An Overview of TWDB's Coastal Modeling Activities: Modeling Coastal Flooding in Drought-Prone Zones

Amin Kiaghadi, Ph.D., P.E.

Galveston Bay Council Meeting
January 21, 2026

Coastal Science Team

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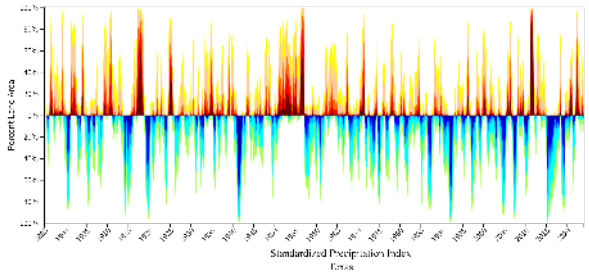
Coastal Ecologist

Outline

The Texas Water Condition



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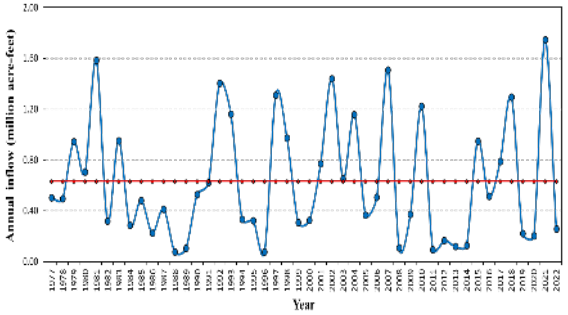
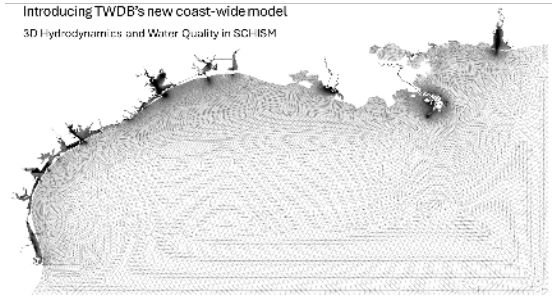
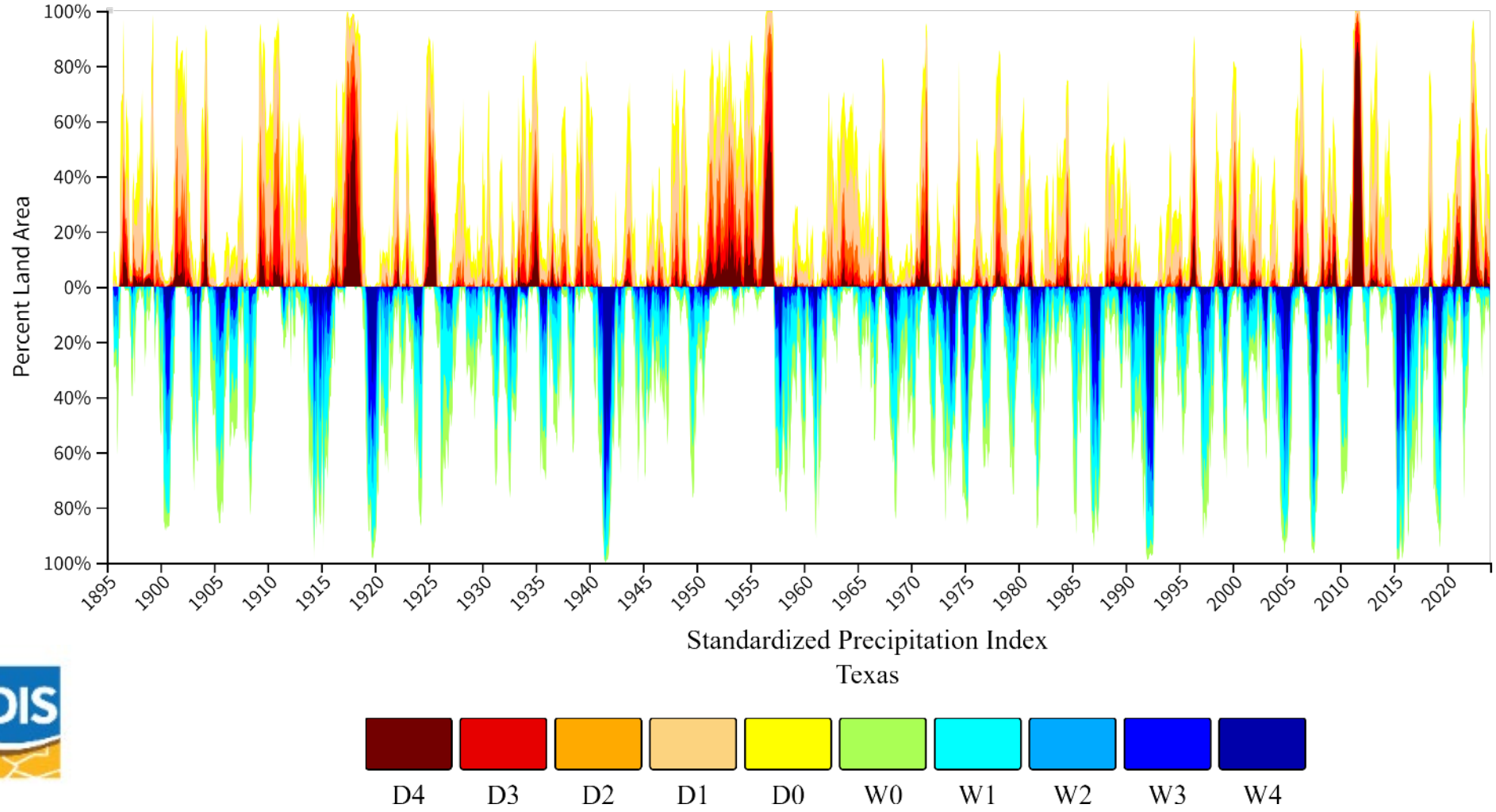


Models



Stakeholder Solicitation

"Texas is a land of perennial drought broken by the occasional devastating flood." — National Weather Service, 1927



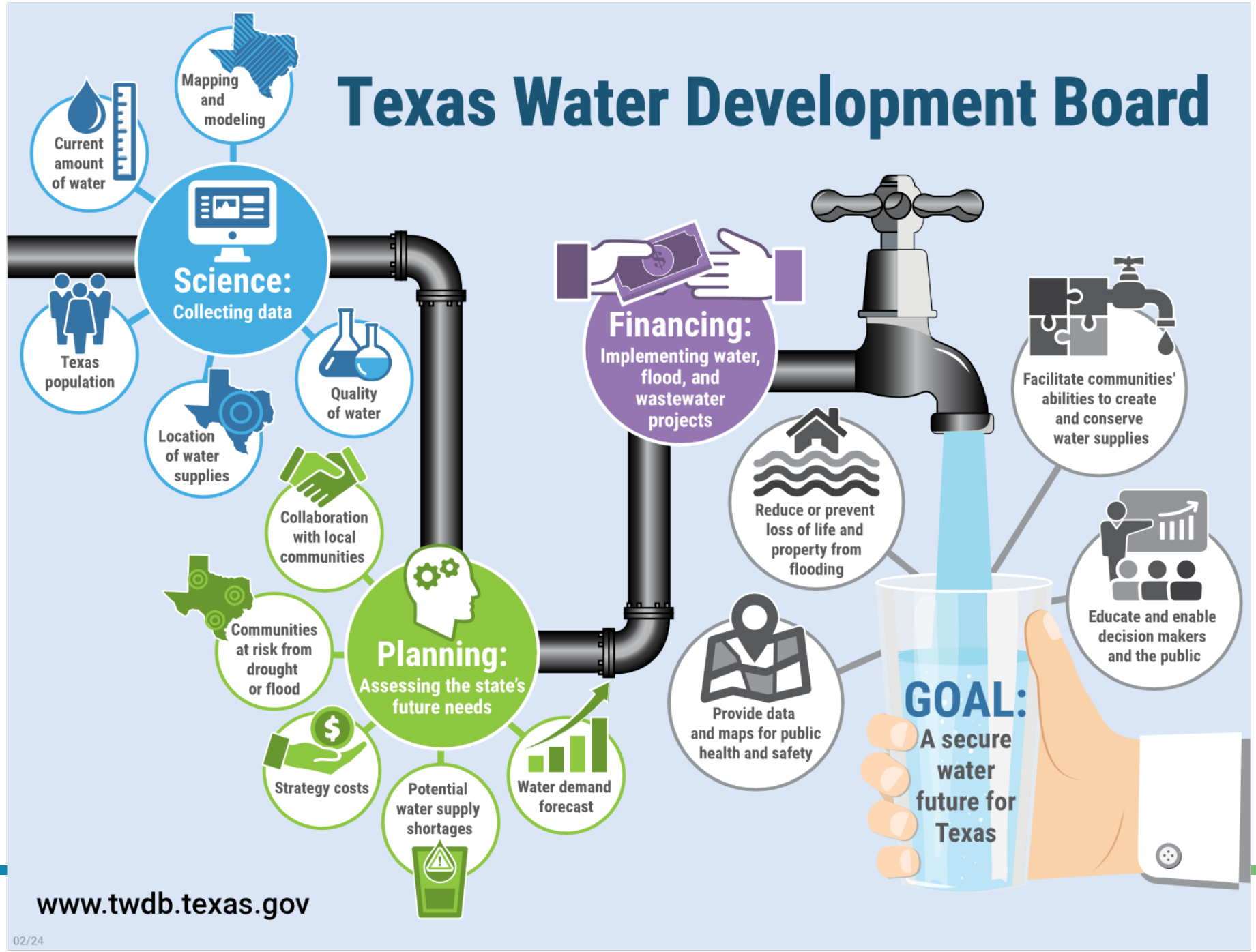
https://www.drought.gov/states/texas

The Texas Gulf Coast is on the frontlines of change —and the defining water issues of our time

West Fork San Jacinto River near Humble, Texas after Hurricane Harvey, 2017. Image: Steve Fitzgerald, Harris County Flood Control District

Mouth of the Rio Grande, 2002
Image: Texas Parks & Wildlife

Ensuring a secure water future for Texans

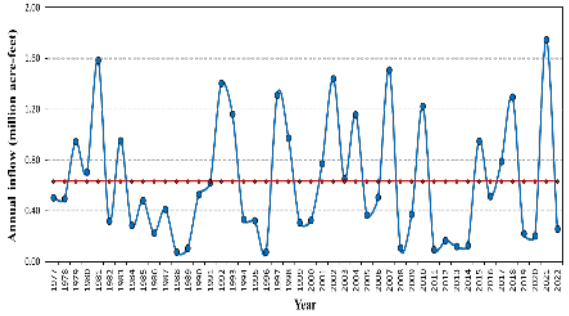


Coastal data and monitoring activities

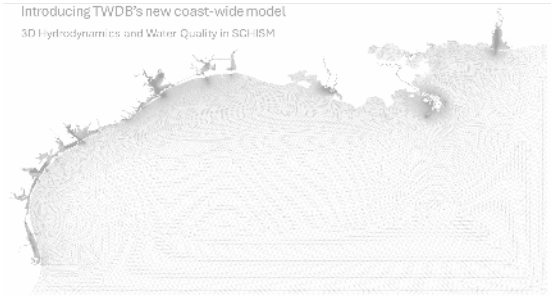
"The better the data, the better the science. The better the science, the better the policy." — Kathleen Jackson, Previous TWDB Director

The Texas Water Condition

Data



Models



Stakeholder Solicitation

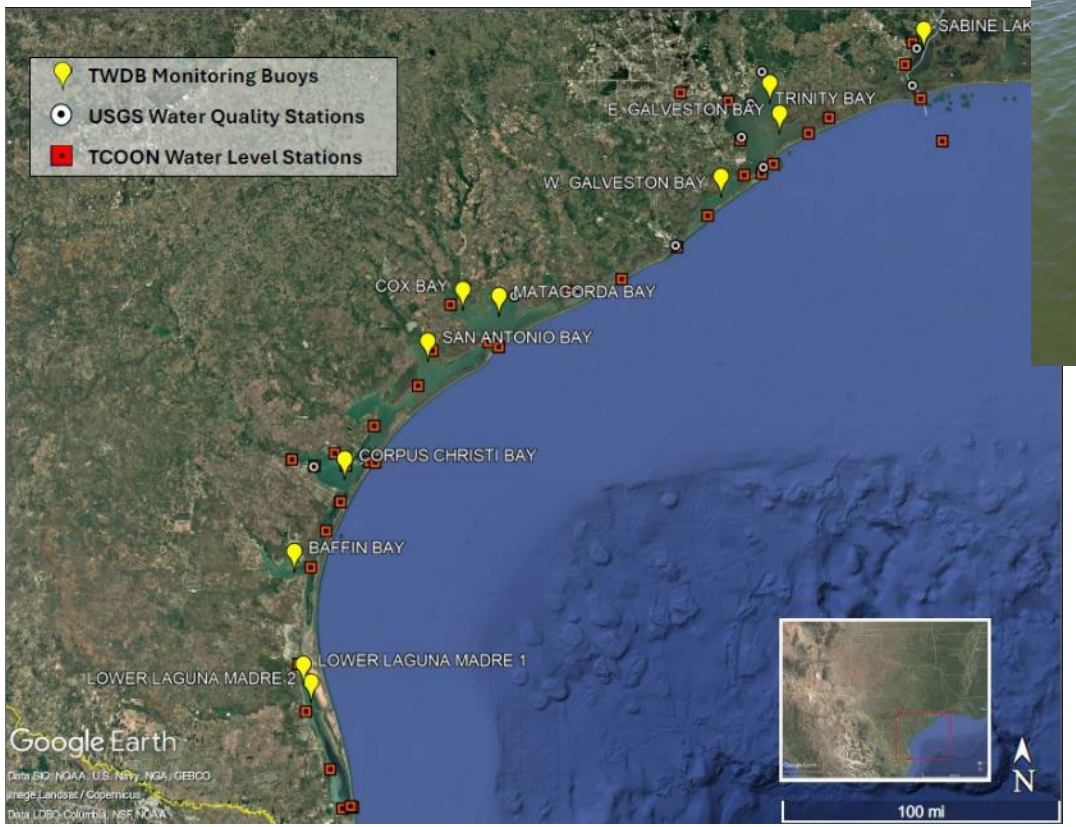
TWDB's Coastal Monitoring Buoys

Six (6) deployed

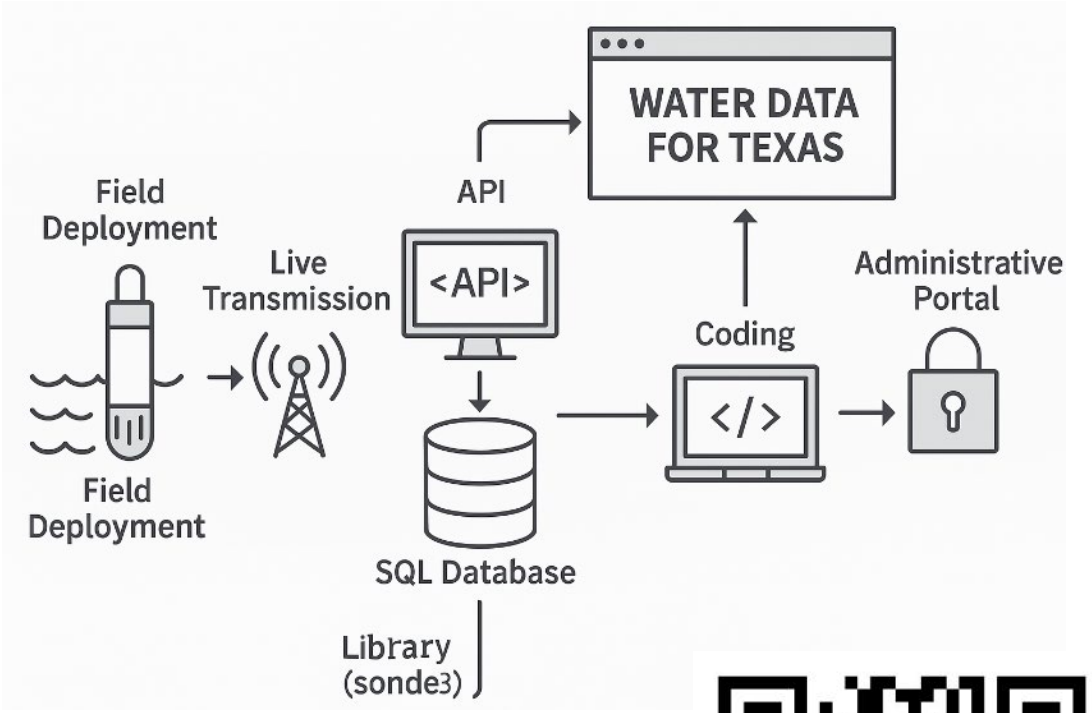
- Corpus Christi Bay
- Baffin Bay
- West Galveston Bay
- Cox Bay
- Matagorda Bay
- Trinity Bay

