Calibrating, extending, and applying the Nueces Delta Hydrodynamic Model

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Goals

- Model that can predict time-space changes in the salinity distribution from Calallen dam out to the Nueces Bay Causeway
- Understanding of pumping effects for different flow rates under different tide/wind conditions
Tasks

• Calibrate Nueces Delta hydrodynamic model
• Add Nueces Bay to model
• Evaluate freshwater pumping scenarios
Calibration

- TWDB installed 38 instruments in Nueces Delta from July 2012 through Nov 2013
- Data sets are water level, temperature, and conductivity (salinity) collected throughout Delta
- Water velocity data using ADCP at two locations
- Calibrating to this data set should provide confidence in the model.
Instrumentation deployed by TWDB
Figures from Schoenbaechler, Neguse and Guthrie (2014)
Summary of work to date

• Calibration is still in progress.
• Previous model used 15 x 15 m grid.
• Coarsened grid to 30 x 30 m to speed calibration and work with Nueces Bay model.
• Developing bathymetry for complete system.
Challenges in coarsening grid

Maintaining detail (1x1 m detail)
Challenges in coarsening grid

30 x 30 m loses channels and banks
Challenges in coarsening grid

Identify blocking structures
Challenges in coarsening grid

Identify channels
Challenges in coarsening grid

Creating channels and edge embankments
Calibration

• Adjusting drag coefficients in channels,
• Minimum channel size (30 m) is wider than many channels, so we need increased drag to slow flows.
• Critical issues are at several choke points within the Rincon bayou that control flow paths.
Adding Nueces Bay

- Present model uses Nueces Bay as a “dummy” domain to enforce tides.
- New model will have dummy domain outside of Nueces Bay Causeway for tidal conditions.
- We don’t have the same detail of bathymetry for Nueces Bay that we do for the Delta (shouldn’t be a problem).
Adding Nueces Bay

Nueces Bay and Delta

550,000 grid cells at 30 x 30 m
Movies of preliminary model results

Model results using Aug. 2012 wind, tide, and freshwater pumping. Initial salinity field based on sensors in Nueces Delta

- Salinity:  [YouTube](http://youtu.be/N1Zyziul1m0)
- Elevation:  [YouTube](http://youtu.be/ankf_ecQQpY)

Model results starting from uniform salinity field of 35 ppt and tidal inflow that is always 35 ppt. These results allow us to more easily see the fate of the pumped freshwater.

- Baseline
- Project 2  [YouTube](http://youtu.be/XqUpTzQbl7Q) blocking Upper Rincon.
- Project 3  [YouTube](http://youtu.be/uAvc8Gi0RLg) providing Upper Rincon control structure and channel to South Lake.
- Project 4  [YouTube](http://youtu.be/DKC4EvqIOcw) providing Middle Rincon control structure and channel to South Lake.
- Project 5  [YouTube](http://youtu.be/mFTeLKWxnac) providing North Lake to South Lake channel (no control structure)
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…and that’s all, folks!