Summary Report: Texas General Land Office Virtual Sediment Workshop No. 2

Workshop Date and Time: Wednesday, Nov. 10, 2021, 8 a.m. – 4 p.m. CST

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- Sediment Budget Analysis and Modeling on the Texas Coast (Richard Lewis)
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- The Marine Minerals Program: A Quick Guide to Policies and Processes (Jessica Malindine)
- Conflict Resolution in Managing Offshore Sediment for Multiple Use (Beth Forrest)
- An Objectives-Oriented Approach to Regional Sediment Management: The Louisiana Barrier Island System Management (Soupy Dalyander)
- Texas General Land Office Region 1 Reconnaissance Geophysical Sand Search, Project Summary and Results (Beau Suthard)

The Role of Ancient Rivers in Building the Texas Shelf and Their Importance to Future Sediment Resource Needs (John Swartz)

Use of Higher-Level Processed Chirp Subbottom Data for Identifying Potential Offshore Sand Resources: A Geologic Systems Approach (John A. Goff)

Panel Discussion: Offshore Dredging Technology

Panel Discussion: Coordination and Permitting for Borrow Areas and Placement Areas

Panel Discussion: Local Sediment Management Plans

1. Introduction

The Coastal Protection Division of the Texas General Land Office (GLO) hosted a virtual Sediment Workshop on Wednesday, Nov. 10, 2021, from 8 a.m. – 4 p.m. CST to provide experts and stakeholders with a forum for information sharing and discussion about the needs and uses of sediment resources on the Texas coast.

The GLO's virtual sediment workshop included presentations and panel discussions that included the following topics:

- Identification and Development Methods for Sediment Resources
- Permitting Use of Sediment Resources
- Inventorying Sediment Resources
- Allocating Sediment Resources
- Monitoring Construction Methods, Borrow Areas, Sediment Budgets, and Sediment Transport
- Planning Effective Use of Sediment Resources
- Developing or Modifying Policy for Sediment Resources

The information shared during the workshop will be used by the GLO to aid in the development of the Texas Sediment Management Plan, which will provide guidance for future coastal restoration, resilience, and nourishment projects with sediment needs.

2. Workshop Notifications

The GLO provided experts and stakeholders with an opportunity to register and attend the virtual sediment workshop through the following means:

- **Establishment of an online, publicly accessible Eventbrite page for the virtual sediment workshop:** The Eventbrite page for the GLO's virtual sediment workshop was established on Sept. 14, 2021, and provided the following information:
    - Workshop date and time
    - Information about the workshop's purpose
    - Workshop presentation and discussion topics
    - Workshop agenda
    - An opportunity for potential attendees to register prior to the workshop
    - Access information to the Cisco WebEx online meeting platform

  Prior to the virtual sediment workshop, the GLO provided those who registered on the online Eventbrite page with workshop email reminders on Wednesday, Nov. 3, 2021 (seven days prior) and Tuesday, Nov. 9, 2021 (one day prior). A screenshot of the online Eventbrite page is included in **Appendix A**.

- **Email invitations to an identified list of experts and stakeholders:** The GLO distributed email invitations to identified experts and stakeholders on Tuesday, Sept. 14, 2021, to announce the workshop date and time, information about the workshop's purpose, and workshop presentation and discussion topics. The email invitation directed potential attendees to register for the workshop through the established online Eventbrite page. A copy of the email invitation is included in **Appendix B**.

- **Email announcement from the Texas Chapter of the American Shore and Beach Preservation Association (ASBPA):** To further advertise the virtual sediment workshop to relevant experts and stakeholders, the GLO contacted the Texas Chapter of the ASBPA and requested that workshop information be distributed to their email distribution list. This email announcement was distributed by the President of the Texas Chapter of the ASBPA, Jerry Mohn, on Thursday, Oct. 14, 2021, and

included the workshop date and time, information about the workshop's purpose, and workshop presentation and discussion topics. This email announcement also directed potential attendees to register for the workshop through the established online Eventbrite page. A copy of the email announcement from the Texas Chapter of the ASBPA is included in **Appendix C**.

A total of 299 experts and stakeholders registered to attend the virtual sediment workshop through the established Eventbrite page between Tuesday, Sept. 14 and Wednesday, Nov. 10, 2021.

3. Workshop Summary

The virtual sediment workshop began with an introduction of opening remarks from Carla Kartman, GLO Coastal Protection Division representative, and an overview of the workshop agenda and ground rules for participation by Connor Stokes, Hollaway Environmental + Communications Services (Hollaway) Communications Technical Expert and workshop facilitator. A copy of the virtual sediment workshop agenda is included in **Appendix D**.