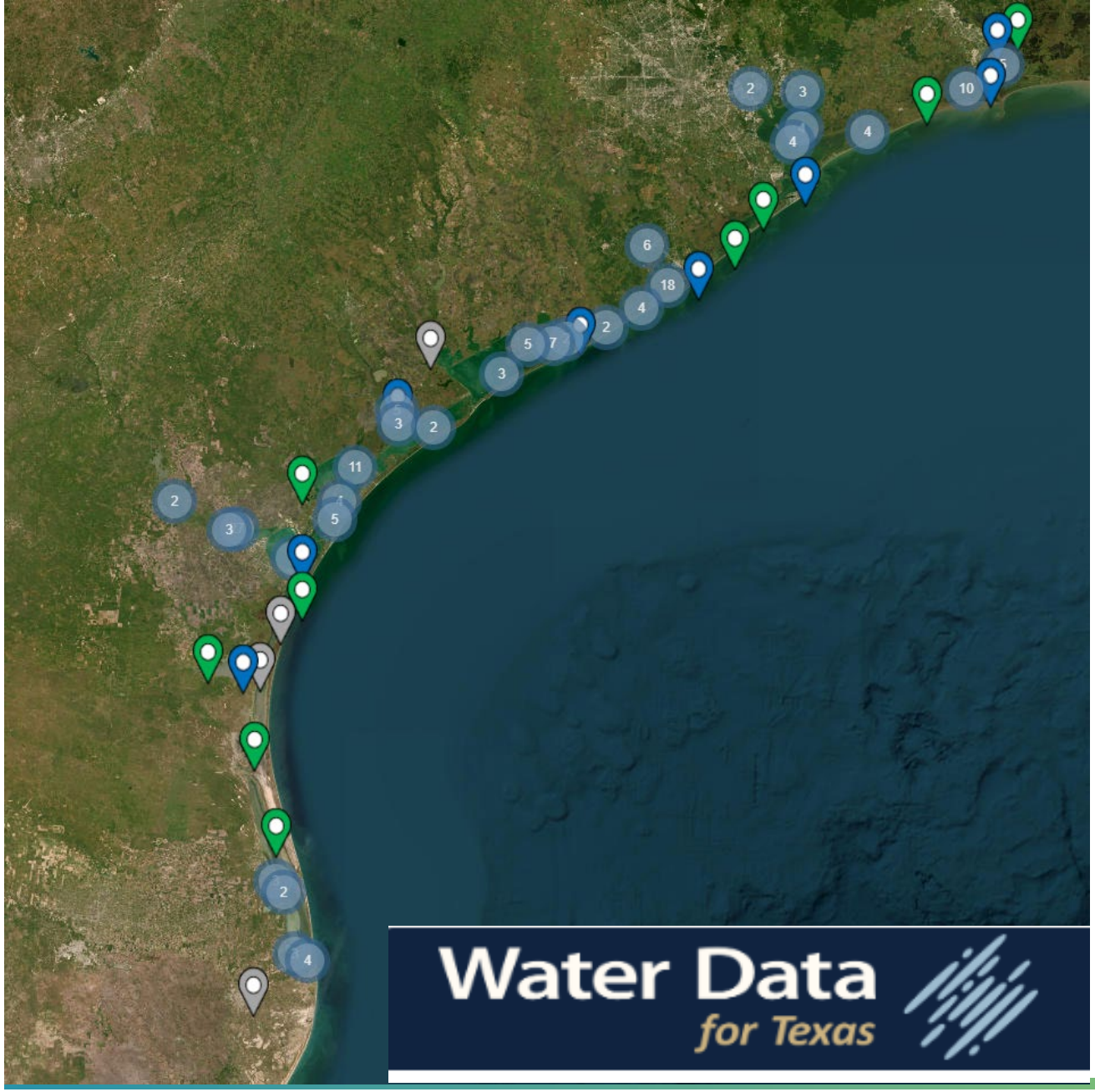
Five (5) waiting to be deployed

- All permits have been acquired
- Hardware
- Set up



Water Data for Texas web portal





TEXAS WATER DEVELOPMENT BOARD

TWDB maintains 84 years (1941-2024) of freshwater inflow data

Gaged Watershed Flows

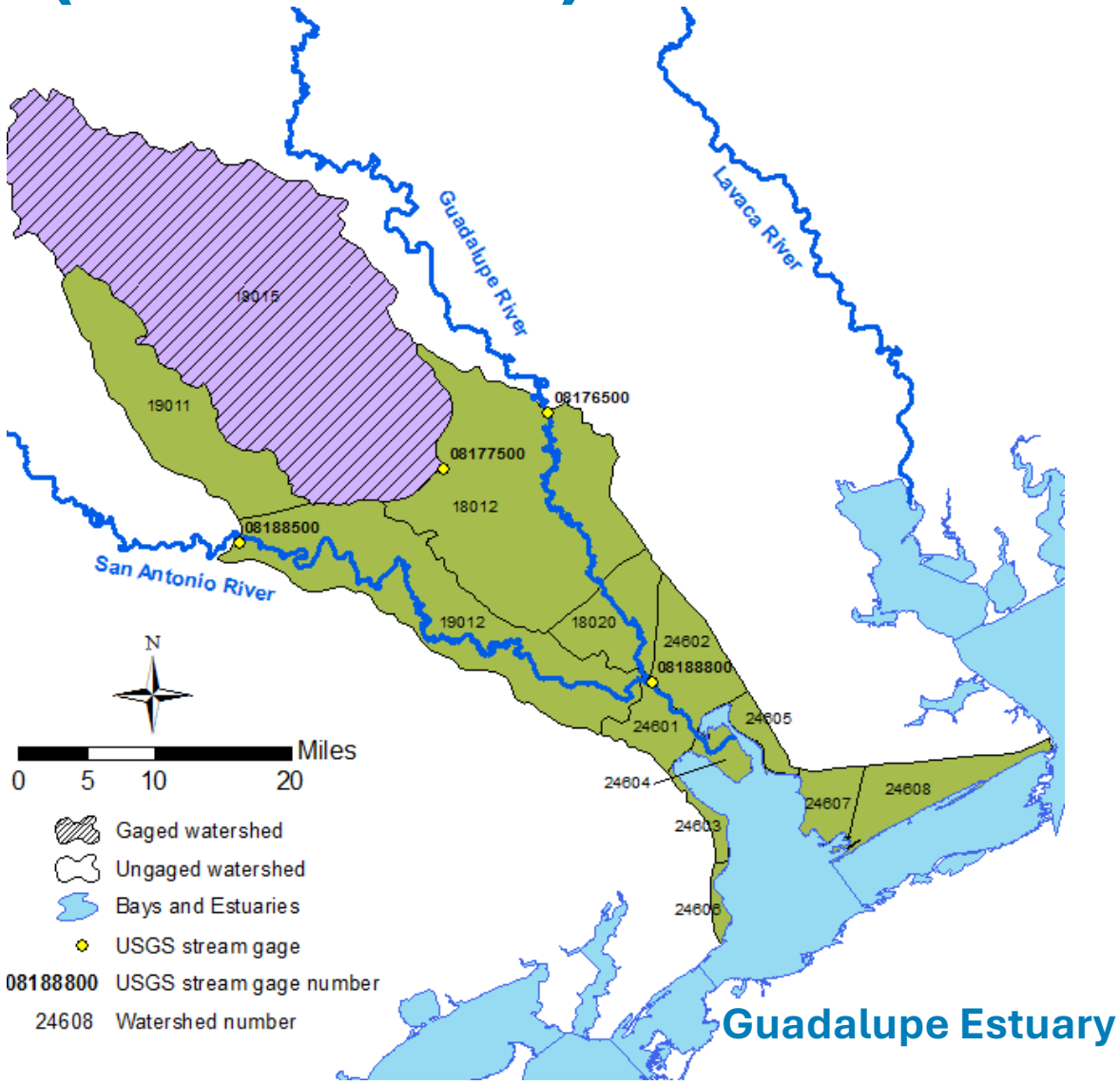
Ungaged Watershed Flows

+ Modeled (Texas Rainfall-Runoff Model)

- Diversions

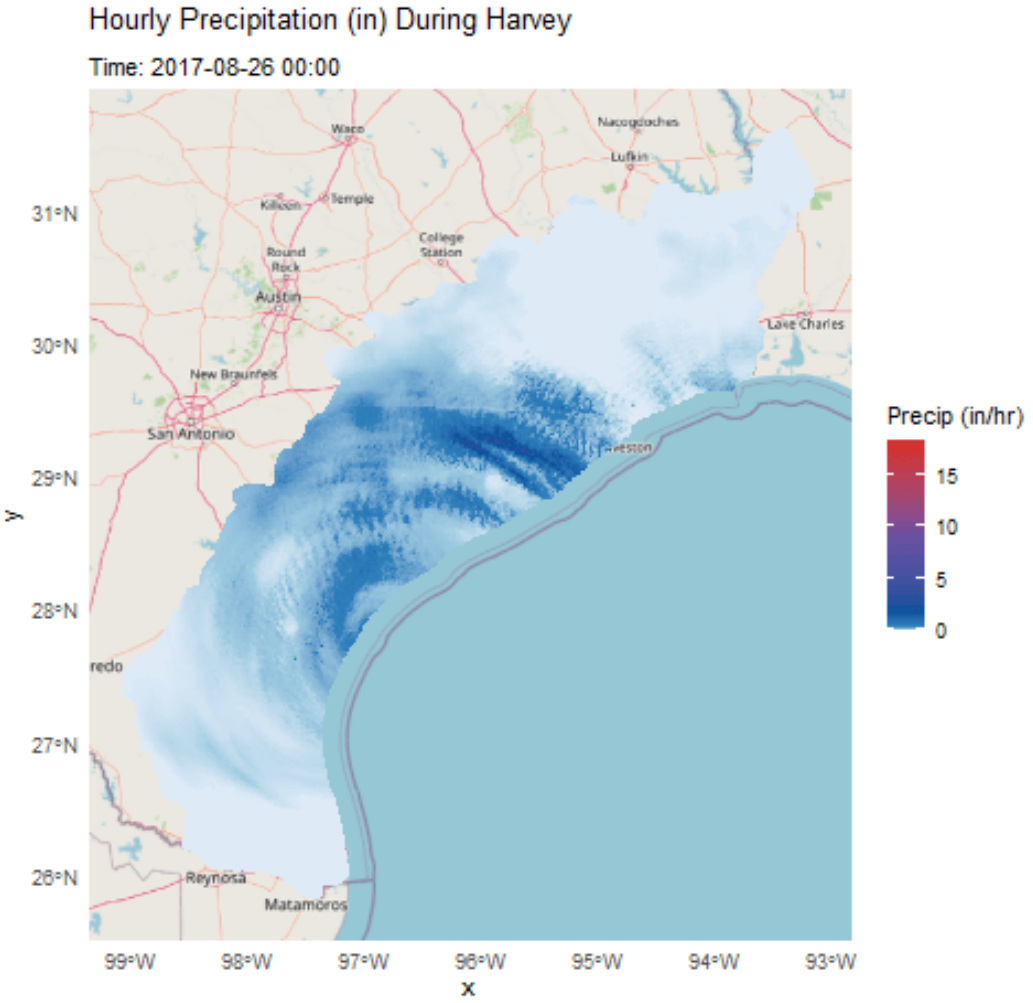
+ Returns

= Surface Inflows to Bay

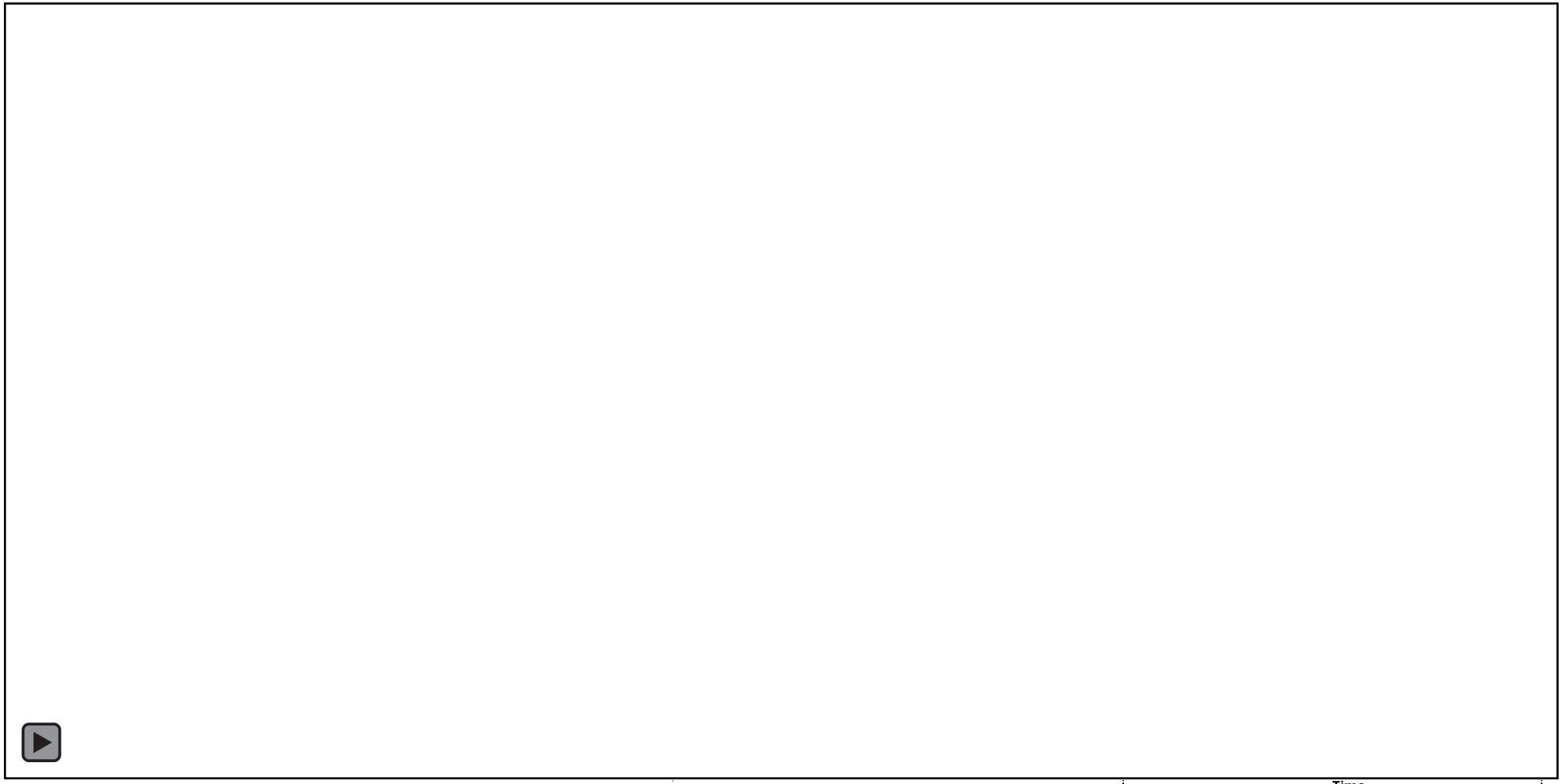


ENHANCED RADAR PRECIPITATION PRODUCT FOR THE COASTAL TEXAS AREA

- Improved gauge network density compared with other products
- Customized interpolation algorithm to the spatial distribution of the local gauge network within the coastal region
- Tailored gauge quality control algorithms to use as many gauges as possible. (Sometimes doubling the number of gauges compared to alternative products)

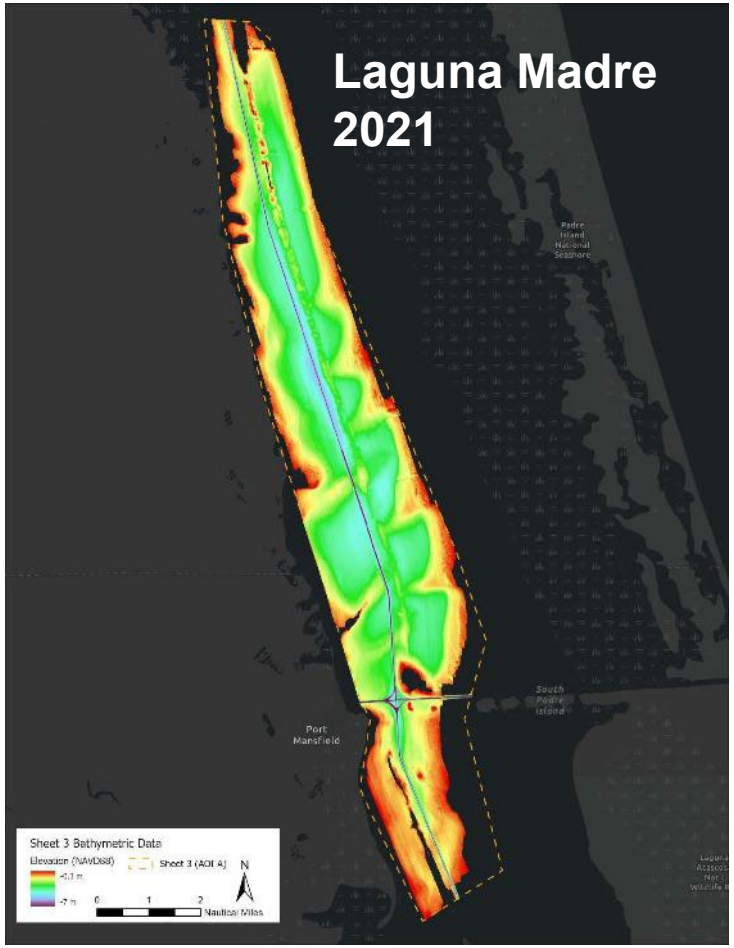


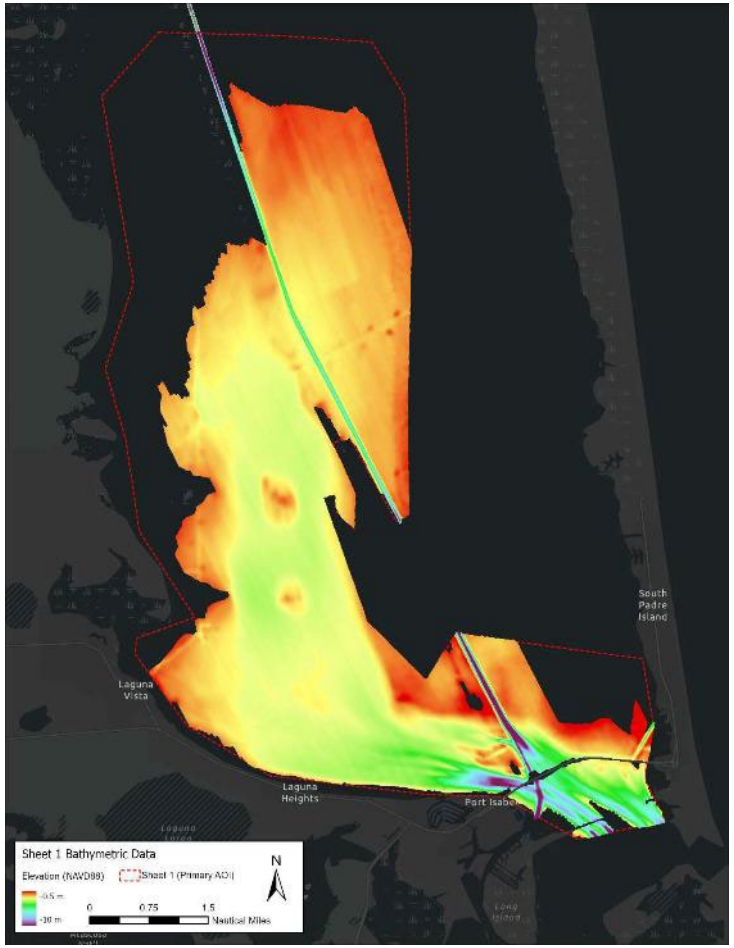
ENHANCED RADAR PRECIPITATION PRODUCT FOR THE COASTAL TEXAS AREA

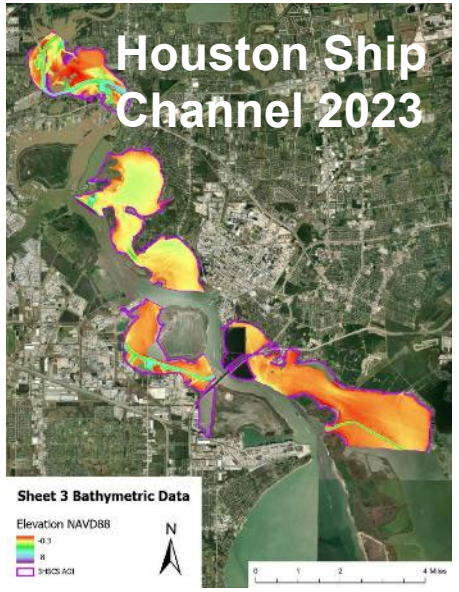


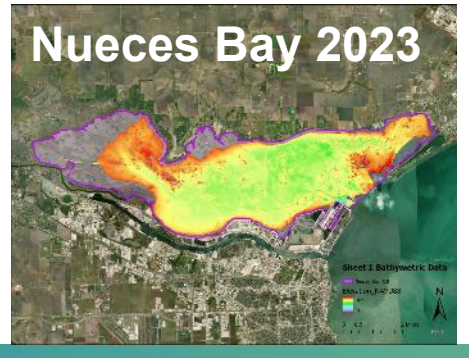
TEXAS WATER DEVELOPMENT BOARD

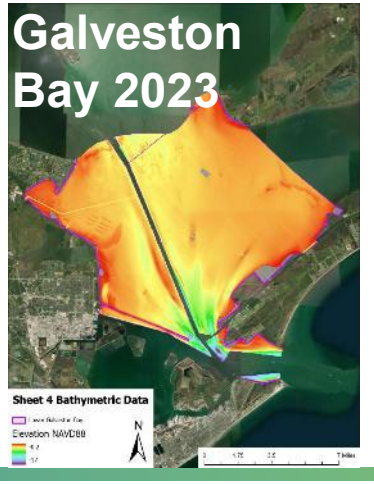
TWDB and TxGIO filled critical bathymetry data gaps based on recommendations for priority areas











