

Council on Watershed Management Meeting

MARCH 28, 2019

Meeting No. 7



Old Business

Listening Tour Report Out

2019 Outreach & Engagement Plan

Round 1 Project Application Summary and Evaluation Criteria
Worksheets



Updates and Introductions

Data Deliverables





Data and Modeling TAG Data Deliverable Summary

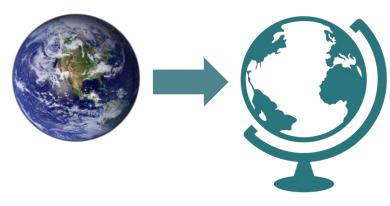
Cindy How

March 28, 2019



working together for sustainability and resilience

Why Model?



Models Simplify reality...

...so that we can draw conclusions only from the relevant inputs



INPUTS

DATA

Precipitation Topography Hydraulic Structures Land Use / Land Cover Soils Hydrography **Bathymetry** River Gages **Buildings/** Assessor

Ecological and Biological Resources

Water Quality

How does rain become flood?

Predictive CONCLUSIONS:

- WHEN rain will cause floods
- What DAMAGES will be caused
 - People
 - Property
 - Environment
- What CHANGES we can make to reduce or manage floods

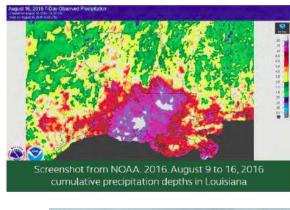
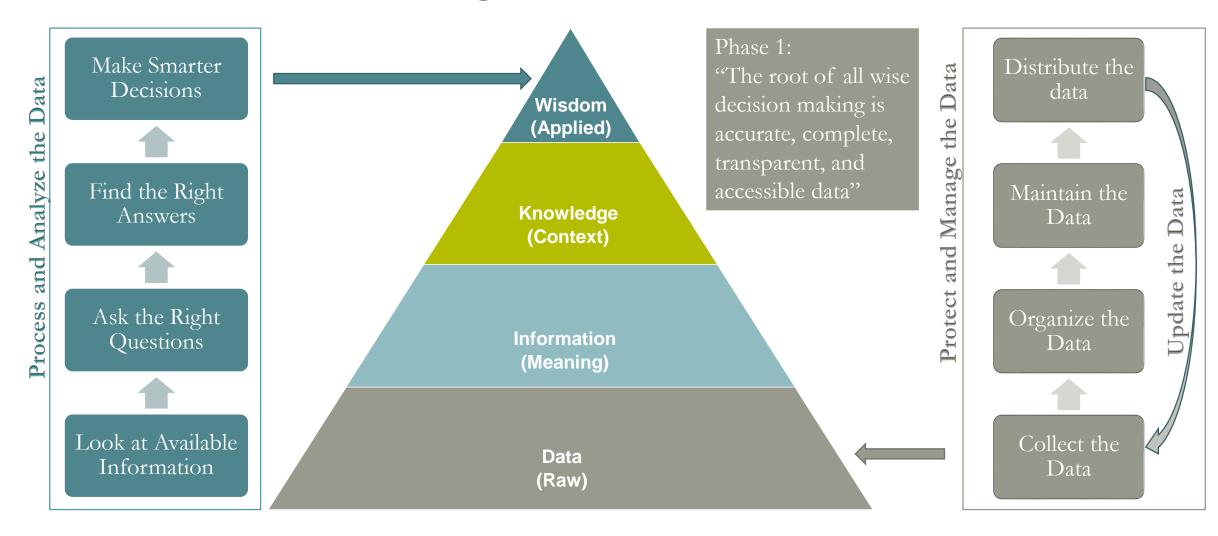




Image from: USGS Lower Mississippi-Gulf Water Science Center -- Louisiana

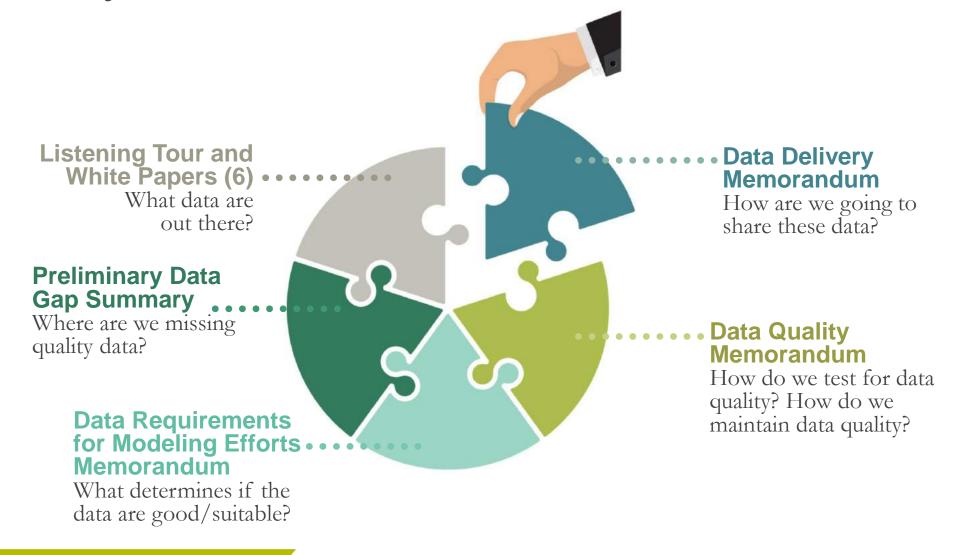


Data and Modeling TAG Goals



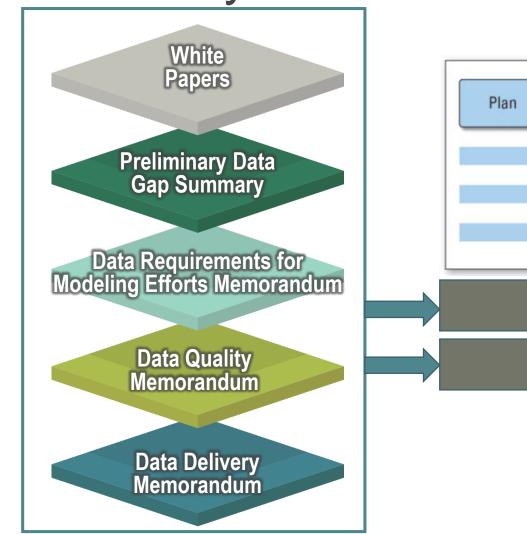


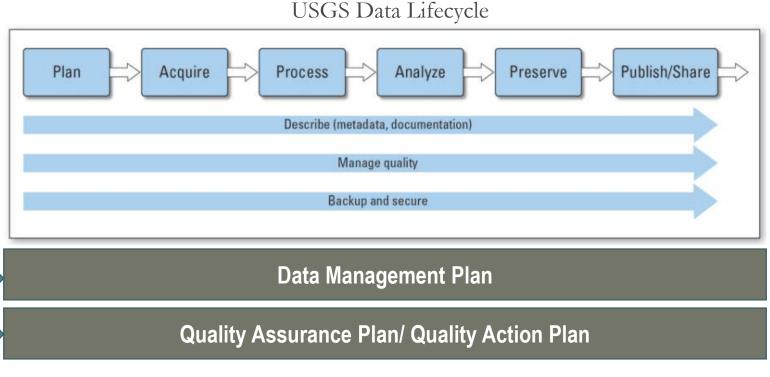
Summary of Data Deliverables





Summary of Data Deliverables







Themes Across Findings and Recommendations

Provide guidelines to contractors to ensure recommended methods are used uniformly for handling and analyzing data

- •Data Management Plan
- •Quality Assurance Plan
- •Modeling guidelines



Use widely accepted data standards

"Record Datasets" – Leverage existing "authoritative" data sources (USGS, USACE, DOTD, etc.)









"Value-Added Datasets" -Manage and store only local/project data



Leverage existing tools, knowledge, and experience





White Papers

Preliminary Data Gap Summary

Data Requirements for Modeling Efforts Memorandum

Data Delivery Memorandum





Data Gap Analysis



Key Gaps

LiDAR/ River Gages/ NHD

- Data gaps have been identified
- Additional data are being collected / data edits being made
- Recommendation: Continue on current course of action

Assessor/Built Inventory

- No statewide standard data for assessor data
- No existing built inventory dataset
- Recommendation: Standardization of minimal fields for assessor data

Bridge and Culvert data

- Data required for modeling not available in statewide datasets
- Recommendation: Create consolidated dataset based on a template

Ecological/Biological

- Indicator datasets and expert support needed
- Recommendation:
 Create statewide
 datasets and leverage
 existing expertise to
 evaluate potential
 project impacts

Historical Flooding

- No existing consolidated dataset for historical damages
- Recommendation:
 Use of standard form
 for collection
 information after
 flooding events, flood
 complaint log



Data Gap Analysis



Recurring Themes

Importance of consistent, well documented horizontal and vertical references

Need to consolidate data from multiple sources

Hard copy records need to be digitized



Data Standards Memorandum



Existing standards for each type of data

Comparison of standards when more than one exists

Recommended standards



Data Quality Assessment



Examples of how other organizations manage quality

Types of quality control/quality assurance approaches

Recommended approaches by dataset



Data Quality Assessment



- Procedures and certification requirements put into place
- Guidance documents and adopted standards

Programmatic



 Programmed tools to check for acceptable inputs or results

Automated



Review by qualified staff

Hands-on

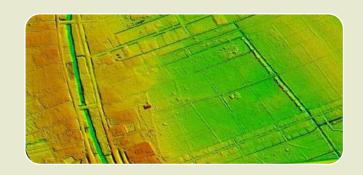




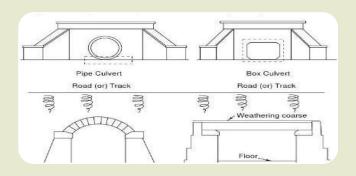
Data Quality Assessment



Example Dataset Specific Recommendations







LiDAR: USGS 3DEP as Record Dataset.

Rely on incorporation into USGS 3DEP products, 3DEP quality standards apply.

Survey: Track via polygon with contact and file location listed, GIS and CADD data requirements.

Hydrography: NHD as Record Dataset.

Additional data collection to follow USGS standards and to be submitted via the NHD Markup App.

Create record datasets, starting with bridge and culvert data collected and maintained by DOTD.

Coordinate multiple agencies for future data collection based on SARP stream crossing survey templates.