Following the workshop introduction, the workshop proceeded with a series of 15 presentations covering the sediment resource topics identified in Section 1 of this Summary Report. Presentations were provided from sediment resource management experts from the following agencies and organizations:

- APTIM
- Bureau of Ocean Energy Management (BOEM)
- Coastal Protection and Restoration Authority of Louisiana
- Freese and Nichols, Inc.
- GLO
- HDR
- Mott MacDonald
- Quantitative Clastics Laboratory
- The Texas A&M University System
- The University of Southern Mississippi
- The University of Texas System
- The Water Institute of the Gulf

Workshop attendees were initially encouraged to ask questions at the conclusion of each presentation either verbally or through the "Chat" feature available on the Cisco WebEx online meeting platform. However, due to time constraints the workshop facilitator instructed attendees to hold all questions until the panel discussion portion of the workshop. Copies of each workshop presentation are included in **Appendix J**.

At the conclusion of the presentation portion of the workshop and following a brief lunch break, the workshop proceeded with a series of three, one-hour panel discussions. The three panel discussion topics included Offshore Dredging Technology, Coordination and Permitting for Borrow Area Placement Areas, and Local Sediment Management Plans. Panelists included sediment resource management experts from the following agencies and organizations:

- Atkins
- BOEM
- City of Galveston
- City of South Padre Island
- Coastal Engineering Consultants
- GLO
- Great Lakes Dredge & Dock Company, LLC
- Manson Construction Co.
- Mott MacDonald
- Sullivan/Callan Marine
- Texas Historical Commission
- U.S. Army Corps of Engineers, Galveston District
- Weeks Marine

Prior to each panel discussion, the workshop facilitator provided information about the purpose and intent of each panel discussion topic and encouraged workshop attendees to participate in discussion following introductions from each panelist. A digital panelist biography information sheet (**Appendix E**) was also

provided to workshop attendees through the Cisco WebEx online meeting platform to provide attendees with background information for each panelist prior to the panel discussion portion of the workshop.

At the conclusion of the panel discussion portion of the workshop, GLO Coastal Protection Division representatives Carla Kartman and Melissa McCutcheon thanked workshop attendees for their participation and encouraged attendees to complete an online workshop follow-up survey (**Appendix F**) that was distributed via email following the workshop on Friday, Nov. 12, 2021. The purpose of the workshop follow-up survey was to receive feedback regarding workshop format, information presented, and to provide an opportunity to further coordinate with the GLO in the development of the Texas Sediment Management Plan.

A total of 179 experts and stakeholders from various agencies and organizations attended the virtual sediment workshop. A workshop attendee database is included in **Appendix G**.

4. Workshop Comment Analysis

A total of 25 comments/questions were received from workshop attendees during the virtual sediment workshop. A database of comments received, and responses provided is included in **Appendix H**.

The following list identifies the topics of the comments/questions received during the virtual sediment workshop *(tally of associated comments)*:

- Offshore Dredging Technological Limitations *(4)*
- Study Methodology *(3)*
- Dredge Project Scheduling/Coordination *(3)*
- Environmental Impacts *(2)*
- GLO Sediment Needs/Requirements *(2)*
- Material Usage *(1)*
- Project Design *(1)*
- Sediment Movement *(1)*
- Report Availability *(1)*
- Dredging Industry Capacity *(1)*
- Marsh Creation Design Constraints *(1)*
- Dredging Best Practices *(1)*
- Long-Term Borrow Area Management *(1)*
- Recommendations from Previous Sediment Workshop *(1)*
- Anticipated Dredge Project Needs *(1)*
- Sediment Source Jurisdiction *(1)*

5. Workshop Follow-Up Survey Analysis and Recommendations

A total of 32 workshop attendees completed the workshop follow-up survey between Friday, Nov. 12 and Friday, Dec. 10, 2021. A database of complete responses from the workshop follow-up survey is included in **Appendix I**.

The table on the following pages provides a question-by-question analysis of responses received from workshop attendees.

