



# Forecasting the Mississippi River During Hurricane Season



David Welch

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# Overview



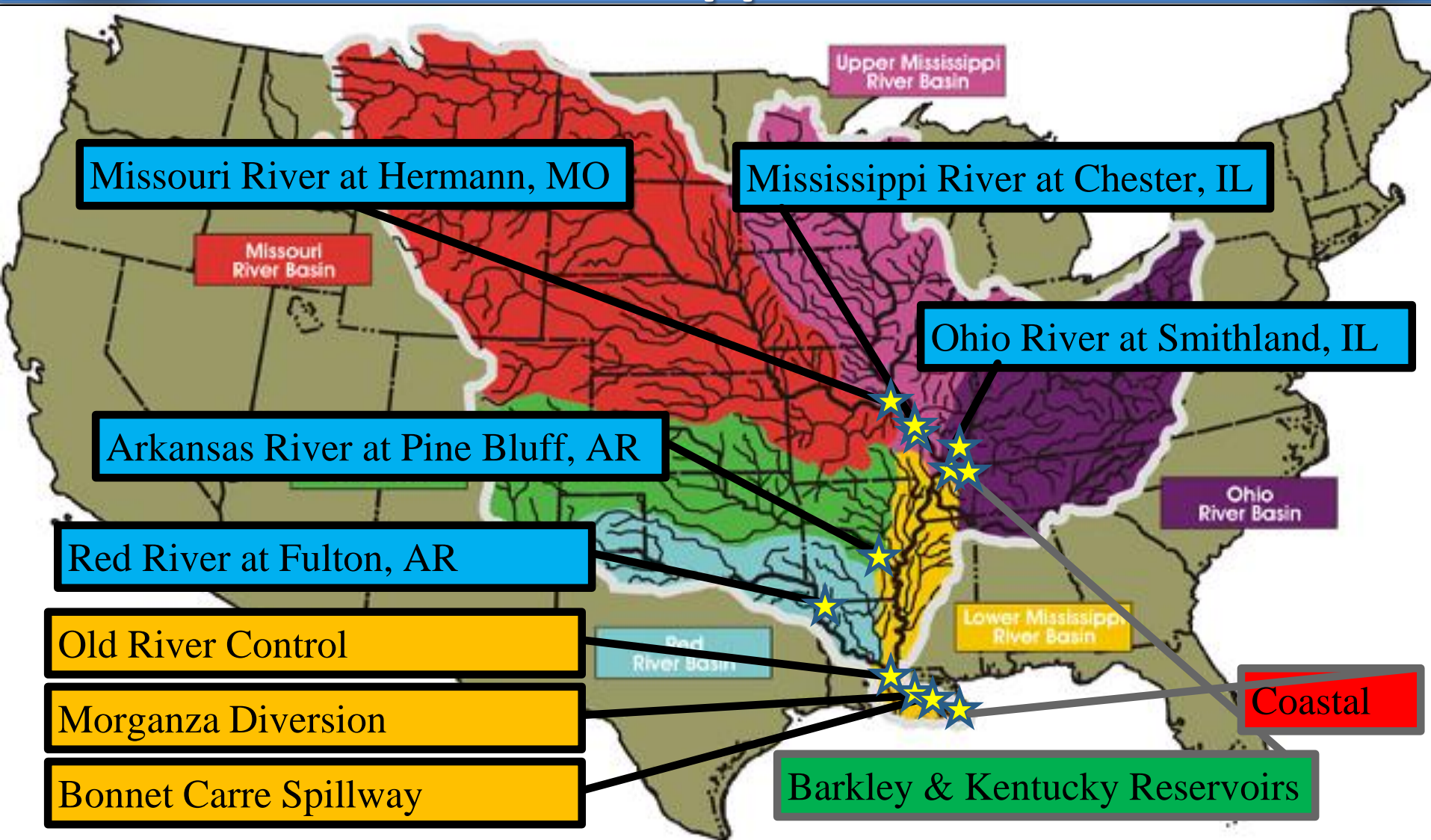
- The Greater Mississippi River Basin.
- Regulation/Flood Control.
- Hurricane Storm Surge Forecasts.







# Major Tributaries of the Mississippi River



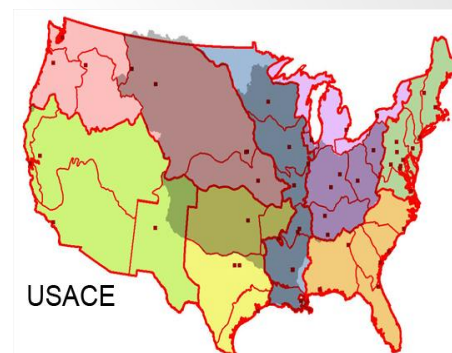


# Partners Involved in Lower Mississippi River Forecast Coordination

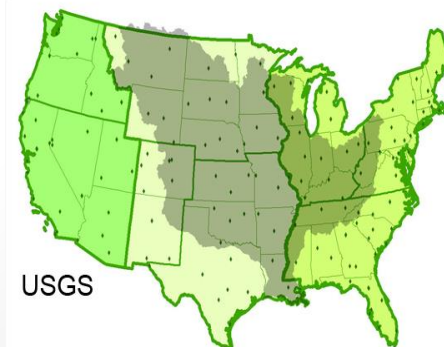


## ■ Inter-Agency Coordination

- ❖ NWS – 4 Upstream RFCs / 3 WFOs
- ❖ USACE - 3 Divisions and 7 Districts
- ❖ TVA - Tennessee River
- USGS – 12 District Offices
- USCG – 1 District and 9 Sectors
- FEMA - 3 Regions
- State Ems
- Navigation
- HAZMAT
- More