TEXAS WATER DEVELOPMENT BOARD

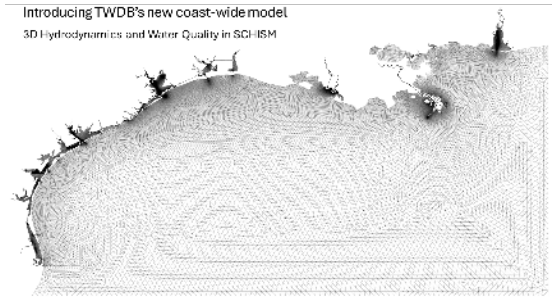
TxGIO

Hydrologic and hydrodynamic models

The Texas Water Condition

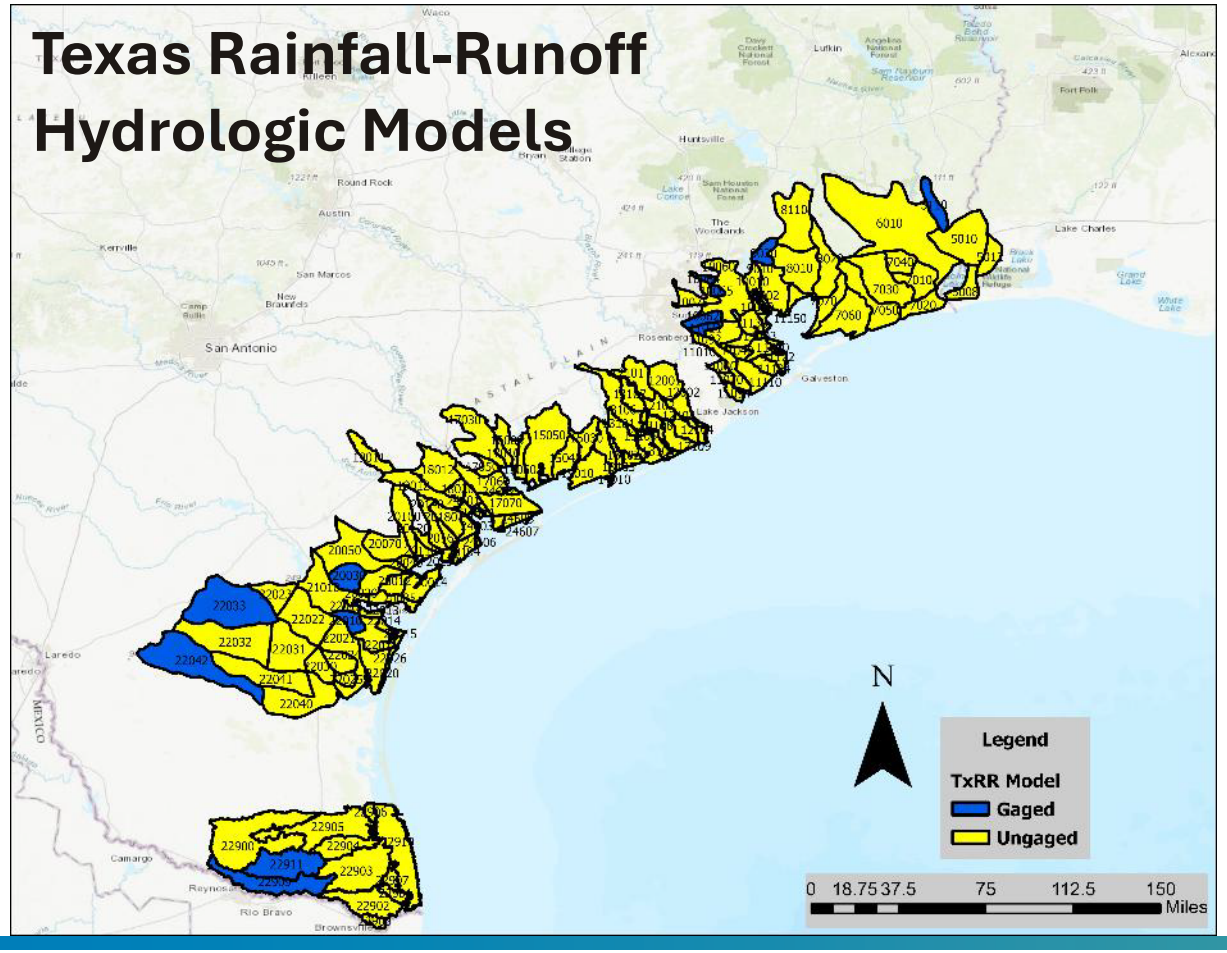
Data

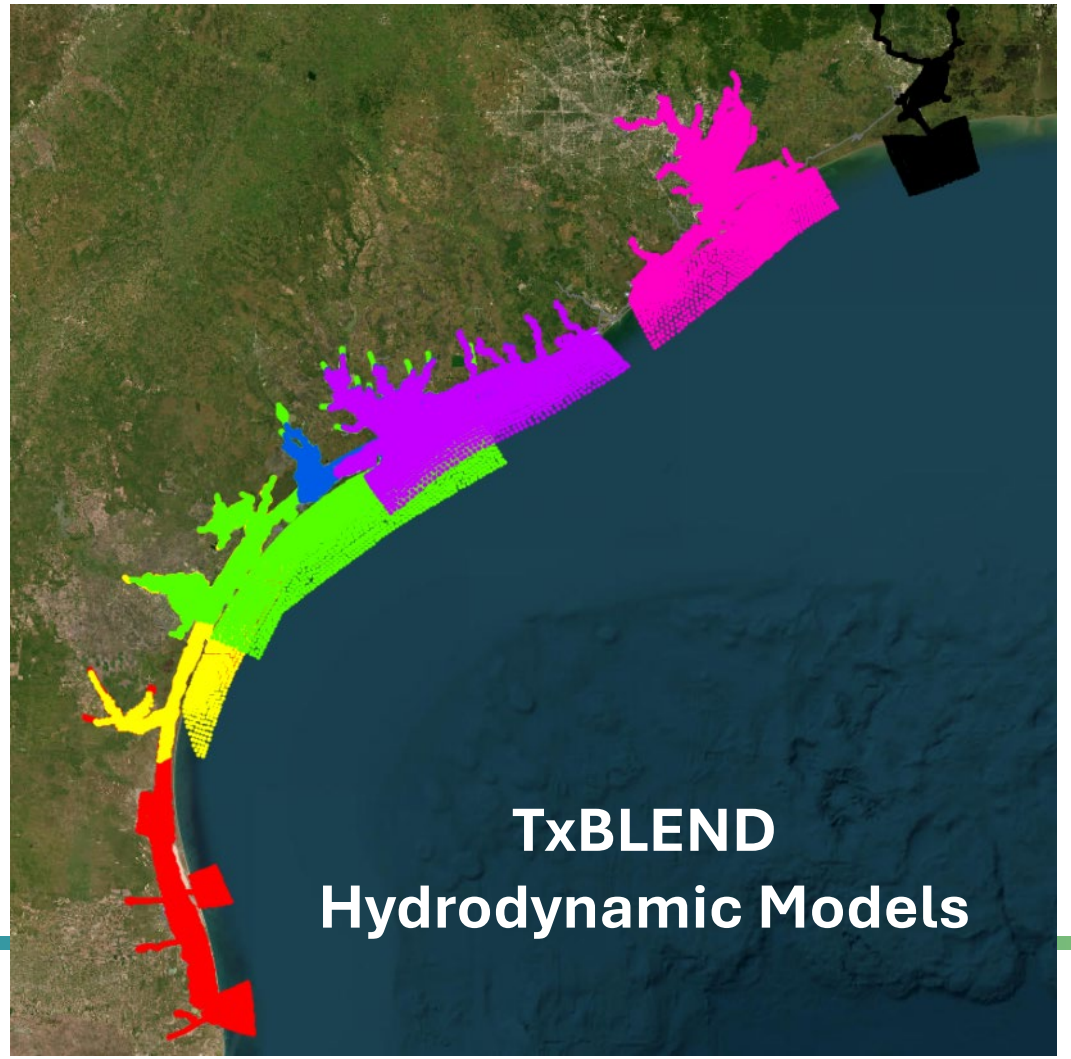
Models



Stakeholder Solicitation

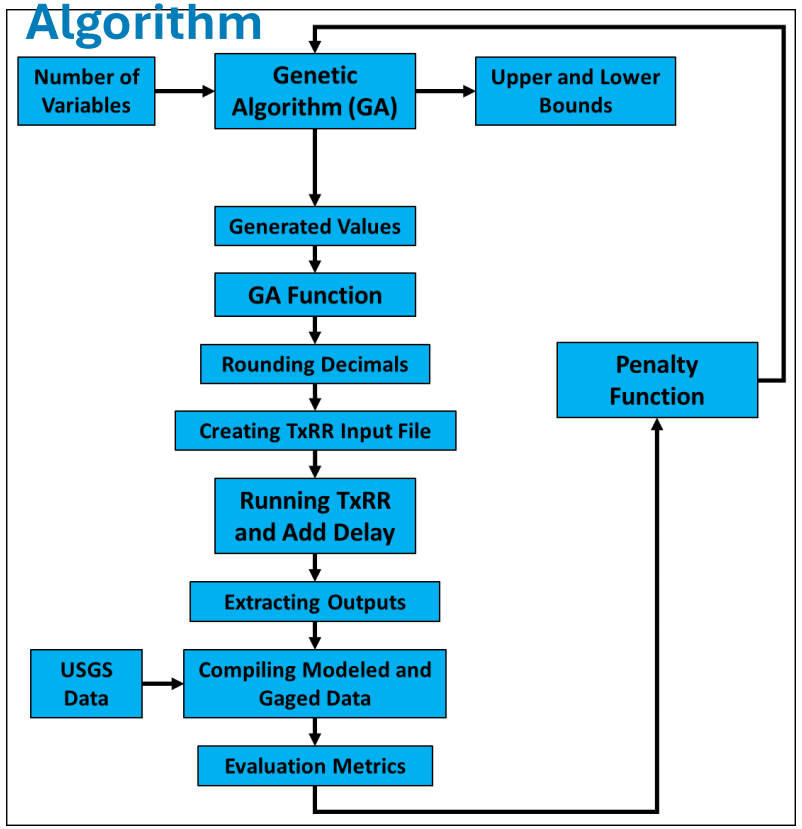
The TWDB's legacy coastal models are outdated, but simple, fast, and available for use



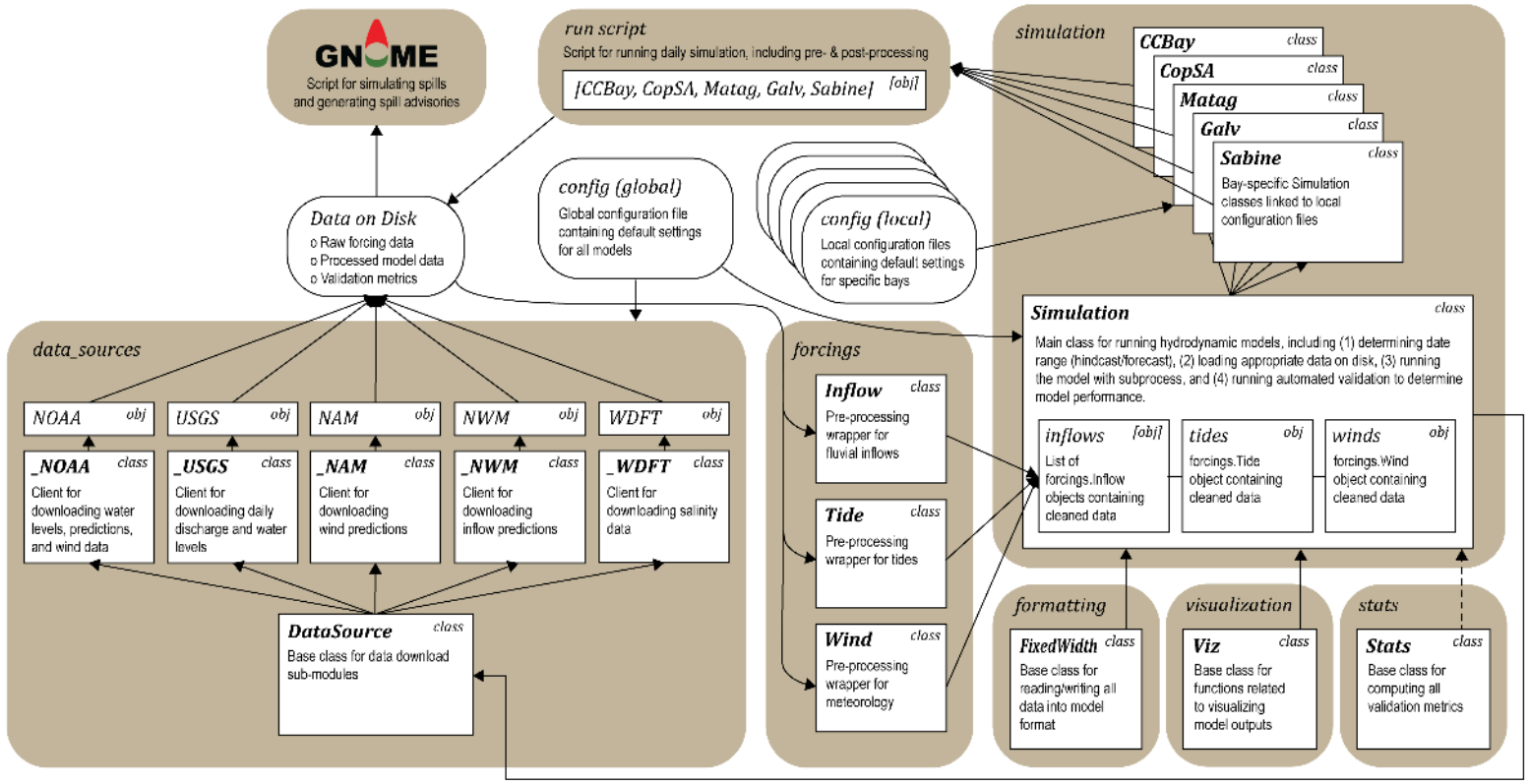


We've improved existing hydrologic and hydrodynamic models

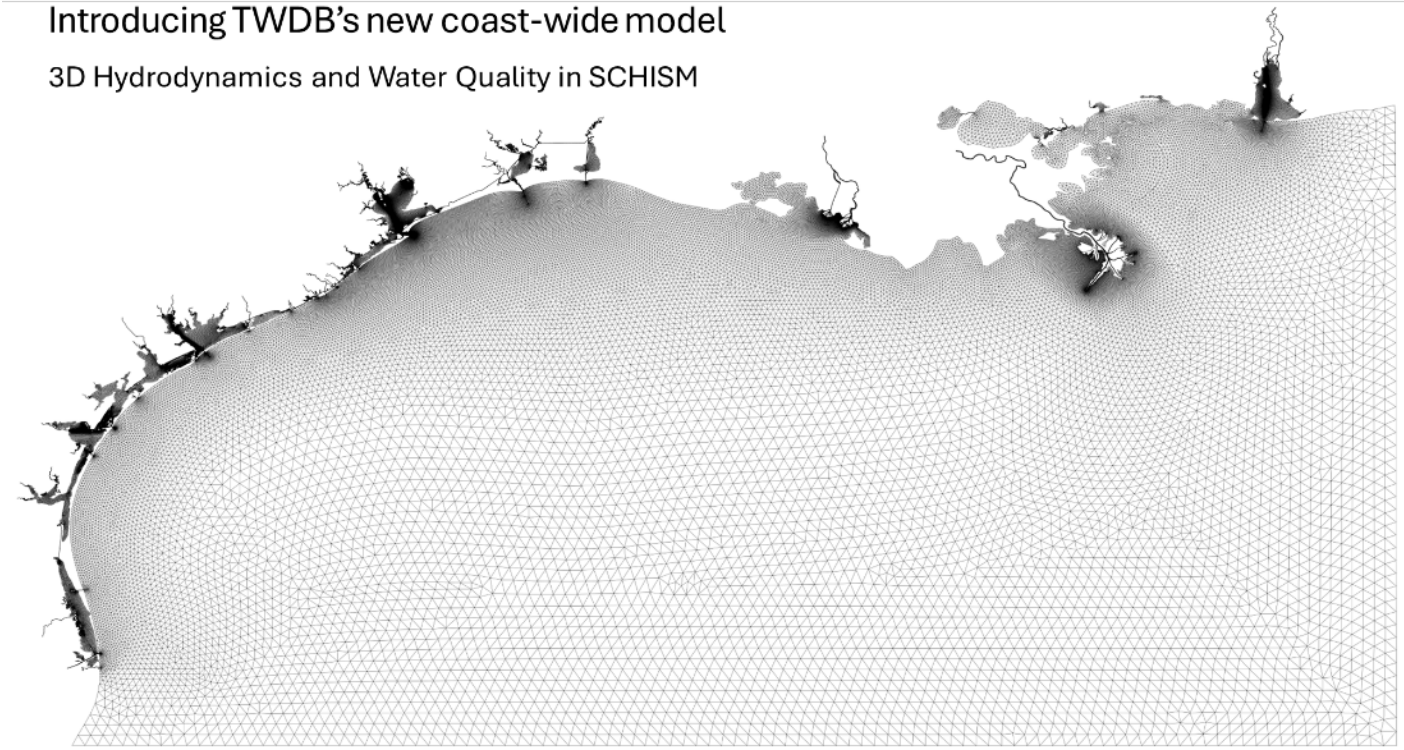
TxRR Automated Calibration Using Genetic Algorithm

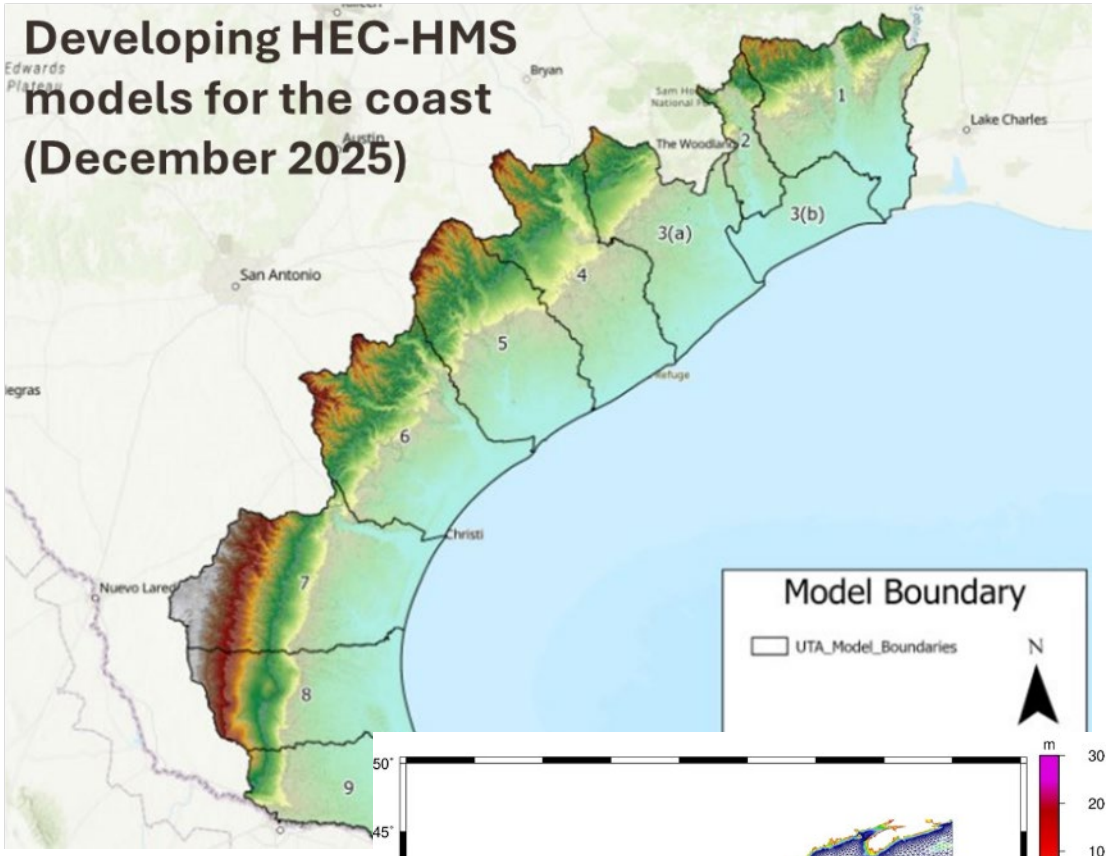


Oil Spill Modeling System TxBLEND Automated TxBLEND Validation

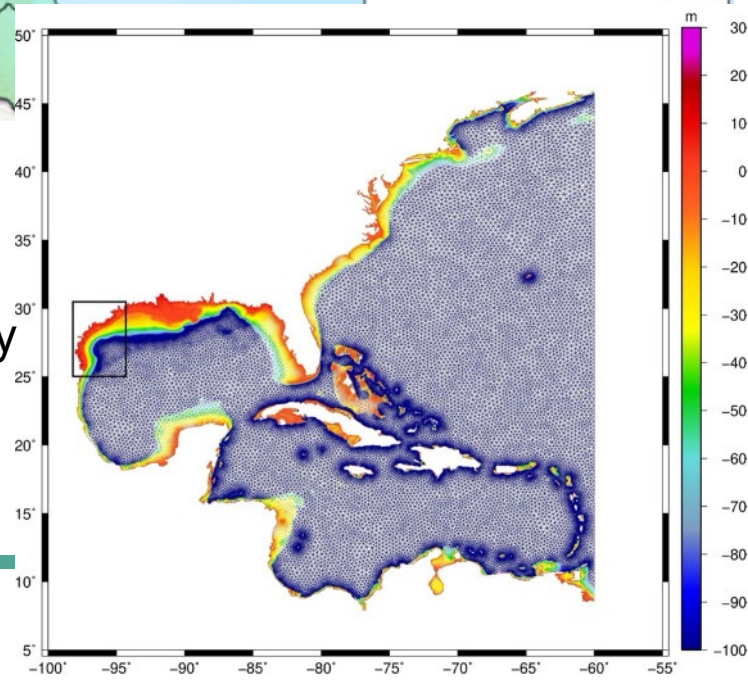


We're modernizing our modeling systems by developing and testing state-of-the-art models





Compound Flood modeling to identify transitional zone using ADCIRC



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HEC-HMS 2D: Study Overview

TWDB Contract # *2401792866*

TWDB Contract #2301792723

HEC-HMS 2D Example

HEC-HMS Model Development
- 5-8 Models
- 2D Flow Routing

Hydrological Parameter Estimation

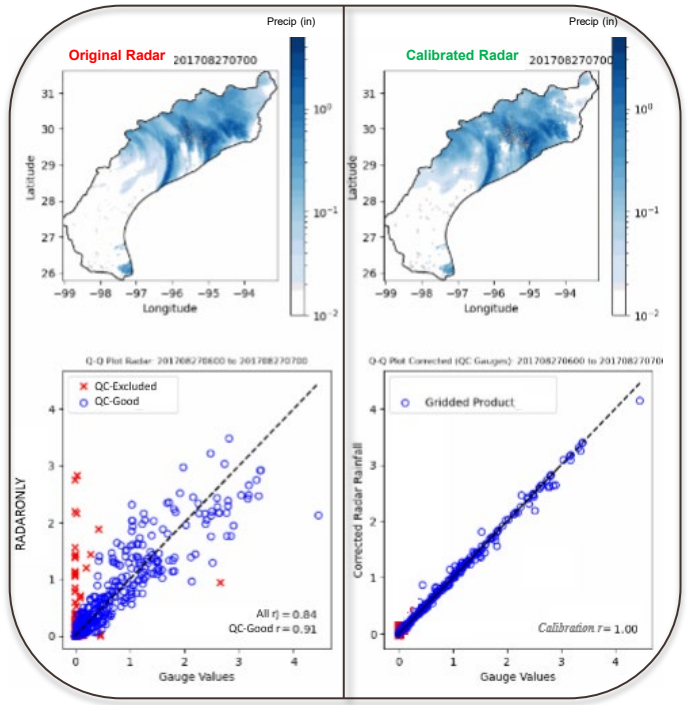
Sensitivity Analysis and Model Runtime Optimization

Model Validation

Hindcasting and Automation

Gauged Catchments: Calibration

Ungauged catchments: Parameter estimation aided by spatial regression and basin characterstics analysis