Survey Question	Response Analysis
I found the workshop to be beneficial.	96% of workshop attendees strongly agree or agree that they found the workshop to be beneficial. Remaining workshop attendees indicated that they were undecided or did not provide a response.
I was provided with the proper details to attend the workshop virtually.	93% of workshop attendees strongly agree or agree that they were provided with the proper details to attend the workshop virtually. Remaining workshop attendees indicated that they were undecided or did not provide a response.
How would you rate your experience using the Cisco WebEx virtual meeting platform for the workshop?	64% of workshop attendees rated their experience as very good or good. 29% of workshop attendees rated their experience as excellent. Remaining workshop attendees rated their experience as fair or did not provide a response.
I am likely to attend subsequent workshops.	84% of workshop attendees strongly agree or agree that they would attend subsequent workshops. Remaining workshop attendees indicated that they were undecided or did not provide a response.
What part of the workshop was most beneficial to you?	Major themes in responses include the following: Workshop attendees found it beneficial to hear presentations from the different industries. Workshop attendees found the discussion that followed the panels/presentations to be meaningful and enlightening. Workshop attendees found the presentations on new models and upcoming projects to be useful for their professional application. Workshop attendees think the workshop will help with cross-communication among industries.
What would like for us to improve at the next workshop?	Major themes in responses include the following: Workshop attendees indicated that the GLO should allocate more time for discussion and networking during the workshop. Workshop attendees indicated that the workshop facilitator should have done more to keep the presentations on schedule. Workshop attendees indicated a preference for an in-person workshop in the future and/or more opportunities for discussion if remaining virtual.
Do you have any information that you can share in the development of the Texas Sediment Management Plan?	Six (6) workshop attendees indicated that they DO have information to share. The remaining workshop attendees DID NOT have information to share or provided no response Additional information is included in **Appendix J**.
You may also submit a file with comments if that is easier.	No files were provided from workshop attendees.

Survey Question	Response Analysis
Do you have any discussion topic suggestions for the next workshop?	The following discussion topics were suggested: Updates on sediment resource investigations Updates on dredge technology Information about further work used to delineate resources on the upper Texas coast Information about recon surveys in the middle and lower regions of the Texas coast Beach surveying before and after sediment placement Sediment budget studies along the Texas coastline Economic aspects High level overview and timeline of current and future sediment management projects led by the GLO
Would you like to schedule a follow-up meeting with the GLO to discuss your organization's sediment uses and/or needs?	Four (4) workshop attendees indicated that they would like to schedule a follow-up meeting. Contact information is included in **Appendix J**.
Do you have any additional comments or recommendations for the next workshop?	The following recommendations were provided: Workshop attendees indicated a need for longer presentation times (more than 15 minutes) or a stricter adherence to the workshop agenda. Workshop attendees recommend an RSVP link that will provide an automatic calendar invitation for the workshop. Workshop attendees recommended sending the agenda out earlier. Workshop attendees recommended ordering presentations so related topics are grouped together.

Per the feedback received from workshop attendees through the workshop follow-up survey and participation in the virtual sediment workshop, Hollaway offers the following recommendations to support efficient and effective GLO sediment workshops in the future:

- Continue to provide an opportunity for experts to present about a variety of topics related to sediment resource management.
- If permitted by GLO and government guidelines related to the COVID-19 pandemic, consider offering in-person/hybrid workshops going forward to allow for more discussion and networking opportunities among workshop attendees.
- If in-person workshops are not permitted, consider structuring a virtual workshop with more discussion/question-and-answer opportunities by:
    - Scheduling fewer presentations to allow more time for questions/discussion between presentations
    - Offering topic-specific breakout sessions following the presentation portion of the workshop
- In lieu of establishing an Eventbrite page or similar, provide invitees with an RSVP link that provides an automatic email calendar invitation with meeting details upon registration through the link,

including workshop date, time, agenda, venue location (if in-person or hybrid), and access information (if virtual or hybrid).

- Consider scheduling future workshop over a two-day period (in-person or virtual) to allow for greater flexibility if agenda items take more time than expected.