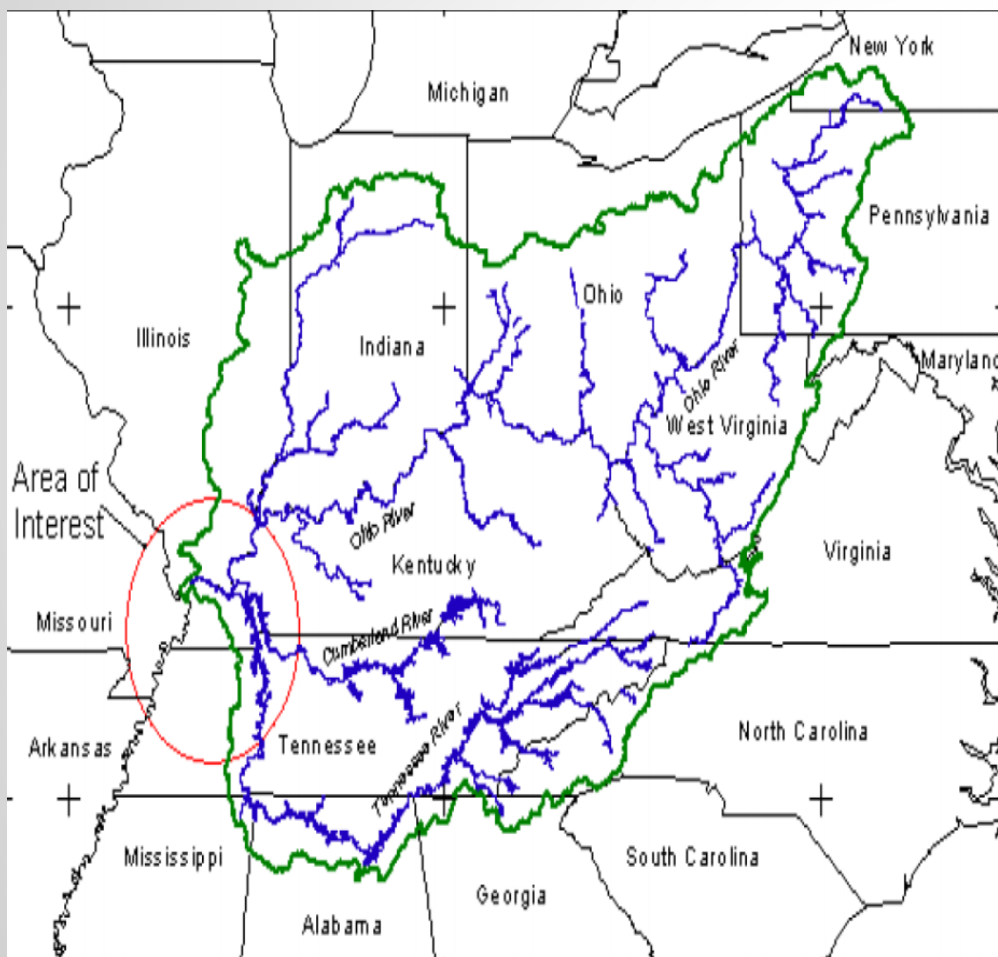
USACE



USGS



## Barkley and Kentucky Dams



- When Cairo, IL gage exceeds 40 ft, USACE manages both lakes to minimize flood impacts on Ohio/Mississippi River and upstream of lakes.
- If storage allows, discharges can be managed to reduce crest at Cairo by several feet.