Data Delivery



Organization and Content Recommendations

- Separate landing pages based on target audience
 - Public User
 - Technical User
 - Local Government User
 - Funding Applicant User
- Include a site guide that helps the user navigate
- Evaluate desired content and functionality based on existing examples





Data Delivery



Data Delivery Recommendations

- Rely on record dataset sources, with new framework for value-added and project-related data
- Make links to available data sources available on LWI's website (from White Papers and Preliminary Data Gap Summary)
- Ensure that data is well organized based on data type and category/theme





Next Steps

Prioritize Efforts

Data and
Modeling TAG
Recommendations
to Council

Data
Management
Plan /
Quality
Assurance
Plans

Data Collection and Plan Implementation

Ongoing Maintenance





watershed@la.gov

Updates and Introductions

Statewide Modeling Framework





Statewide Modeling Framework

Ehab Meselhe, PhD PE

Tulane University

Emad Habib, PhD PE

University of Louisiana at Lafayette



working together for sustainability and resilience

Independent Technical Guidance























Our Role

LWI - INDEPENDENT TECHNICAL TEAM

Provide independent technical guidance and review to ensure quality and consistency in program design and implementation Provide latitude for contracted teams to exercise their experiences and knowledge

Coordinate periodical interaction among all contracted teams to ensure efficient exchange of information and consistency

Update on Overall Approach & Design Framework

We are developing a consistent statewide approach for designing:

Monitoring network of key hydrologic parameters:

- Rainfall, stage and flow rate
- Value: model calibration for key flood attributes

Predictive models for inland and transitional watersheds, with proper connectivity to coastal zone:

• Flood stage and flow rate, flood inundation depth, extent & duration

Main Recommendations MONITORING APPROACH

All statewide watersheds (HUC8s) should share a consistent hydrologic monitoring standard:

A flow gauge in each HUC10, on average

A stage and a rain gauge in each HUC12, on average

Refine/add based on additional criteria:

- hydrologic characteristics (e.g., gradient, drainage area)
- population/urbanization
- flood risk
- key structures with flow diversions/exchanges
- key sites along coastal/inland interfaces



Main Recommendations

MODELING APPROACH

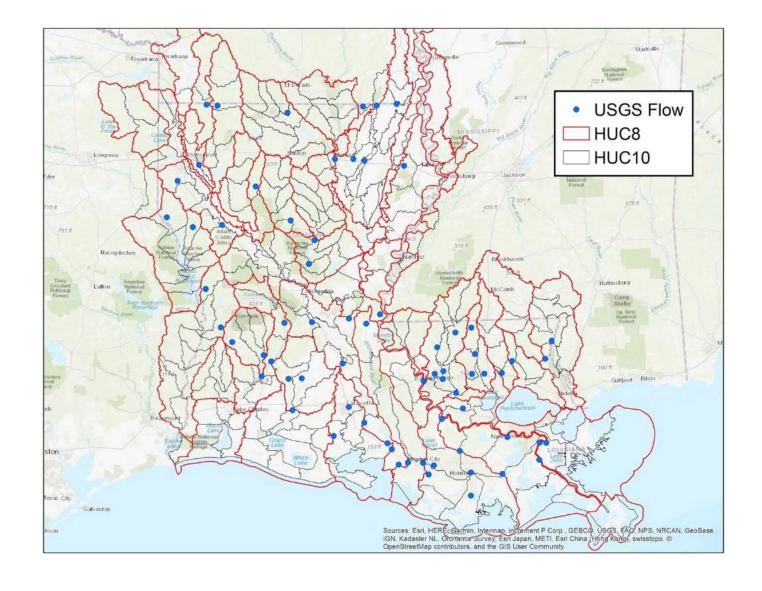
- Develop a suite of high-quality H&H Models
- Statewide coverage allows for systemwide/regional planning and development of policies
- Detailed spatial resolutions support local needs and interests: local development, projects, and implementation of ordinances
- Utility of public models generates full buy-in from community of practice and government officials

Existing Situation FLOW MONITORING

Significant gaps:

- 26 of 60 HUC8's without flow gauges
- 188 of 250 HUC10's without flow gauges

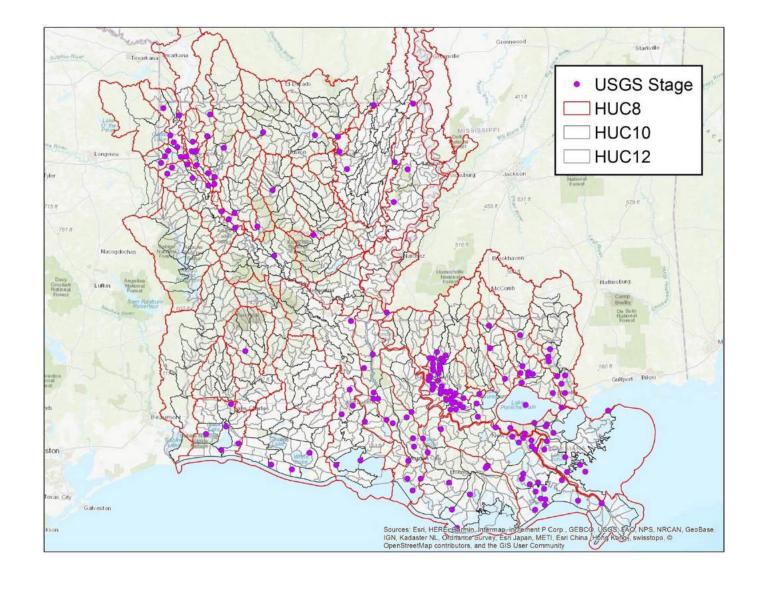
Northeast & southwest Louisiana are particularly under-monitored



Existing Situation STAGE MONITORING

Significant gaps:

- 23 of 60 HUC8's without stage gauges
- 177 of 250 HUC10's without stage gauges
- 1,104 of 1,227 HUC12's without stage gauges

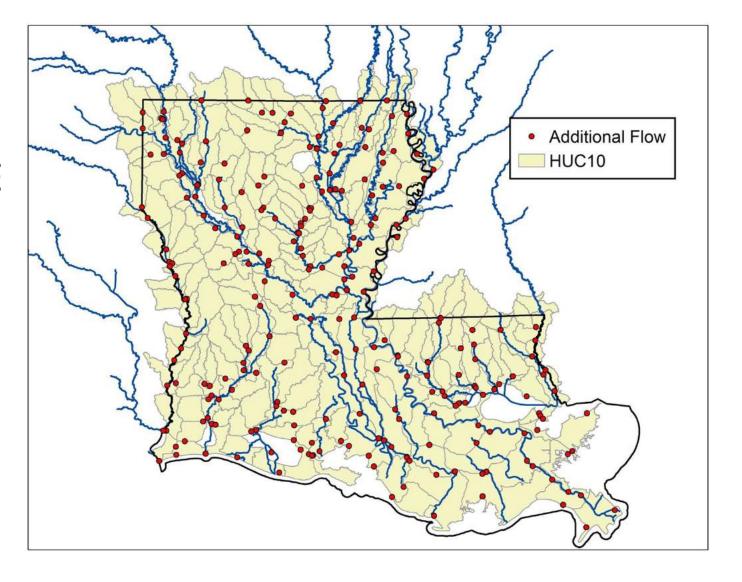


Proposed Flow Monitoring

BACKBONE COVERAGE

A flow gauge at the outlet of every HUC10, On Average

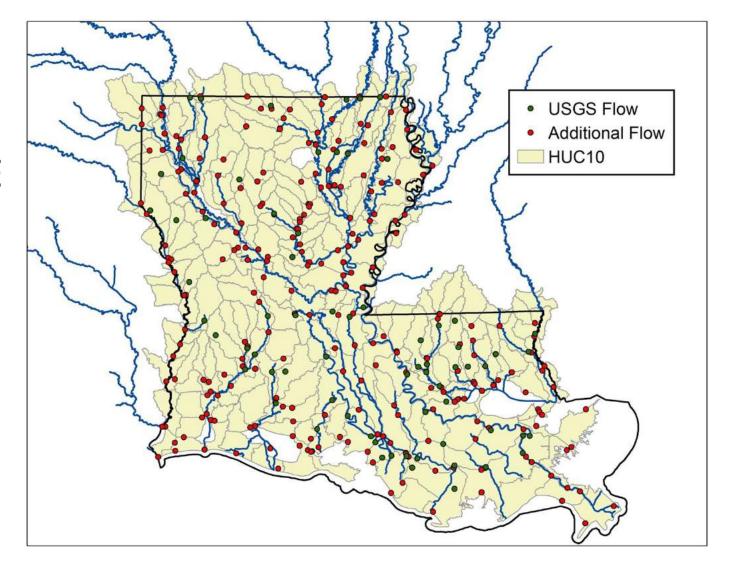
Add more gauges at selected locations depending on local hydrologic and land-use criteria



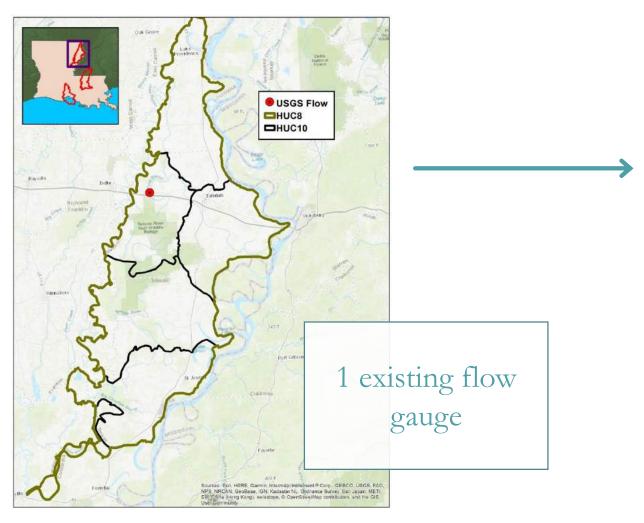
Proposed Flow Monitoring

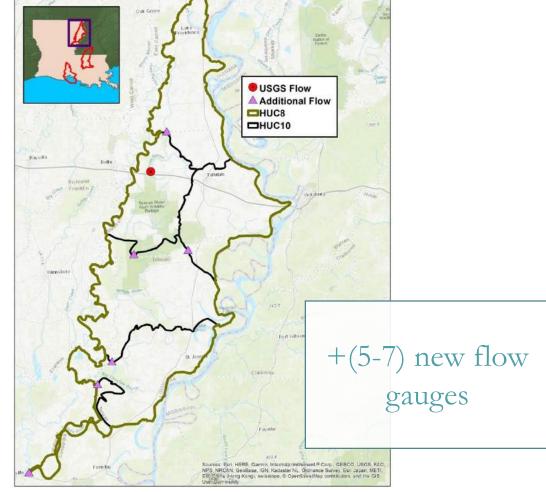
BACKBONE COVERAGE

"Added Value" to what we already have through USGS (and other agencies)