List of Appendices

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H. Workshop Comment/Response Database
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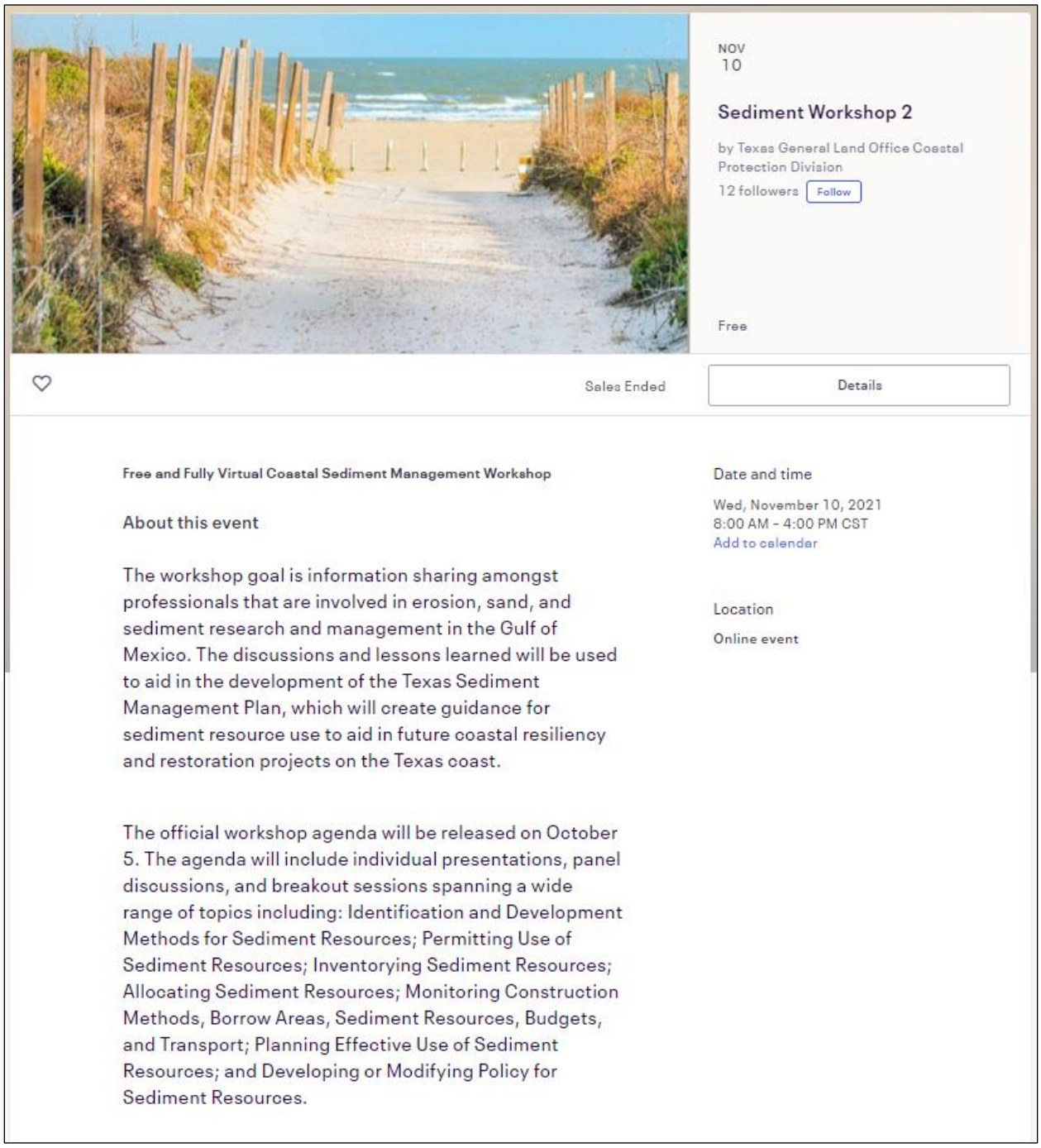
J. Workshop Presentations

Appendix A: Eventbrite Page Screenshot

Online Workshop Eventbrite Page Screenshot



NOV
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Sediment Workshop 2

by Texas General Land Office Coastal Protection Division

12 followers Follow

Free

Sales Ended

Details

Free and Fully Virtual Coastal Sediment Management Workshop

About this event

The workshop goal is information sharing amongst professionals that are involved in erosion, sand, and sediment research and management in the Gulf of Mexico. The discussions and lessons learned will be used to aid in the development of the Texas Sediment Management Plan, which will create guidance for sediment resource use to aid in future coastal resiliency and restoration projects on the Texas coast.

The official workshop agenda will be released on October 5. The agenda will include individual presentations, panel discussions, and breakout sessions spanning a wide range of topics including: Identification and Development Methods for Sediment Resources; Permitting Use of Sediment Resources; Inventorying Sediment Resources; Allocating Sediment Resources; Monitoring Construction Methods, Borrow Areas, Sediment Resources, Budgets, and Transport; Planning Effective Use of Sediment Resources; and Developing or Modifying Policy for Sediment Resources.

Date and time

Wed, November 10, 2021
8:00 AM - 4:00 PM CST
Add to calendar

Location

Online event

Appendix B: Workshop Email Invitation (distributed by the GLO)

You are invited to attend the Texas General Land Office's (GLO) 2nd Sediment Workshop, a free and fully virtual coastal sediment management workshop hosted by the Coastal Protection Division of the GLO on **Wednesday, November 10, 2021,** from **8:00 a.m. to 4:00 p.m**.