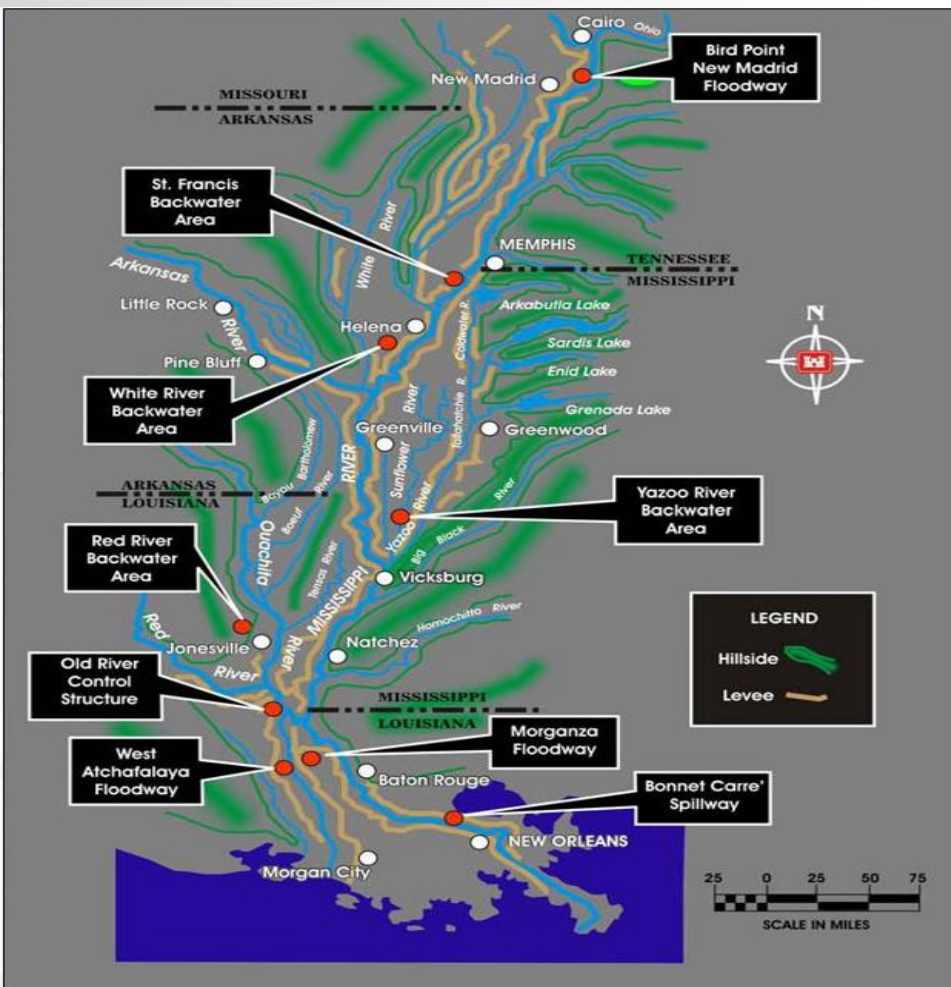




# USACE Flood Control Operations



## Floodways and Backwater Areas

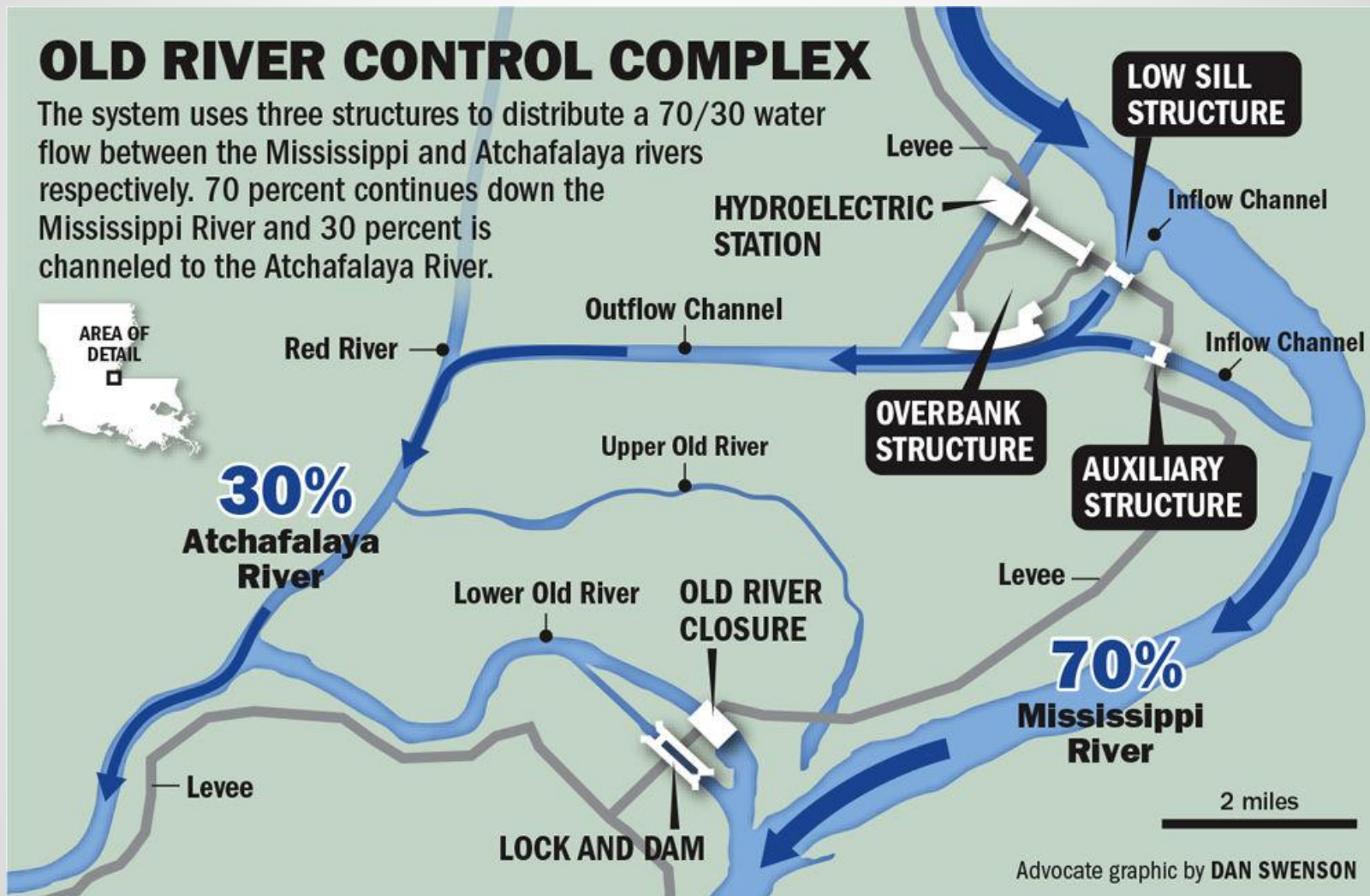


- Birds Point New Madrid Floodway reduces stages at Cairo, IL
- Backwater areas store flow and reduce stages on the Mississippi River
- Old River Control Structure distributes water between the Mississippi and Atchafalaya Rivers
- Morganza reduces stages for Baton Rouge through New Orleans
- Bonnet Carre reduces stages for Reserve & New Orleans