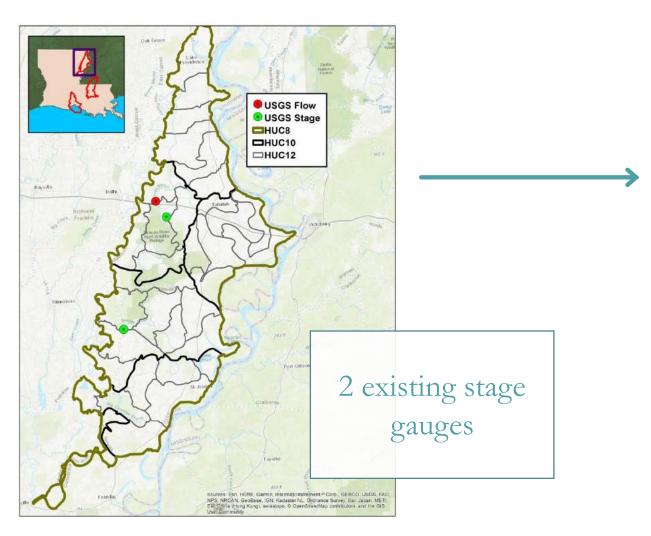


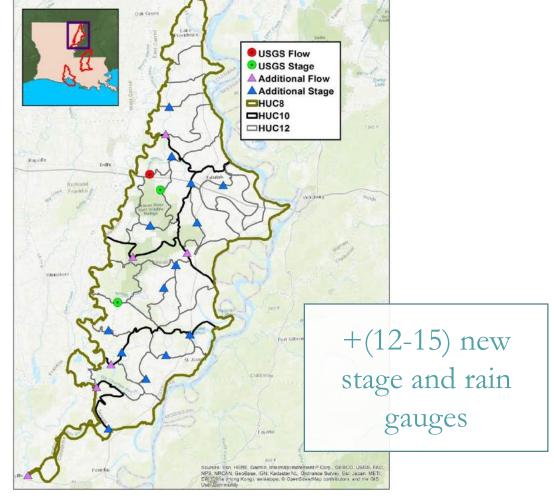
Example: Tensas HUC8



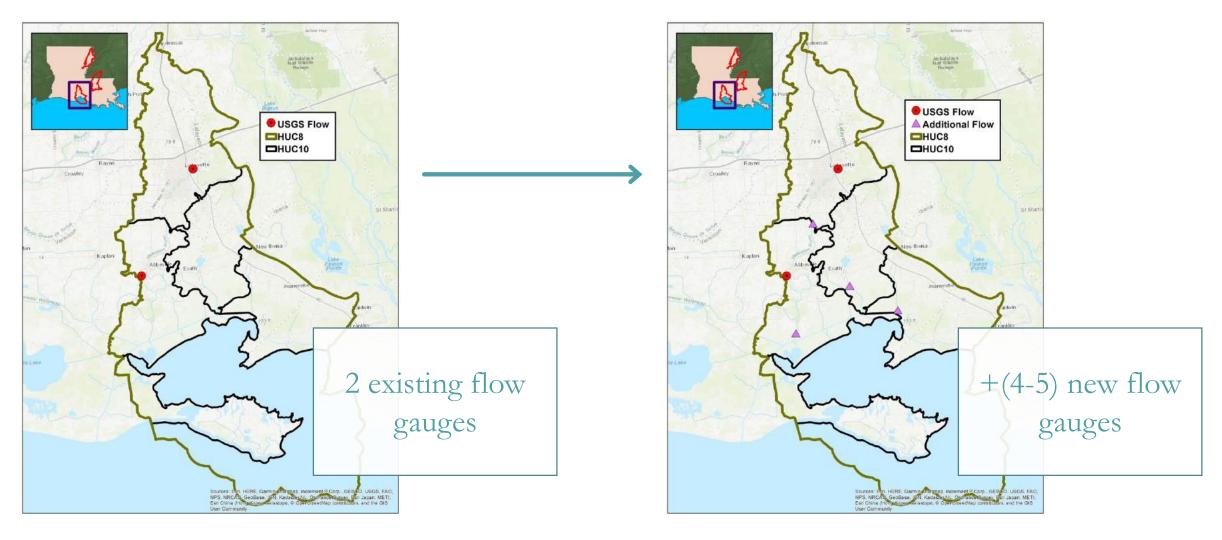


Example: Tensas HUC8

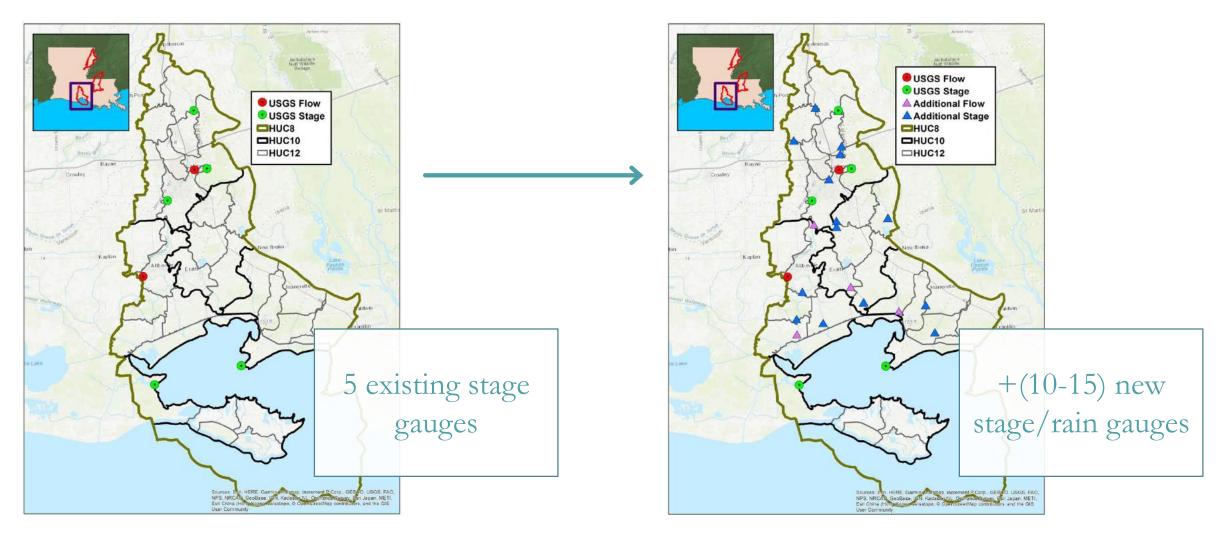




Example: Teche/Vermilion HUC8

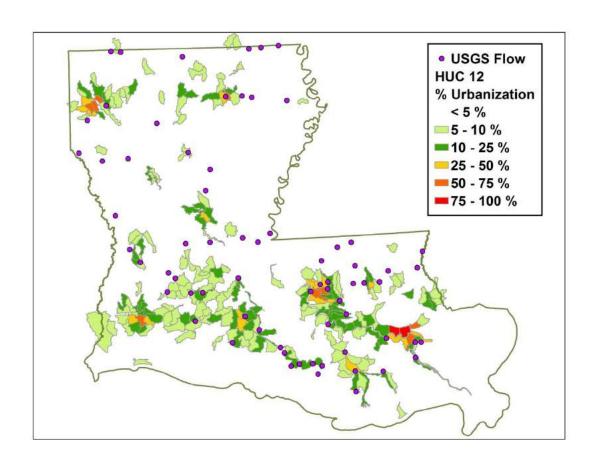


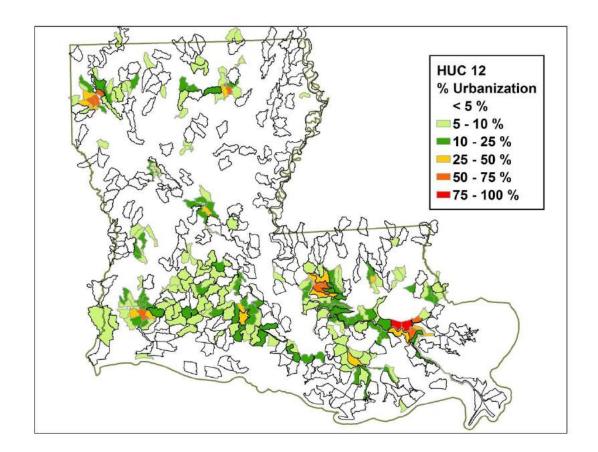
Example: Teche/Vermilion HUC8



Additional Criteria for Placing Gauges

Urbanization (Imperviousness + Population) + Runoff Generation (Large Drainage Areas)

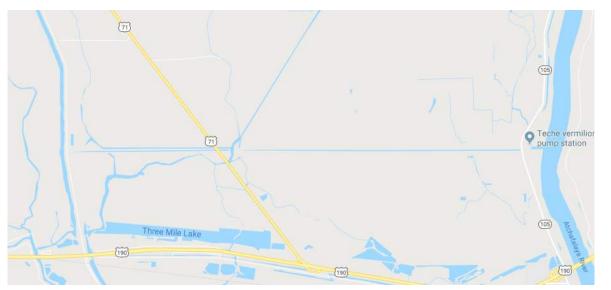




Additional Criteria

FLOW DIVERSIONS/EXCHANGES ACROSS KEY STRUCTURES

Small to midsize structures, which are mostly unmonitored, can bring significant flows across the watersheds



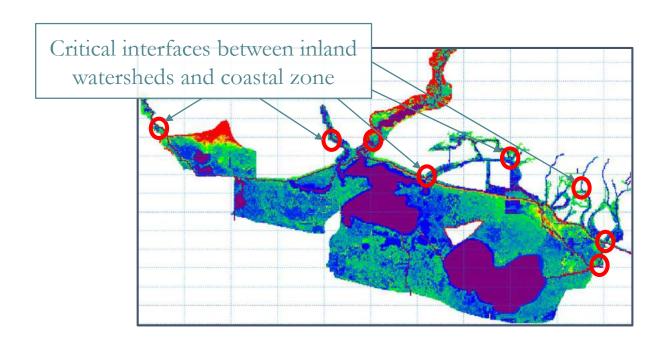


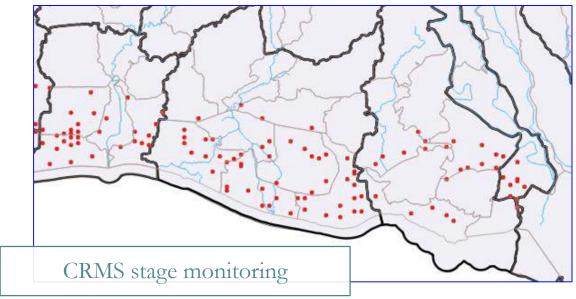




Monitoring to Capture Inland-to-Coastal Interfaces

- Coastal zone is well monitored by CRMS for stage
- We still need to capture key flow exchanges between upper watersheds and coastal zone across corridor channels and coastal structures





Yes, this is an unprecedented monitoring effort!

"It's harder. It requires more work. It's politically risky, but it is the right thing to do."

- Governor John Bel Edwards

"Unprecedented" Initiative:

- Statewide Coverage
- Community-Relevant Scales

Substantial investment in capacity building is needed:

- Improvement in hydrologic monitoring
- Innovative approaches for local/regional governance and partnerships
- Support living models via ongoing calibration using incoming data

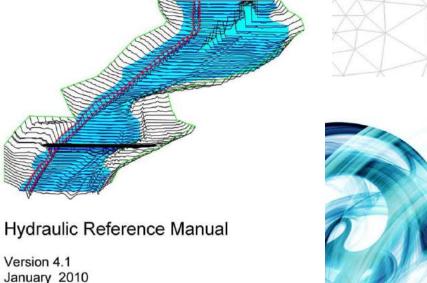


Philosophy of Model Selection

Focus on Models that are:

- Demonstrated record of "success"
- Publicly available
- Widely used by practitioners
- Accepted/approve by Federal Government
- Additional benefit if already setup for watersheds within Louisiana







Deltares

Development and Implementation of Models

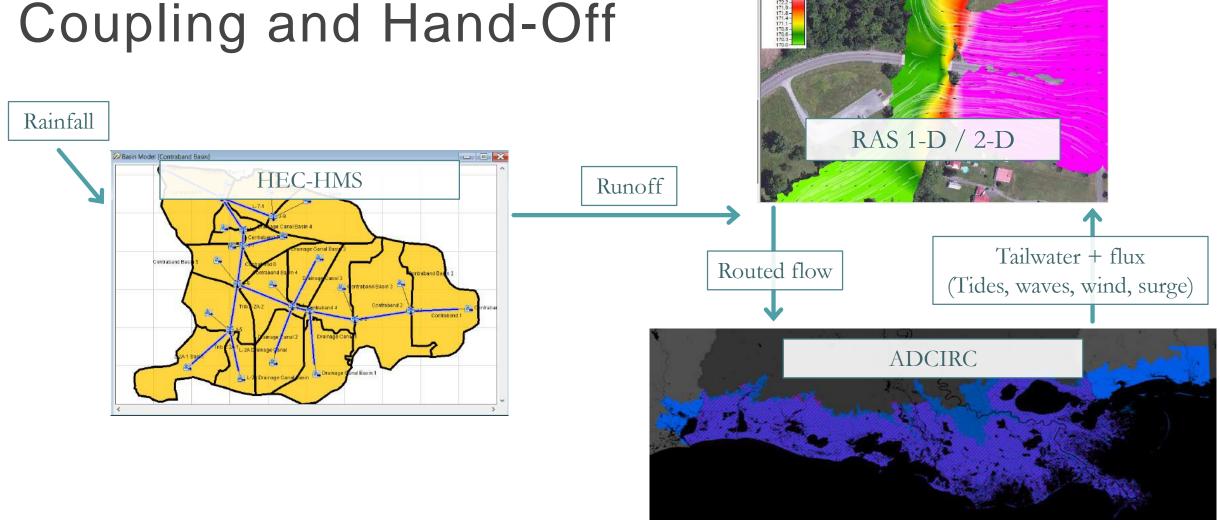
Model Setup and Calibration/Validation

- Model setup
 - Channel geometry (transects or Multi-beam)
 - Road crossings (Bridges, culverts, etc.)
 - Overland geometry (LiDAR & raised features)
- Model performance assessment
 - Calibration against recently collected data (or historical events) under different flow regimes
 - Evaluation criteria to capture: runoff volume (high & low), flood depth/extent/duration

