An ADH Model to Support the Hydrologic Restoration of Cole’s Bayou
Teche-Vermilion Basin, Louisiana

Steve Sanborn
Amanda Taylor
Shannon Haynes
John Foret
Christopher Wallen
Marsh Loss

2004
Pre Hurricanes Katrina & Rita

2007
Objectives

- Hydrologic rehabilitation
  - Increased freshwater and sediment inflow

- Hydrodynamic model
  which captures flow processes so restoration scenarios may be tested
Model Development

• ADH – USACE finite element, implicit, adaptive hydrodynamic model
  – Efficient wetting/drying algorithm
  – Unstructured mesh allows for intricate modeling domain
  – Friction parameterization for unsubmerged rigid vegetation
  – Ability to implement structures (culverts with flap-gates)
Typical Marsh Cross-Section
The Problem of Scale
Unstructured Model Grid

FR URV  1  0.1  0.03  1000
TV63-04 Water Level Calibration

RMSE = 0.14 ft, rRMSE = 0.06
Flows

Legend

**99** – Average Flow Magnitude (cfs)

**0.9** – Net Flow (cfs)
Scenario Analysis (SC-3)

- Assumed marsh creation (raising elevations in major open water areas)
- North: One-way culverts flowing into the marsh
- South: One-way culverts flowing out of the marsh
- Terracing (previously constructed)
SC-3
Flows

Legend
99 – Flow Magnitude (cfs)
(9%) - Magnitude Difference from Scenario 1
9 – Flow Point Number

2.7 -87%
5.2 3%
2.8 -95%
4.9 -89%
6.4 -95%
10.3 -88%
7.9 -90%
1.8 -69%
4.4 -89%
1.5 -39%
2.6 -65%
3.1 -84%
11.5 N/A
10.2 N/A
9.0 N/A
Mesh Adaption

![Graph showing the number of computational nodes and water level over time. The black line represents the number of nodes, and the blue line represents WSE.](image)
Results

- Flow magnitudes and flow patterns changed
- Inundation frequency analyzed
- Results used in marsh creation box model SAND
Questions?

Steve Sanborn
scsanborn@dsllc.com
www.dsllc.com
865.212.3331