## OLD RIVER CONTROL COMPLEX

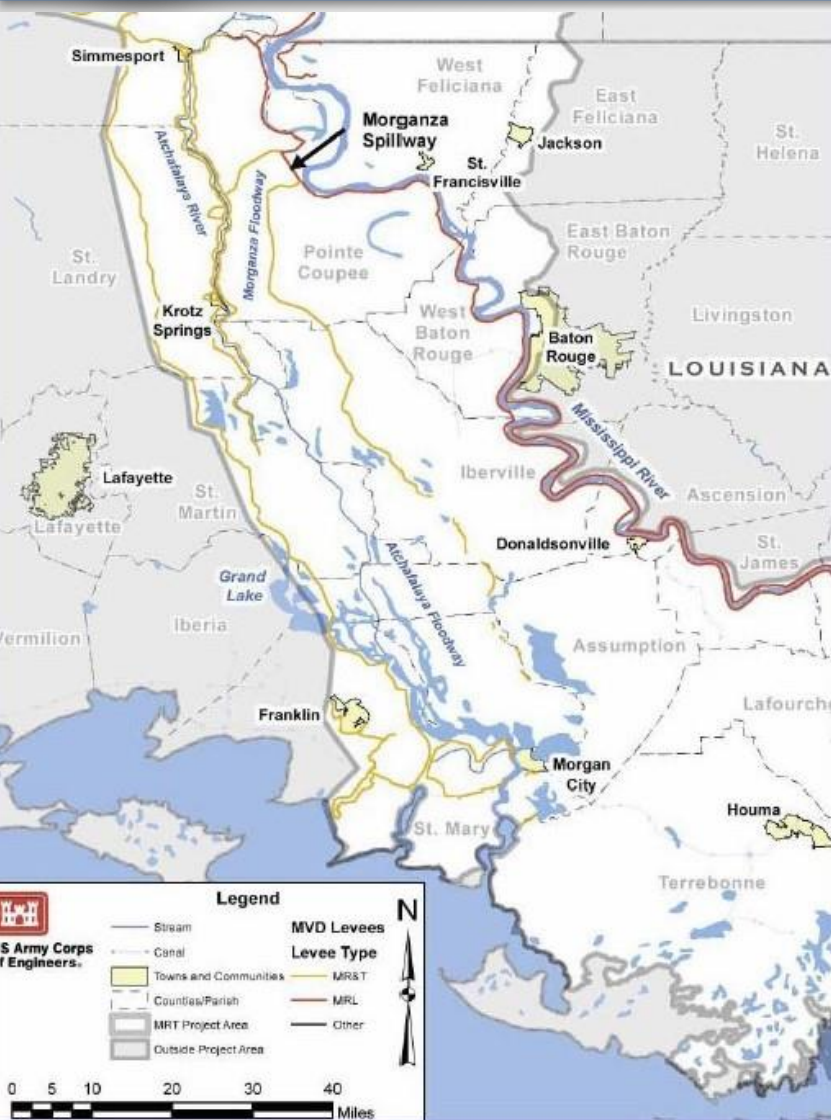
The system uses three structures to distribute a 70/30 water flow between the Mississippi and Atchafalaya rivers respectively. 70 percent continues down the Mississippi River and 30 percent is channeled to the Atchafalaya River.







# Morganza Spillway Operation



- Operational Trigger is 1.5 MCFS passing Tarbert Landing.
- Regulates stages to 45 ft at Baton Rouge with ~ 2 ft of freeboard.
- Designed to pass up to 600 KCFS.
- Operated twice since construction in 1954 in 1973 and 2011.







# Bonnet Carre Spillway Operation



- Operational Trigger is 1.25 MCFS passing New Orleans.
- Regulates stages to 17 ft at New Orleans.
- Operated 15 times since construction in 1931 (7 times since 2008).
- Designed to pass ~250 KCFS