Model Implementation/Application

- Utility of both historical events and design storms
- Evaluation of proposed projects (Project TAG)
- Analysis of future watershed management strategies (Planning TAG)
- Support of policy development (Policy TAG)

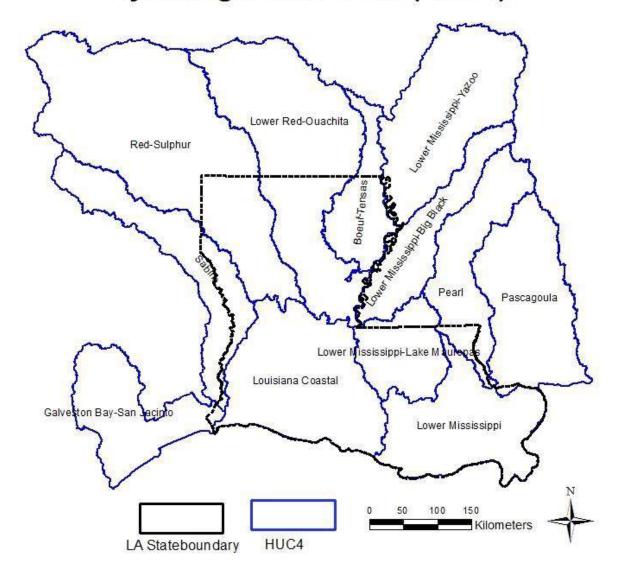
Modeling Components Coupling and Hand-Off



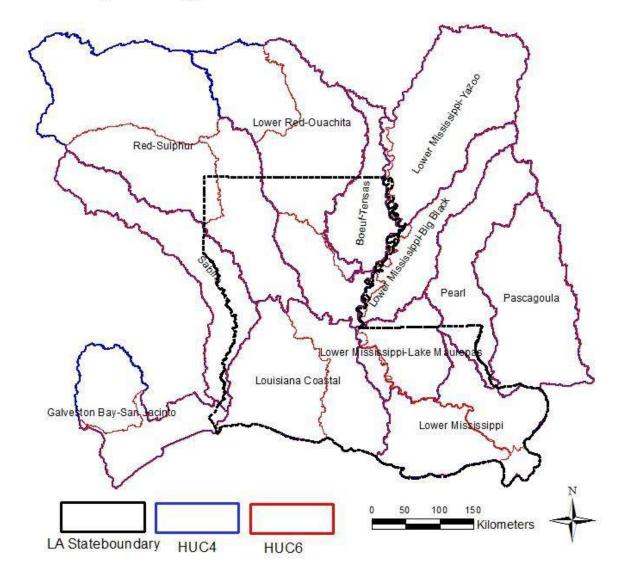
Modeling Hierarchy Across Spatial Scales

- HUC-8 is the likely development spatial unit
- Models will be developed consistently so they can be "stitched" to evaluate regional strategies
- Models could also be broken to local units (HUC-10, HUC-12 or smaller) to support local projects, development, or to support implementation of drainage ordinates

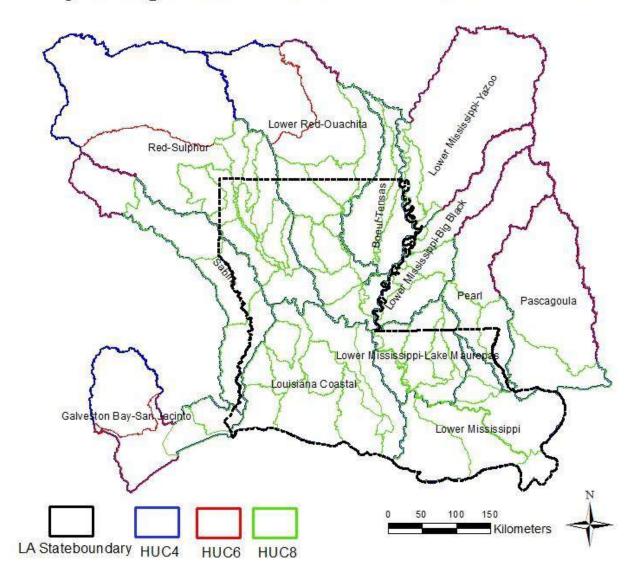
Hydrologic Unit Code (HUC4)



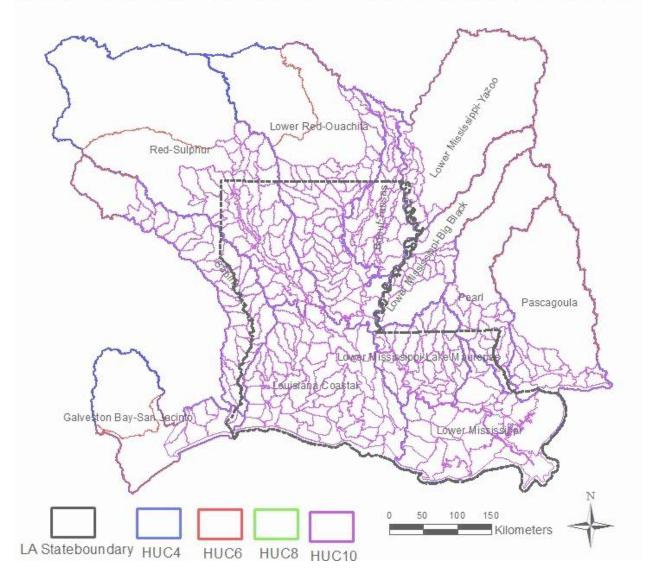
Hydrologic Unit Code HUC4 & HUC6



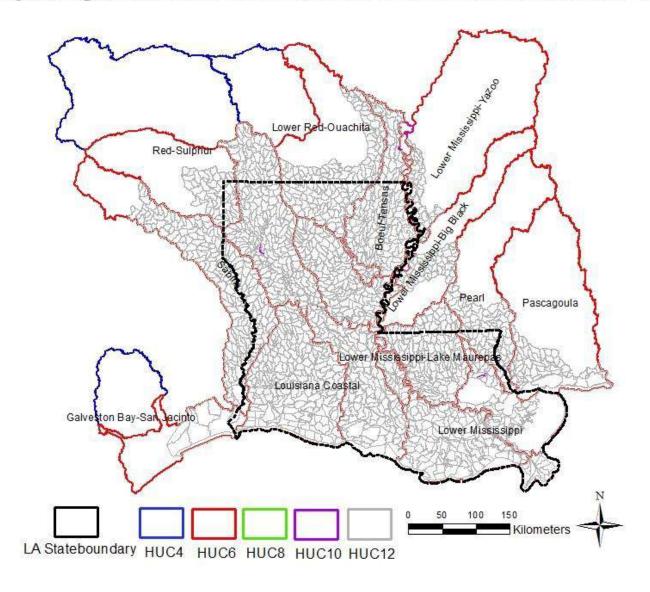
Hydrologic Unit Code HUC4 & HUC6 & HUC8



Hydrologic Unit Code HUC4 & HUC6 & HUC8 & HUC10

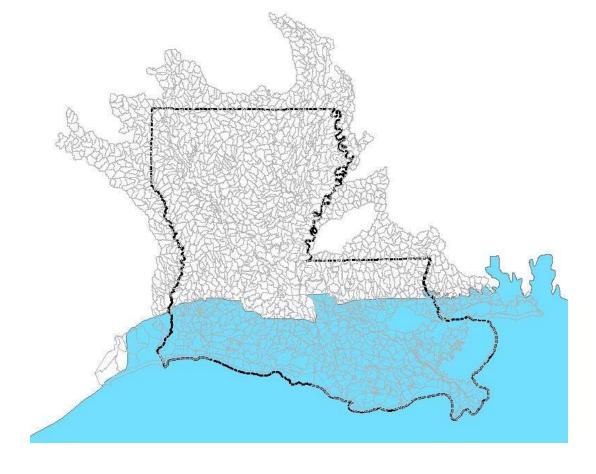


Hydrologic Unit Code HUC4 & HUC6 & HUC8 & HUC10 & HCU 12



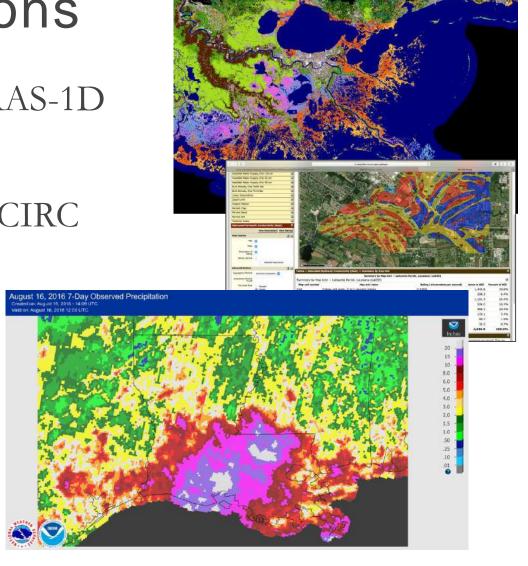
Overlap between transition zone and inland

watersheds



Additional Recommendations

- Identification of channels to be modeled in RAS-1D
- Resolution of RAS-2D
- Delineation of interface between RAS & ADCIRC
- Metrics for acceptable model performance
- Bathymetric survey philosophy
- Consistency on data sources



Summary

DEVELOPING CONSISTENT STATEWIDE APPROACH FOR D&M

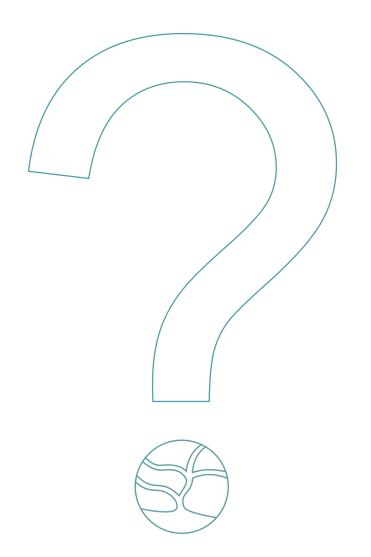
- Leveraging ongoing data and modeling efforts
- Capture successes and lessons learned from the Amite effort
- Harnessing best practices from state and federal agencies

- All HUC8 watersheds follow similar monitoring standard
- Flow gauge in each HUC10 on average
- Stage & rain gauge in each HUC12 on average
- Refine based on additional criteria

- Statewide coverage allows for systemwide planning and policies
- Modularity of models supports both regional & local needs
- Public models generate
 buy-in from practitioners
 & government officials



Questions





- @LAWATERSHEDINITIATIVE
- **■** @LAWATERSHED
- ☑ WATERSHED@LA.GOV

Thank You



Updates and Introductions

Amite River Model









Amite River Basin Model Overview

Council on Watershed Management Briefing, March 28, 2019 Sam Crampton, P.E., CFM, Jerri Daniels, CFM

What is the Amite River Flood Model?

Hydrology

How much stormwater runoff?



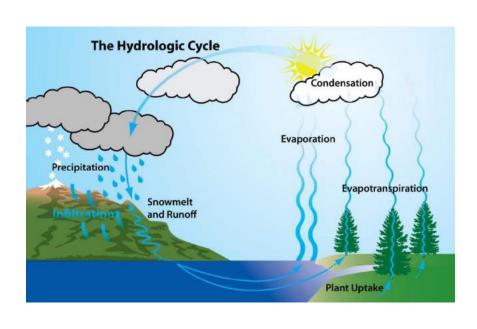
Hydraulics

How high will it get?



