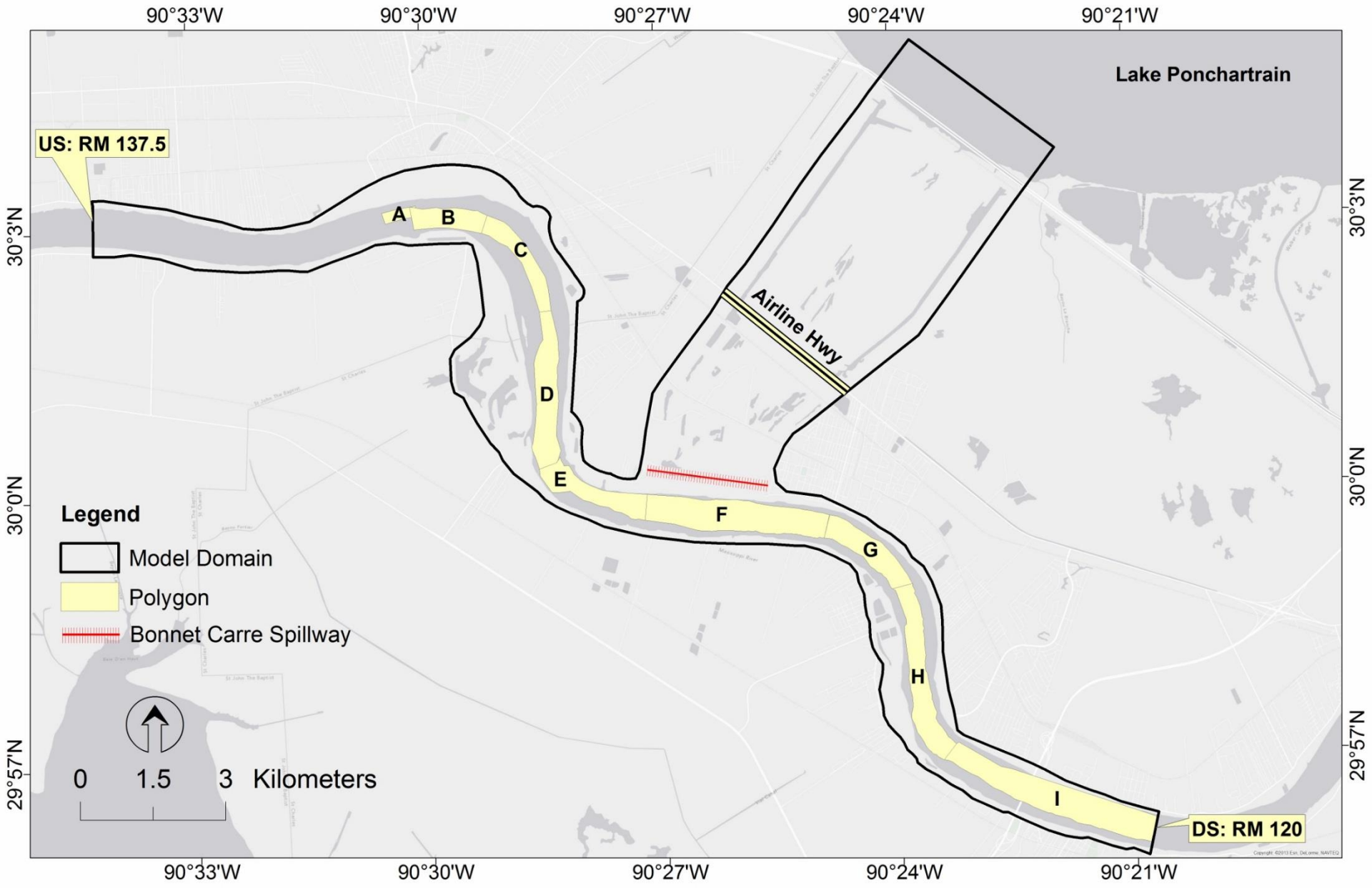
LOCAL MODELS

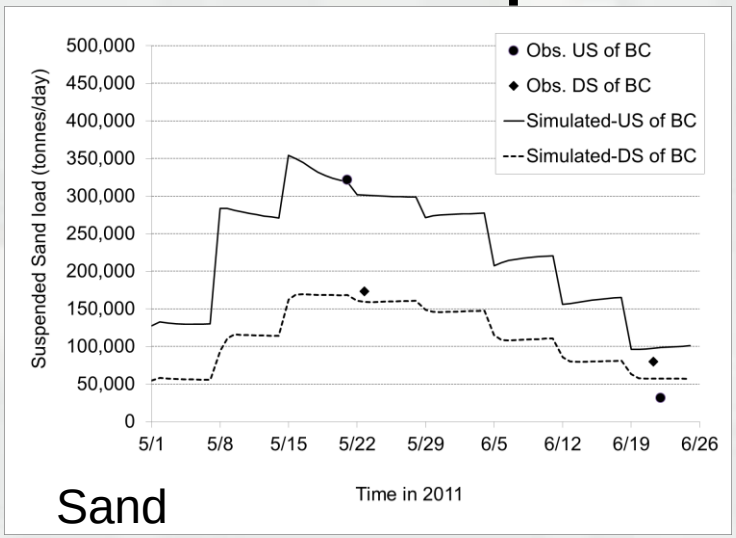


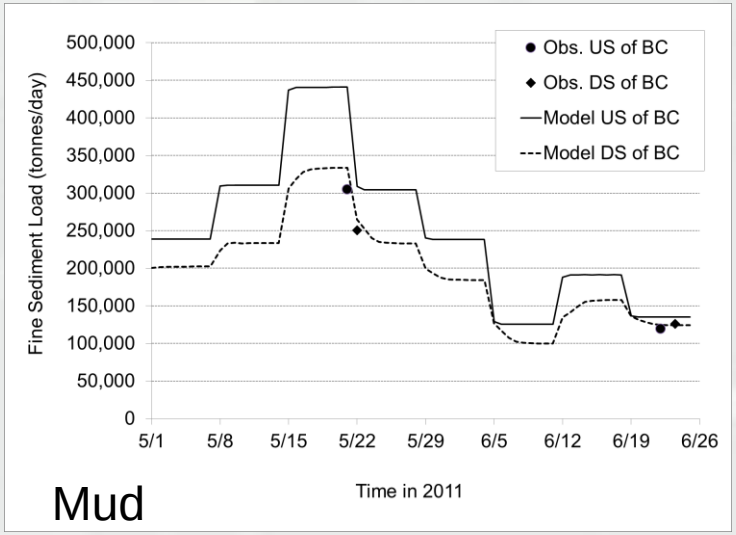
BONNET CARRÉ – Delft3D



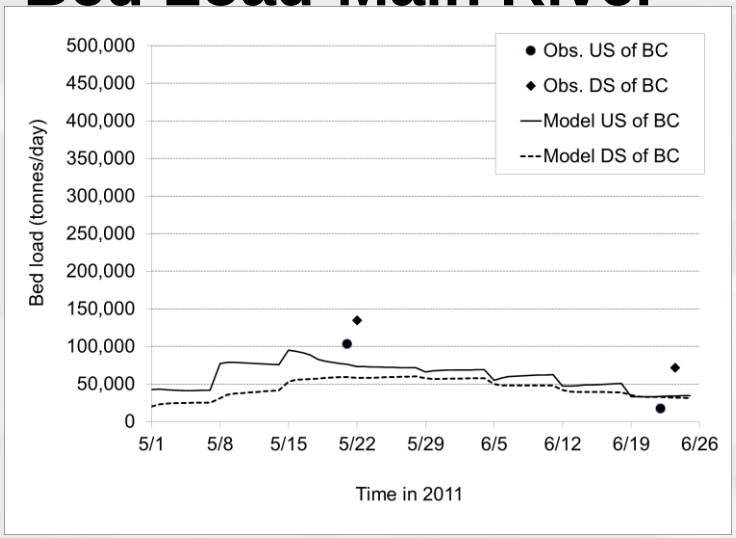
MODEL CALIBRATION

Suspended Load-Main River





Bed Load-Main River



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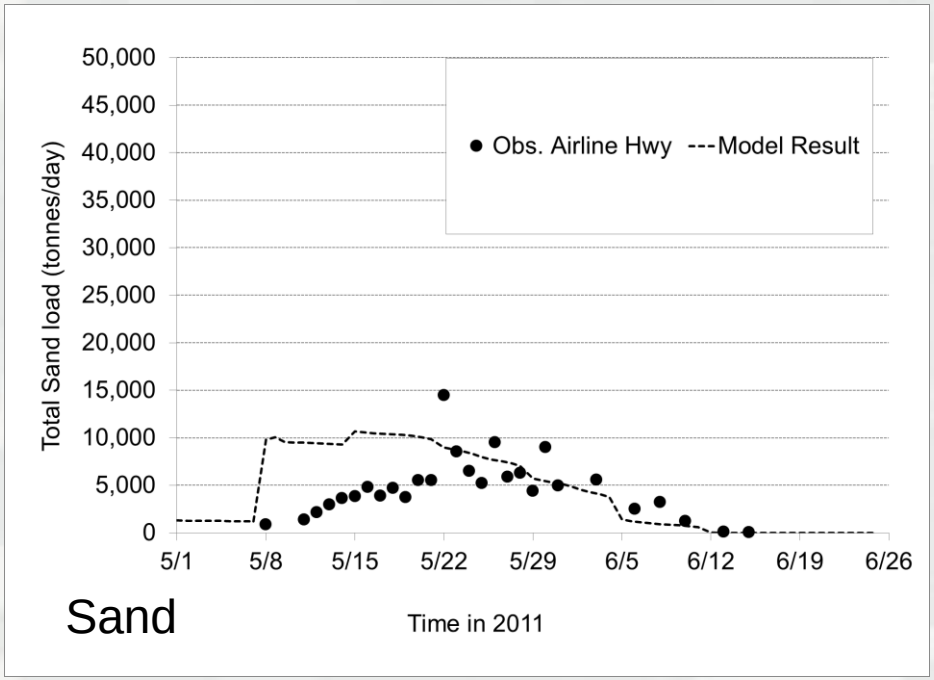
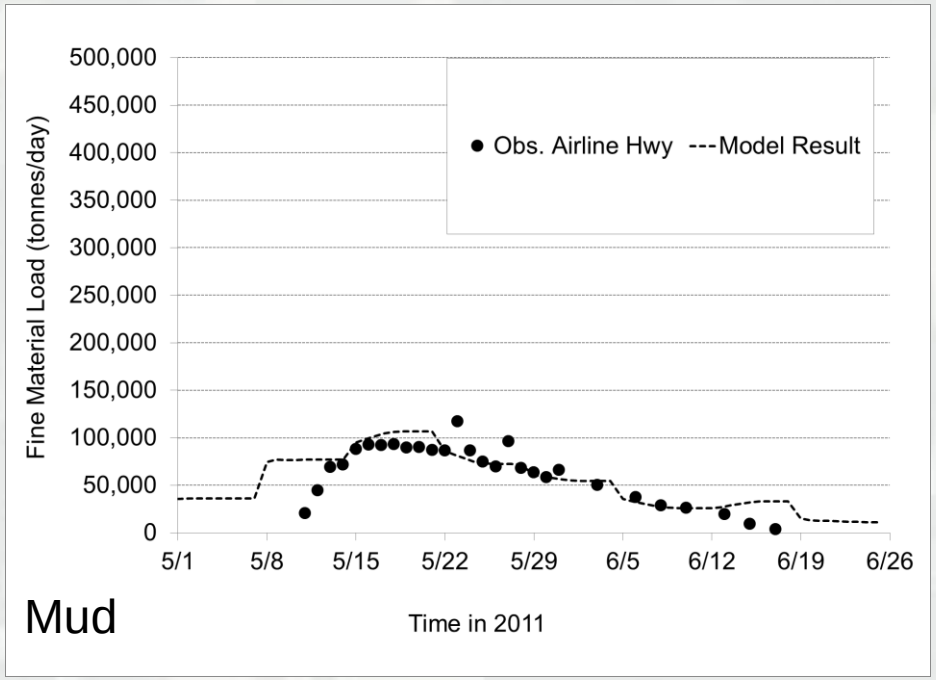
MODEL CALIBRATION

Loads at Airline Highway



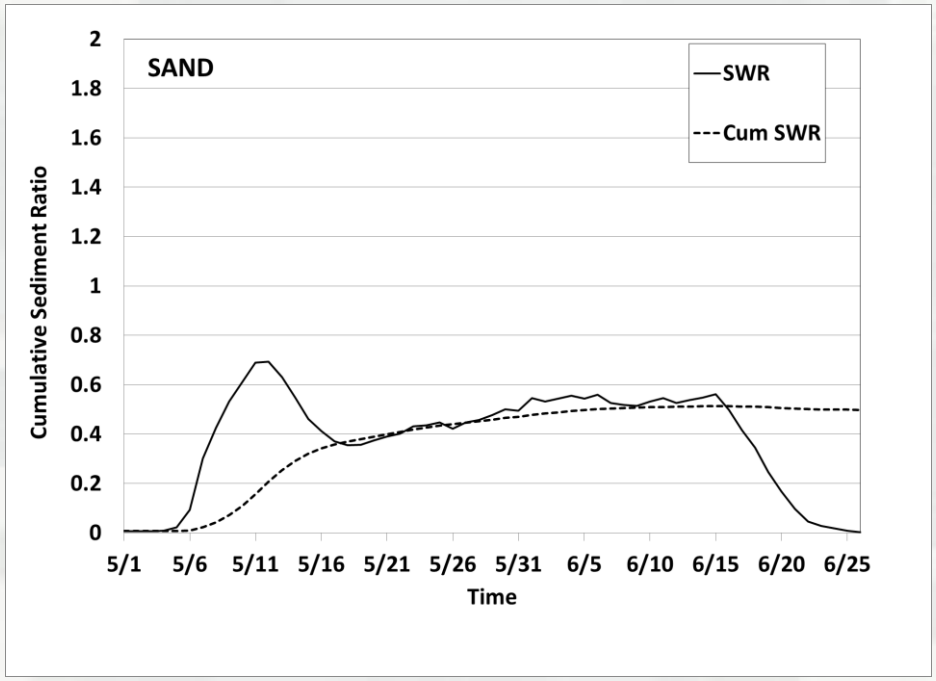
Sand

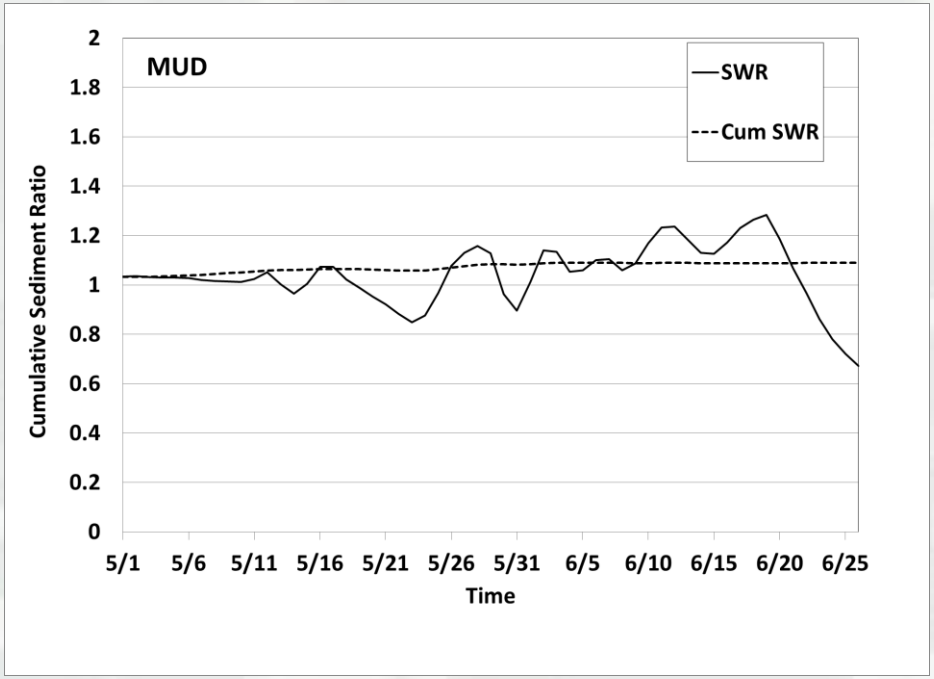


Mud

SEDIMENT-WATER RATIO

$$\text{Sediment Water Ratio, SWR} = \frac{\textit{Sediment Concentration Diverted}}{\textit{Sediment Concentration in the River}}$$