# Hurricane Surge Impacts



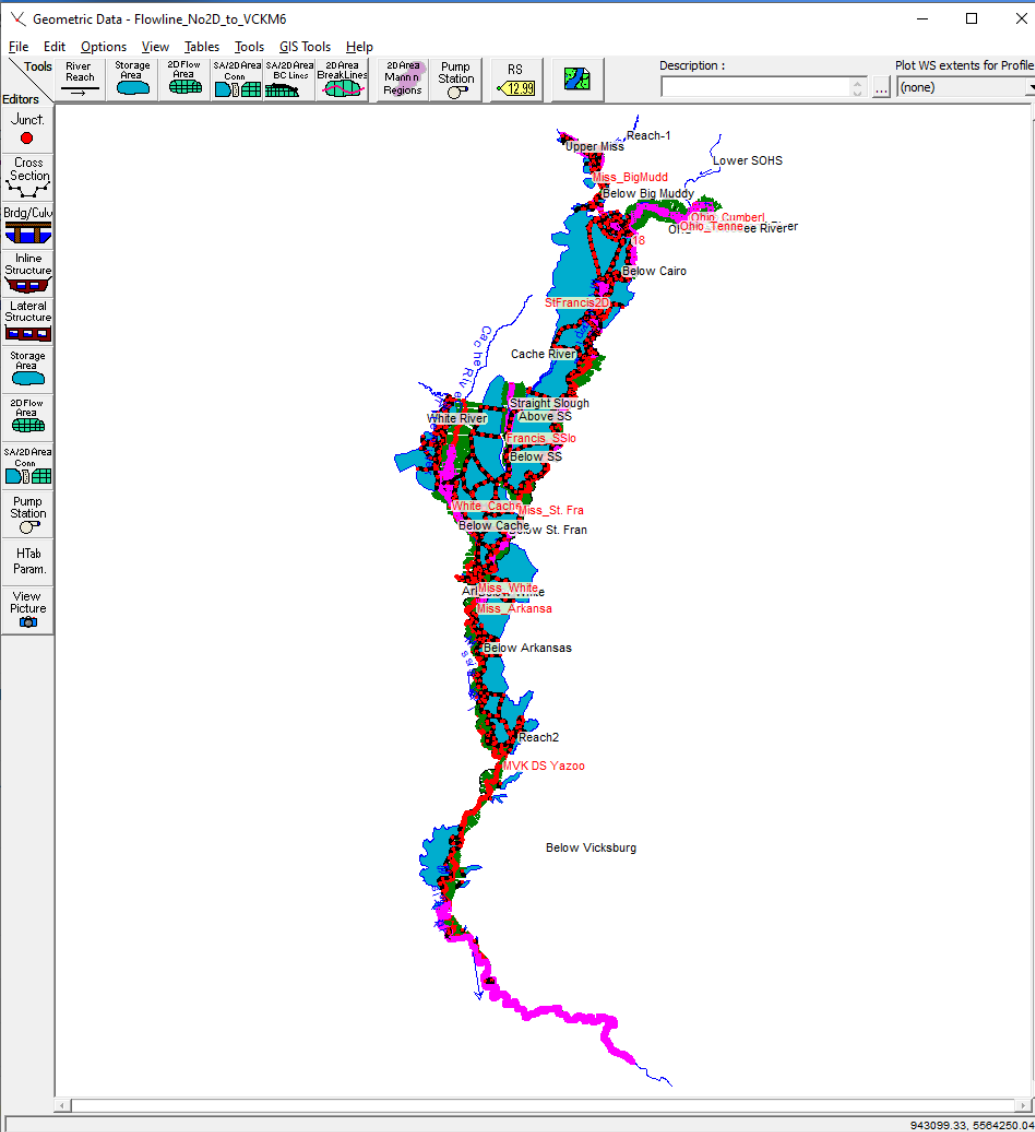
Hurricane Betsy, September 11, 1965

- Hurricane Surges occur rapidly causing ship groundings.
- Numerous flood gates and docks must be closed which takes time to complete. USACE needs 3-5 days lead time.





# HEC-RAS Model



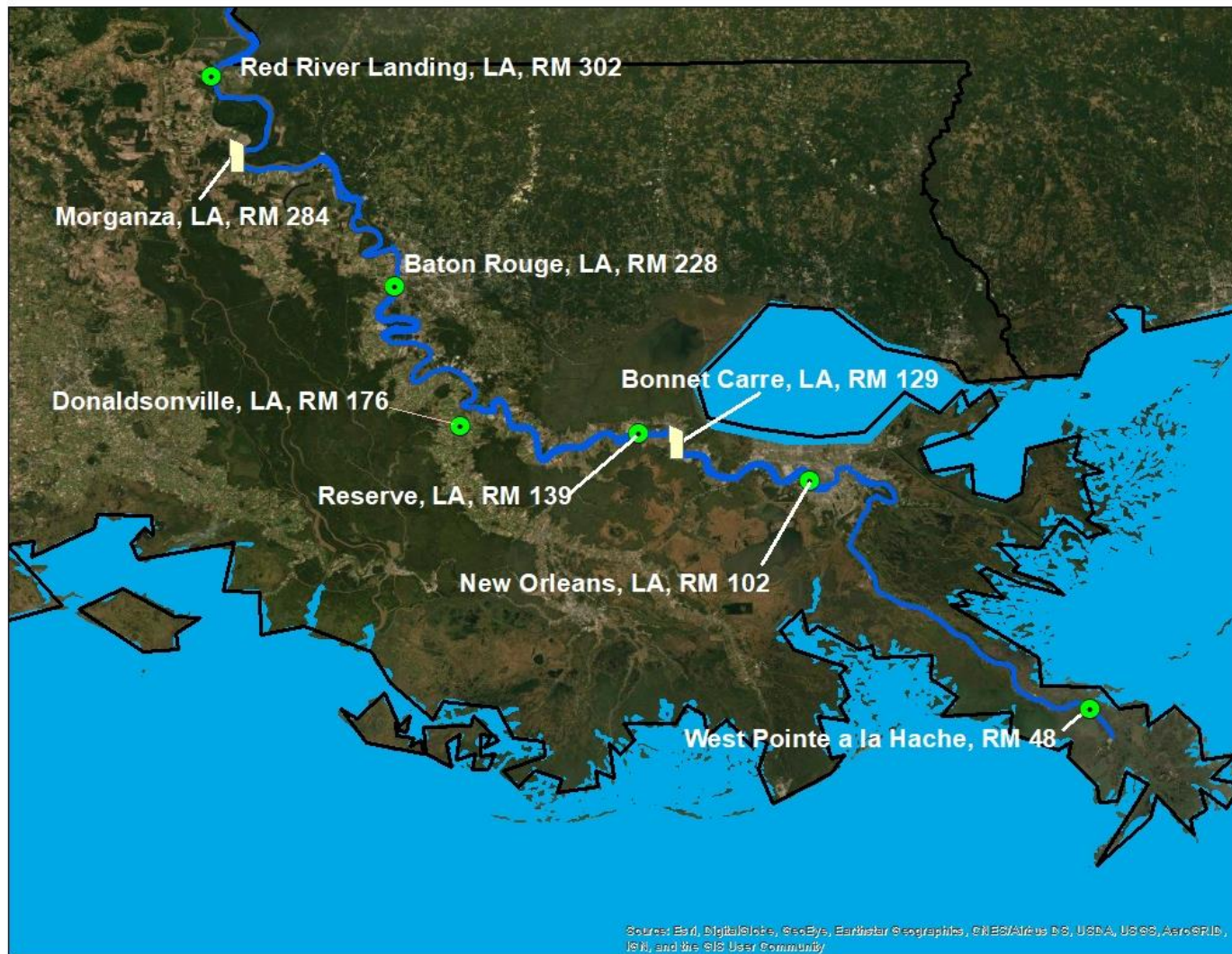
- 1-D USACE HEC-RAS Unsteady Flow Model.
- 22 Dynamic Tributaries and lateral inflows/outflows.
- Coordinate regulation scenarios for the major dams/diversions with TSCHNG modifiers.
- Select Coastal Boundary via a TS-Option Modifier at West Point a la Hache, LA.