Consequences

Economic & Life Safety Consequences



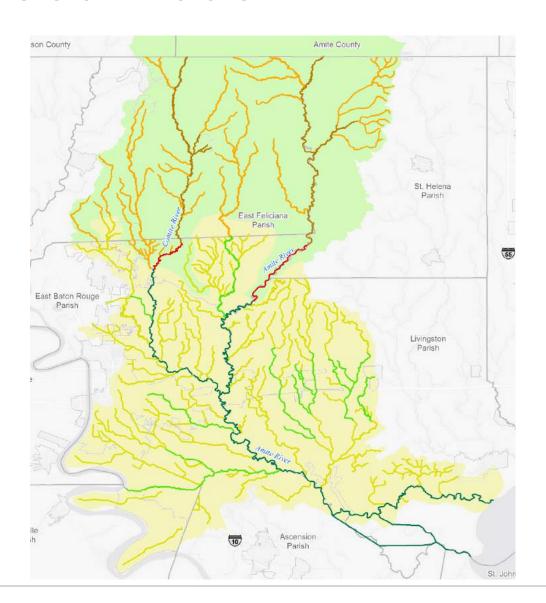




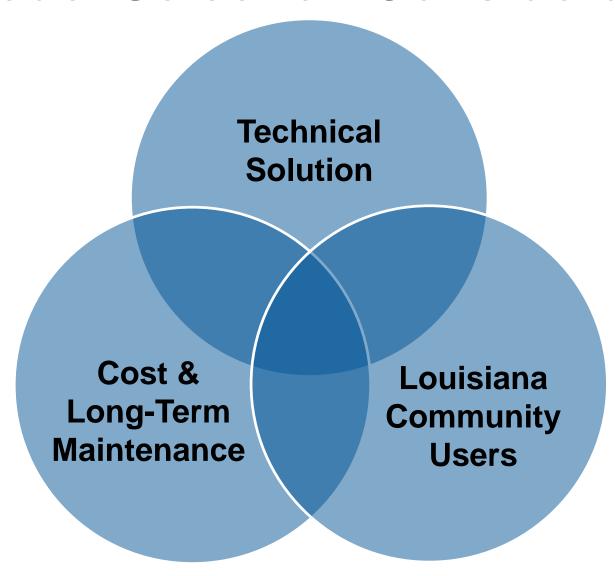
FLOODED TURN AROUND DON'T DROWN

What is the Amite River Flood Model?

- Nearly 1,200 miles of rivers, creeks, canals and bayous
- Watershed scale approach to modeling
- Includes hydrology, hydraulics and consequence assessments
- Tool to support engineers, scientists, planners, regulators
 - Assess risk
 - Assess project impacts



Model Selection Considerations



- Technical Solution
 - Suitable for the unique geography and needs of LA
- Cost and Maintenance
 - Affordable solution
 - Continued software development/enhancement
- Community of Users
 - Making a solution that is accessible to the Louisiana community of users

Suite of HEC Tools and Potential Utilization

Primary

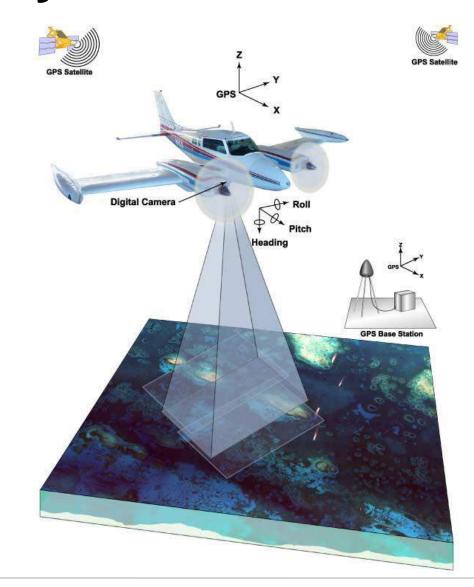
- HEC-HMS Hydrology
 - Sometimes used to assess project impacts, generally on larger scale
- HEC-RAS Hydraulics
 - Most frequently used software to be used for almost all projects
- HEC-FIA Consequences
 - Likely to be used more for larger regional planning studies when compared to day to day projects

Secondary

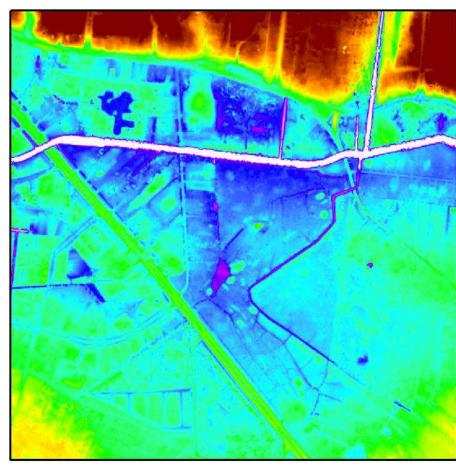
- HEC-SSP Statistical Analysis
 - Periodically used for updates to model calibration
- HEC-DSSVue Database Mgt.
 - Advanced applications and users
- HEC-MetVue Hydro Meteorology
 - Advanced applications and users
- HEC-WAT Watershed Assessment
 - Advanced applications and users
 - Longer term potential for large regional studies

Data Collection and Gap Analysis

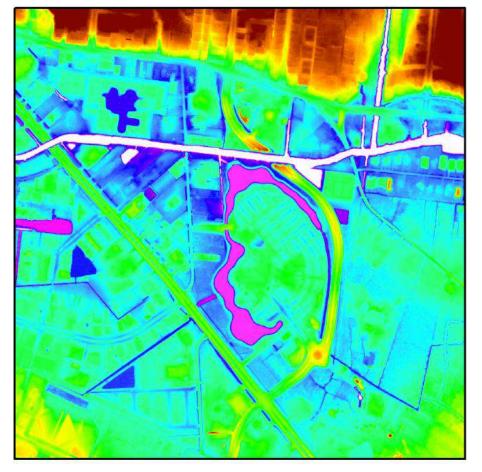
- Extensive coordination with stakeholders to obtain existing data
 - Major survey effort received from U.S. Army Corps of Engineers
 - High water mark survey from Amite River Basin Commission
 - Data from public and private sectors
 - New aerial topographic survey (LiDAR) collected for project



Data Collection and Gap Analysis



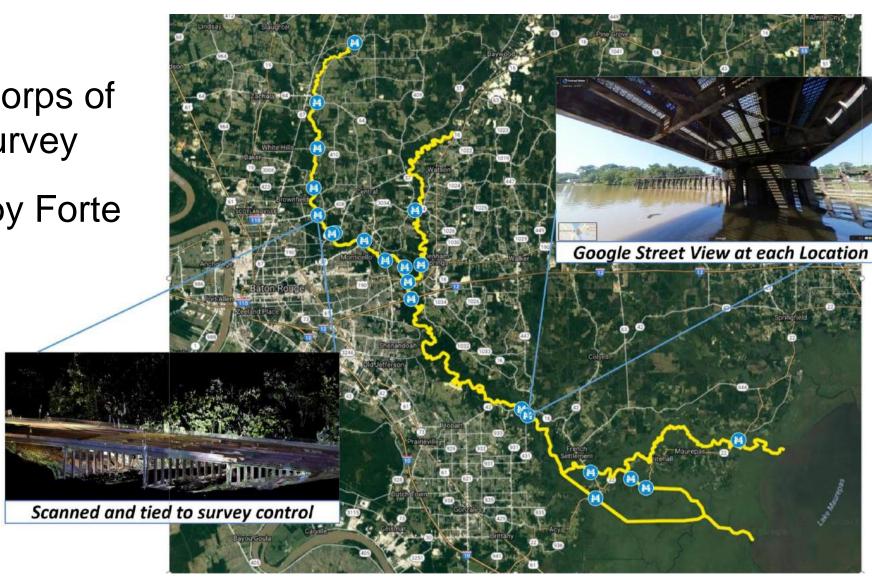
2004 LiDAR



2018 LA DOTD LIDAR

Survey

- Extensive use of Corps of Engineers 2017 Survey
- Additional survey by Forte
 & Tablada
- Survey included
 - Structures
 - Channel sections



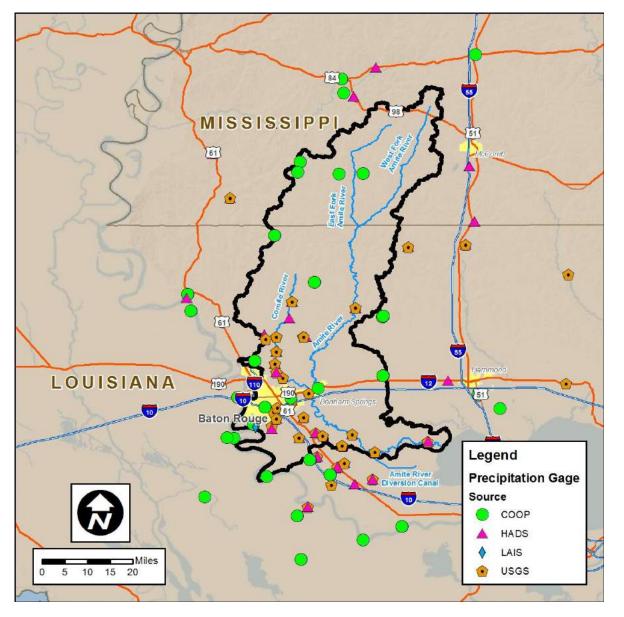
Data Validation

- Observed numerous discrepancies between datasets
 - Performed extensive validation task before using data
- Ensured all modeling assumptions were reasonable
 - Compared to observed data wherever possible
 - Used historic events to calibrate and validate accuracy



Monitoring of Basin

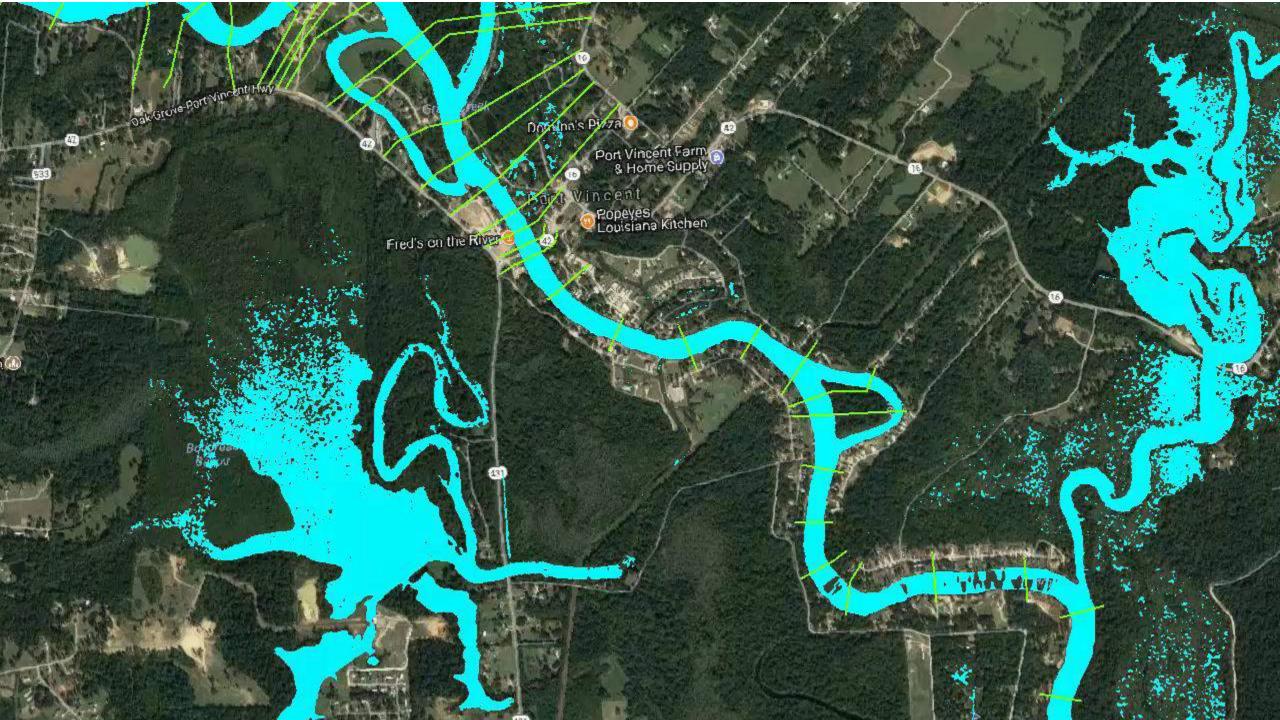
- Existing flow and rainfall monitoring
 - Well represented in lower basin
 - Under represented in upper basin
- Benefits of improved coverage would include
 - Better information to validate models
 - Better insight into what may be coming from upstream