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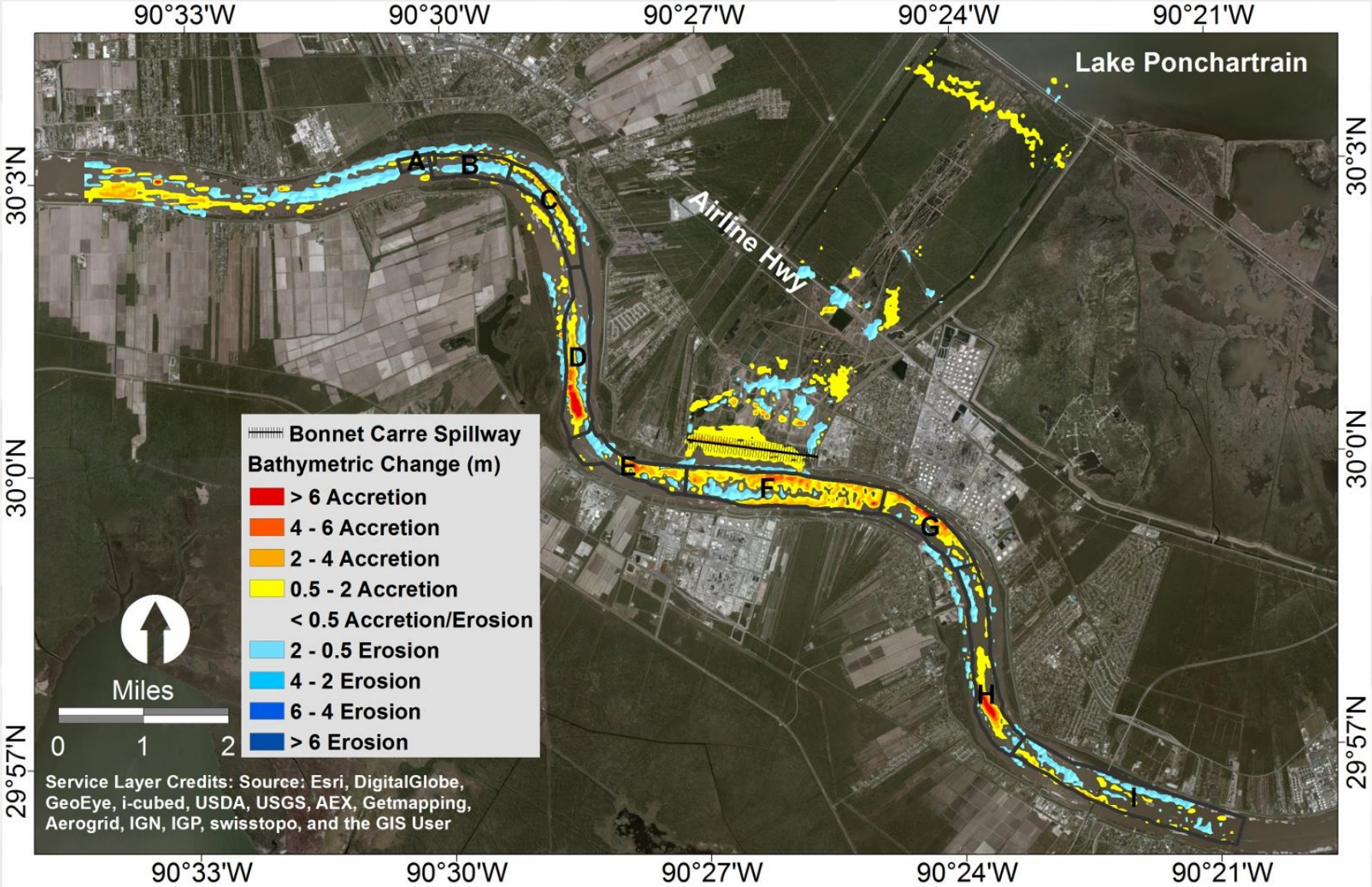
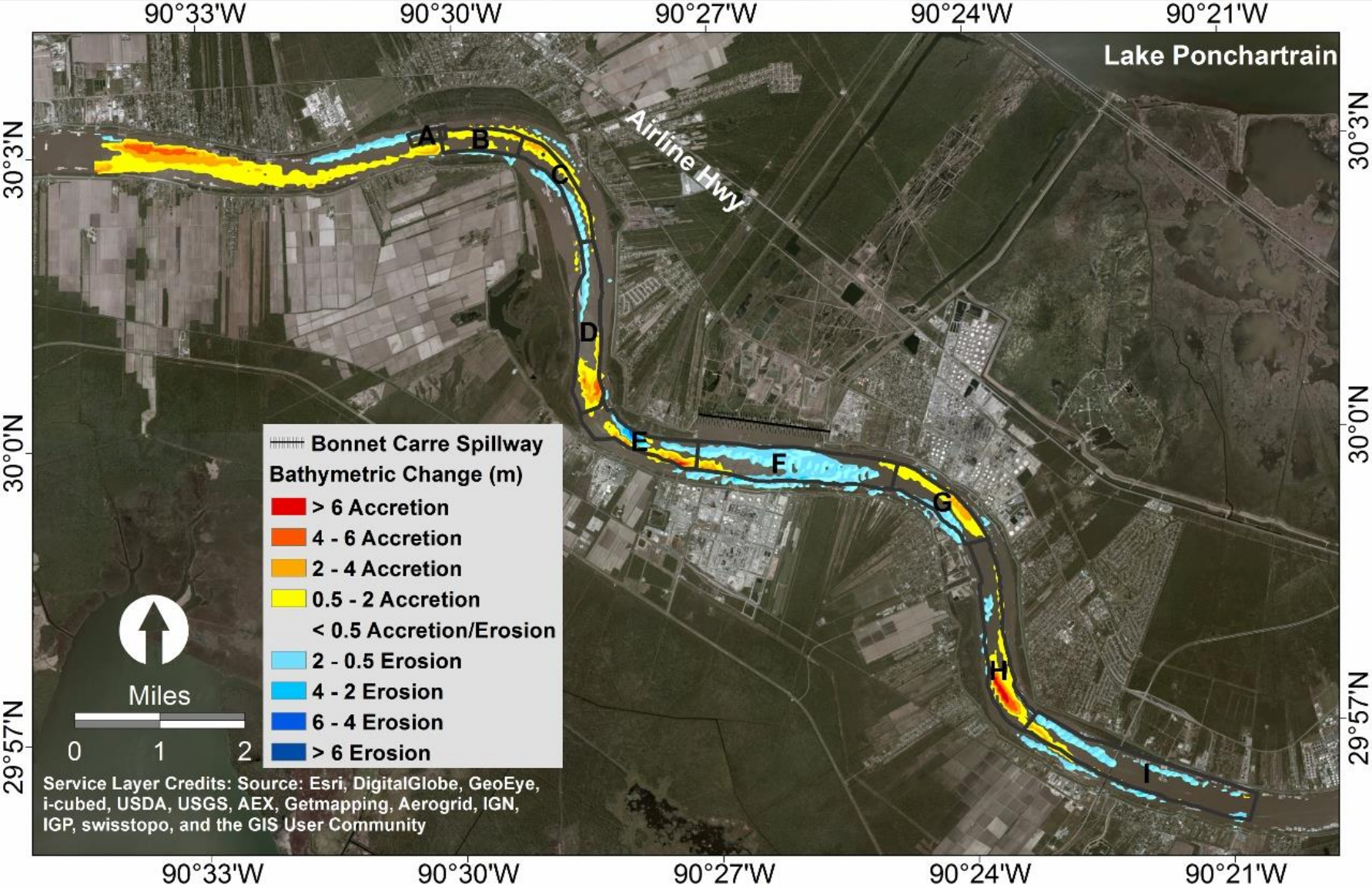
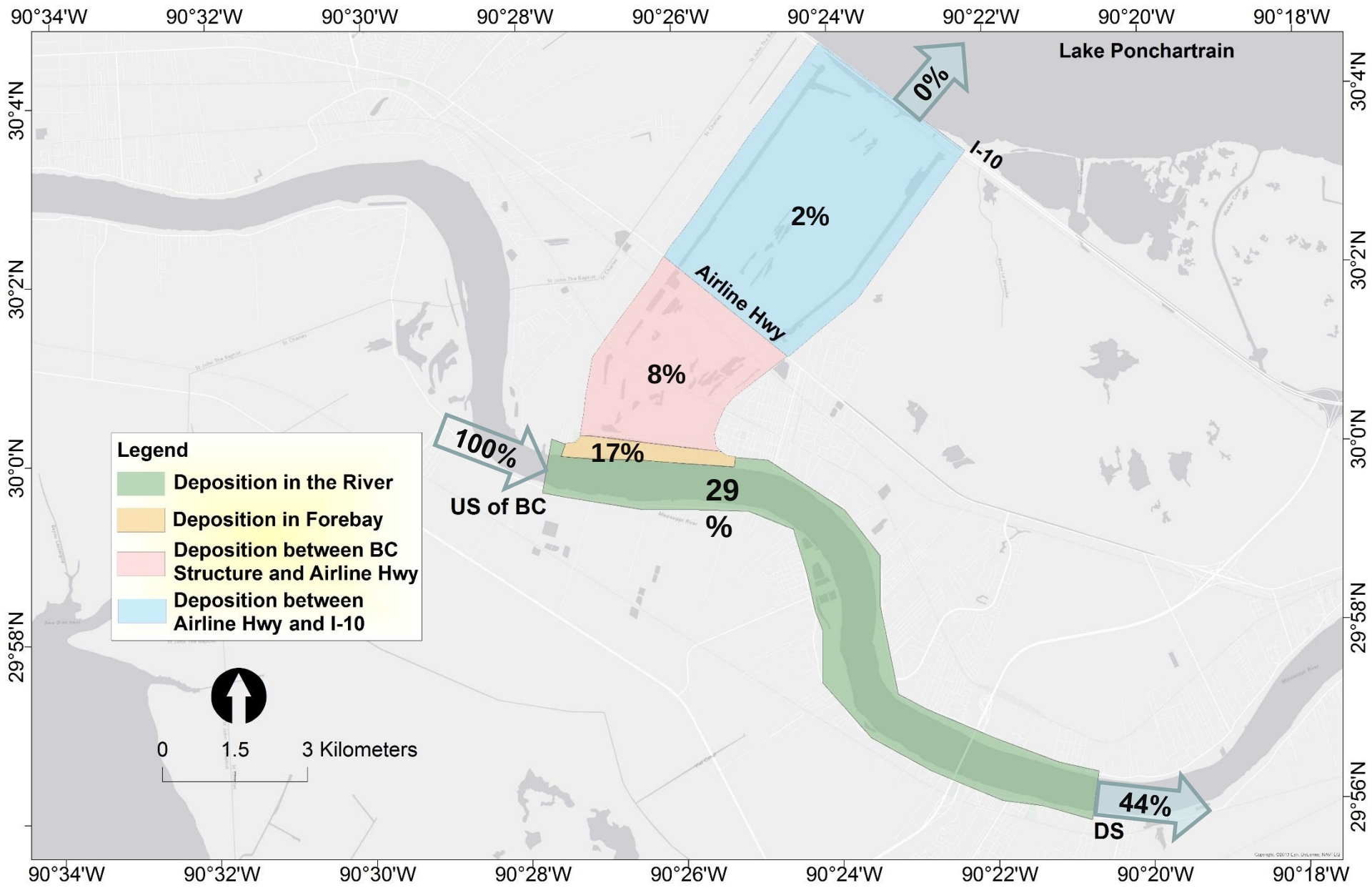
Bathymetric change (FLOOD 2011) observation polygon A to I