# Mississippi River Hurricane Surge Zone





# Coastal Boundary Data



- National Ocean Service Tide (default)
- National Ocean Service ESTOFS (ADCIRC)
- National Weather Service P-ETSS (SLOSH)  
(10/20/30/40/50 Pct Exceedances)
- National Hurricane Center PSURGE (SLOSH)  
(10/20/30/40 Pct Exceedances)
- Louisiana State University ADCIRC  
(NHC/50/100% left/right of NHC track)
- Local library of 1,500 Hypothetical storms (SLOSH)
  - Direction of Storm: W, WNW, NW, NNW, N, NNE, NE, ENE, E
  - Size of Storm (RMW): 25, 40 nm
  - Intensity (Saffir Simpson category): 1, 2, 3, 4, 5
  - Forward Speed: 5, 15, 28 kt
  - Track Offset: nm left, right of New Orleans





# Mississippi River at New Orleans Surge



CHPS - Lower Mississippi River Forecast Center (Stand alone)

File Tools Options Help

1: Forecasts

5: Data Viewer

Warm state selection

Time zero: 08-27-2012

Forecast length:

edit run options

Mod ty...	Description	Summary	Locations	Start	End	Valid Time	User	Creation time	Active	Delete	Copy
Time S...	TS OPTION_WPHL...		WPHL1_SURGE	--	--	--	dmw	12-12-2014 1...	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Create mod SACCO CHGBLEND UNITHG Re-run

Modifier Properties: Time Series Select WPHL1

Description TS OPTION\_WPHL1\_SURGE Apply

Option

☒ P10pctTWLM ☐ P20pctTWLM ☐ P30pctTWLM ☐ P40pctTWLM ☐ P50pctTWLM ☐ STWLMHS ☐ STWLM00 ☐ ADCTWLM ☐ ESTTWLM

Map Plots Topology Modifiers Manual Forecast Spatial Data

6: Logs 9: Run Info 7: Forecaster notes

dmw(LMRFC) Current system time:08-27-2012 12:00 GMT 14:55:57 GMT 14:55:57 GMT Stand alone -78.799 , 38.309 0.0 MB/s 493 MB

Downstream Boundary selection via a TS\_Option  
Modifier at West Pointe a la Hache, LA