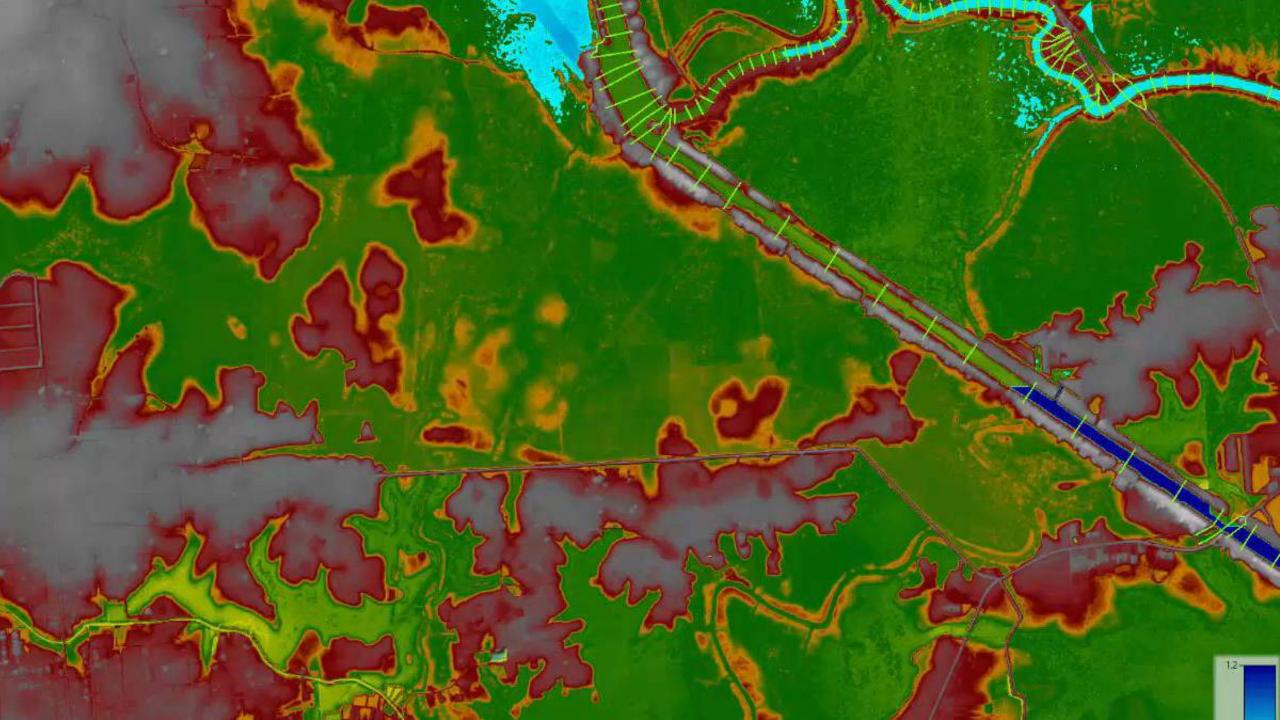


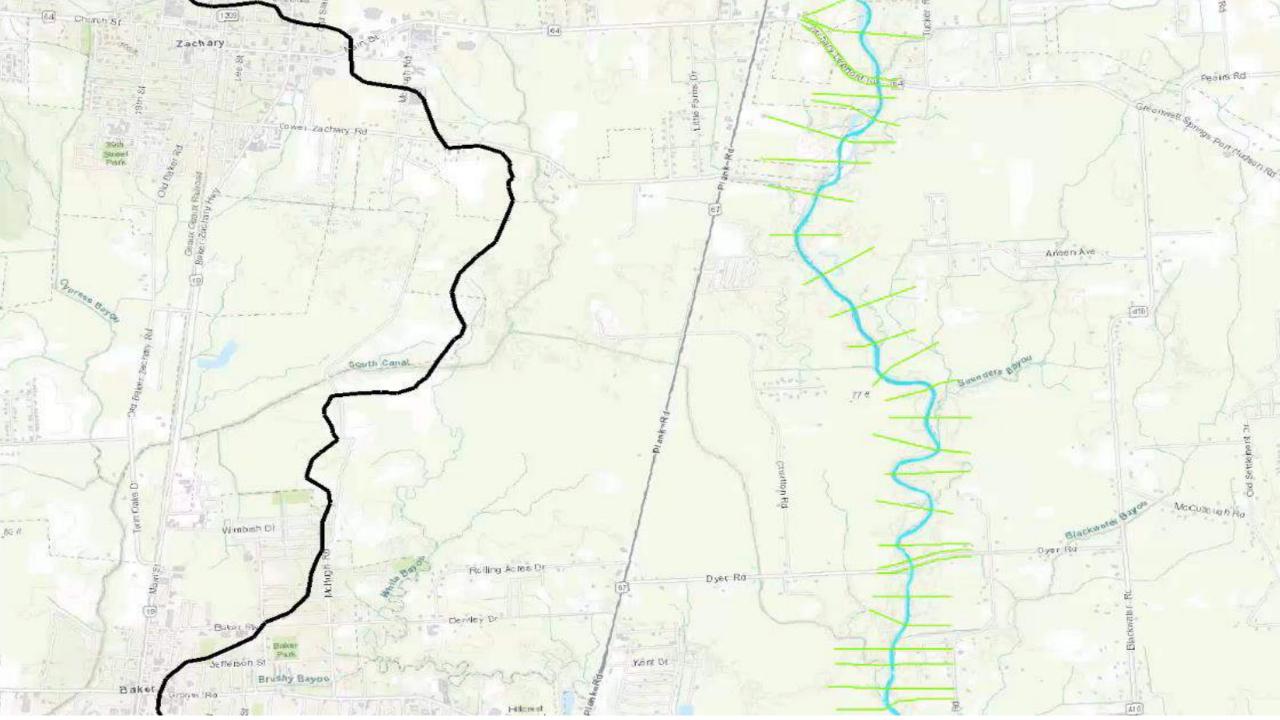
Model Overview and Demonstration

- Nearly 1,200 miles of rivers, creeks, canals and bayous
- Watershed scale approach to modeling
- Includes hydrology, hydraulics and consequence assessments
- Tool to support engineers, scientists, planners, regulators



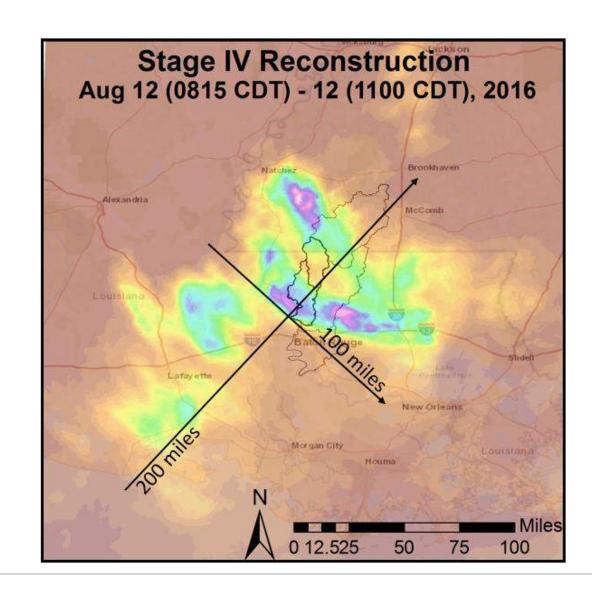






Model Overview and Demonstration

- Suite of simulations available to users
 - Historic Floods
 - August 2016 flood Major flood
 - March 2016 flood Significant flood
 - October 2017 Small flood
 - August 2017 Small flood
 - Design Floods
 - 8", 10", 12", 14", 16", 18", 20" and 22" rainfalls
 - Future land use conditions simulations based on census projections



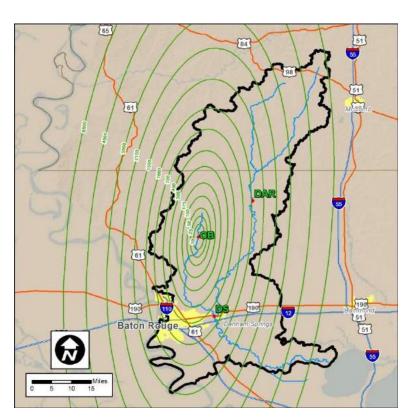
What Questions Can the Model Answer?

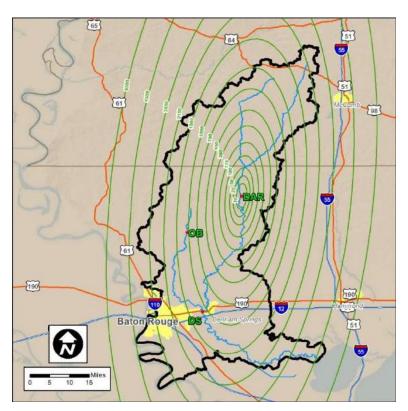
- Understanding risk
 - What are the flood depths?
 - What are the flood velocities?
 - What is the flood frequency?

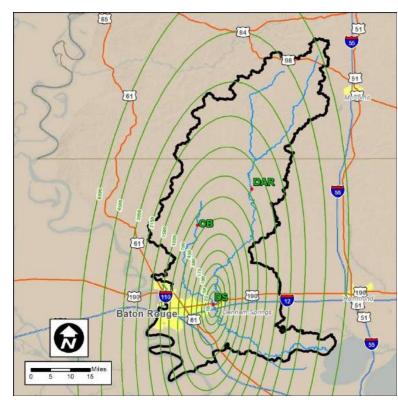
- Planning Level Impacts (Examples)
 - Land use plans
 - Zoning
 - Stormwater practices

- Projects Level Impacts (Examples)
 - Dredging and snagging
 - Levees
 - Channelization
 - Diversions
 - Dams
 - Land developments

What Questions can the Model Answer?



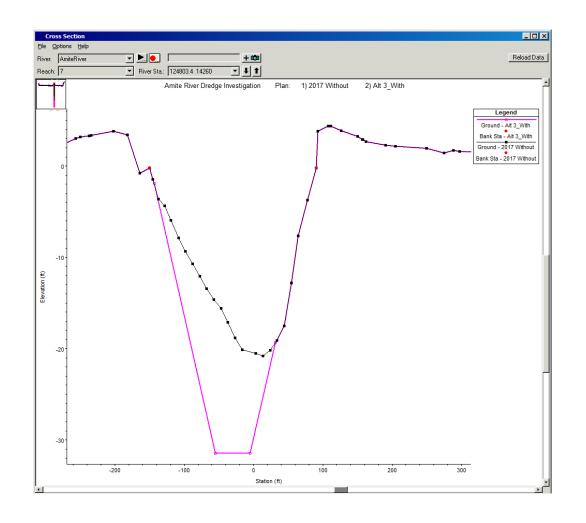




- What if a storm hit in various parts of the watershed?
- What if the Darlington Reservoir had been in place for the August 2016 flood?