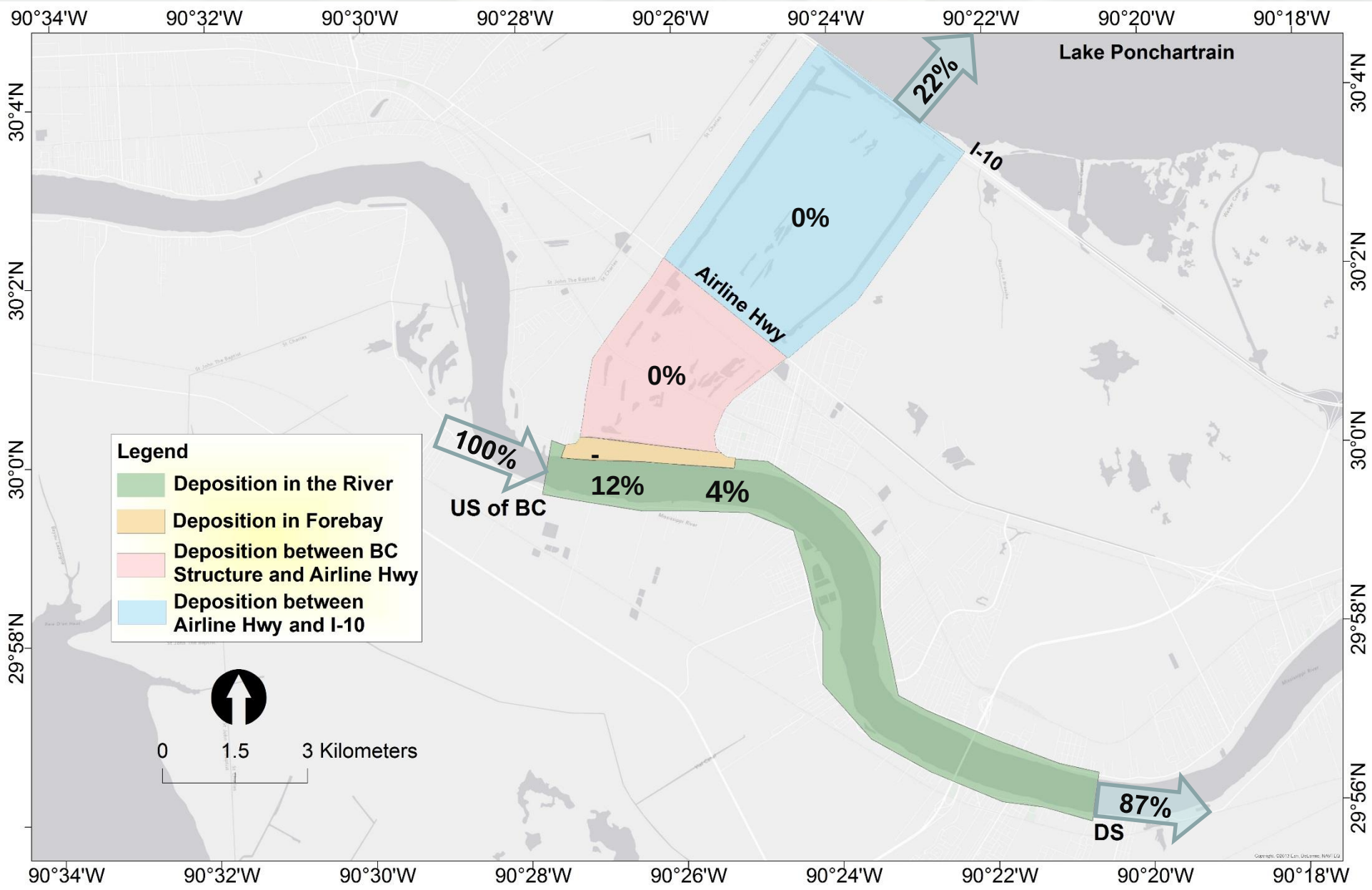
Bathymetric change (June 2011-June 2012)polygon A-I