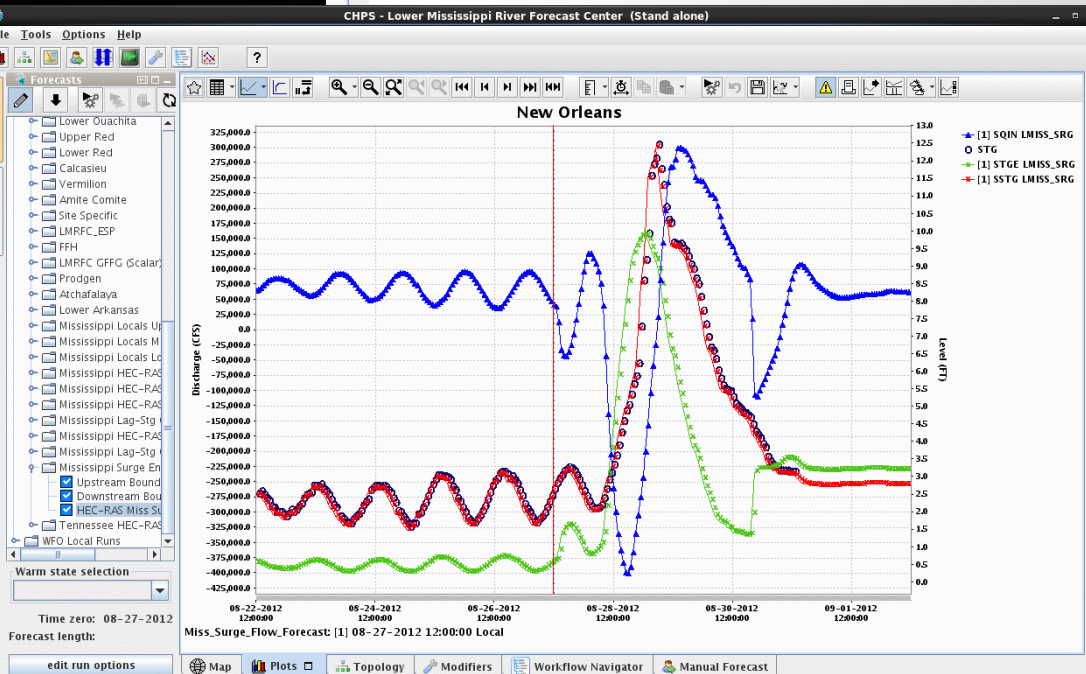
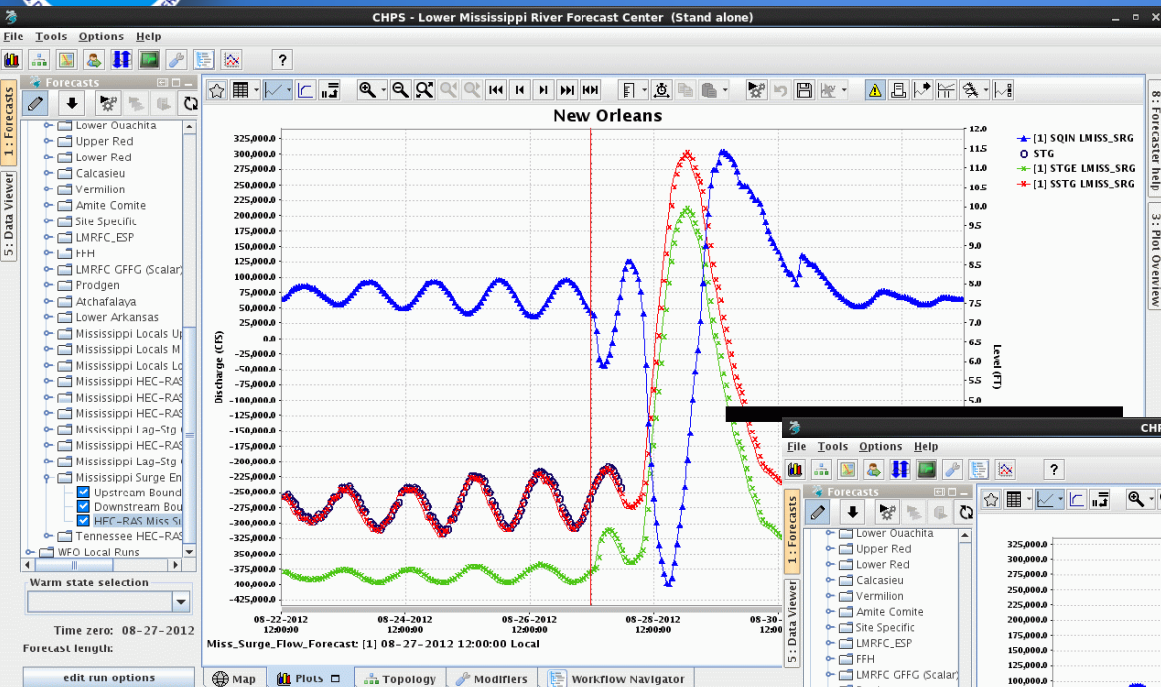


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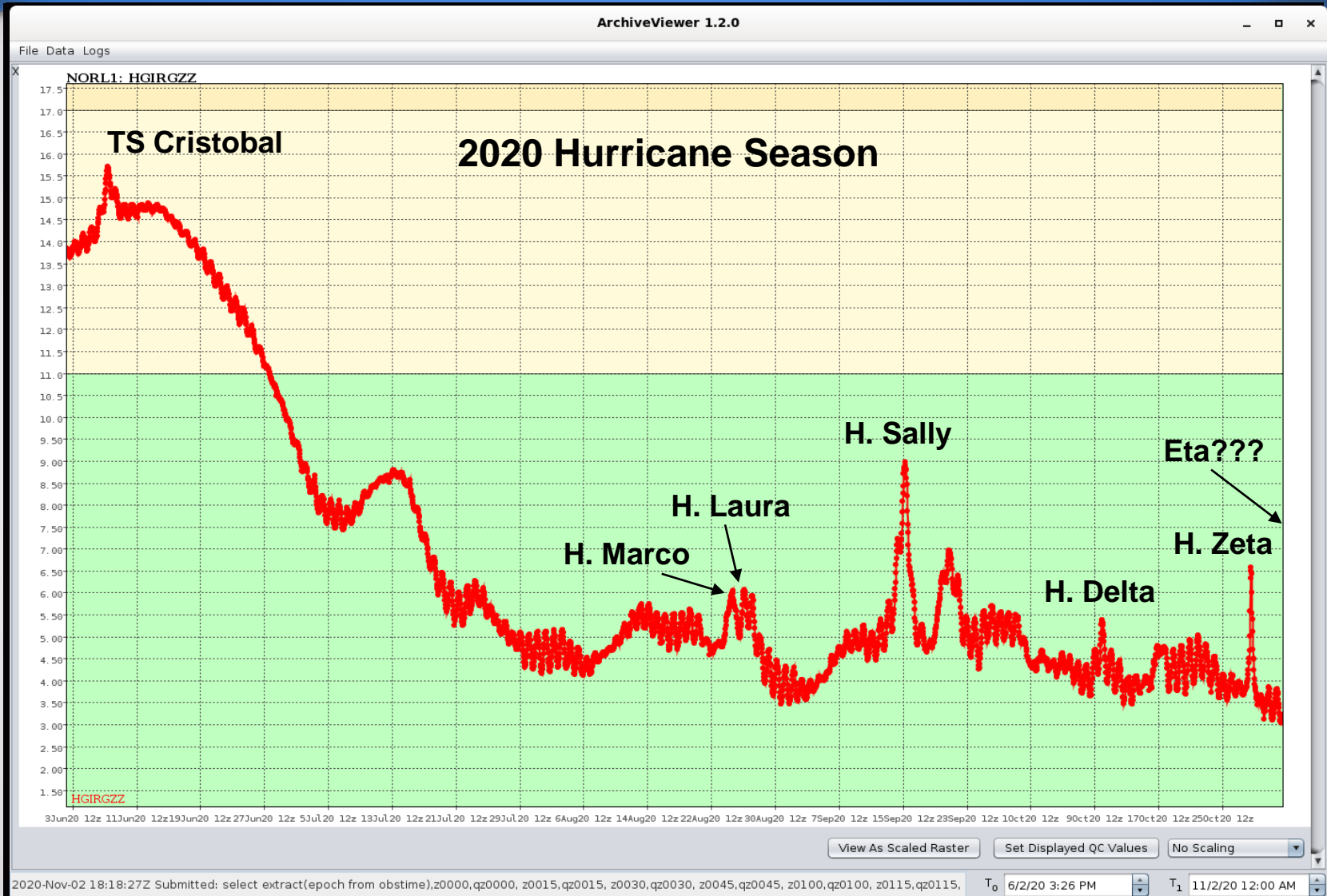
# New Orleans PSURGE 10pct Exceedance