The workshop will include presentations, panel discussions, and breakout sessions spanning a wide range of topics including: Identification and Development Methods for Sediment Resources; Permitting Use of Sediment Resources; Inventorying Sediment Resources; Allocating Sediment Resources; Monitoring Construction Methods, Borrow Areas, Sediment Budgets, and Sediment Transport; Planning Effective Use of Sediment Resources; and Developing or Modifying Policy for Sediment Resources. GLO will use workshop discussions and lessons learned to aid in the development of the Texas Sediment Management Plan, which will provide guidance for future coastal restoration, resilience, and nourishment projects with sediment needs.

To register to attend the workshop, please visit https://www.eventbrite.com/e/sediment-workshop-2-tickets-171311616657

Please feel free to forward this workshop invite to others who may be interested. The full workshop agenda will be posted on the EventBrite page and emailed to all who are registered on October 5. The WebEx link for the workshop will be posted on the EventBrite page and emailed to all who are registered in advance of the workshop.

Please reach out to Carla Kartman (carla.kartman@glo.texas.gov) and Melissa McCutcheon (melissa.mccutcheon@glo.texas.gov) with any questions.

The Texas General Land Office's Sediment Workshop 2 (the "Workshop") is conducted for informational purposes only and is not a sales, marketing, or promotional opportunity. Workshop participants may not conduct any sales, marketing, or promotional activities during the Workshop and the Texas General Land Office (the "GLO") may, in its sole discretion, remove any person from the Workshop who violates this prohibition.

The individuals and entities participating in this Workshop have done so voluntarily and have not been compensated for their participation. Nothing contained in or related to this Workshop shall be construed as an endorsement or promotion by the GLO. The GLO does not endorse or promote any individuals or entities participating in this Workshop. The GLO does not endorse or promote any goods, services, individuals, or entities mentioned or described during this Workshop.

The GLO assumes no responsibility or liability for material, information, or opinions presented during the Workshop. The GLO assumes no responsibility for goods or services provided or performed by any Workshop participant. The GLO is not responsible for content presented by any Workshop participant or the accuracy of any content, information, or opinion presented during the Workshop. The GLO does not endorse, approve of, or ratify any content, information, or opinion presented during the Workshop. The GLO is not responsible for any error, omission, or defect in any content, information, or opinion presented during the Workshop. Opinions or views expressed during the Workshop are not the opinions or views of the Texas Land Commissioner, the GLO, or its officers or employees in their official capacities.

The GLO is not responsible for any loss or damage, including personal injury or death, resulting from: participation in this Workshop; use of any goods or services offered by a Workshop participant; reliance on any content, information, or opinion presented during the Workshop; or from the conduct of any Workshop participant.

Appendix C: Workshop Email Announcement (distributed by the Texas Chapter of the ASBPA)

From: Jerry Mohn
To: Jerry Mohn
Subject: GLO Sediment Workshop
Date: Thursday, October 14, 2021 2:54:14 PM

Attn: Texas ASBPA Chapter and Friends

You are invited to attend the Texas General Land Office's (GLO) 2nd Sediment Workshop, a free and fully virtual coastal sediment management workshop hosted by the Coastal Protection Division of the GLO on Wednesday, November 10, 2021 from 8:00 a.m. to 4:00 p.m.

The workshop will include presentations, panel discussions, and breakout sessions spanning a wide range of topics including: Identification and Development Methods for Sediment Resources; Permitting Use of Sediment Resources; Inventorying Sediment Resources; Allocating Sediment Resources; Monitoring Construction Methods, Borrow Areas, Sediment Budgets, and Sediment Transport; Planning Effective Use of Sediment Resources; and Developing or Modifying Policy for Sediment Resources. GLO will use workshop discussions and lessons learned to aid in the development of the Texas Sediment Management Plan, which will provide guidance for future coastal restoration, resilience, and nourishment projects with sediment needs.

To register to attend the workshop, please visit https://www.eventbrite.com/e/sediment-workshop-2-tickets-171311616657

Please feel free to forward this workshop invite to others who may be interested. The full ~~workshop agenda and WebEx link~~ for the workshop will be posted on the EventBrite page and emailed to all who are registered in advance of the workshop.

Please reach out to Carla Kartman (carla.kartman@glo.texas.gov) and Melissa McCutcheon (melissa.mccutcheon@glo.texas.gov) with any questions.

Thank you.