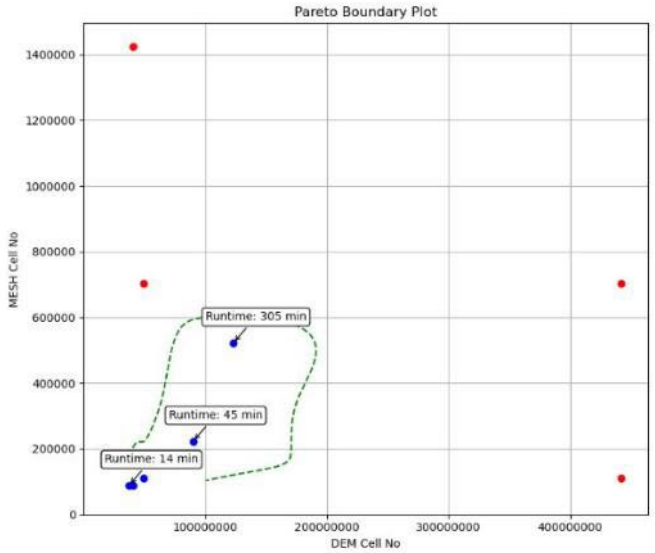
Bias-Corrected Radar Rainfall Product

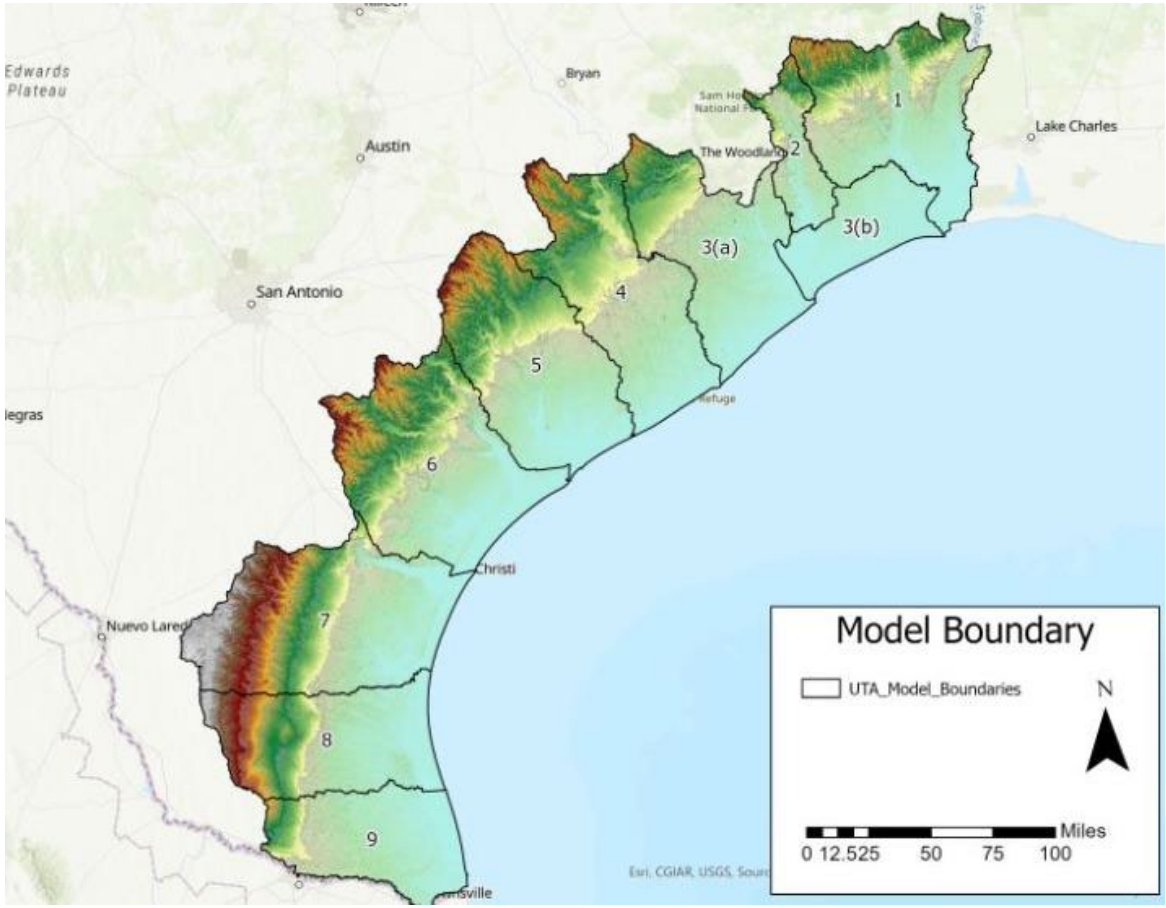
TEXAS WATER DEVELOPMENT BOARD

FANG RESEARCH GROUP
—WATER RESOURCES
The University of Texas at Arlington

HEC-HMS 2D

	DEM Grid recommended cell size (m)	Mesh recommended cell size (m)
	15	244
	19	234
	17	229
	15	229
	18	262
	14	231
	12	205
	11	182
	6	90
Max:	19	262
Avg:	14	212
Recommended	**20 m**	**250 m**

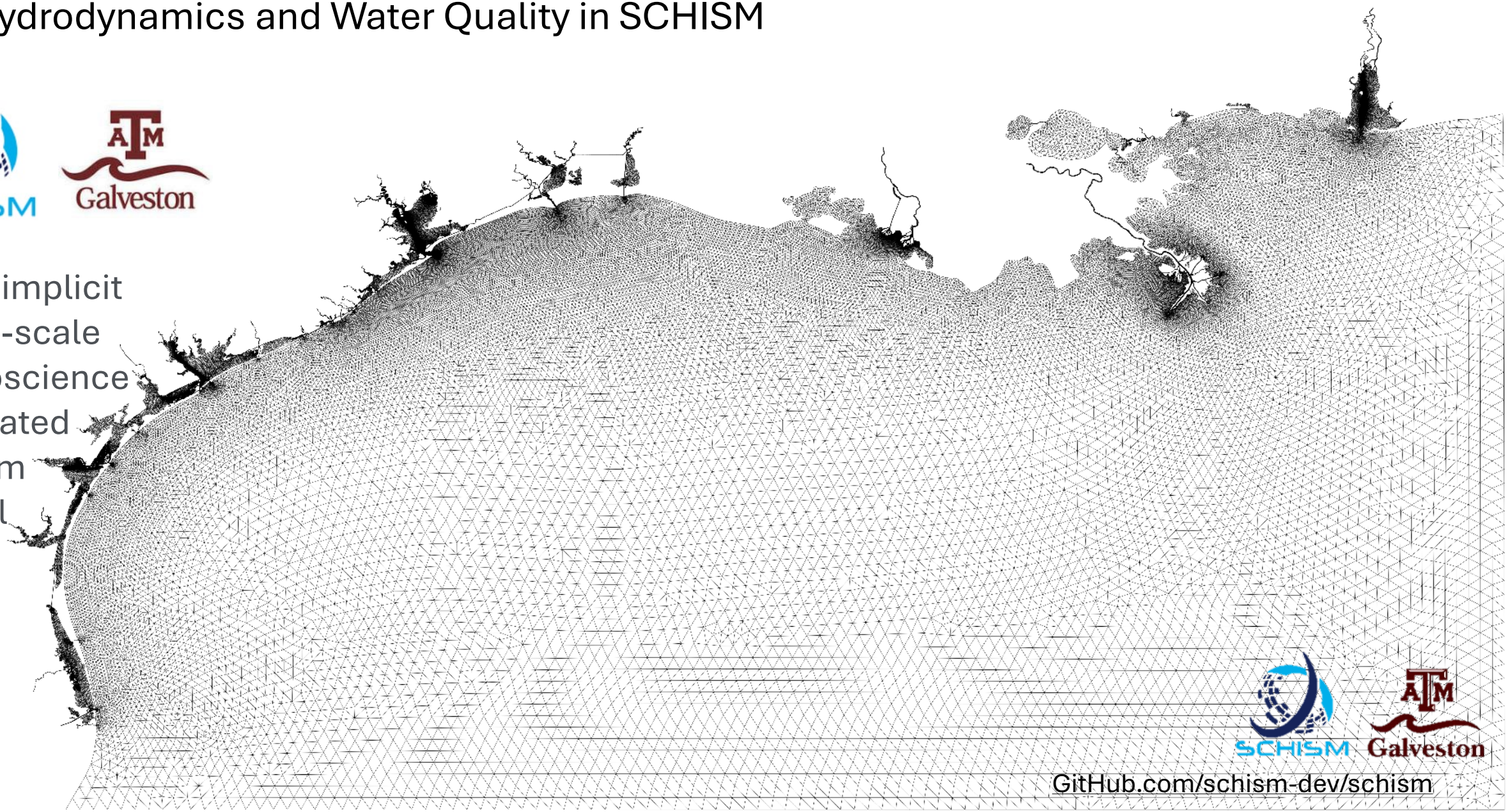




Introducing TWDB's new coast-wide model

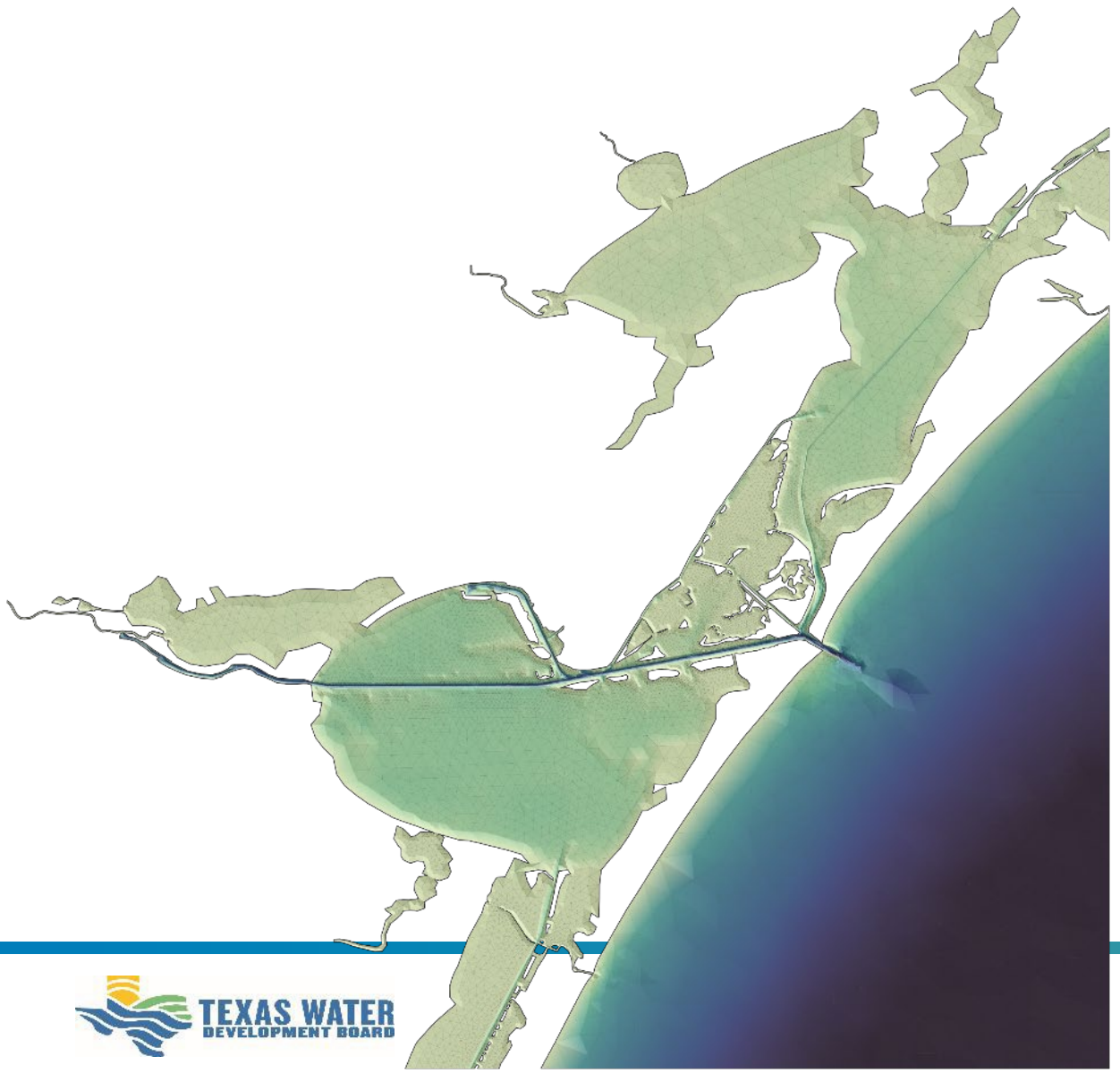
3D Hydrodynamics and Water Quality in SCHISM

Semi-implicit
Cross-scale
Hydroscience
Integrated
System
Model

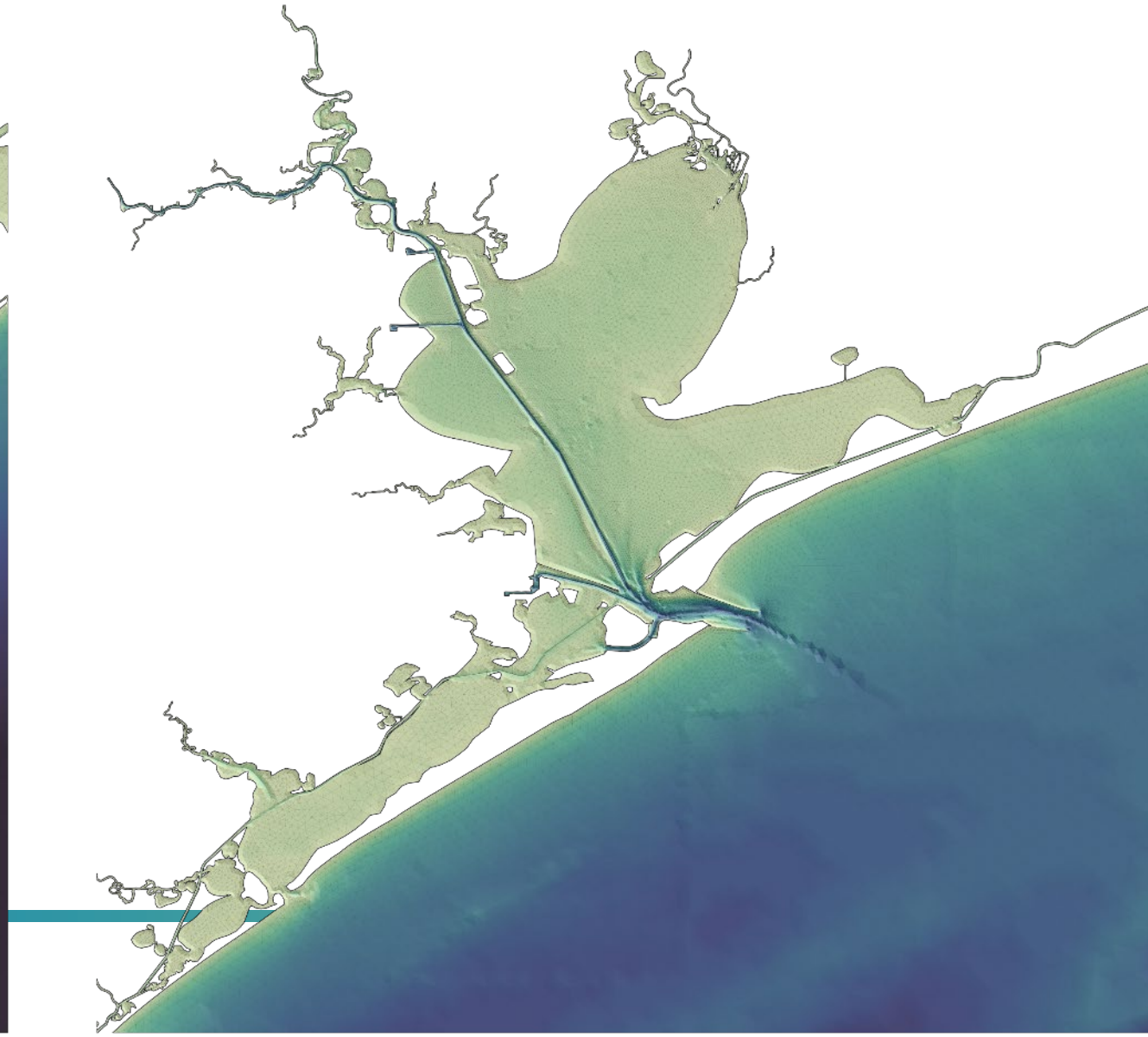


GitHub.com/schism-dev/schism

Corpus Christi Bay



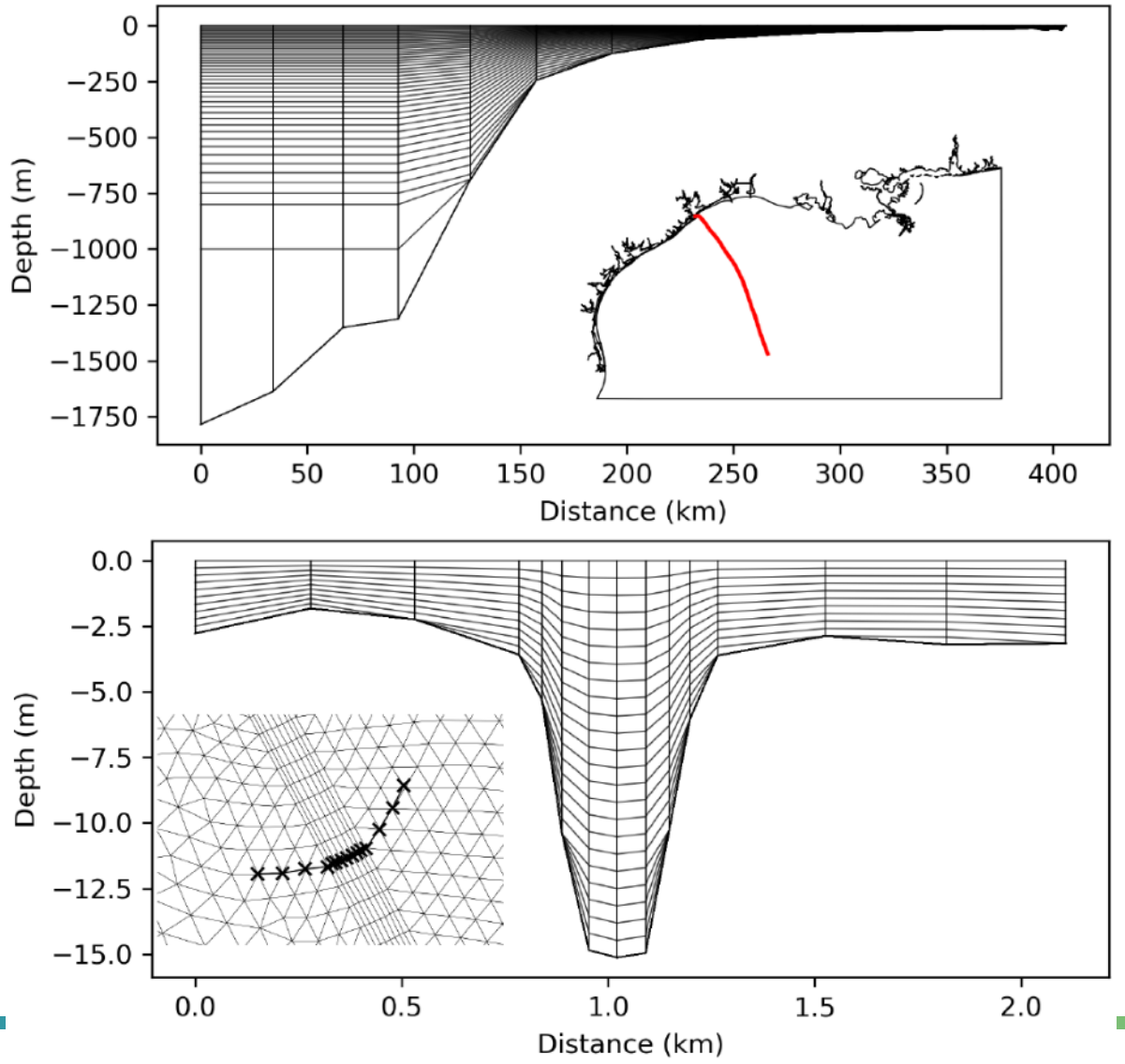
Galveston Bay

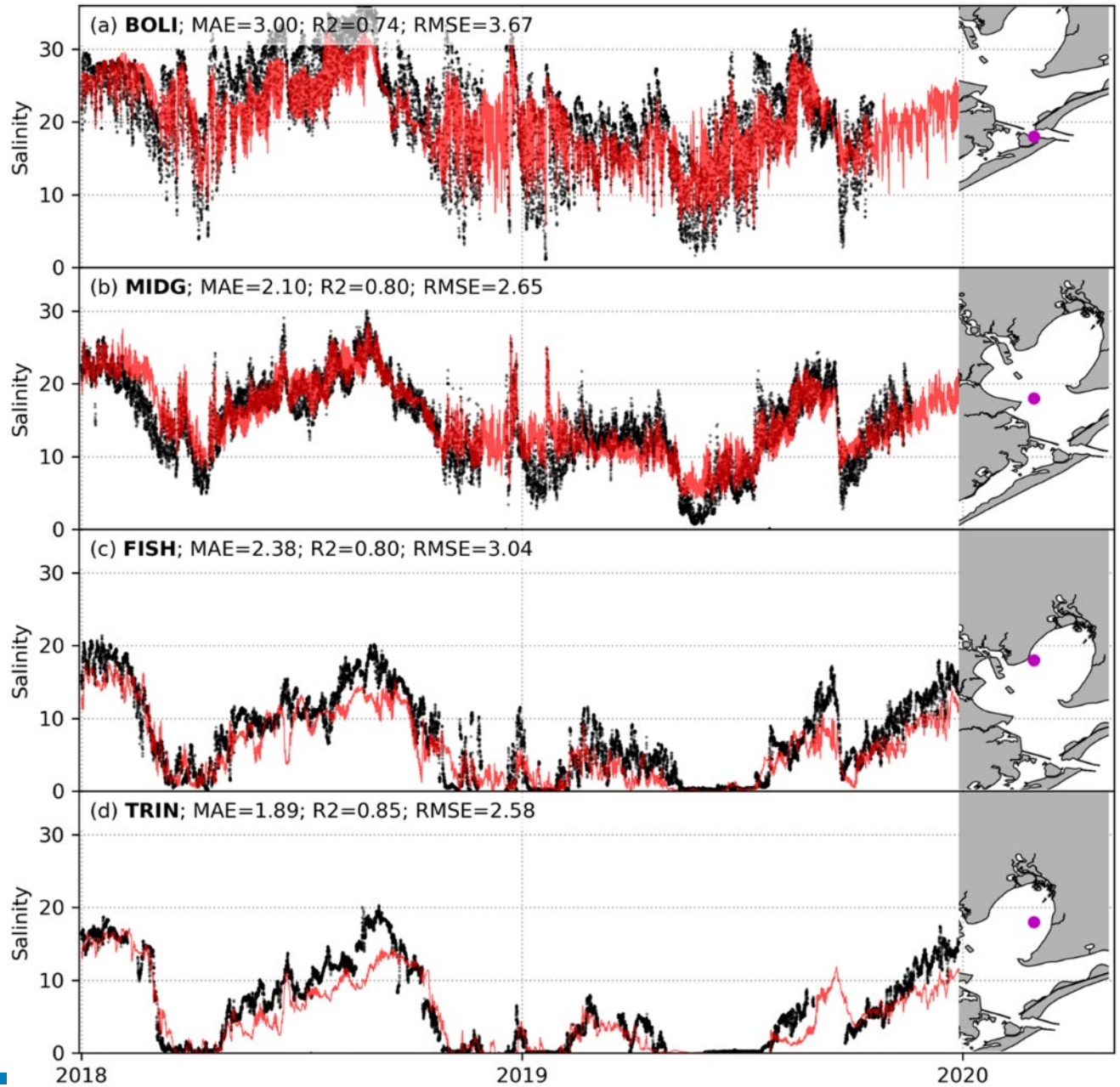


TEXAS WATER DEVELOPMENT BOARD

SCHISM: The next generation of ocean modeling

- Finite Element Model (FEM) with 188,395 elements (118,200 nodes)
- Horizontal resolution varies from 10km in gulf to ~30m in shipping channels
- Vertical resolution varies, with between 10 and 47 layers
- Two tracers (salinity and temperature)
- Fluvial inflows from 25 largest rivers (USGS gages)
- Open boundary forced with tidal harmonics and global HYCOM outputs
- Meteorology from Global Forecast System (GFS)





The New State of the Art for Texas

We have been working closely with collaborators at TAMUG for past two years to refine and calibrate the model.