Build



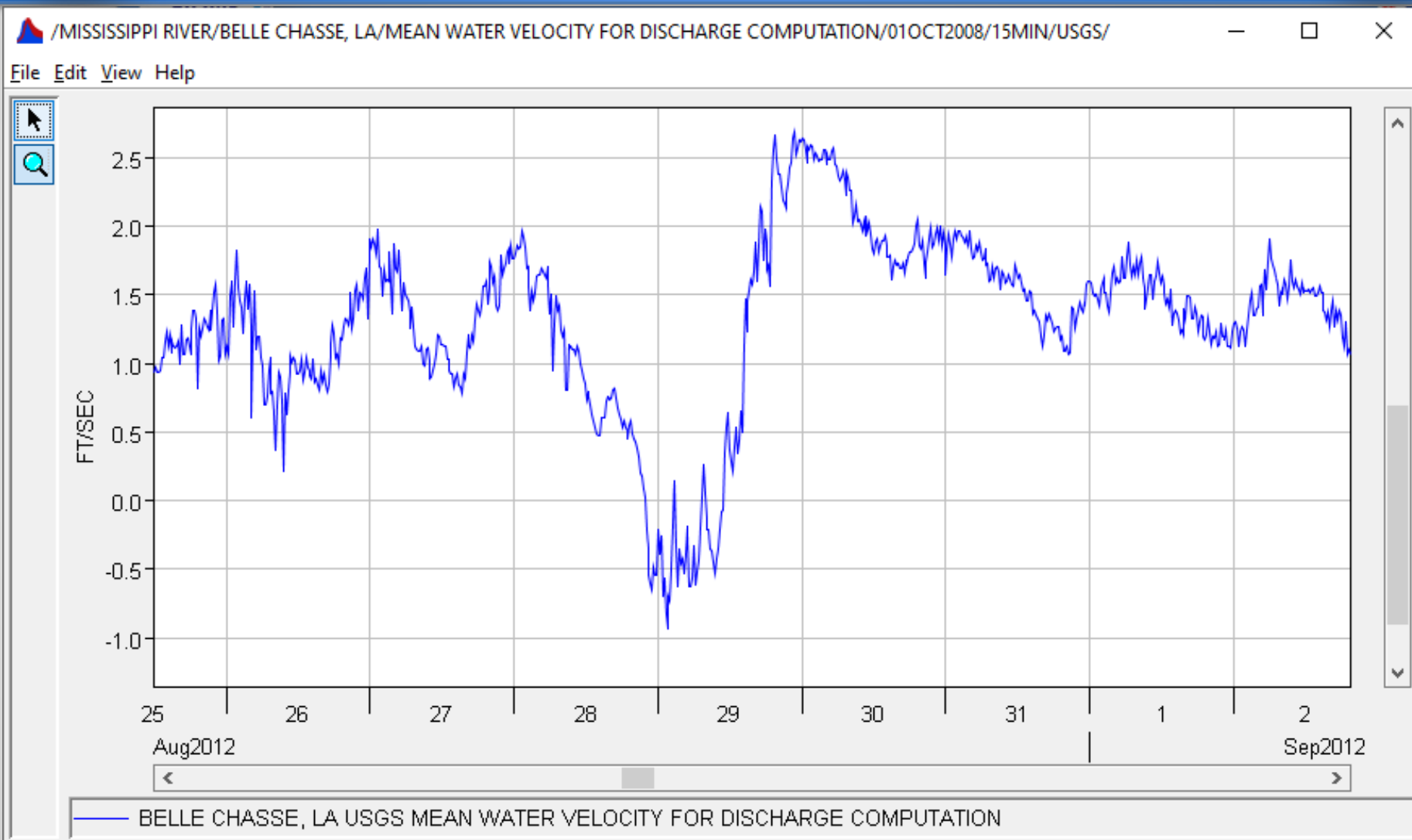
# Notable Storm Surges



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# Discharge and Velocity with Surge







# Questions



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