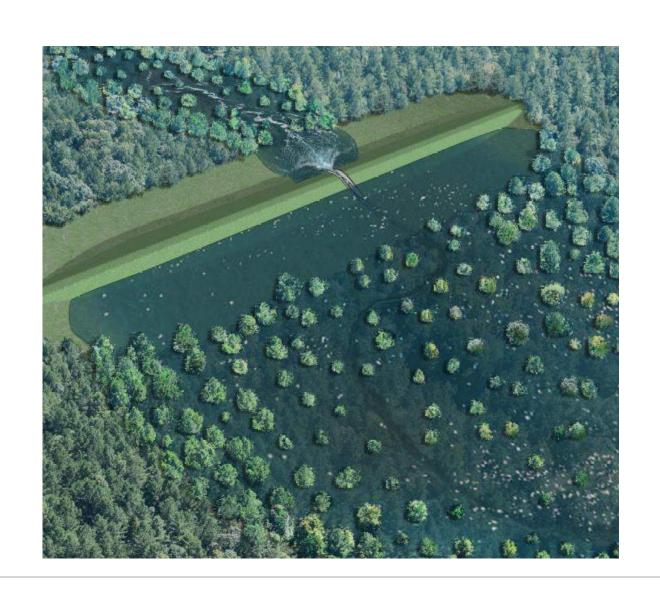
What Questions Can the Model Answer?

- Example: Dredging
 - Optimize extent of dredging
 - Quantify volume of dredged material
 - Quantify the project impacts on water surface elevations, velocities and depths
 - Support and advise the full feasibility study



What Questions Can the Model Answer?

- Example: New dams and regional detention ponds
 - Optimize the configuration of dams
 - Quantify the project benefits
 - Quantify the project impacts on water surface elevations, velocities and depths
 - Support and advise the full feasibility study



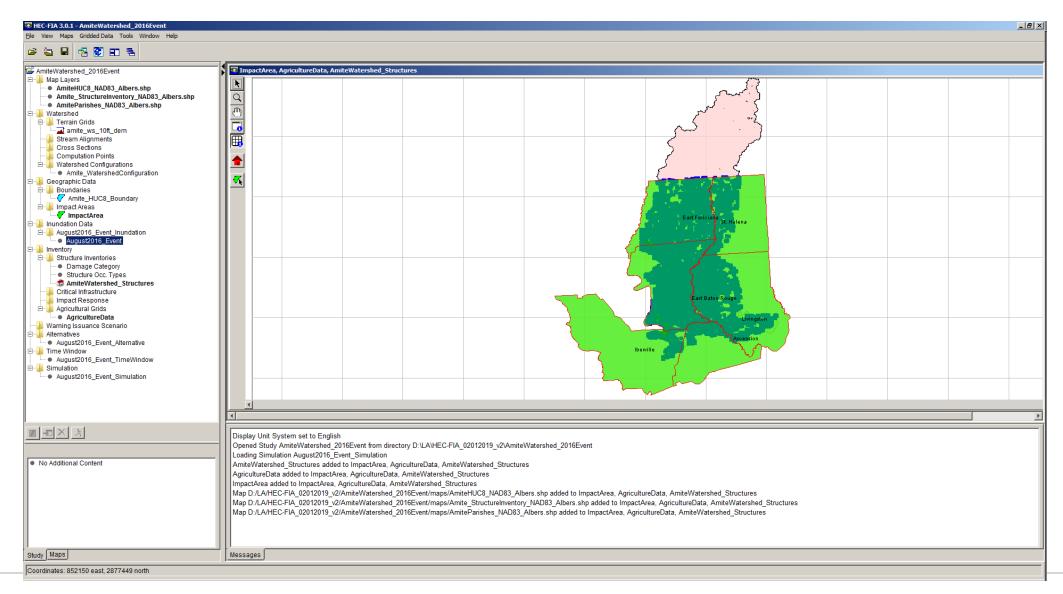
Benefits to Louisiana Stakeholders

- Tool to assess flood control projects assessing impacts on a watershed scale with insight into economic and life safety implications
- Models that are usable by the local Louisiana engineering community; building capabilities and supporting the local economy
- Costs are only incurred to refine and update project conditions by eliminating the cost of existing conditions modeling
 - Value of the existing conditions model is estimated at over \$4 million including leveraged data from other agencies
 - Ensures stakeholders use a consistent quality model baseline

HEC-FIA: Flood Impact Assessment

Consequence Modeling – Jerri Daniels, Dewberry

HEC-FIA Interface

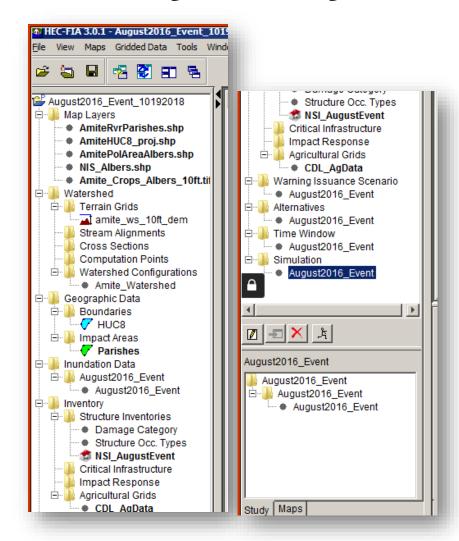


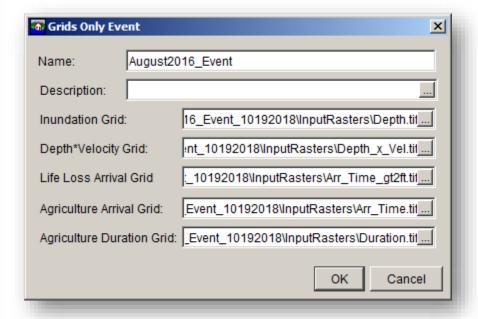
Data Inputs

- LiDAR collected in winter 2017/2018
- National Structure Inventory: assimilated from 2010 census data.
- Agricultural data
 - Data obtained from USDA National Agricultural Statistics Service
 - LSU AgCenter Reports

- August 2016 Event input grids:
 - Depth
 - Depth x Velocity
 - Arrival time (hours)
 - Arrival time (hours) of 2 feet.
 - Duration (hours)

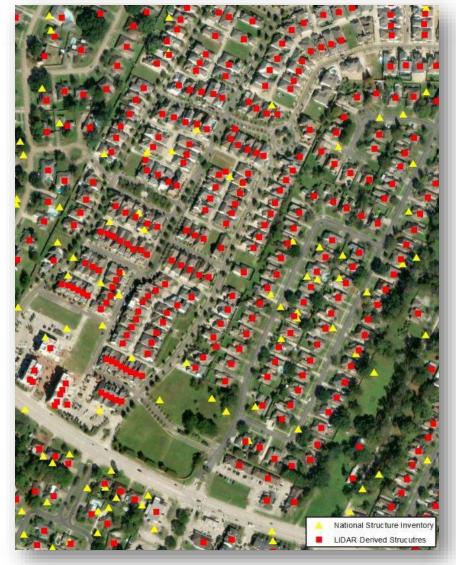
Grids Only Analysis





Structure Inventory Attributes

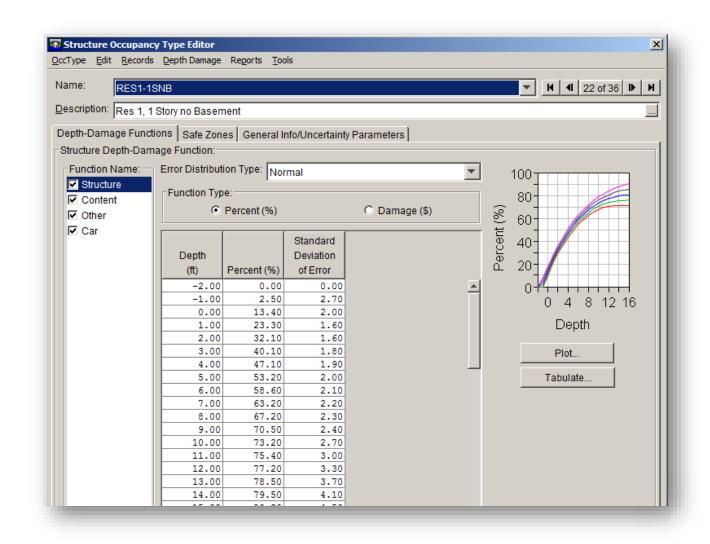
HEC-FIA Structure Inventory inputs for HEC-FIA			
Damage Category	Number of Cars		
Occupancy Type	Population 5pm Over 65		
Replacement Value	Population 5pm Under 65		
Construction Type	Population Day Over 65		
Content Value	Population Day Under 65		
Foundation Height	Population Night Over 65		
Foundation Type	Population Night Under 65		
Number of Stories	Number of Years in Service		



Structures

- NSI Structures: 35,039
- LiDAR-Derived Structures: 230,382
- Structure inventory:
 - For East Baton Rouge, Livingston, and Ascension parishes, structure values (replacement values) will be obtained from parcel datasets obtained from the parishes.
 - For all other data input (i.e. population, building type, etc), the building footprints will be conflated with the NSI datasets.

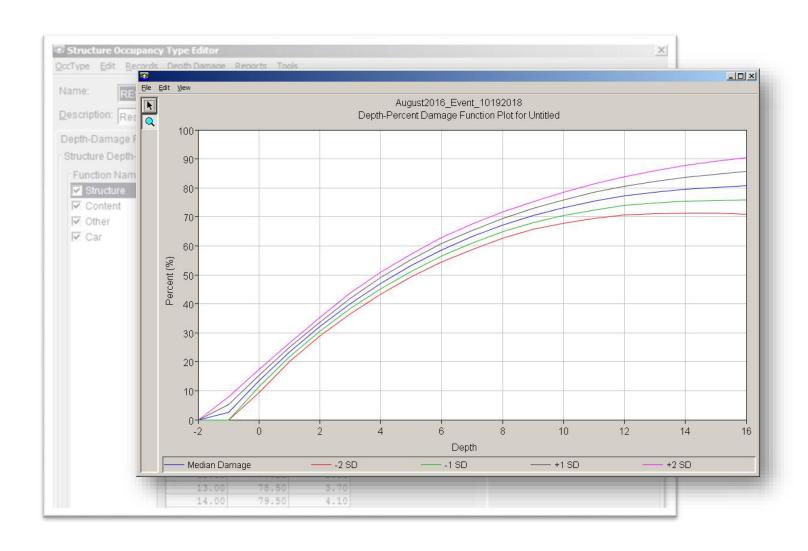
Structure Occupancy Types

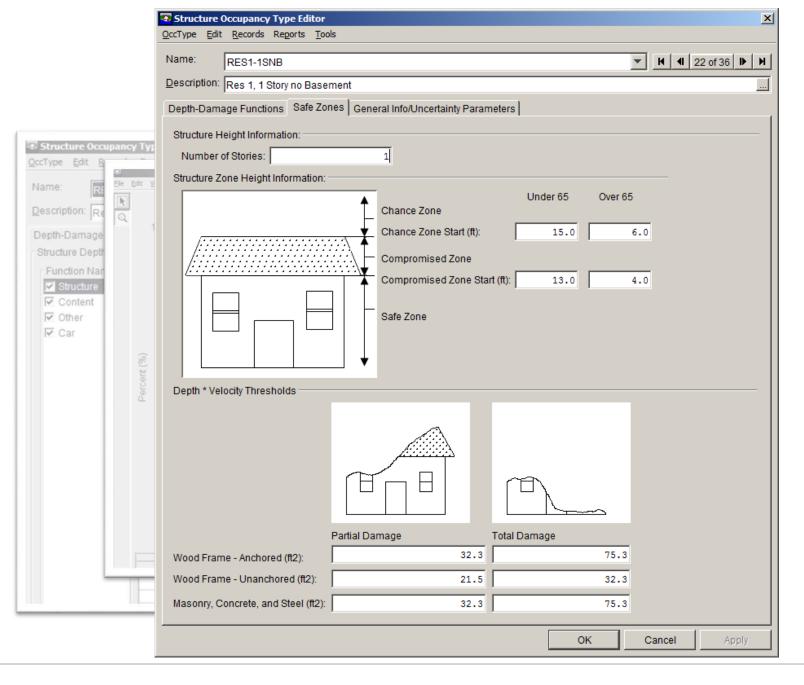


Structure Occupancy Types

Occupancy Type and Count Estimated for the ARB					
Structure Occupancy Type	Description	Number of Structures			
Agricultural	Average Agricultural	446			
Commercial	Retail, Wholesale, Personal & Repair Services, Professional/Tech Services, Bank, Hospital, Medical Office, Entertainment/recreation, Theater	12,697			
Educational	School, College/University	852			
Government	Government Services, Emergency Response	562			
Industrial	Heavy Industrial, Light Industrial, Food/Drug/Chemical, Metals/Minerals Processing, High Technology, Construction	3,321			
Religious	Church	2,043			
Residential	1, 2, or 3 Story, Split Level, Condominium with living area on multiple floors, Mobile Home, Hotel & Motel, Institutional Dormitory, Nursing Home	210,461			
Total:		230,382			