Jerry Mohn
President

Appendix D: Workshop Agenda

Texas General Land Office Sediment Workshop 2 Agenda

November 10, 2021

Time	Topic	Speaker(s)
8 – 8:15	Welcome – Intent of Workshop and Intent of Sediment Management Plan	Carla Kartman/ Melissa McCutcheon
8:15 – 8:30	Overview of the National Offshore Sand Inventory and the Marine Minerals Information System	Jennifer Steele/ Lora Turner
8:30 – 8:45	Sediment Characterization on the Texas Continental Shelf using 3D Geological Models: the Case of the Sabine Bank	Juan Moya
8:45 – 9:00	Borrow Material Search for Swan Lake	Philip Blackmar
9:00 – 9:15	Potential Sand Sources within submerged Pleistocene Terraces along the upper Texas Coast.	Timothy Dellapenna
9:15 – 9:30	Incised valley systems and connections with barrier islands: Insights from the Mississippi/Alabama Shelf	Davin Wallace
9:30 – 9:45	Automated machine learning/artificial intelligence approaches to sediment resource characterization and modeling at UT-Austin	Jake Covault/ Zoltan Sylvester
9:45 – 10:00	Sediment Budget Analysis and Modeling of the Texas Coast	Richard Lewis
10:00 – 10:15	BREAK	
10:15 – 10:30	Beach Dune Rules for Beach-Quality Sand	Michelle Culver
10:30 – 10:45	The Marine Minerals Program: A Quick Guide to Policies and Processes	Jessica Mallindine
10:45 – 11:00	Conflict Resolution in Managing Offshore Sediment for Multiple Use	Beth Forrest/ Syed Khalil
11:00 – 11:15	An Objectives-Orientated Approach to Regional Sediment Management: the Louisiana Barrier Island System Management (BISM)	Soupy Dalyander
11:15 – 11:30	Texas General Land Office Region 1 Reconnaissance Geophysical Sand Search, Project Summary and Results	Beau Suthard
11:30 – 11:45	The Role of Ancient Rivers in Building the Texas Shelf and Their Importance to Future Sediment Resource Needs	John Swartz
11:45 – 12:00	Use of higher-level processed chirp subbottom data for identifying potential offshore sand resources: a geologic systems approach	John A. Goff/ Sean Gulick
12:00 – 1:00	LUNCH BREAK	
1:00 – 2:00	**Panel Discussion:** **Offshore Dredging Technology**	
2:00 – 3:00	**Panel Discussion:** **Coordination and Permitting for Borrow Areas and Placement Areas**	
3:00 – 4:00	**Panel Discussion:** **Local Sediment Management Plans**	

Appendix E: Workshop Panelist Biography Information Sheet

TEXAS GENERAL LAND OFFICE SEDIMENT WORKSHOP 2

PANELIST INFORMATION

Panel Discussion: Offshore Dredging Technology

Michael Poff, P.E. is President of Coastal Engineering Consultants, Inc. As Principal Engineer, Mr. Poff has been in responsible charge of numerous barrier island-ecosystem restoration projects, in Coastal Louisiana and Southwest Florida. Mr. Poff's experience with engineering design with nature, includes preparing and overseeing shorebird protection conditions during construction; designing and implementing shorebird habitat creation; designing and implementing sea turtle-friendly beach and dune templates to enhance nesting habitat and promote hatching success; and designing and implementing seagrass restoration and transplanting for dredge and fill projects. Michael holds a bachelor's degree in Civil Engineering and master's degree in Coastal Engineering from the University of Delaware.
Email: mpoff@cecifl.com

David Johanson is a Senior Vice President of Project and Area Operations in the Gulf Region. Before that, Mr. Johanson worked as the Vice President and Hydraulic Division Manager, then served as Vice President Project Director of Charleston Deepening Projects. This position included the largest dredging contract ever awarded by the US Army Corps of Engineers. He joined the company in 1994 as a field engineer and has held positions of increasing responsibility in project management. Mr. Johanson earned a Bachelor of Science in Ocean Engineering from Virginia Polytechnic Institute & State University and an MBA – finance specialization from University of South Carolina. He is a current board member and President of the Western Dredging Association Eastern Branch and is a member of American Society of Civil Engineers.
Email: djjohanson@gldd.com

Henry Schorr, Jr., P.E. is responsible for overseeing all of Manson's dredging projects in the Gulf and East Coast regions including contract management, estimating, operations and equipment modifications. Henry Schorr has 41 years of experience within the dredging and marine construction industry. Mr. Schorr has successfully managed large-scale, complex dredging projects involving beach restoration for both federal and state level agencies. Mr. Schorr has a bachelor's degree in Civil Engineering and an MBA from Tulane University. He has over 41 years of experience within the dredging and marine construction industry.
Email: hschorr@mansonconstruction.com