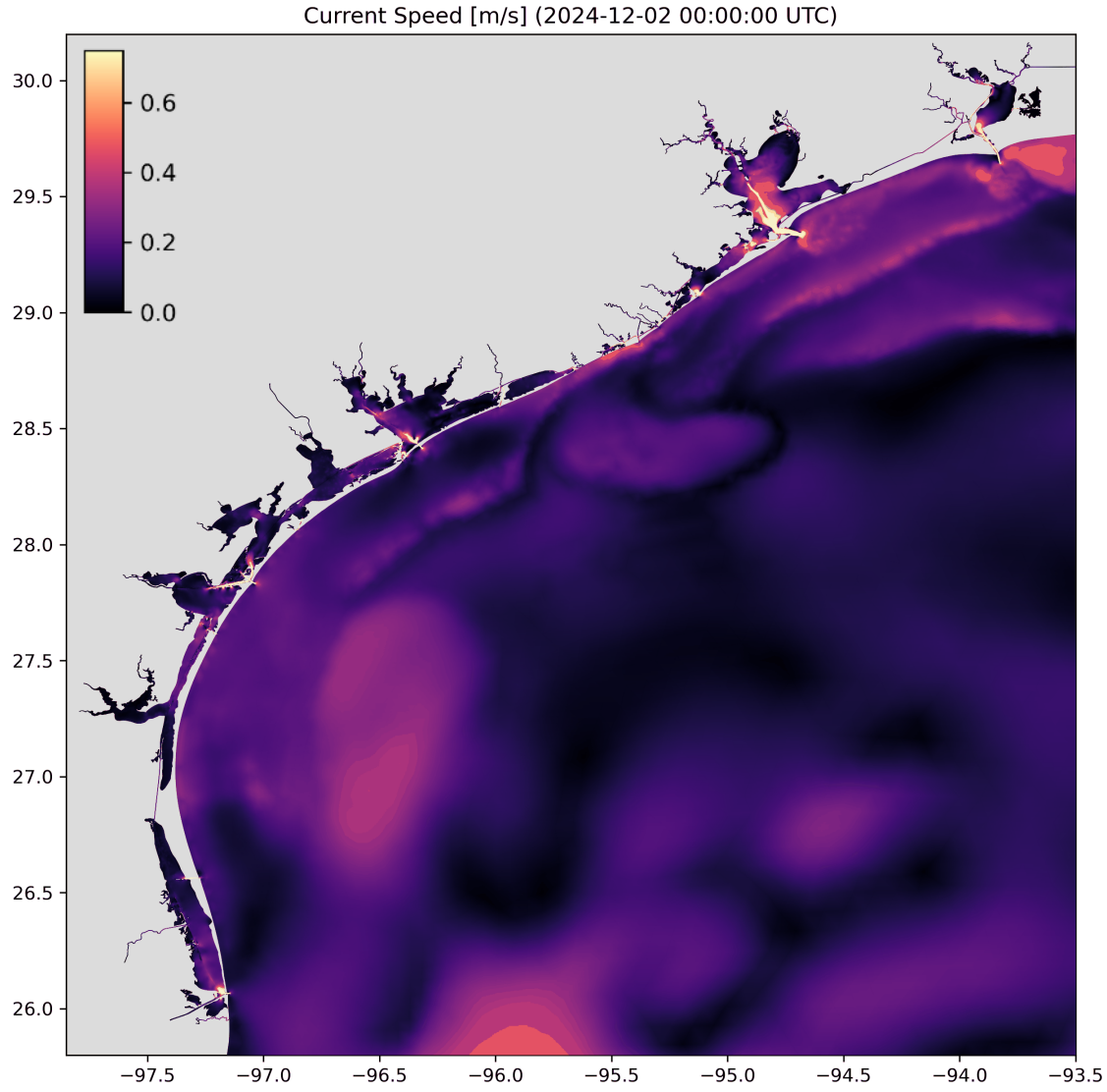
Tested on in-situ water level, salinity, temperature, and currents from multiple source organizations.

The result provides **unprecedented** spatial coverage and accuracy in Texas bays and estuaries.

Bays and estuaries, in real time, on your computer:

The Texas BAYCAST

- In 2025, the TWDB launched the **next-generation** 3D operational hydrodynamic model using the **SCHISM** software.
- Provides real-time and forecasted **currents**, **water level**, **salinity**, and **temperature** for all Texas coastal waters.
- Outputs **freely available** for researchers and first-responders during oil spill events.
- Started contract with TAMUG for Phase II development: **Integrated biogeochemistry** and **compound flooding**.

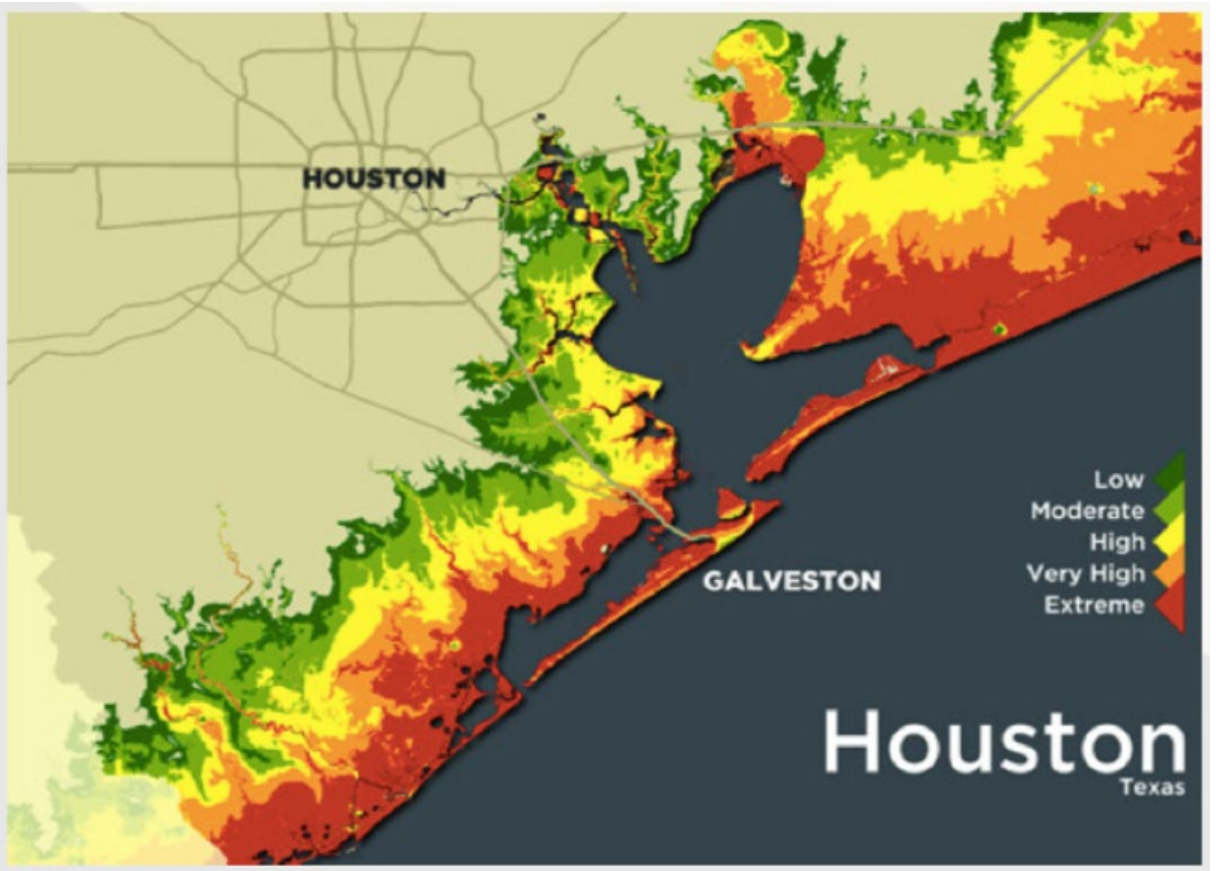


TEXAS WATER DEVELOPMENT BOARD

https://midgewater.twdb.texas.gov/index.html

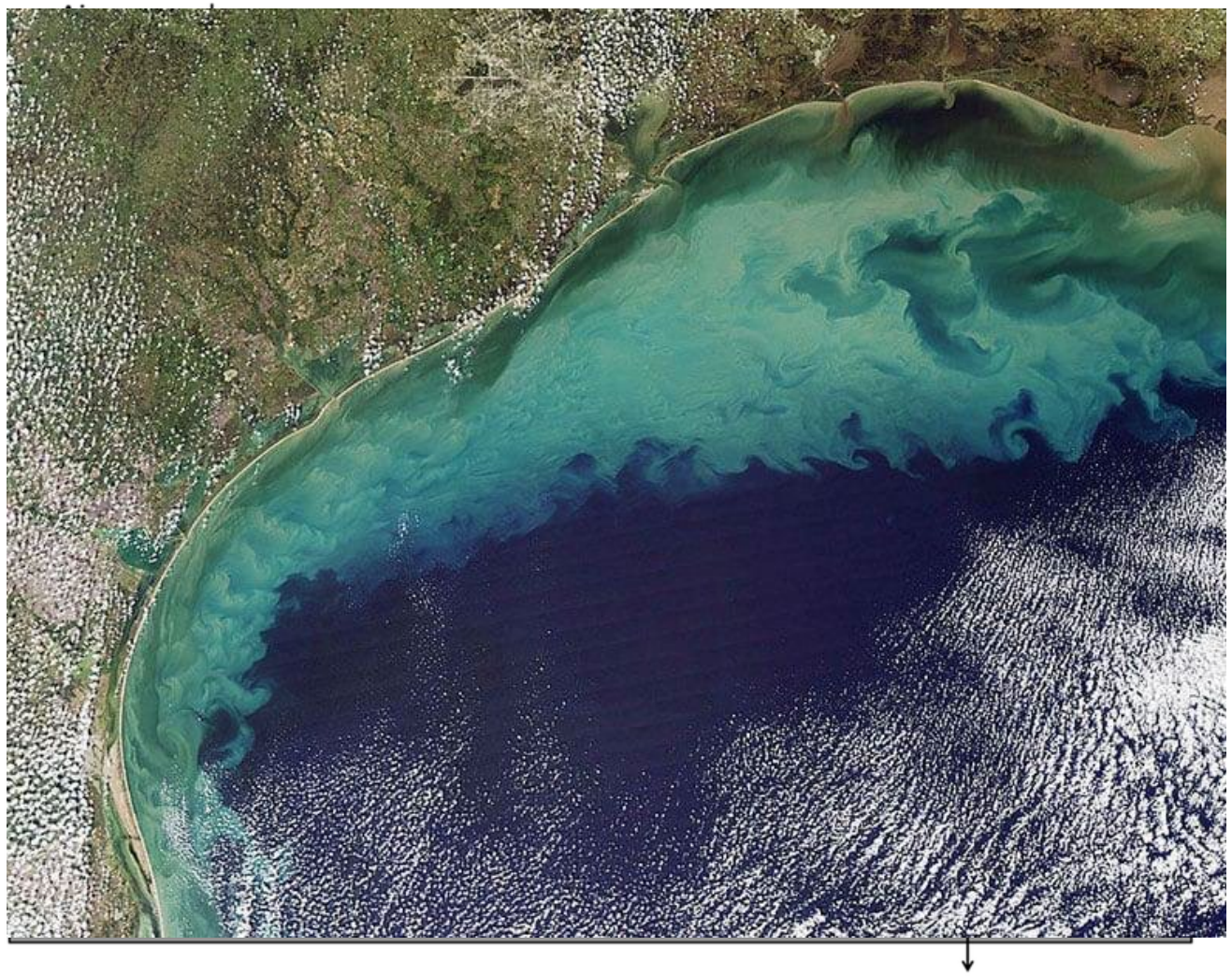
Expanding the Mesh for Flooding Applications

- In the process of adding **low-elevation land**, **intertidal wetlands**, and **transitional floodplains** to the model mesh.
- Will improve our understanding of **compound flood risk**, wetland ecology, and oil spill trajectory modeling during storms.



Houston Regional Storm Surge Risk. Source: CoreLogic, 2013.

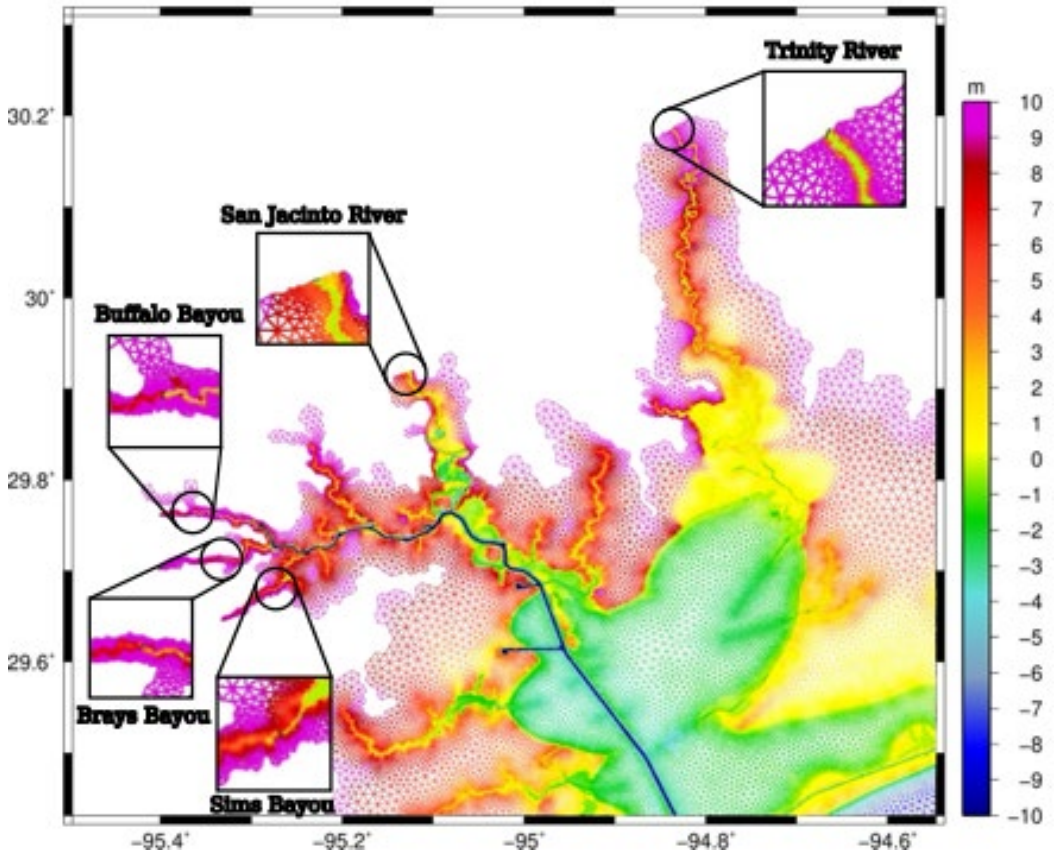
A Digital Chemistry Lab for the Texas Coast

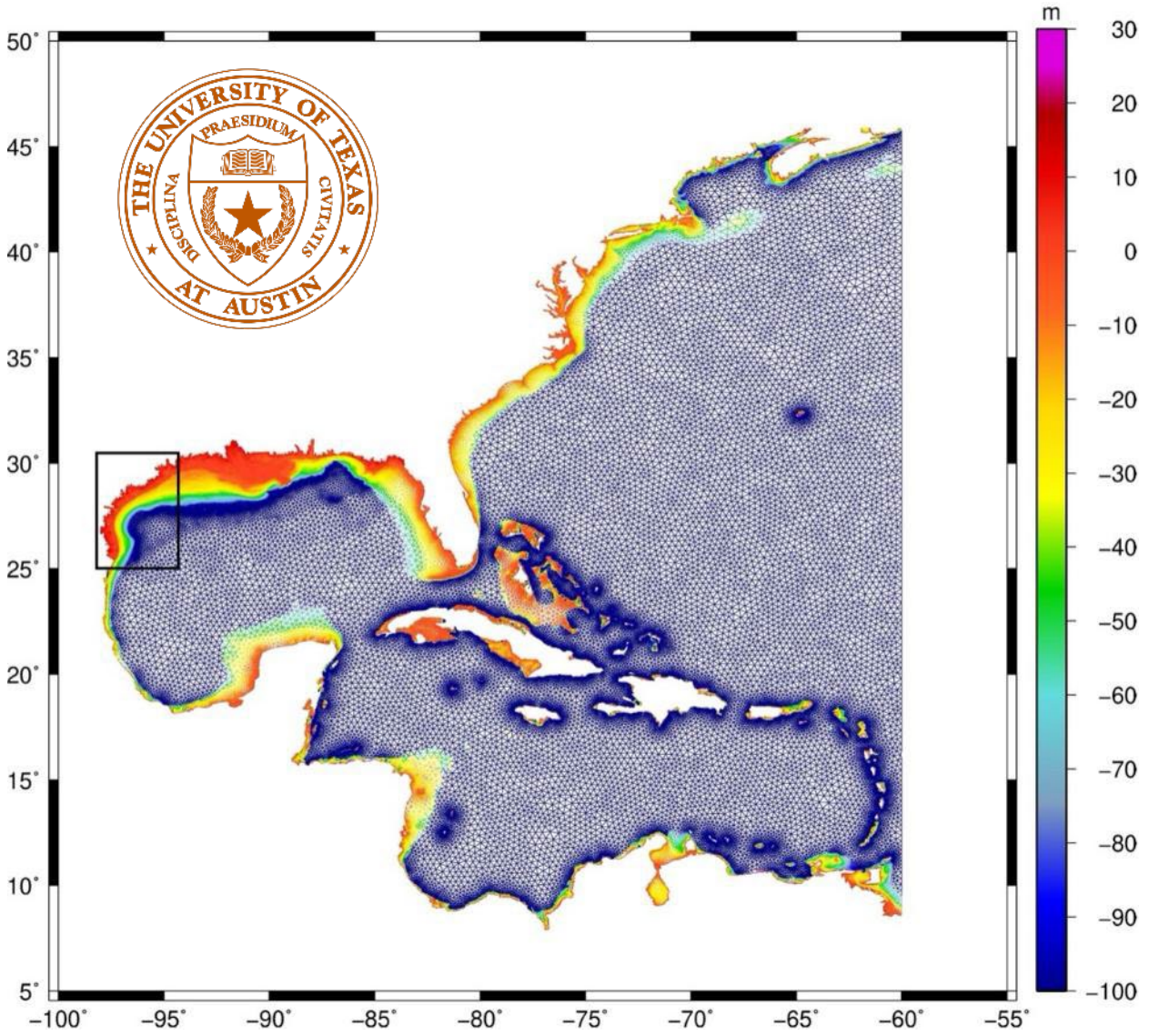


- Integrating the biogeochemistry module **ICM** allows us to model important **water quality constituents** in near-real-time.
- Includes key nutrients like **Nitrogen**, **Oxygen**, **Carbon**, and **Phosphorus**, as well as **phytoplankton** and **algae**.
- Can help us better understand the locations and durations of **coastal dead zones** and fill a critical gap in **ecological** studies.