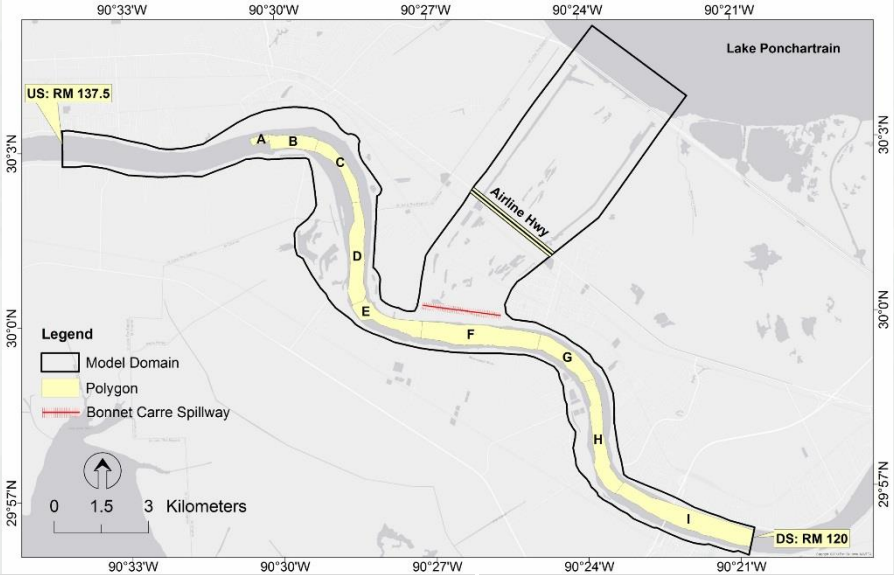
2011 Flood Event-Sand Budget

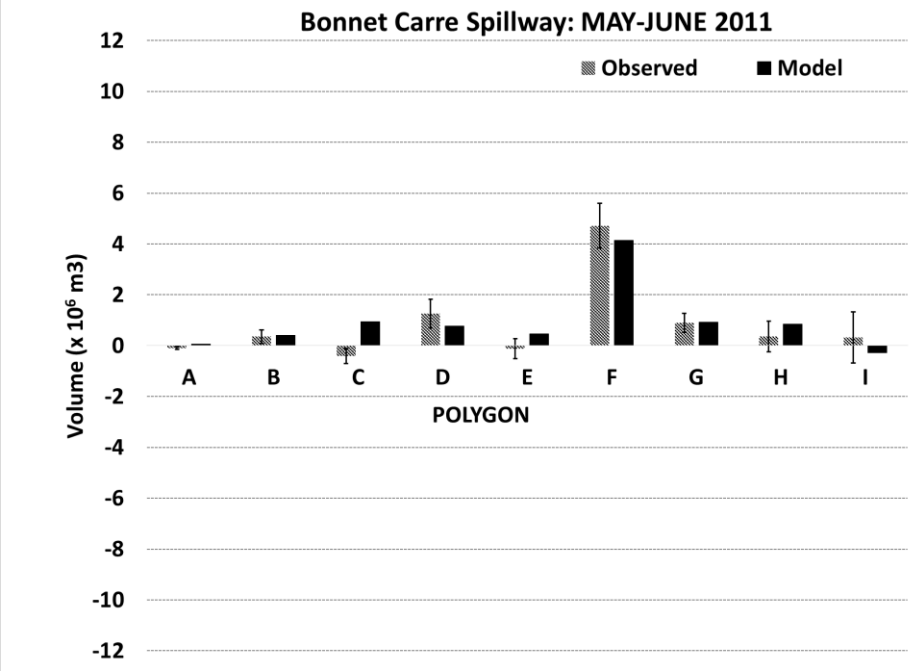


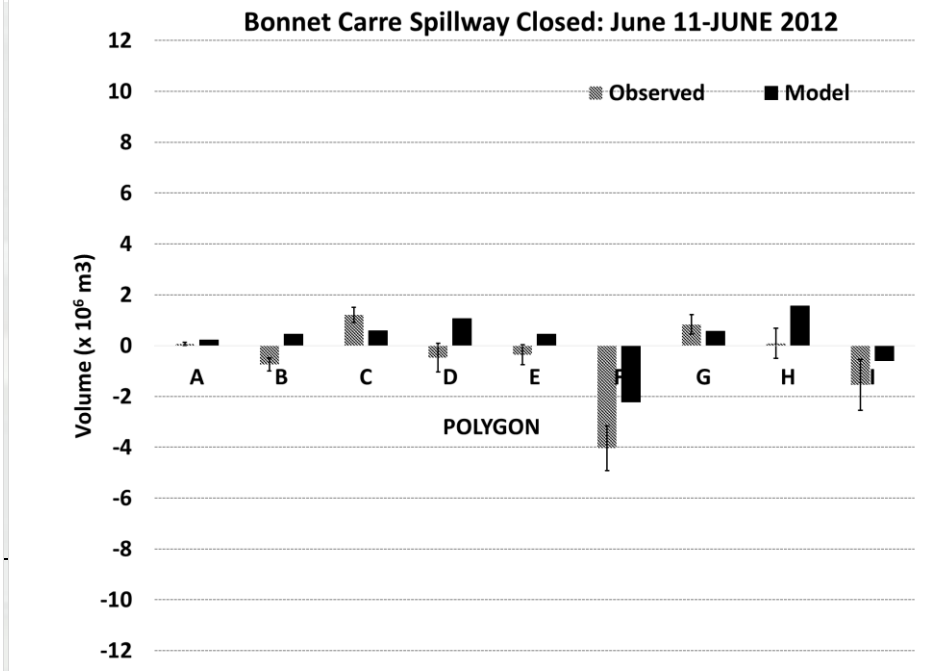
2011 Flood Event Mud Budget



Volume of Erosion and Accretion

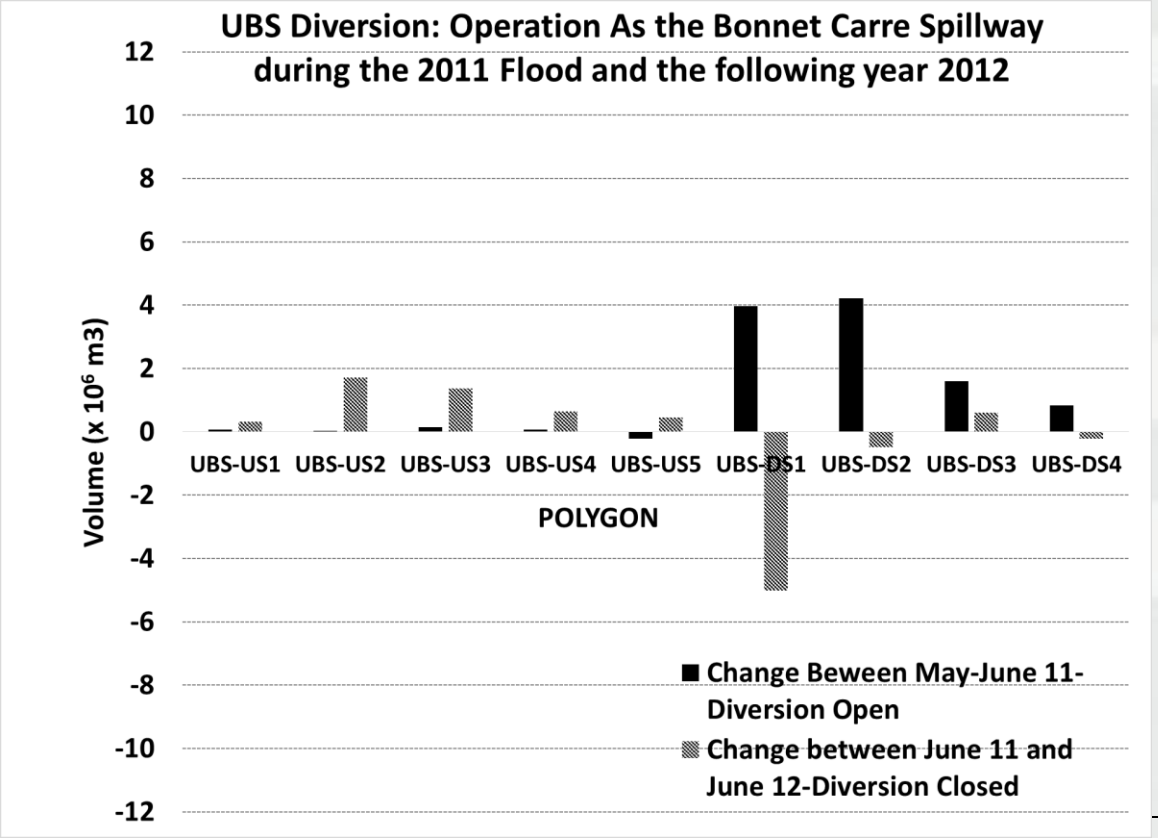


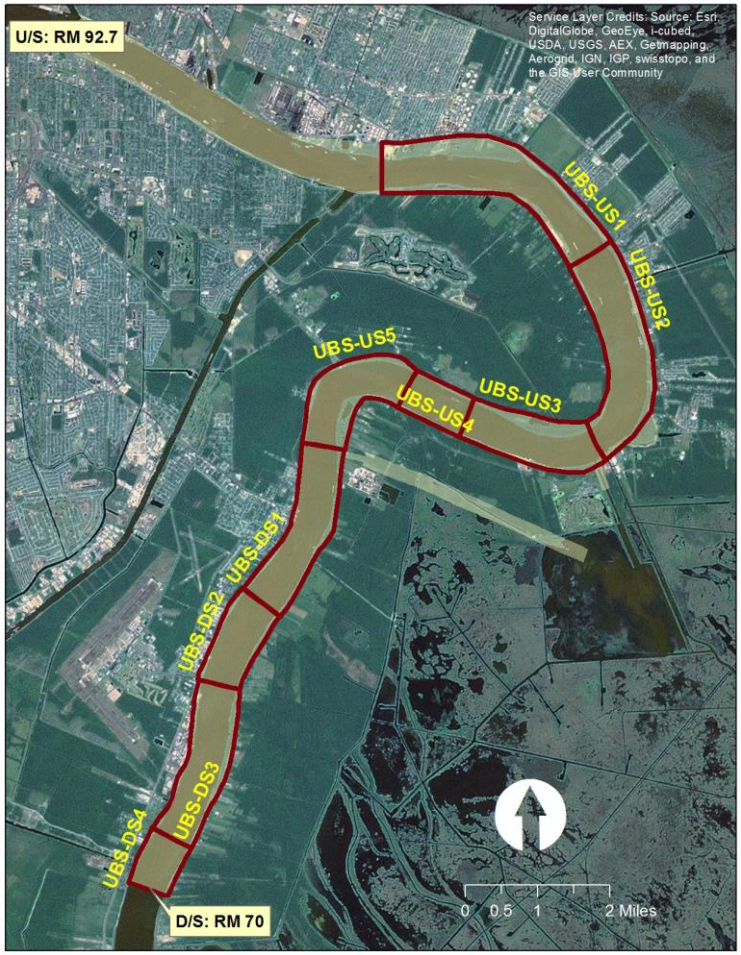




Production run: Result Analysis

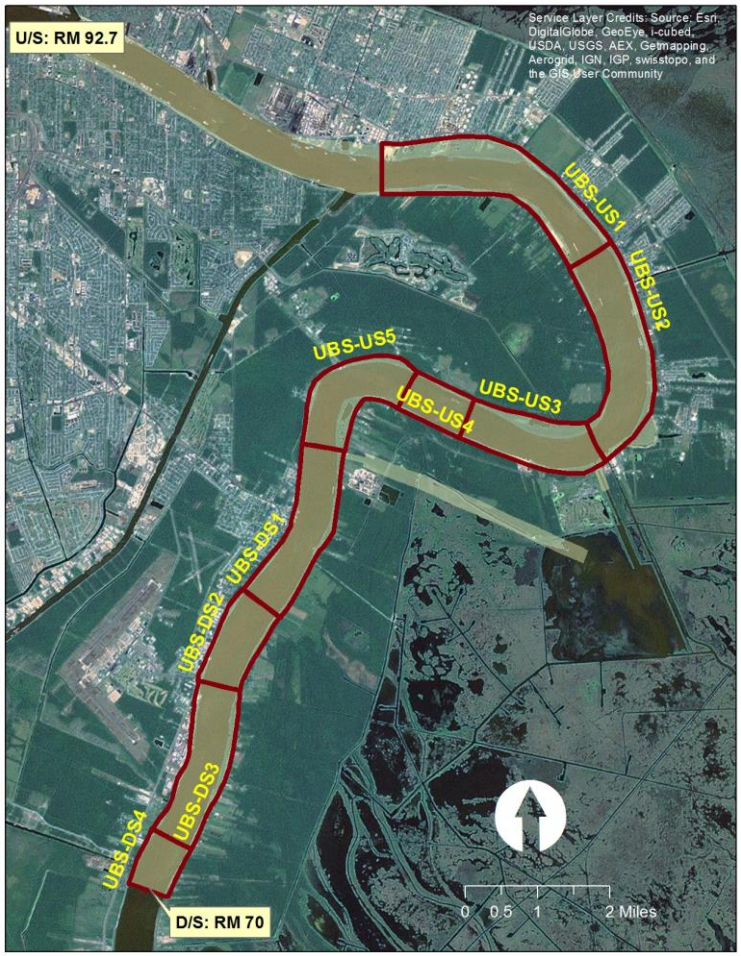