Structure Occupancy Types



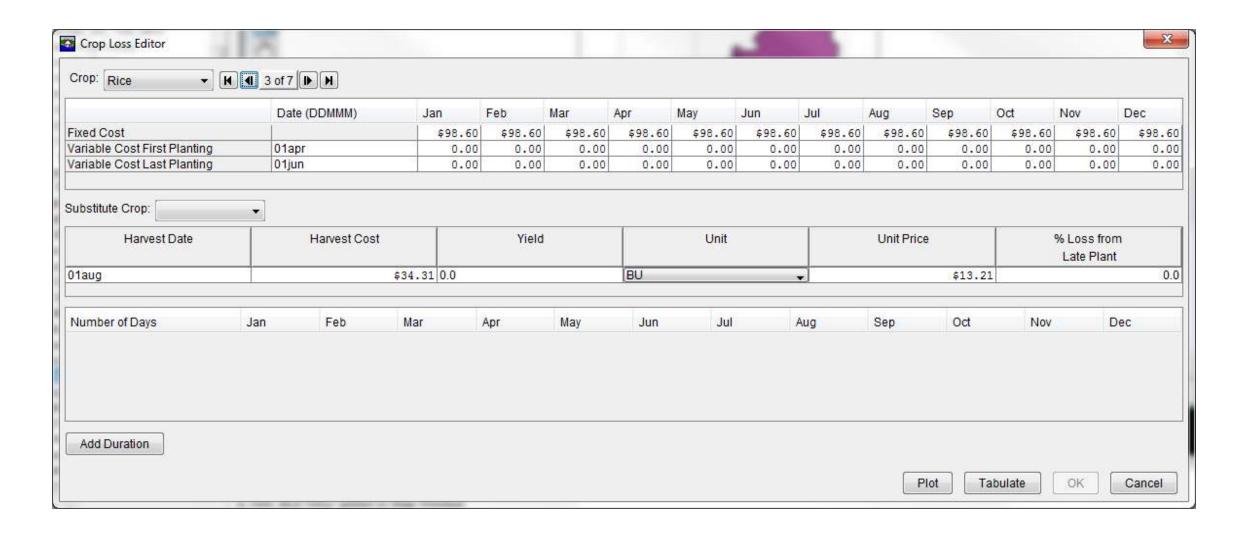


Agricultural Data

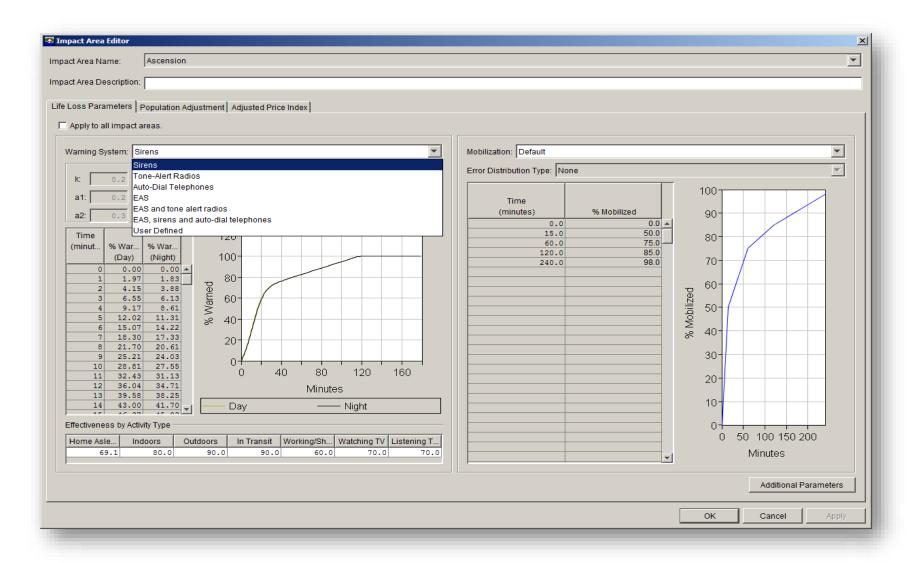
- There are eight crops in the Amite Watershed:
 - · corn,
 - other hays,
 - rice,
 - soybeans,
 - sorghum,
 - sugar cane,
 - sweet potatoes, and
 - winter wheat

0.0047% of the Amite River Basin is crops (ie negligible), but applicable to future study areas within Louisiana

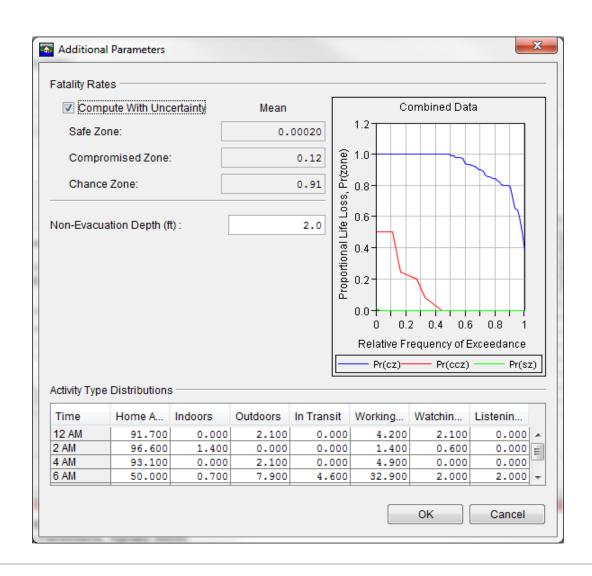
Agricultural Data



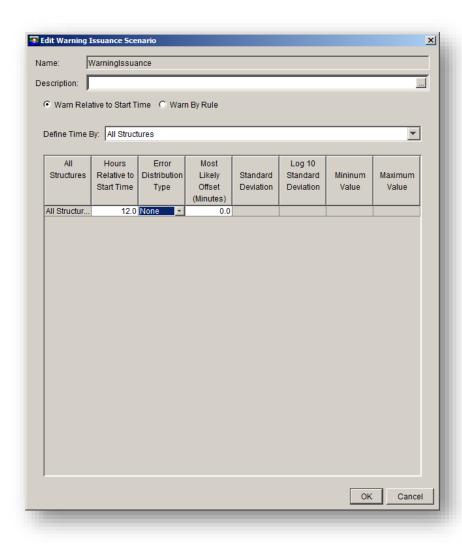
Impact Areas Defined



Impact Area Additional Parameters



Impact Area Warning Issuance Scenario



- Mon 1014a Hydrologic Outlook (ESFLIX) issued headlining Heavy Rainfall May Produce Elevated River Levels in Coming Days mentioning a flood watch may be posted at a later time
- Mon 359p First email sent to emergency managers talking about heavy rainfall potential later in the week
- Mon 451p First graphic posted to social media and website showing potential for heavy rainfall later in the week.
- Tues 139p Flood Watch issued for St. Tammany and MS Coastal Counties
- Tues 200p First webinar briefing held for emergency managers to talk about heavy rainfall potential
- Wed 951a Flood Watch expanded to include north shore and southern Tangipahoa Parishes
- Thur 432a Flood Watch replaced with Flash Flood Watch and expanded to include all
 of SE LA and S MS Thursday morning (first issuance for BTR area)
- Thur 854a First Flash Flood Warning issued for parts of coastal MS
- Thur 928a First Flash Flood Warning issued for parts of LA River Parishes
- Thur 1019a First Flood Warning issued for Amite/Comite Rivers
- Thur 516p First Flash Flood Warning issued for part of SW MS
- Fri 209a First Flash Flood Warning issued for parishes north of Baton Rouge
- Fri 423a First Flash Flood Warning issued for Baton Rouge and surrounding areas
- Fri 618a First Flash Flood Emergency issued for part of SW MS
- Fri 621a First Flash Flood Emergency issued for parts of SE LA north of Baton Rouge
- Fri 1005a First Flash Flood Emergency issued for parts of Baton Rouge metro

Timeline of watches and warnings issued by the NWS for Louisiana August 21-26, 2016. Source: Ken Graham, Meteorologist in Charge, National Weather Service for New Orleans and Baton Rouge

Results, dollars

Parish	Structure Damage (\$1000)	Content Damage (\$1000)	Car Damage (\$1000)	Total (\$1000)
Ascension	102,303.07	38,023.41	9,895.57	150,222.05
East Baton Rouge	1,499,495.04	706,891.26	112,432.77	2,318,818.82
East Feliciana	9,994.10	5,534.93	1,588.50	17,117.52
Iberville	8,018.76	3,921.36	45.95	11,986.07
Livingston	1,134,989.06	514,080.80	58,352.05	1,707,421.82
St. Helena	2,772.98	1,148.95	782.31	4,704.24
Total	2,757,573.12	1,269,600.64	183,097.14	4,210,270.98

Results, dollars

- Total Damage in FIA: \$4.2 billion in 6 parishes
- LA Economic Development commission states that losses from Aug 2016 were \$4.439 for 20 parishes. (Does not break down loss by parish.)

Q&A

Updates and Introductions

Technical Advisory Group (TAG) Updates

TAG Updates

Projects TAG

- Public comments received and incorporated into draft application material
- Visit

 <u>www.watershed.la.gov</u> for more info.

Planning TAG

- Provisional Watershed boundaries
- Provisional Regional
 Steering Committee
 composition, roles, and
 objectives drafted for
 discussion at meetings with
 Parish Leadership

Outreach TAG

- Successful Best Practices
 Summit on 2/19
- Parish Leadership meetings prepared
- Consolidation of 2019
 Listening Tour Report out and 2019 Engagement and Outreach Plan



TAG Updates

Data & Modeling TAG

- Prior updates provided on modeling framework, deliverables, and Amite River Model.
- Visit
 <u>www.watershed.la.gov</u> for more info.
- RFQs & Contract
 Boundaries being
 finalized to facilitate AD

Policy TAG

- Drafting policy objectives to accompany the use of watershed models
- Interagency investigation of the Office of Community Development underway
- Production of whitepapers on mitigation strategies underway



- @LAWATERSHEDINITIATIVE
- **♥** @LAWATERSHED
- ☑ WATERSHED@LA.GOV

Thank You