Panel Discussion: Local Sediment Management Plans

Brandon Hill, MMRM, CCP is the Coastal Resources Manager for the City of Galveston where, through inter-division and inter-agency efforts, he helps steward the Island's natural resources. As a Coastal Zone Foundation Certified Coastal Practitioner (CCP), Hill has applied his expertise in the planning and implementation of coastal community management plans, ship channel dredging, Beneficial Use of Dredged Material, and Regional Sediment Management Projects. Brandon earned his master's degree in Marine Resource Management, and has returned to live on Galveston Island, to lead the Coastal Resources Division of the City of Galveston. Brandon remains dedicated to the cause of conserving Texas's natural resources.
Email: bhill@galvestontx.gov

Juan Moya is a Principal Geoscientist/ Geomorphologist and Coastal Restoration Lead for the Gulf of Mexico with Mott MacDonald. He is a former Project Manager of the GLO Coastal Program managing projects under different programs and participated in several initiatives to identify sediment sources for the GLO coastal projects. Juan graduated with a Ph.D. in Geological Sciences from the University of Colorado at Boulder. He has over 30 years of experience working on geomorphology and coastal issues in Mexico, Puerto Rico, Venezuela, and Colombia. In the US he has worked on geological projects in Colorado, Washington, Texas, Louisiana, and Florida.
Email: juan.moya@mottmac.com

Kristina Boburka works for the City of South Padre Island as the Shoreline Director where she is continually working to protect and promote the natural resources of the Island. She manages and directs the overall functions of the Shoreline Department including the beach and bay public access points, beach renourishment, and restoration within the city. The Department is currently leading numerous studies to increase resiliency on both the bayside and oceanside of South Padre Island.
Email: kboburka@myspi.org

Panel Discussion: Permitting Borrow Areas and Placement Areas

Kristi McMillan is the Leader of the Central Evaluation Unit where she leads a team of individuals that evaluate Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899 permit applications. Ms. McMillan is the subject matter expert, for the Galveston District, on the following topics: Aquaculture, Nationwide Permit Program, and Utilities, and is also serving as the Galveston District point of contact on the following: Corps Regulatory National Template team, State of Texas inter-District team for the renewal of the Texas Regional General Conditions associated with the Nationwide Permit Program, and the Gulf of Mexico Off-Shore Aquaculture Permits Work Group. After Kristi graduated from Texas A&M University with a Bachelor of Science degree in Marine Biology, she worked as an Ecologist for a Houston area non-profit and then for an environmental consulting firm.
Email: Kristi.N.McMillan@usace.army.mil

Amy Borgens is the State Marine Archaeologist at the Texas Historical Commission (THC); she began her work at the agency in 2010. In her role at the THC, Borgens reviews proposed development projects, including coastal restoration, to determine their potential effects on submerged cultural resources such as shipwrecks. This process includes determining if an archaeological survey is required and issuing antiquities permits to firms to conduct archaeological investigations on behalf of contractors. She also serves in role of the THC's SHPO (Coastal) Emergency Response Coordinator and is the principal contact for oil spill response and marine hurricane debris removal consultation. Borgens has a B.A. in Fine Arts from Purdue University and a M.A. in Anthropology from Texas A&M University from the Nautical Archeology Program. She is currently a part-time doctoral student in the Geography Department at Texas State University studying the role of environment and coastal processes towards the cause and long-term preservation of historic Texas shipwrecks.
Email: Amy.Borgens@thc.texas.gov

Dianna Ramirez is the upper Coast Regional Manager of Coastal Field Operations for the Texas General Land Office (GLO). She also is an integral member of the team working on the Coastal Texas Feasibility Study in which GLO is the non-federal sponsor. Dianna has as a bachelor's from Texas A&M University, Galveston in Marine Biology and Marine Fisheries. She also earned a master's degree from the University of Houston, Clear Lake in Environmental Biology. She has over 20 years' experience in the environmental field.
Email: dianna.ramirez@glo.texas.gov

Jessica Mallindine is a Marine Biologist at the Bureau of Ocean Energy Management for the Marine Minerals Program in the GOM regional office in New Orleans, Louisiana. She acts as a liaison for OCS conflicts of use with mineral resources, specializing in coastal restoration as well as scientific expertise on biological impacts related to offshore dredging. She received her M.S. in Marine Biology with a focus on Barrier Island ecology at the University of North Carolina.
Email: jessica.mallindine@boem.gov