- **Simulation Period : May 1 – June 25, 2011 (Diversion Open)**
  June 26, 2011 – June 15, 2012 (Diversion Closed)

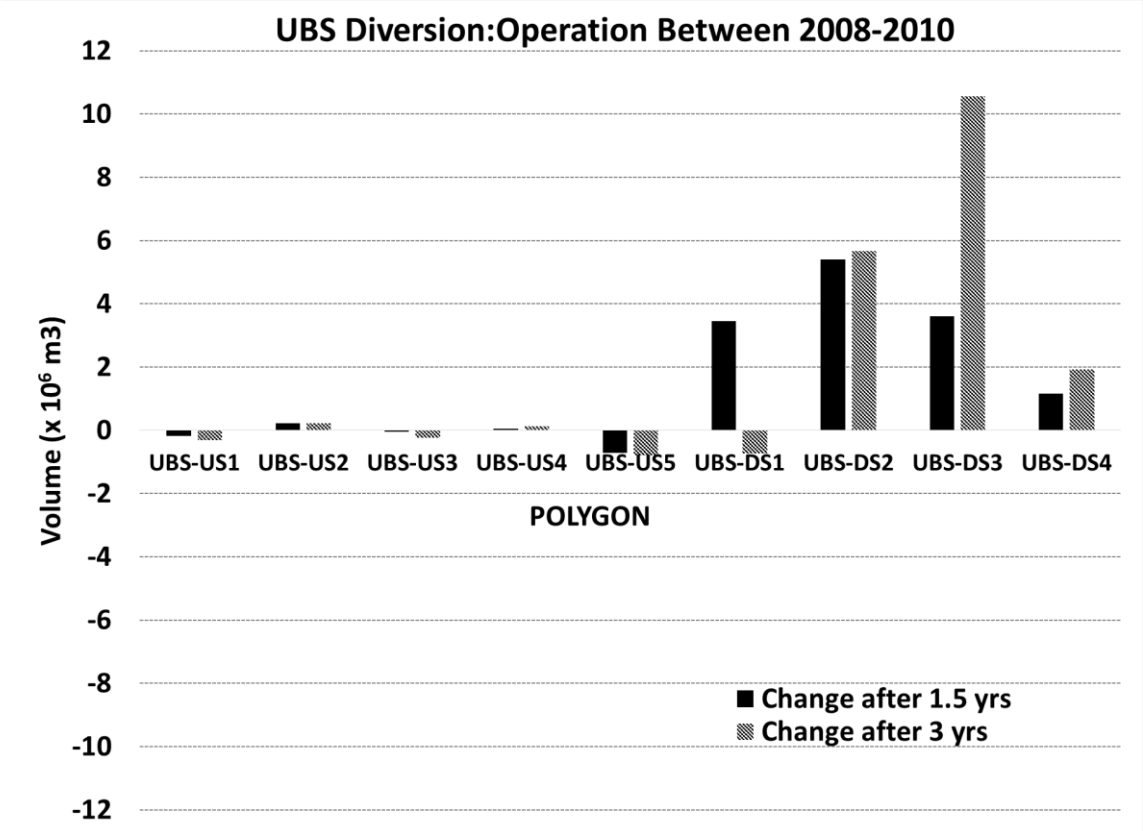




Production run: 2

- **Simulation period: January 2008 – December 2010**
- **Erosion and Deposition volume in the river bed for operating the diversion for continuously three years between 2008-2010**