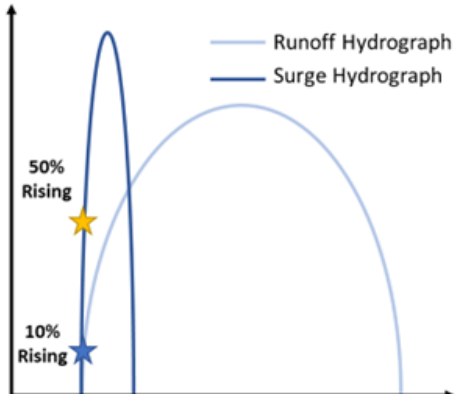
Transition zones for compound flooding (ADCIRC model)

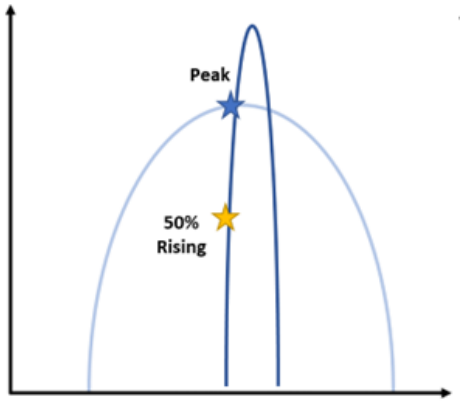
- New mesh contains 15 million finite elements
- Resolution of Texas rivers and floodplains is 30m
- 45 Major Texas rivers added

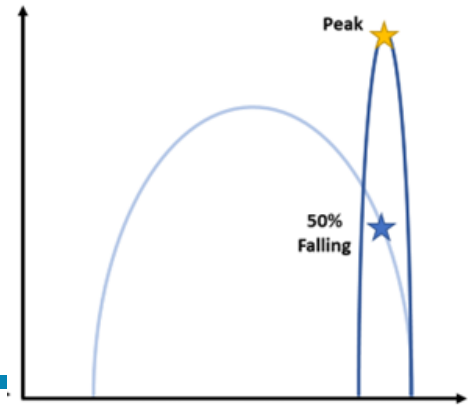


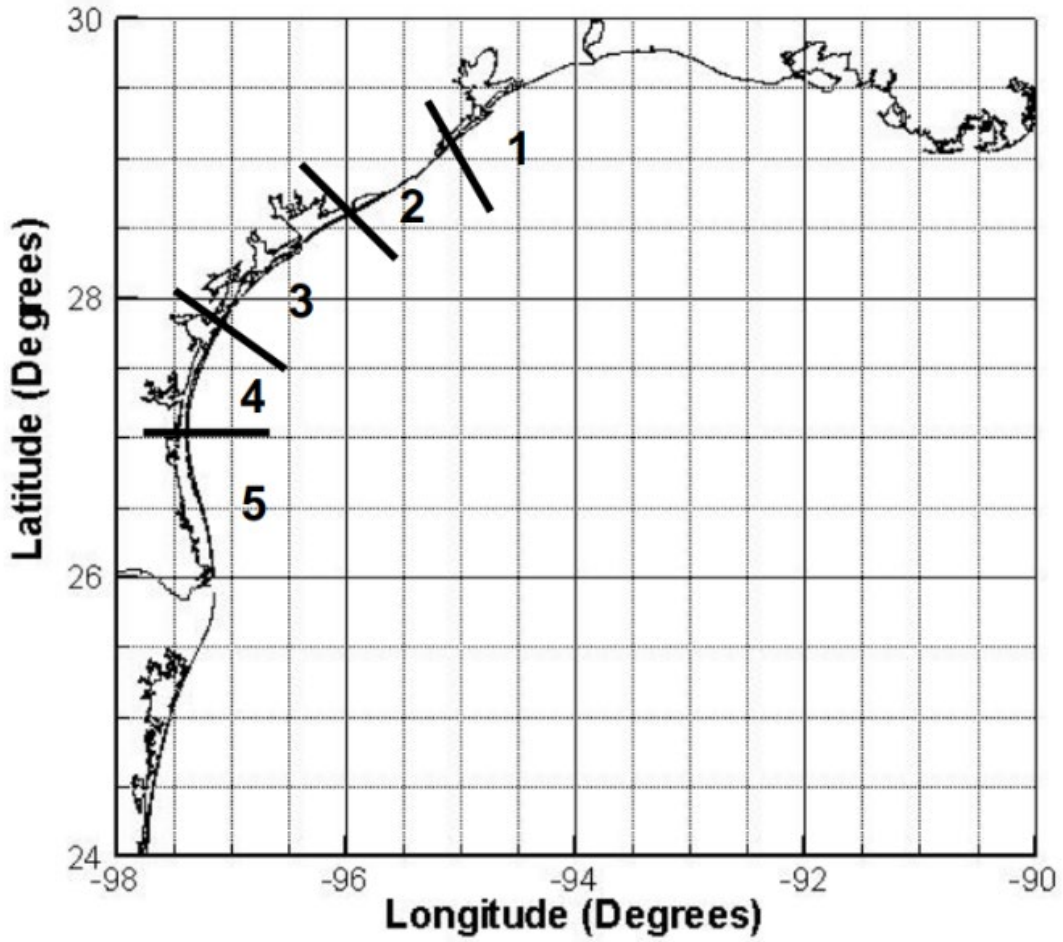


Geographic zones used on Q-Q Plots



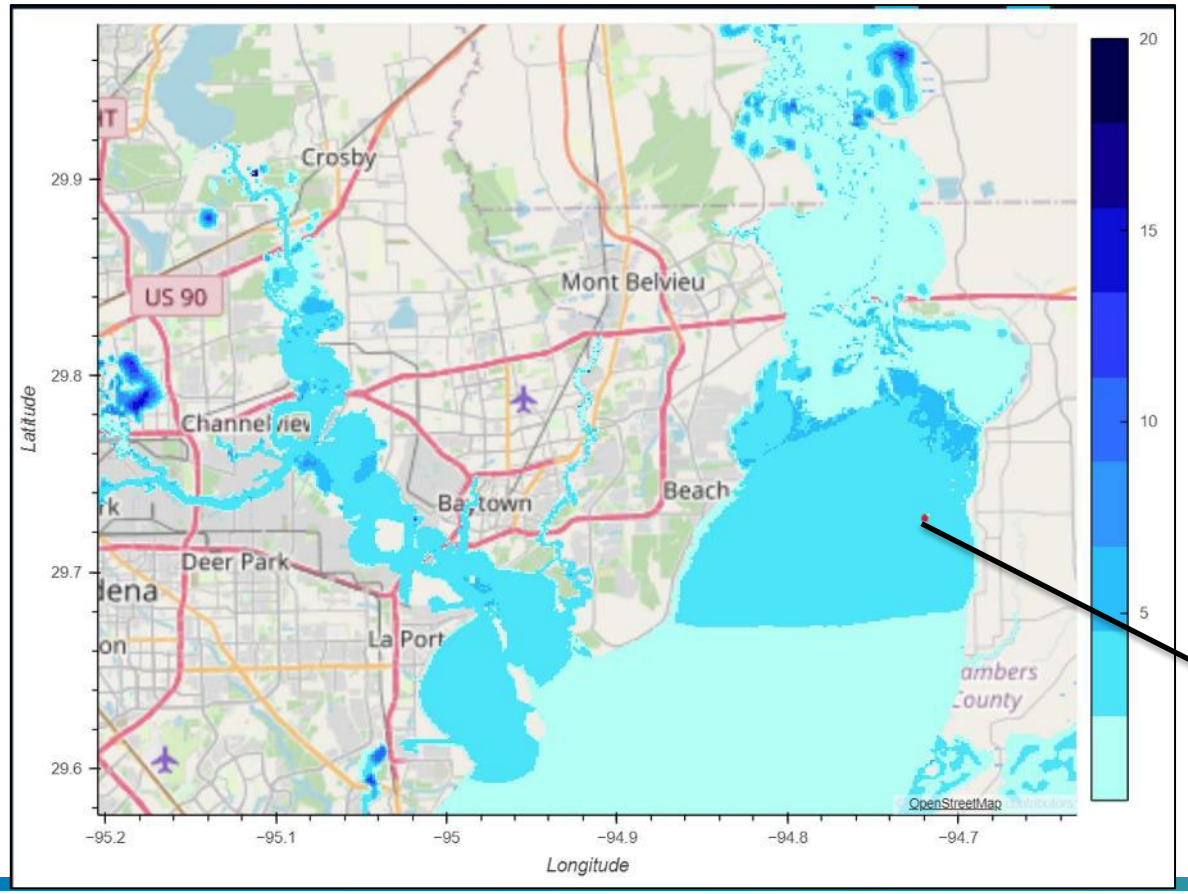




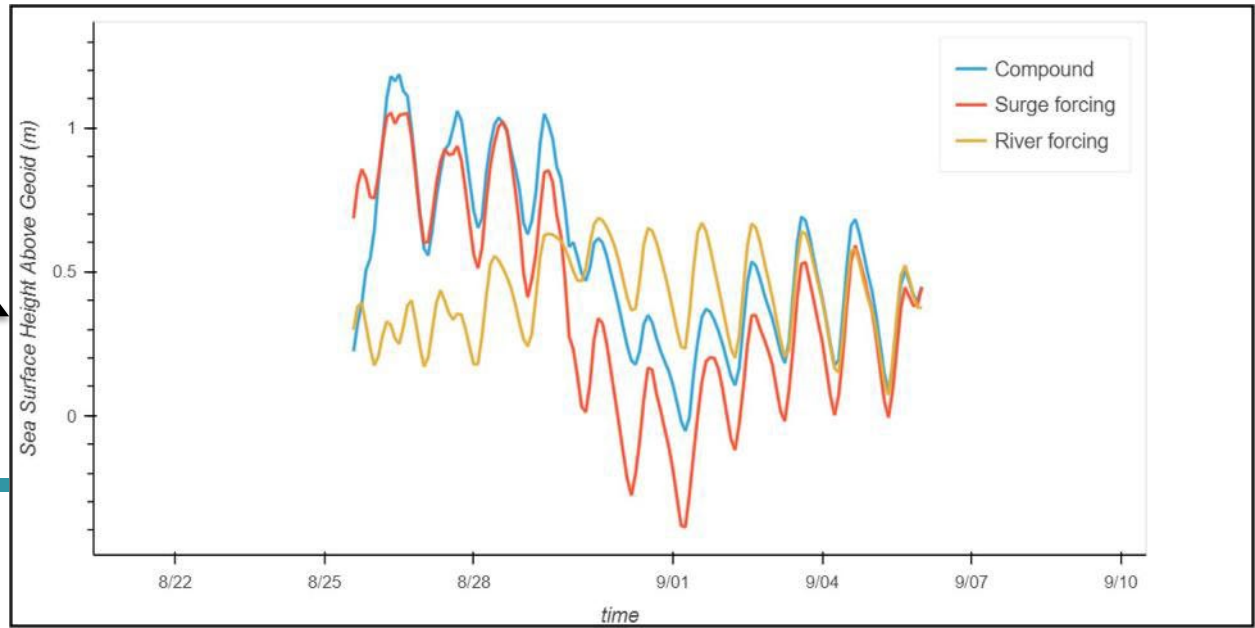


Transition zones for compound flooding

$$compoundness = \min(RMSE(WSE_{rivers+surge}, WSE_{surge}), RMSE(WSE_{rivers+surge}, WSE_{rivers}))$$



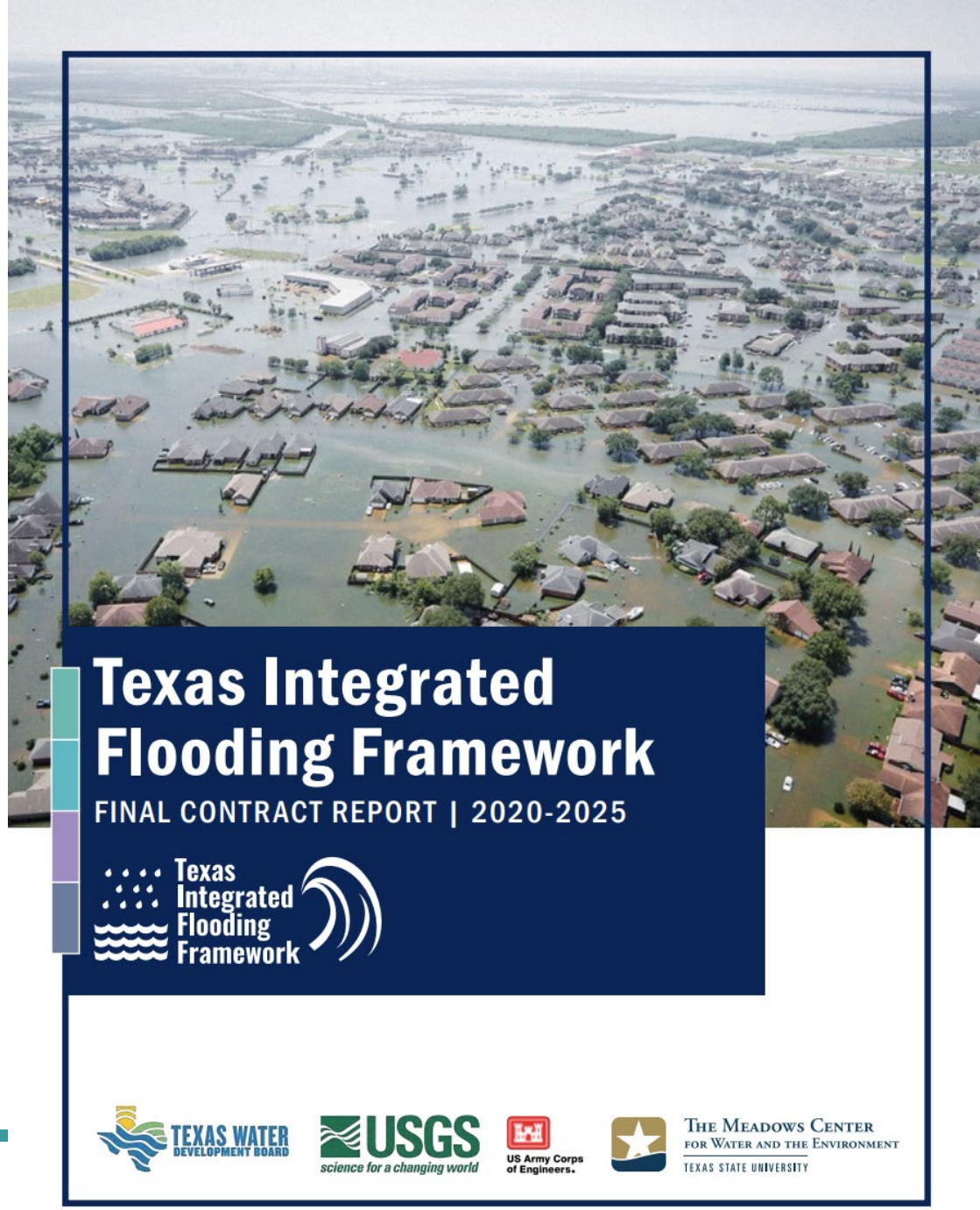
Hurricane Harvey



TIFF Final Contract Report

- 300+ pages and 30+ Supporting Documents
- 50+ individuals touched the report
- Overview of TIFF 2020-2025
- Highlights significance and influence of Technical Advisory Team input and expertise

https://acrobat.adobe.com/id/urn:aaid:sc:US:fff8dc3b-9c1e-414b-8f17-3a21bb143236



TIFF by Pages

- **Deliverables**
  - 3 Annual Reports (Including LRGV)
  - Final Report
    - Total number of pages in Final Report — 1,257
    - Report — 368
    - Appendices — 889
  - 42 Vetted Recommendations
  - Coming soon: LRGV Final Report

TIFF by Contracts

Type of Service	Number
Total number of contracts and subcontracts	14
Total number of amendments	16
Total number of processed invoices	76

TIFF by People

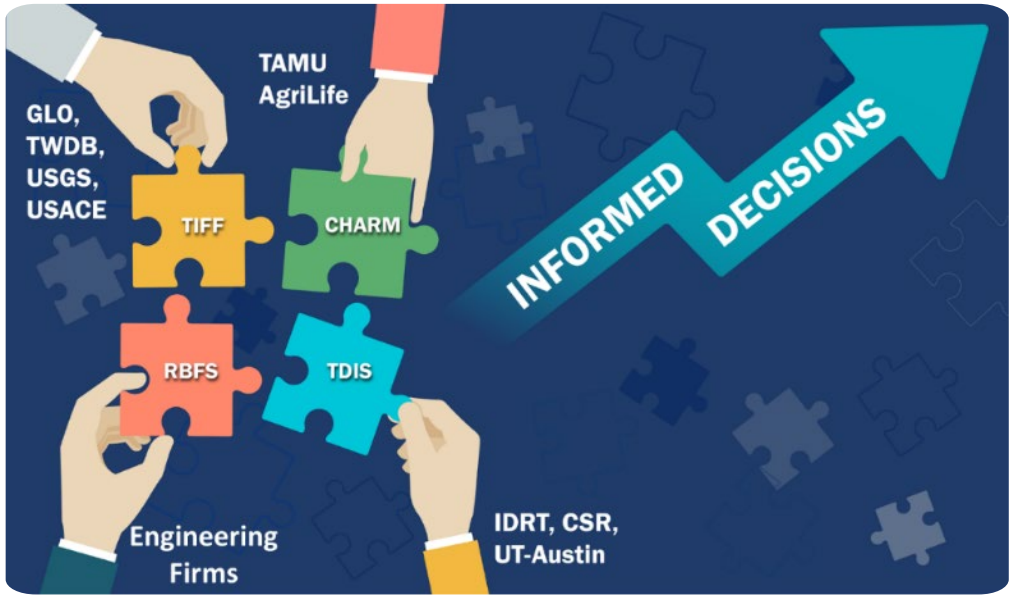
People (186 +)

- 10 Steering Committee Members (past and present)
- 135 Technical Advisory Team (TAT) Members
- 4 Facilitation Team Members
- 2 Project Management Assistants
- Study Providers
    - 8 research teams
        - 35+ researchers

TIFF by Meetings

- 23 TAT Meetings
  - 10 RGV TAT Meetings
- 12 Brown Bags
- 7 Workshops
- 4 TIFF SC/TDIS Quarterly Meetings
- 88 SC/Leadership Meetings
- 120+ contract biweekly meetings

TIFF by Collaborations/Relationships



- Community Health and Resource Management (CHARM)
- GLO Combined River Basin Flood Studies, conducted by various Engineering Firms
- Interagency Flood Risk Management (InFRM)
- National Oceanographic and Atmospheric Administration (NOAA)
- Regional Flood Planning Groups (RFPGs) or their Coastal Liaisons
- Texas Coastal Master Resiliency Plan
- Texas Disaster Information System (TDIS)
- Institute for a Disaster Resilient Texas (IDRT)
- TWDB Community Assistance Program
- Engineering Firms
- Texas Coastal Master Resiliency Plan
- City of Philadelphia
- Federal Highway Administration

Questions/Discussion

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Component 1: Recommendations for Improved Data & Monitoring Gap Analysis

1. **Enhance the Coastal Data Surfer** – Strengthen partnerships between TIFF, TDIS, and GLO's RBFS to create a robust framework for coastal flood data visualization and evaluation.
2. **Expand Measurement Networks** – Increase coverage of measurement networks in under-sampled areas prioritized by flood frequency and severity.
3. **Establish Nearshore Wave Data Collection Network** – Build a nearshore wave monitoring system to improve forecasting and coastal risk assessment.
4. **Develop and Maintain a Centralized Subsidence Monitoring Dashboard** – Create a user-friendly platform to consolidate and analyze subsidence data for coastal planning.
5. **Collect, Process, and Integrate High-Resolution Land Cover Data to Enhance Flood Models** – Incorporate 1-meter resolution land cover data into Texas coastal flood modeling systems.
6. **Collect Bathymetric Data for Priority Areas** – Gather bathymetric data in critical coastal zones to strengthen flood modeling and forecasting.
7. **Operate Testing Sites for Water Monitoring Devices** – Establish coastal testing sites to ensure reliability and compliance of water monitoring technologies.
8. **Assess Extent of High-Frequency Radar Accuracy for Wave Measurements** – Evaluate HF radar systems for improving wave and current measurement accuracy.