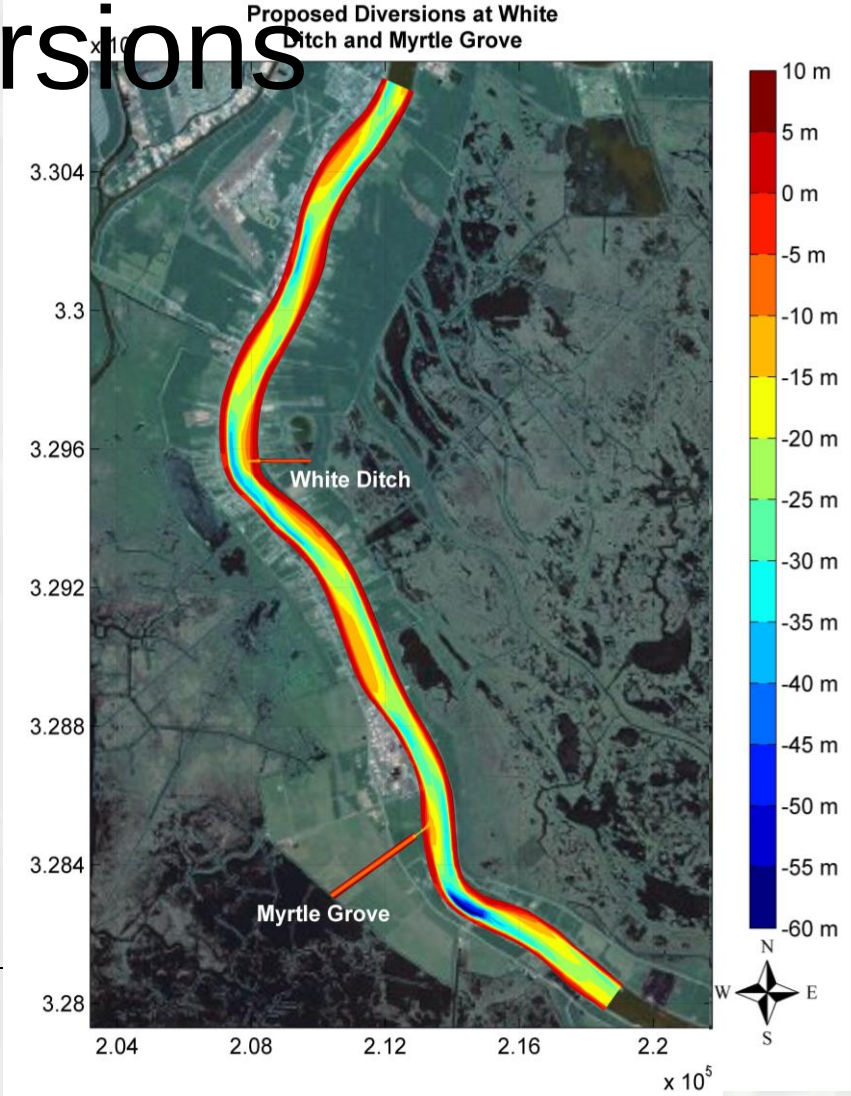


Combined model myrtle grove (MG) and white ditch (WD) diversions

Model Domain: RM 76 – RM 56

Design Capacity for MG: 75,000 CFS

Design Capacity for WD: 35,000 CFS



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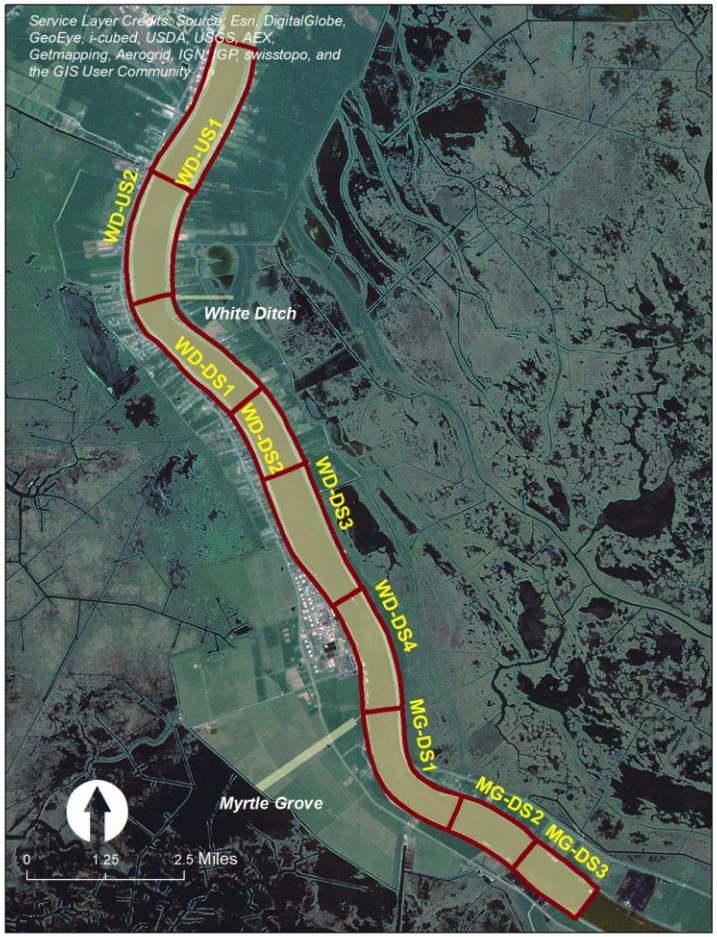
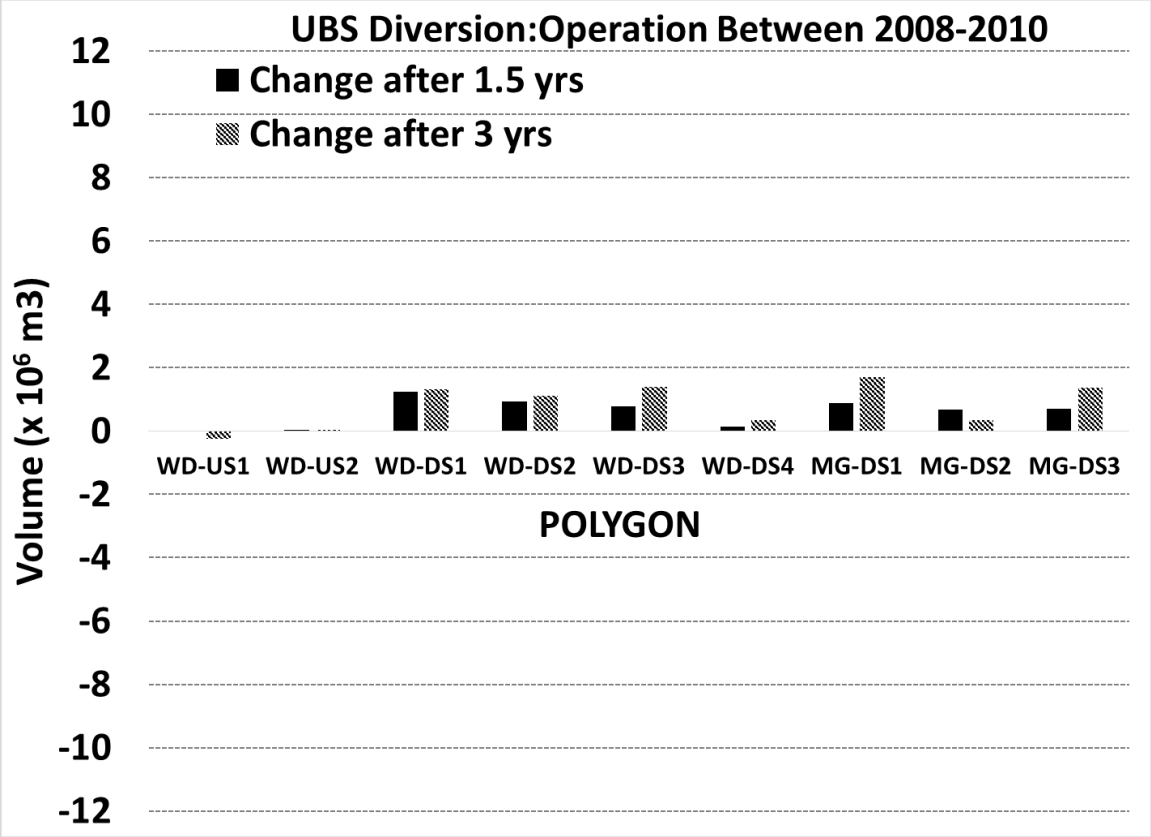
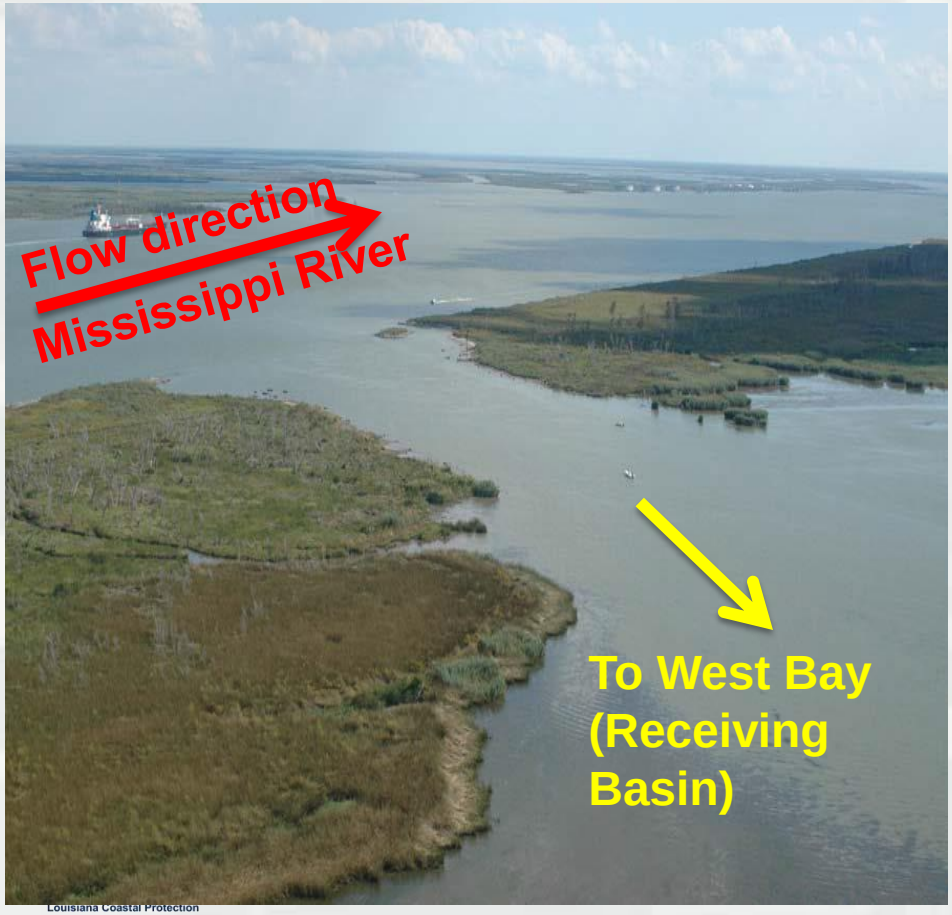
MG+WD Model: production run analysis

- Erosion and Deposition volume in the river bed for operating both the diversions for continuously three years between 2008-2010





WEST BAY DIVERSION



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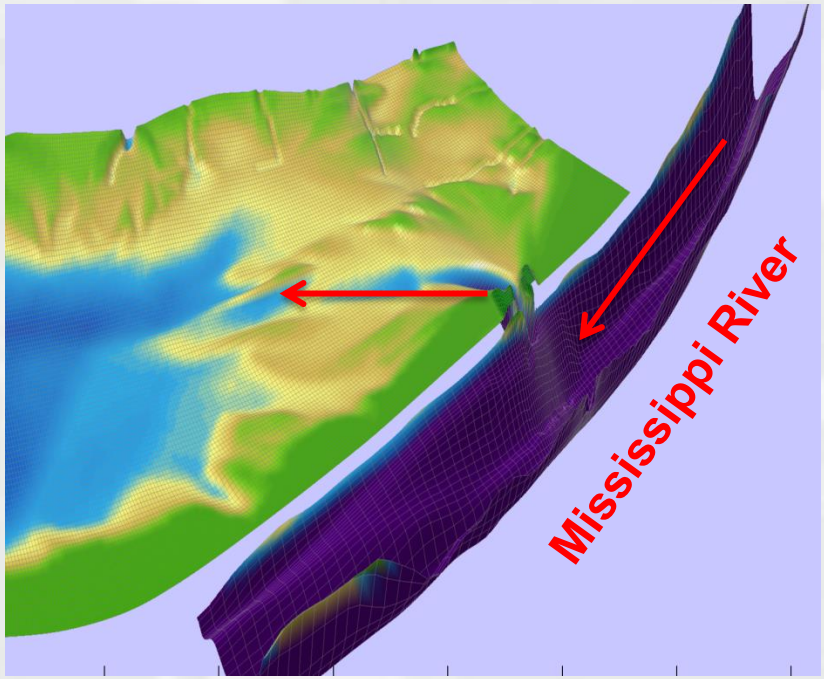
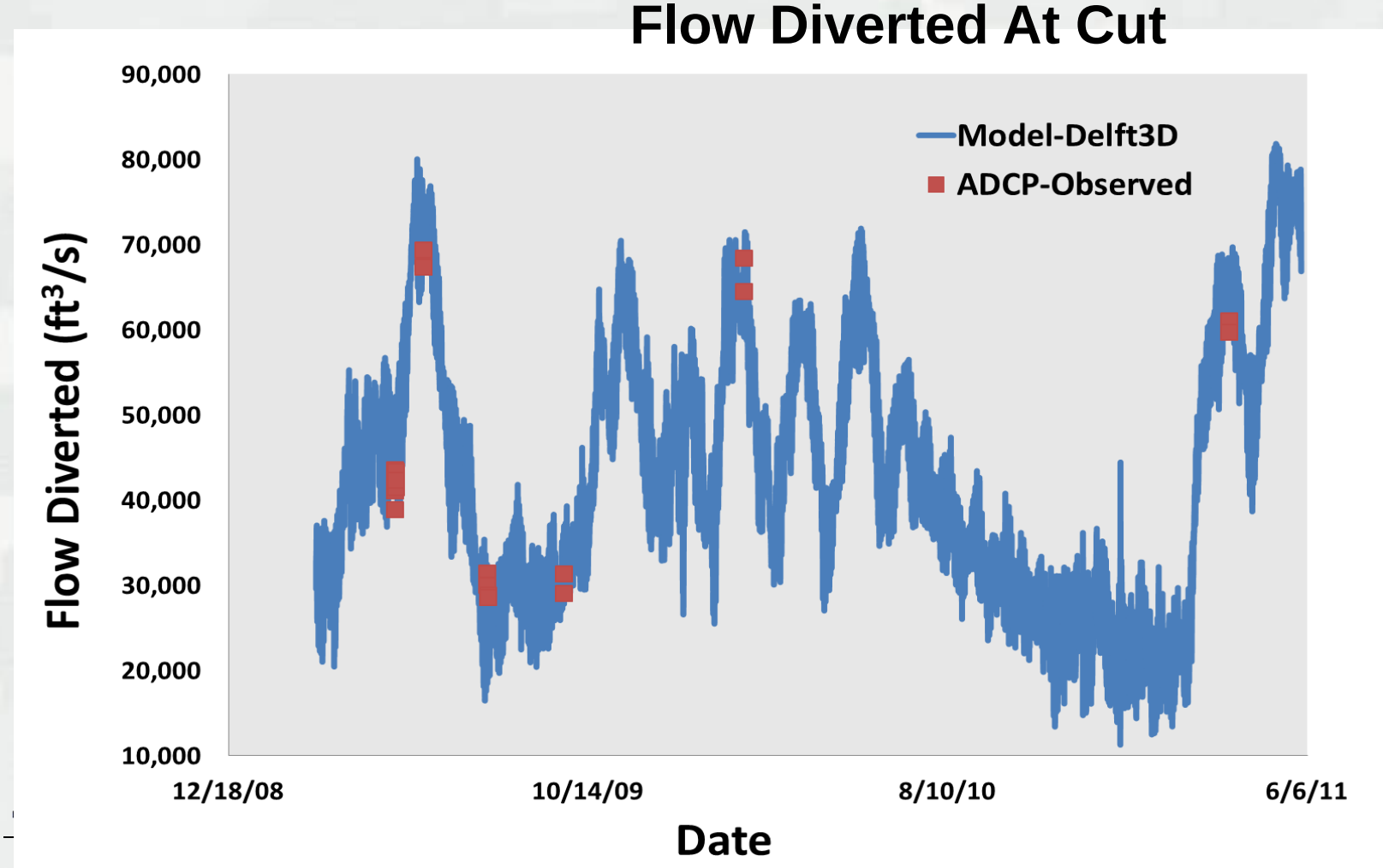


HD CALIBRATION RESULTS (CONTD)



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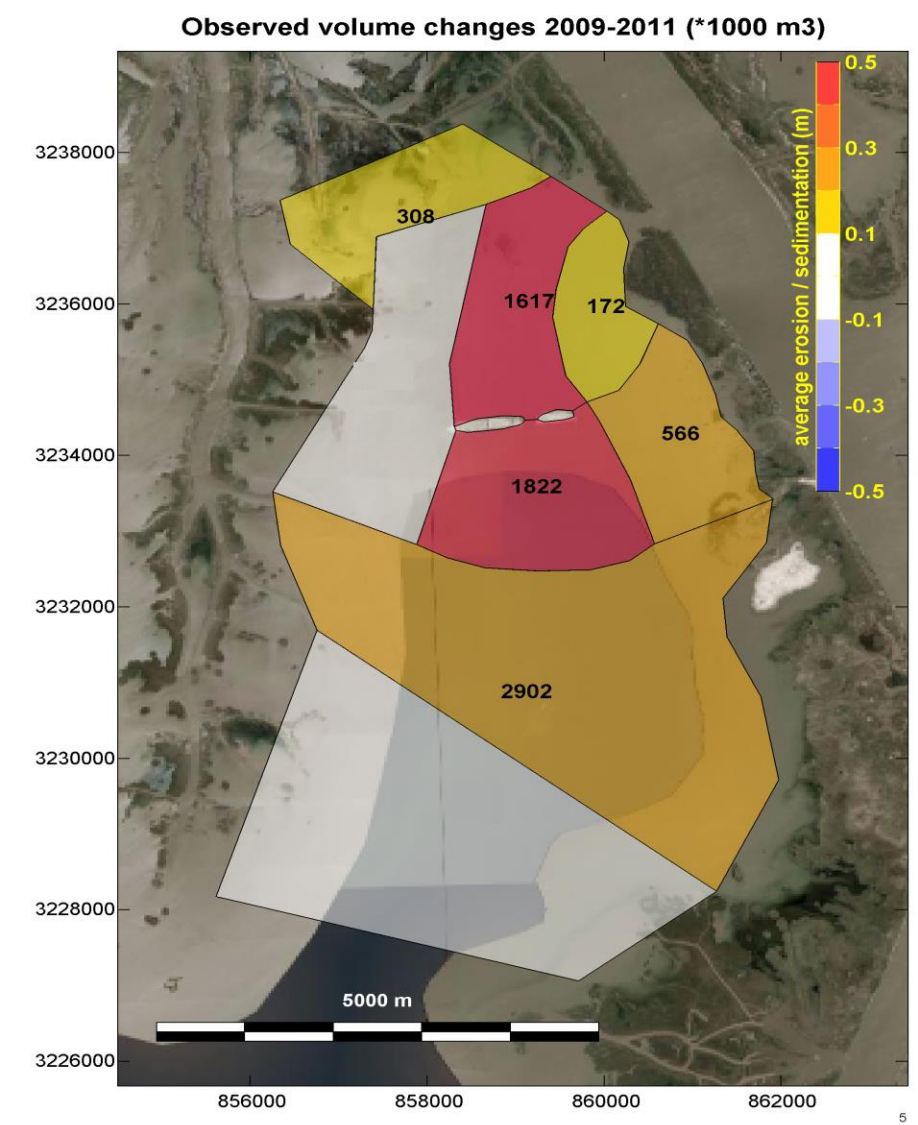
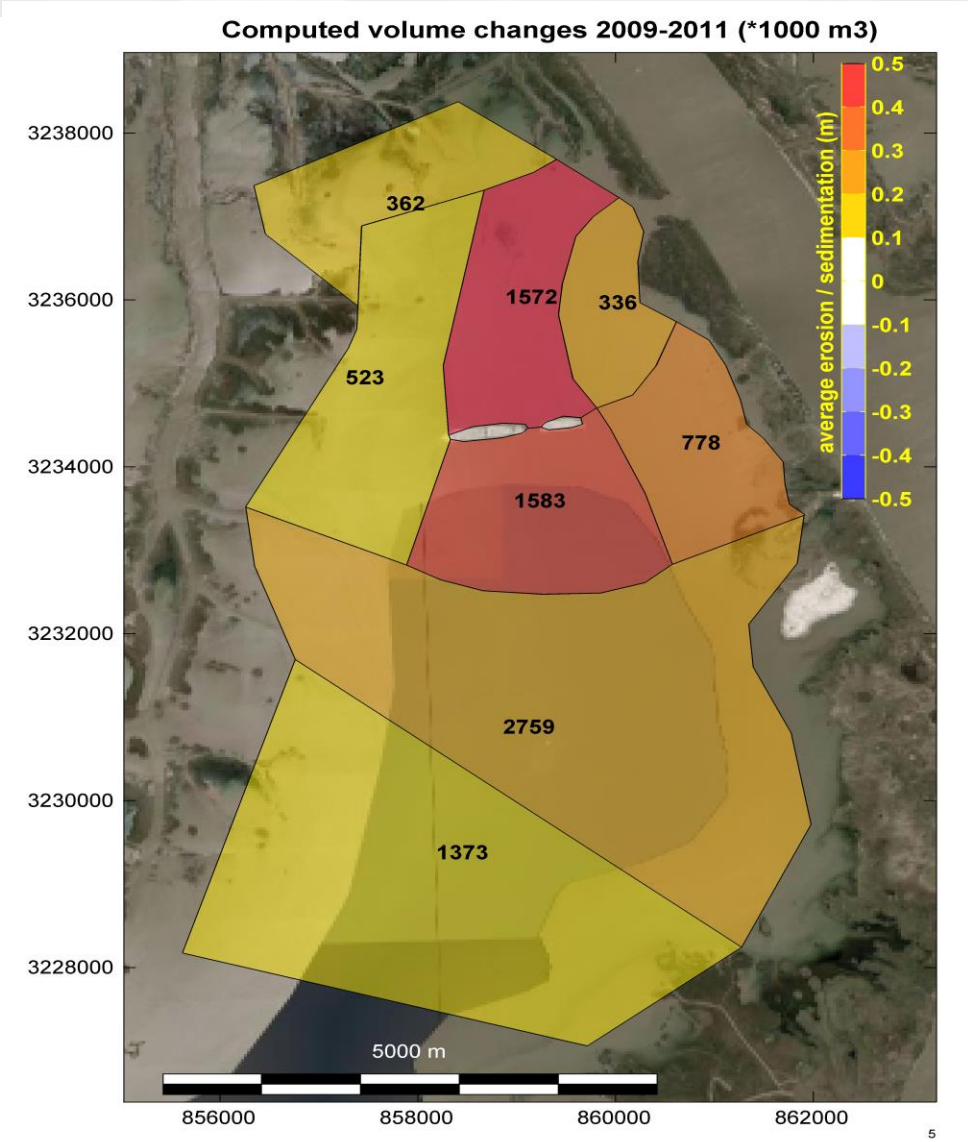
2009-2011 volumes