ZOOMING IN: TIFF'S PRIORITY RECOMMENDATION FOR ONGOING COASTAL FLOOD DATA INVENTORY AND GAP ANALYSIS

The Coastal Data Surfer (TIFF Recommendation C1.2A)

This robust web application is built on top of products, tools, and Application Programming Interfaces (APIs) generated by various data service providers. As any inventory (including data repositories) is only as current as its latest update, this web interface will consistently expand its scope by incorporating publicly available databases from diverse sources, thereby securing its enduring relevance, utility, and sustainability. This information will empower coastal communities to better prepare for future floods and protect lives and property. A suite of critical features for conducting coastal flood analysis will include a user-friendly interface to enable users to seamlessly define desired study areas on interactive maps, ensuring effortless visualization of relevant geographic regions. The scope extends beyond visualization, incorporating a deep understanding of the unique data prerequisites associated with diverse forms of analysis tied to inland and coastal areas – encompassing inundation modeling to risk assessment. The tool helps address critical coastal flood planning challenges, including:

- identifying data gaps that could impact flood modeling and mitigation planning by highlighting spatial and temporal data gaps that currently prevent informed mitigation planning and modeling efforts
- streamlining the process of finding relevant datasets for specific projects
- enhancing collaboration between agencies and researchers by providing a centralized, interactive platform for data exploration
- highlighting coastal data needs that could aid in improving the accuracy and efficiency of flood modeling efforts, leading to better flood predictions and risk assessments

KEY FUNCTIONS OF THE COASTAL DATA SURFER

By integrating interactive mapping, expanded dataset access, and modeling support, the TIFF-informed CDS will directly contribute to better flood preparedness, response, and mitigation efforts across Texas, ultimately reducing risks to communities, infrastructure, and ecosystems. The CDS will serve as 1) an adaptable data and model repository, 2) a coastal data inventory, 3) a tool for performing ongoing data gap analysis, 3) an interactive mapper, and 4) a catalog of model inputs:

1. **Adaptable Data and Model Repository** - The data availability web interface aims to help decision-makers identify future data collection needs to support flood assessments and planning by compiling readily available published flood-related datasets into a single, simplified, categorized, and readily accessible database. The TIFF dataset aggregates a diverse set of contributions from federal, state, local, academic, and nonprofit institutions. Each source provides datasets in various formats, such as GIS layers, tabular data, reports, images, and other digital products, which are essential for flood modeling, hazard analysis, and planning. Major data sources in the CDS include:
   - **USGS**: 26 datasets, including reports, GIS layers, tabular data, and images
   - **TWDB**: 25 datasets, covering reports, GIS layers, tabular data, and images
   - **NOAA**: 15 datasets, including GIS layers, tabular data, images, and other formats
   - **Environmental Information Exchange Network**: 7 tabular datasets relevant to environmental and water quality parameters
   - **FEMA**: 6 datasets, comprising GIS layers, tabular data, reports, and images
   - **Utah Climate Center**: 6 datasets, including GIS layers, tabular data, and images useful for climate and weather analysis

Component 2: Recommendations for Improved Data Management & Visualization

9. **Study User Interactions with Flood Risk Visualizations** – Research how different visualization tools affect user understanding of flood risk.
10. **Assess Public Evacuation Decision-Making** – Examine how local knowledge shapes evacuation choices during flood events.
11. **Replace Frequency-Based Terminology in Flood Communication** – Develop clearer language alternatives to terms like “100-year flood” for better public understanding.
12. **Implement TIFF Guidelines for Coastal Flood Information Design and Communication** – Apply standardized guidelines to improve clarity and effectiveness of flood risk communication.
13. **Create Flood Risk Reduction Planning Cards** – Develop concise planning cards to assist communities in flood risk reduction strategies.
14. **Share Lessons of Texas’ Flood History** – Provide public resources on historical floods to inform future preparedness.
15. **Standardize Grantee Shapefiles** – Require funded projects to submit standardized shapefiles for consistency in data management.
16. **Study and Develop Alternatives to Menu-Driven Dashboards** – Explore new approaches to make flood risk information more accessible to target users.

ZOOMING IN: TIFF'S PRIORITY RECOMMENDATION FOR ONGOING COASTAL FLOOD DATA MANAGEMENT AND VISUALIZATION

The TIFF Guidelines for Coastal Flood Information Design and Communication (TIFF Recommendation C2.3A)

The TIFF Communication Guidelines (Supporting Material 2-1) are meant to establish clear objectives for the design of information tools and communication approaches that inform flood risk decisions. Designs should strive to motivate behavior change that is based on the best available knowledge and information.

STEP #1: DETERMINE OBJECTIVE OF THE FLOOD PRODUCT DESIGN

STEP #2: IDENTIFY AND ALIGN WITH TARGET USERS TO TAILOR INFORMATION

- Use "Behavioral Archetype" techniques to select target users
- Involve target users via interviews, focus groups, and user experiments
- Confirm target user needs and decision types
- Determine engagement tools, like visualizations, that best communicate the project objectives
- Confirm that selected visualization & communication approaches meet target user needs and project objectives
- Engage with related stakeholders periodically to exchange perspectives and confirm shared understandings

STEP #3: DESIGN PRACTICES THAT LEAD TO MEANINGFUL COMMUNICATION

- Design should address basic functionality, reliability of information, and usability capable of supporting task-oriented activities
- Use human-centered/experiential approaches (e.g., accessibility, interactivity with information) to achieve meaningful representations for target user groups

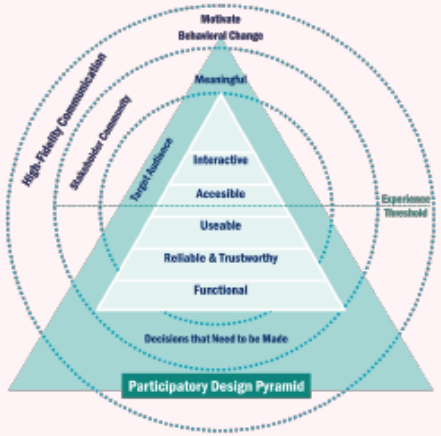

Figure 2-1. Participatory Design Pyramid

Component 3: Recommendations for Improved Integrated Flood Modeling Framework

17. **Advance Hydraulic Modeling Simulations with HEC-RAS Distributed-Memory Parallelization** – Enhance computational efficiency for large-scale hydraulic simulations.
18. **Establish Guidelines for Nature-based Features to Reduce Flood Risk** – Develop best practices for implementing natural solutions to mitigate coastal flooding.
19. **Develop Rapid Predictions of Flooding Hazards** – Create tools for quick flood hazard forecasting to support emergency response.
20. **Develop Database of Flood Modeling Studies** – Compile a comprehensive database of modeling studies and datasets for improved risk assessment.
21. **Enhance Wave Models and Data to Improve Accuracy in Populated Areas** – Upgrade wave modeling to better represent coastal flooding in urban zones.
22. **Automate Topography and Bathymetry Data Processing** – Build automation tools for efficient processing of high-resolution coastal data.
23. **Evaluate the Analysis of Record for Calibration** – Assess AORC data for its suitability in flood hazard analysis.
24. **Advance Artificial Intelligence/Machine Learning Techniques for Flood Modeling** – Apply AI/ML to improve predictive accuracy and modeling efficiency.

ZOOMING IN: TIFF'S PRIORITY RECOMMENDATION FOR ONGOING COASTAL INTEGRATED FLOOD MODELING

The Texas Coastal Flooding Framework (TIFF Recommendation C3.5A)

TIFF recommends the development of a collaborative software platform for compound flood assessment to facilitate planning, design, development, flood recovery, and supporting emergency response efforts along the Texas coast.

The state-of-the-art and the underlying context of models for coastal and compound flood inundation modeling and hazard analysis (see Understanding Flood Modeling above and the Model Coupling Workflow Workshop described in Supporting Material 3-10) leads to some observations on the paths forward for Texas. These ideas and considerations are generally applicable to any coastal flood modeling/analysis effort but are specifically address the complexities of Texas compound flooding. A critical need is for a software framework that encapsulates models and their coupling with analysis tools and workflows.

The TxCFF should be a data and modeling system that provides 1) data linkages to existing databases, 2) data transfer between models, 3) a user interface to setup and execute the models as a coupled system, and 4) integration of the output data from component models into a coherent data set for further analysis and visualization. The TxCFF would streamline model coupling workflows, enhance data integration from federal, state, and local sources, and support widespread application through testbeds across the Texas coastal plain.

The path forward is ambitious and will require sustained investment, interagency cooperation, and technical innovation. However, the anticipated benefits are profound. A fully realized TxCFF will enable local and state entities to better quantify and manage flood risks, reduce redundancy in engineering efforts, and dramatically lower the costs associated with flood hazard assessments and infrastructure planning. By transforming the current fragmented landscape into a reusable and extensible framework, the TxCFF will not only advance the state-of-the-science—it will redefine the future of flood resilience across the Texas coastal plain.

The TxCFF would consist of:

- wind and pressure model
- ocean circulation model
- wind/wave model (far field and near field)
- flood inundation (hydraulics) model for river flow and landscape flooding
- upland runoff model (hydrology)
- stormwater drainage model
- groundwater model
- code for input/output
- code for user customization
- code for coupling the various flood inundation component models
- coupling to external meteorological (storm) models/data sets for historic and synthetic storms
- code for calibration, validation, and testing of inundation models
- code for ingesting flood inundation model results into flood hazard analysis
- flood hazard analysis tools
- code for visualizing inundation and hazard analysis results

At the simplest level, the TxCFF could begin as documented workflows for coupling models and data along with codes developed for pre-processing, post-processing and analysis. Over time, the workflows can be codified into a software framework that addresses the key issues of re-usability, access, training, simplification/complexity, and uncertainty. Developing the TxCFF would require a long-term commitment of funds to a consistent project development team that collaborates with agency-sponsored modeling projects to ensure their work can be integrated into the framework. The benefits of integrating hydrologic, hydraulic, meteorologic, estuarine, and coastal models into a single, interoperable system and making advanced compound flood analysis accessible to a broader user base, including planners, engineers, and policymakers far outweigh the costs.

Component 3: Recommendations for Improved Integrated Flood Modeling Framework

25. **Integrate Urban Stormwater and Flood Hazard Hydrodynamics Model Applications** – Combine stormwater and flood models for holistic urban flood risk analysis.
26. **Quantify the Impacts of Erosion on Storm Surge** – Investigate how erosion influences storm surge dynamics.
27. **Quantify Wind-Driven Inland Flows to Enhance Flooding Models** – Address gaps in inland flooding models by incorporating wind-driven flow physics.
28. **Advance Use of the Joint Probability Method in Compound Hazard Assessment** – Improve compound hazard analysis using joint probability approaches.
29. **Develop a Tropical Cyclone Rainfall Generator** – Create a high-resolution tool for simulating tropical cyclone rainfall across Texas.
30. **Quantify Sensitivities of Existing Models** – Analyze how uncertainties in key parameters affect flood model outputs.
31. **Conduct Retrospective Modeling of Historic Landfalling Hurricanes** – Perform detailed modeling of past hurricanes to refine predictive capabilities.
32. **Texas Coastal Flood Framework (TxCFF) Development** – Build a comprehensive framework for compound flood assessment and emergency planning.

ZOOMING IN: TIFF'S PRIORITY RECOMMENDATION FOR ONGOING COASTAL INTEGRATED FLOOD MODELING

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Component 4: Recommendations for Improved Flood Communications

33. **Incorporate Flood Literacy in K-12 Education** – Integrate flood preparedness and education into school curricula to build resilience among students and families.
34. **Establish TDIS Online Learning Center** – Create a publicly accessible learning hub to organize and share flood-related educational resources.
35. **How to Use Flood Risk Maps for Preparedness** – Promote community engagement by teaching effective use of flood risk maps for planning and preparedness.
36. **Establish State Flood Communication Officer** – Appoint a dedicated officer to coordinate flood-related communications across agencies and organizations.
37. **Enhance Texas Coastal Structures Inventory** – Improve the inventory of coastal structures to support better planning and disaster mitigation efforts.
38. **Develop a Framework for Hazard and Loss Assessments** – Design a standardized framework for evaluating hazards and losses to aid insurance, planning, and prediction.
39. **Target Selected TIFF Target Users with Specialized Graphics** – Update and tailor flood communication graphics for key user groups, including property owners, renters, and those with limited English proficiency.
40. **TexasFlood.org Branding Campaign** – Launch a branding and outreach campaign to increase awareness and usage of TexasFlood.org resources.
41. **Better Understand Stakeholder Social Norms as Related to Flood Decision-Making** – Conduct research on social norms to inform strategies for influencing flood-related decisions.

ZOOMING IN: TIFF'S PRIORITY RECOMMENDATION FOR ONGOING COASTAL FLOOD PLANNING AND OUTREACH

Establish a Texas Flood Coordination Office (TFCO) (TIFF Recommendation C4.5B)

Flooding poses a persistent and growing threat to communities, infrastructure, and ecosystems across Texas. To better prepare for and respond to these challenges, state and regional flood planners need coordinated access to information, planning tools, and technical support.

Currently, multiple state and federal agencies, private and non-profit organizations, and academic institutions are engaged in efforts to raise awareness and respond to floods. However, without a centralized coordinating body, the extensive work being done often overlaps, creating redundancies, inefficiencies, and missed opportunities to leverage project outcomes.

TIFF recommends Texas legislators establish a Texas Flood Coordination Office (TFCO) within an existing state agency.

The TFCO would:

- centralize and streamline flood-related efforts
- create and maintain an official statewide database of past and ongoing projects
- provide technical support to state and regional planners
- enhance collaboration among agencies, institutions, and stakeholders
- reduce redundancy and maximize the impact of state and federal investments
- formalize and expand beyond the current volunteer-based efforts

KEY OBJECTIVES OF THE TEXAS FLOOD COORDINATION OFFICE

By centralizing information and oversight, the TIFF-informed TFCO will enhance the state's ability to manage and mitigate flood risks efficiently. The TFCO will 1) centralize state- and federally funded flood projects in one central body, 2) facilitate collaboration among stakeholders to build partnerships and shared solutions, 3) maintain a central archive of project outcomes and share findings with stakeholders, 4) reduce redundancy to ensure efficient use of state and federal resources, and 5) report to the Legislature on the state of flood projects and recommend improvements for flood management.

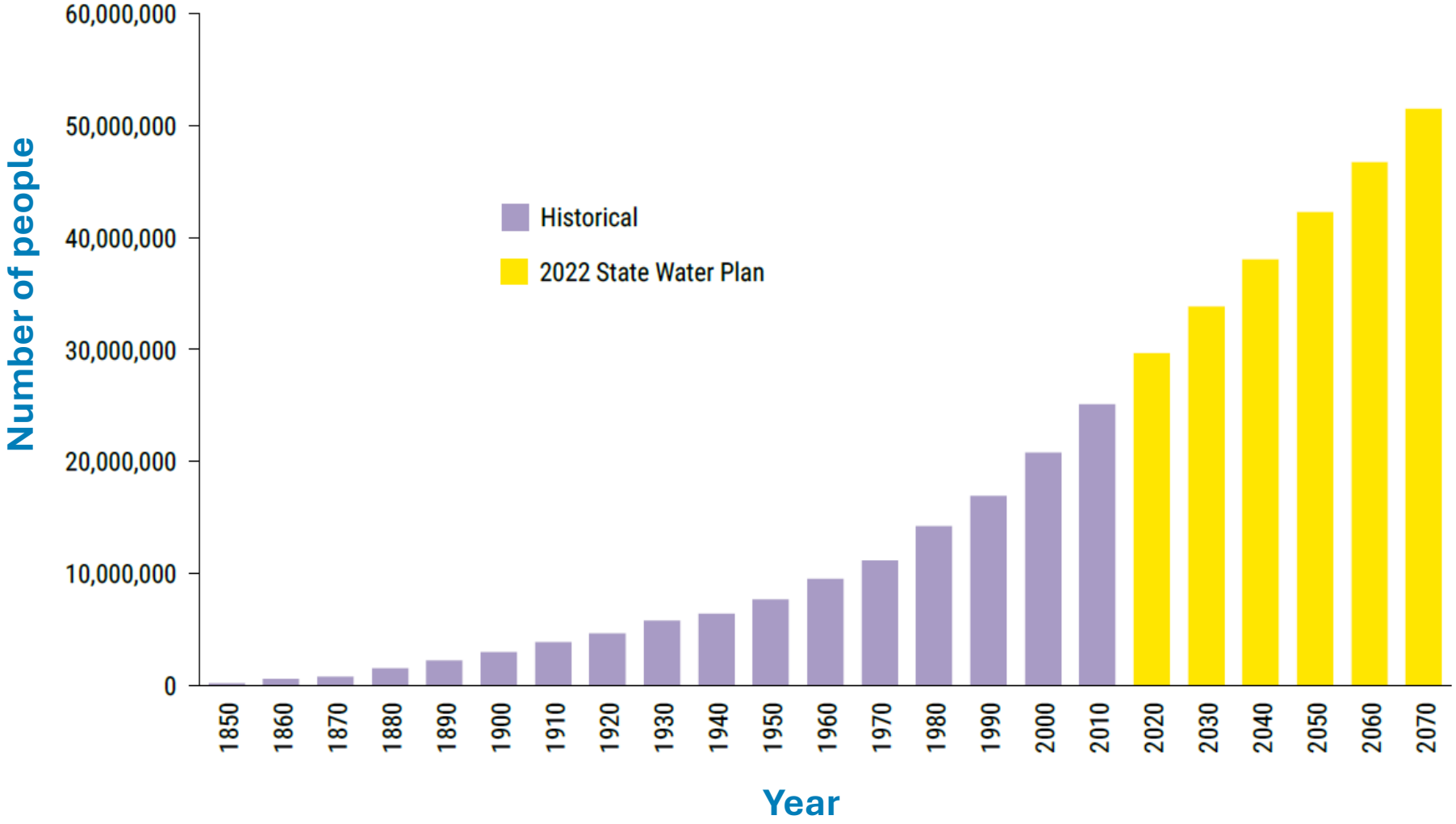
1. **Centralized Oversight of Flood Projects** - The TFCO will oversee all state and federally funded flood-related projects, ensuring that efforts are aligned, complementary, and not duplicated. The Office will maintain a central database of ongoing and completed projects (including information on scope, funding, and progress) to improve coordination and transparency. This oversight will help decision-makers allocate resources more effectively and ensure future flood projects address the state's most pressing needs.

2. **Facilitation of Collaboration** - The Office will actively encourage collaboration among state agencies, academic institutions, non-profits, and private sector organizations to promote innovation and more effective flood management. It will serve as a neutral convener, bringing stakeholders together to foster partnerships and shared solutions. This coordinated approach will help break down silos, align diverse expertise towards state goals, and lead to more efficient project implementation.

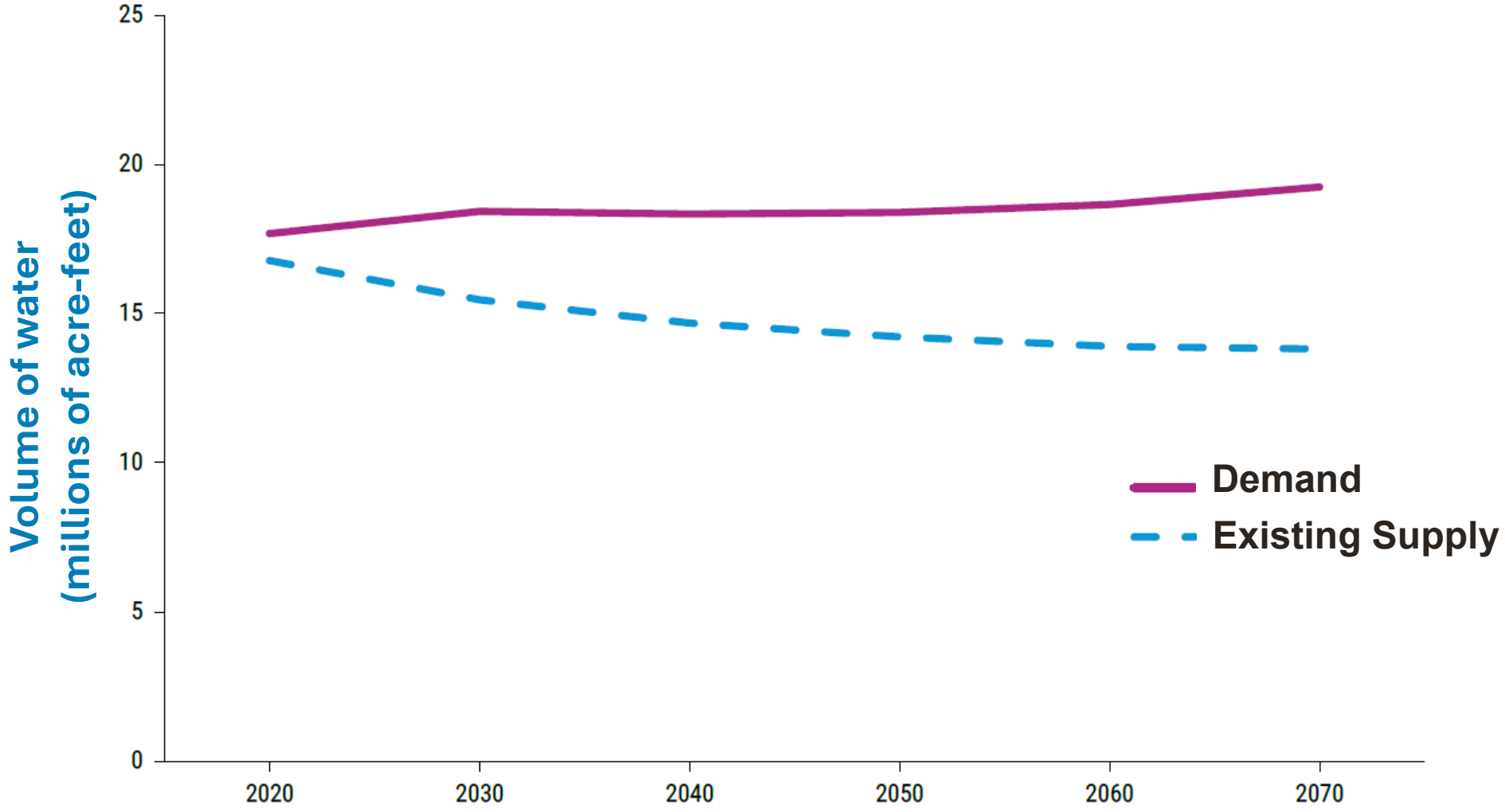
3. **Archiving and Dissemination of Findings** - All project outcomes, data, reports, and findings will be archived in a central repository managed by the TFCO. This information will be made accessible to all relevant parties, promoting transparency and knowledge sharing. The TFCO will ensure that results from projects are effectively disseminated among key stakeholders and can be leveraged in future flood mitigation efforts. By disseminating project findings, the Office will ensure that valuable insights from past projects inform future flood mitigation efforts.