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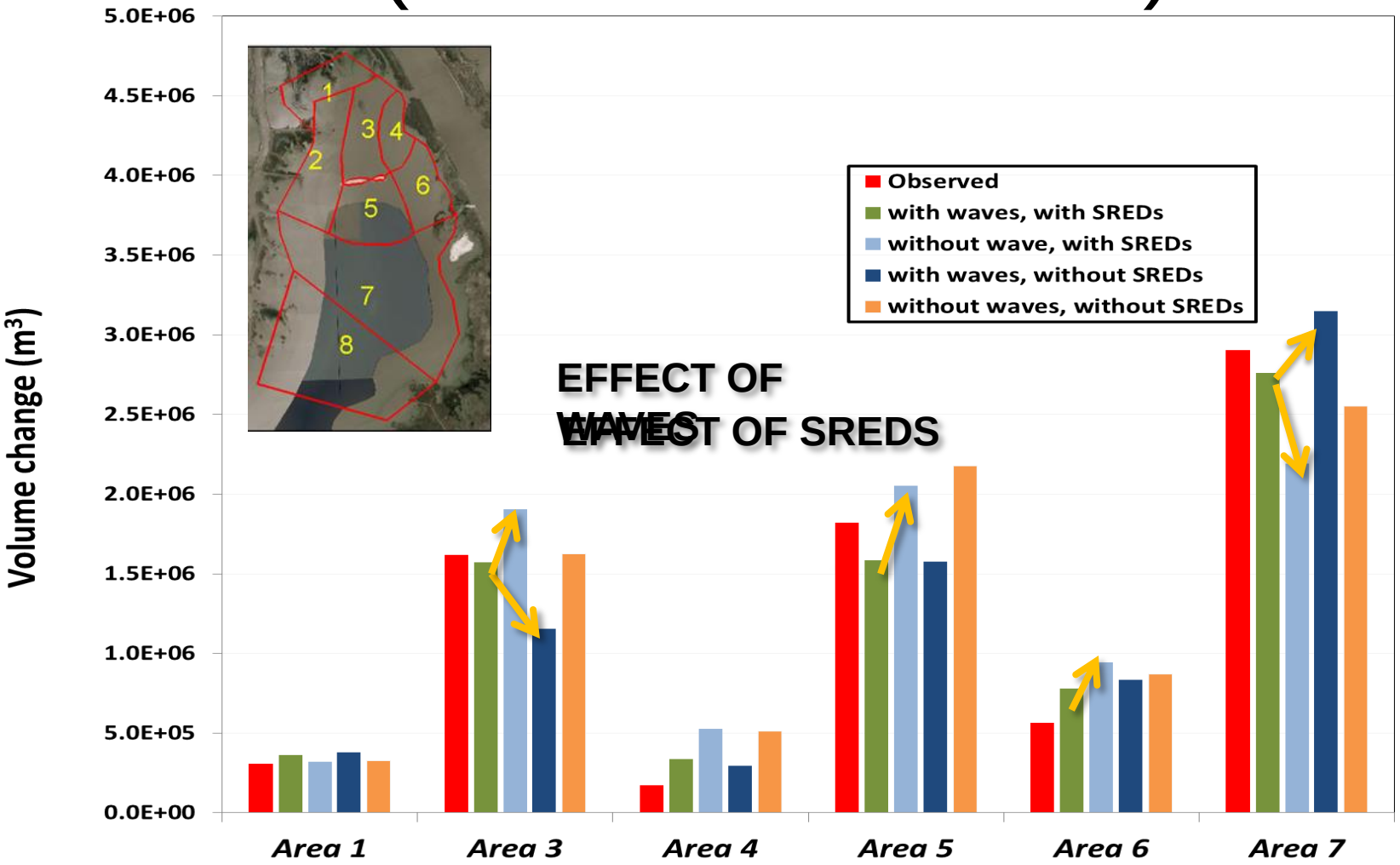
2009-2011 Land Building (~3 km^2 /750 acres)



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Physical Constraints Associated with Sediment Diversions

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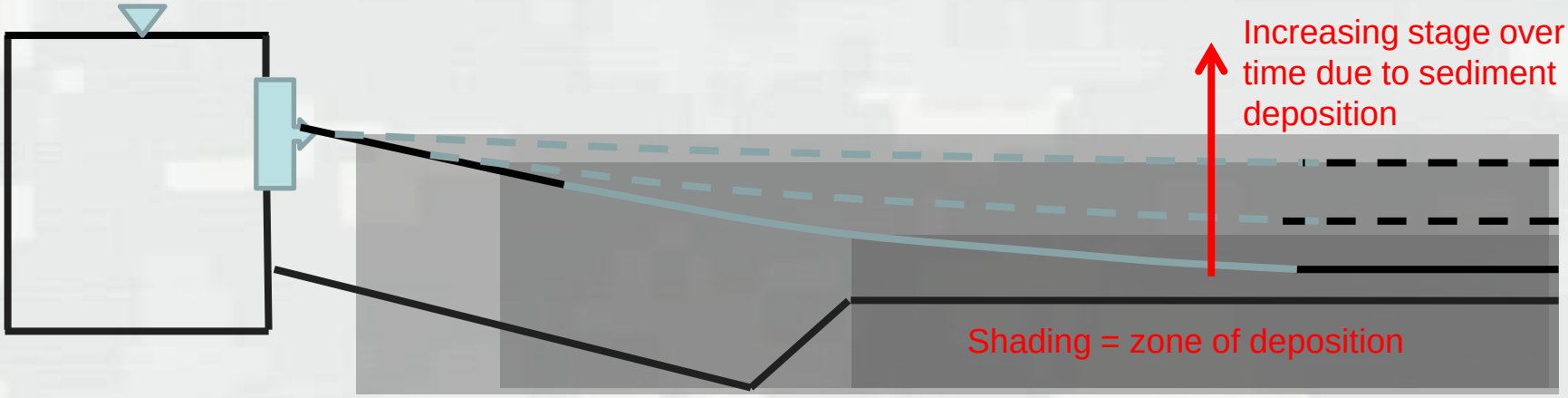
Energy Budget Constraints on Diversion Design

- Greater sand load can transported shorter distance.
- Deposition in basin may impact efficiency of diversion.
- Operation of diversions should allow for deposited material to be “re-worked”, and consolidated. May alternate operation of multiple diversions.
- Rate of land building as time passes is essential.
- Energy budget ***is*** likely to be a significant and measureable constraint on diversion design.



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Lessons Learned

- Models provide valuable insights and inform the decision making process
- Multiple models reduce risk and provide multiple-line-of-evidence
- Receiving Basins and River Side characteristics should be considered and carefully studied
- Models provide quantitative information on shoaling and how it can be used beneficially in the receiving areas to:
  - Absorb energy
  - Reduce erosion
  - Enhance sediment retention

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