4. **Reduction of Redundancy** - Through its oversight and coordination roles, the TFCO will reduce unnecessary duplication

The population in Texas is expected to increase 73 percent over the next 50 years

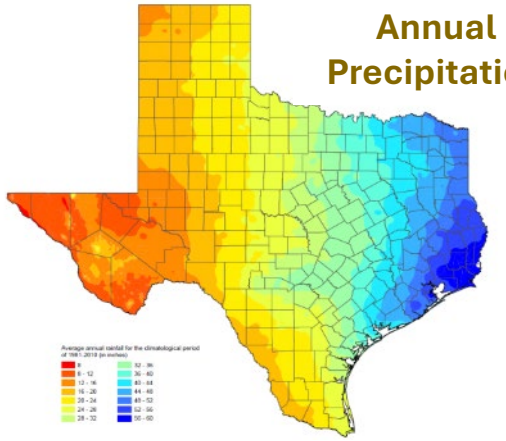


Texans face a potential water shortage of 7 million acre-feet in 2070 in drought of record conditions

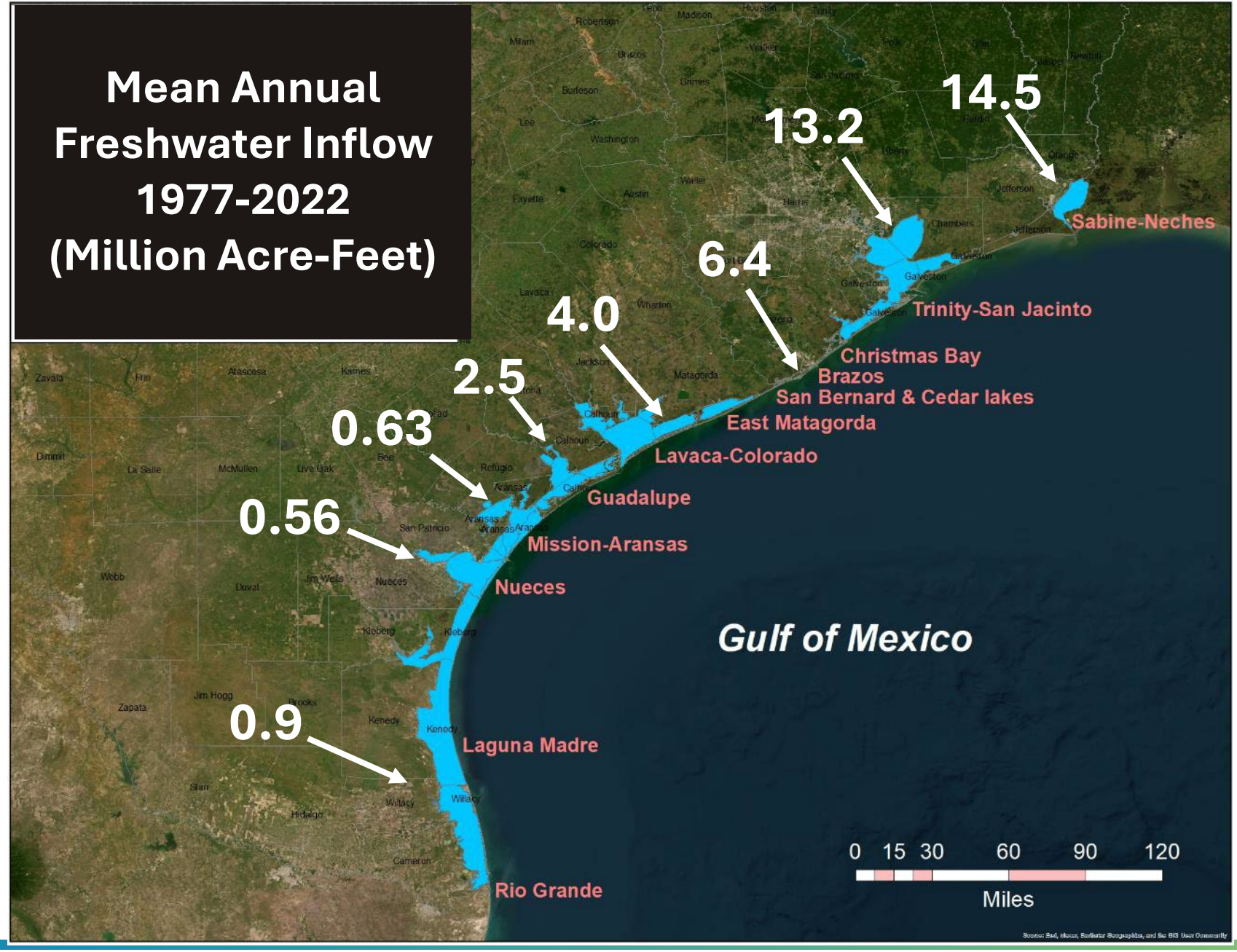


TEXAS WATER DEVELOPMENT BOARD

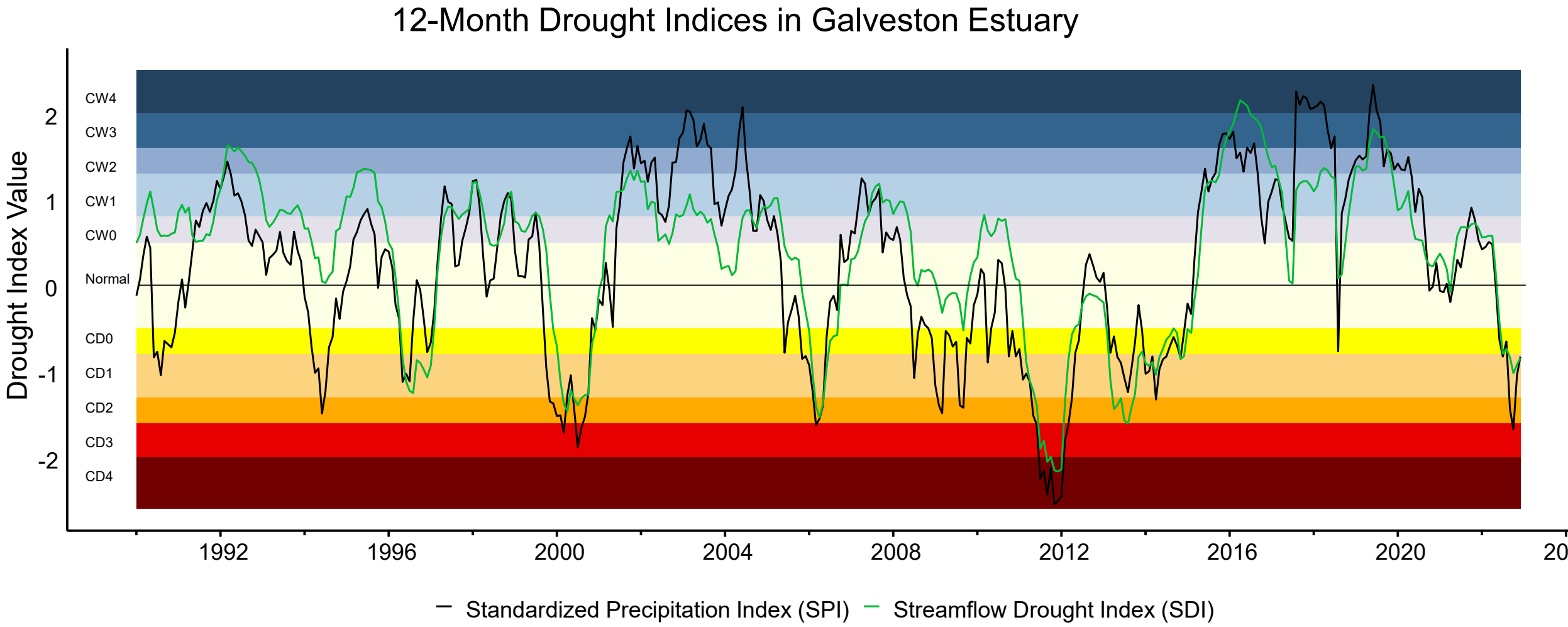
Freshwater inflows to Texas estuaries are driven by the precipitation gradient across the state.



Annual Precipitation

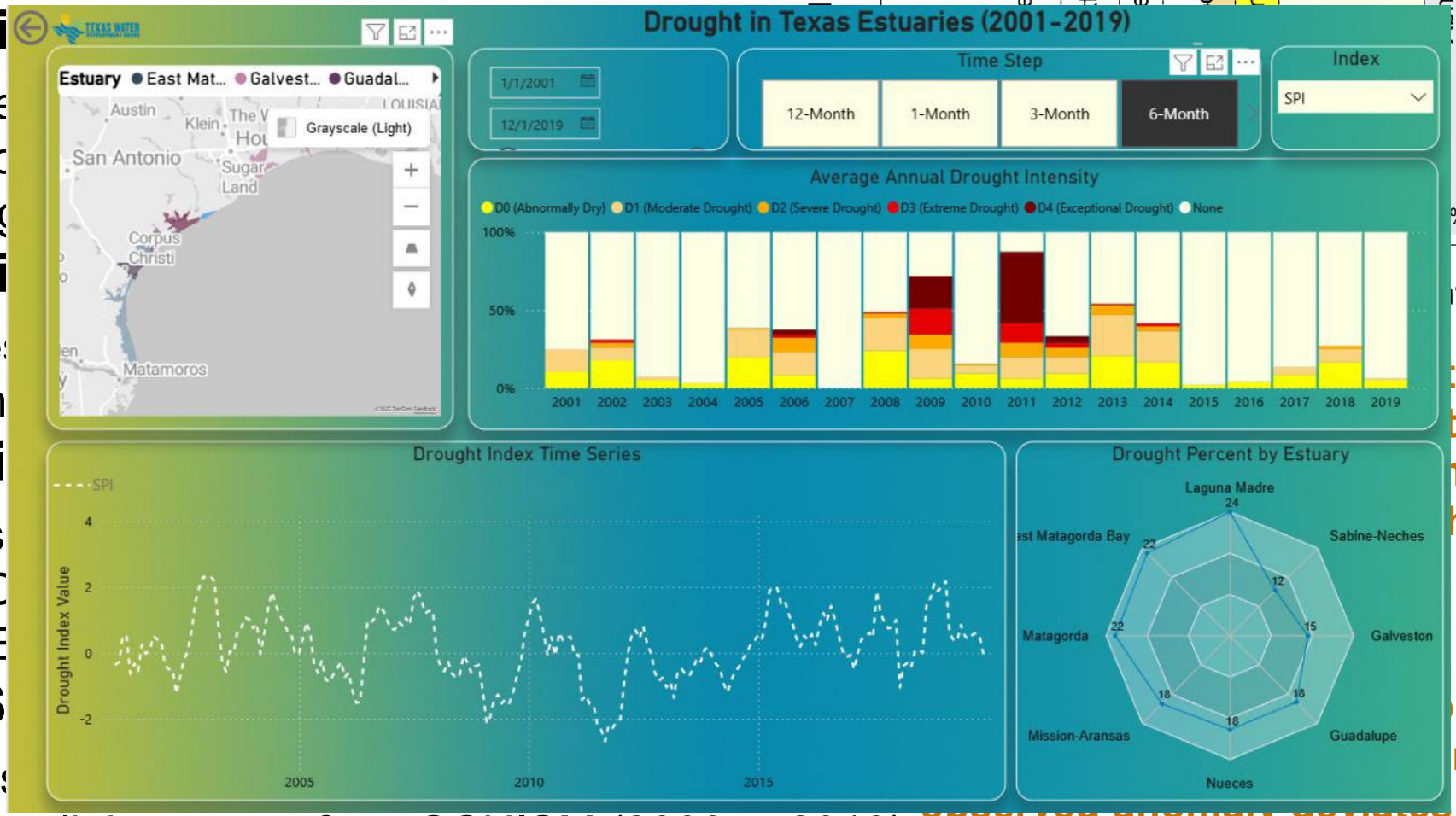


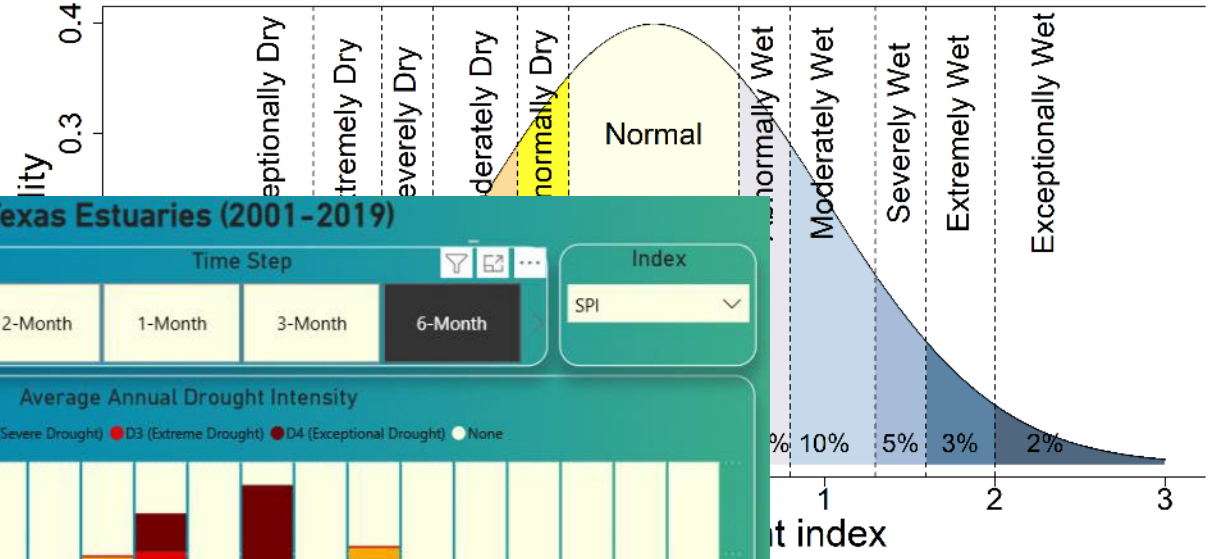
"Texas is a land of perennial drought broken by the occasional devastating flood." — What about the Estuarine Systems?



Standardized Drought Indices

- **Standardi**
  - Measure
  - 4-km mo
  - PRISM g
- **Standardi**
  - Capture
  - TxRR m
- **Evaporati**
  - Reflects
  - 4-km ED
  - GRIDME
- **Coastal S**
  - Indicate
  - Monthly salinity rasters from SCHISM (2000 to 2019)





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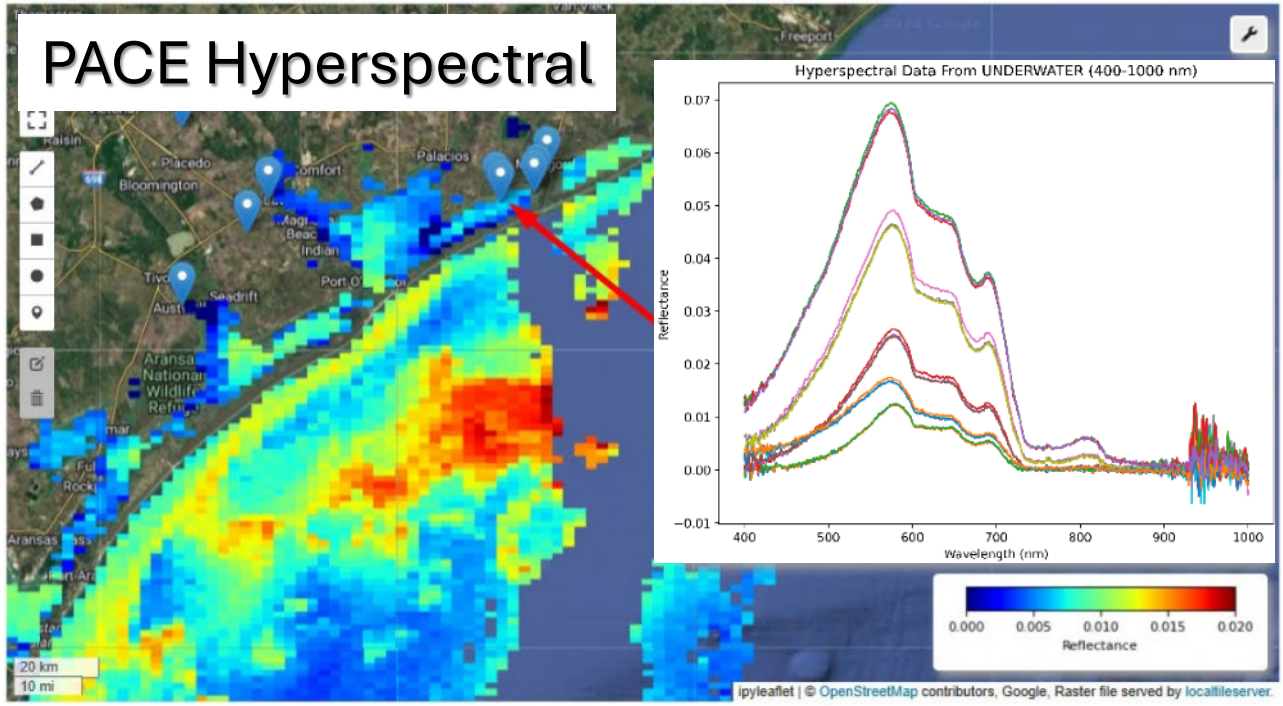
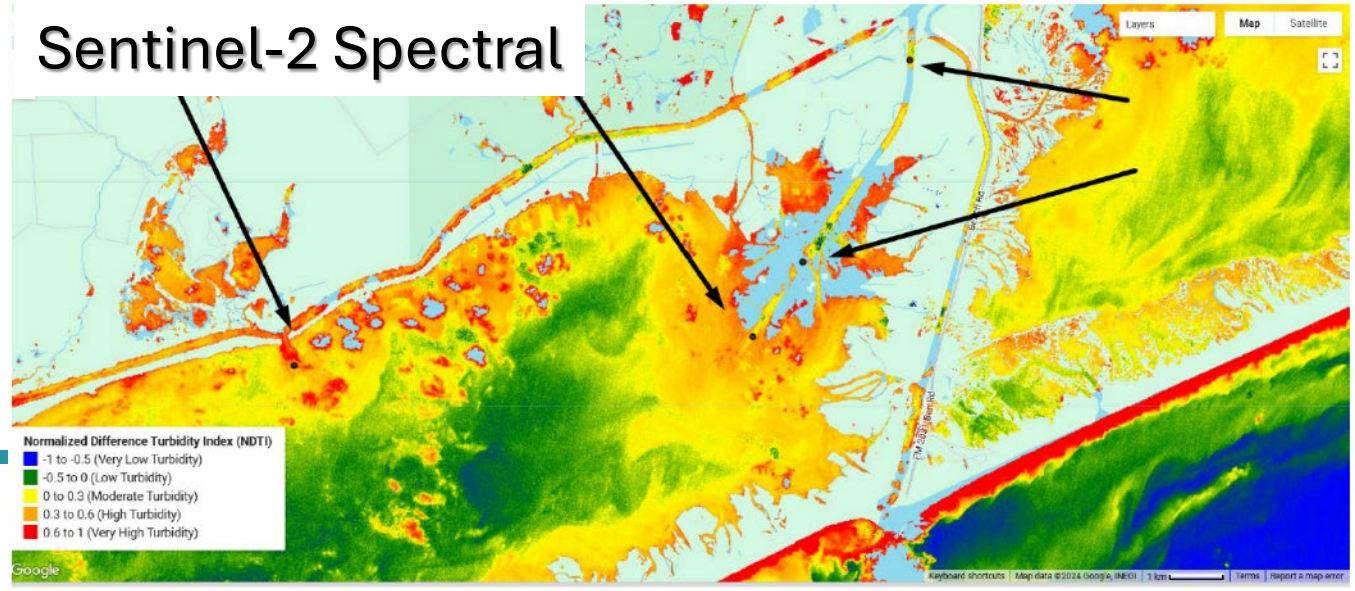
Characterizing sedimentation patterns with hyperspectral remote sensing

- **Monitoring sediment in Texas bays** using field samples, satellites, and drones to better understand water quality.
- **Studying how sediment moves and settles** to improve predictions and guide future monitoring efforts.
- **Informs the frequency** of Bathymetry Acquisition





TEXAS WATER DEVELOPMENT BOARD