Rhonda Gregg Hirsch is a Project Director at ATKINS North America. ATKINS is one of the world's leading design, engineering, and project management consultancies. She has extensive project experience in coastal restoration, sustainable shorelines, and beneficial use of dredged materials. Rhonda has a comprehensive background and solid reputation with USACE and resource agencies; commercial and nonprofit interests; and governmental bodies throughout coastal Texas to achieve a stronger, sustainable coastline. Rhonda has 27 years of experience in project development, execution, and oversight; resource agency liaison and coordination; federal, state, and municipal permitting; environmental conservation and compliance; feasibility studies in both the public and private sector.
Email: rhonda.gregg-hirsch@atkinsglobal.com

Appendix F: Workshop Follow-Up Survey

Texas General Land Office

GLO Virtual Sediment Workshop Follow-up Survey

1. I found the Sediment Workshop to be beneficial.

Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
◯	◯	◯	◯	◯

2. I was provided with the proper details to attend the Sediment Workshop virtually.

Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
◯	◯	◯	◯	◯

3. How would you rate your experience using WebEx for the Sediment Workshop?

Excellent	Very Good	Good	Fair	Poor
◯	◯	◯	◯	◯

4. I am likely to attend subsequent Sediment Workshops.

Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
◯	◯	◯	◯	◯

5. What part of the Sediment Workshop was most beneficial to you?

6. What would you like for us to improve at the next Sediment Workshop?

7. Do you have any information that you can share in the development of the Texas Sediment Management Plan?

8. You may also submit a file with comments if that is easier.

File Size Limit is 15 MB

Choose File Choose File No file chosen

9. Do you have any discussion topic suggestions for the next Sediment Workshop?

10. Would you like to schedule a follow-up meeting with the GLO to discuss your organization's sediment uses and/or sediment needs?

11. Do you have any additional comments or recommendations for the next Sediment Workshop?

Appendix G: Workshop Attendee Database

Workshop Attendee Database
Texas General Land Office Virtual Sediment Workshop No. 2

Name	Affiliation	Email
Adam Clinch	AECOM	adam.clinch@aecom.com
Chris Levitz	AECOM	chris.levitz@aecom.com
Rod McCrary	AECOM	rod.mccrary@aecom.com
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Appendix H: Workshop Comment/Response Database

Comment/Response Database
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Commenter Name	Comment/Question	Comment/Question Topic	Comment/Question Response
Peter Ravella	What is the expected material volume needed for the restoration effort?	Material usage	Philip Blackmar: I should have that more readily available. It depends on how much of the areas, if we're able to do the full project, which I think is the intent. I believe we're on around 800,000 cubic yards. So it's a pretty big project; we're getting close to that million cubic yard need.
David Burkett	What are the environmental concerns? I've not heard any environmental statements regarding the Sabine Bank operation. I don't see environment anywhere in the lists of concerns.	Environmental impacts	Juan Moya: Well, the purpose of this presentation was not to talk about environmental. I mentioned earlier, the collaboration for those efforts are with U.S. Fish and Wildlife, GLO, the Corps of Engineers. So there is a concern, but it was not the purpose of this presentation.
David Burkett	What was the actual source of those sediments at Sabine Bank environmentally? Is it river channels? What is the geologic environment?	Environmental impacts	Juan Moya: According to John Anderson and his team, the source is the barrier islands that got inundated by sea level rise and was left behind in the coastal system.
Seth Jones	Has the project considered constructing containment berms by side casting with marsh buggy?	Project design	Philip Blackmar: Yeah, that's actually how the project's going to move forward, is using the material there and using marsh buggies or some sort of excavation equipment to construct those containment berms and then they'll use that as confinement for the dredge discharge.
Jake Burstein	How are you determining paleo environmental transitions? Forums or purely sedimentological?	Study methodology	Tim Dellapenna: Well, you can start out with sedimentological, we're going from extreme mud to sand. So we didn't use forums in this study, but they're pretty well delineated ecologically. And into the features under Galveston Island. No, we haven't. I haven't had any funding to do any of this work. Looking at the licensing deposits, it was just incidental.
David Burkett	Have any of your studies been related to years of hurricane activity or storm activity?	Study methodology	Richard Lewis: So early on in the first piece of work where we were looking at, I think the hindcast covering 41 years, within that period, we identified some of the major hurricanes and tropical storms, and it was part of the screening process to identify the representative year to make sure that the year that was chosen wasn't abnormally affected by increased storm activity for example.
David Burkett	As you move up the coast, you change the orientation of the coastline, which is strongly affected by the wind and the currents, particularly as we look at the area that I'm at on the Bolivar Peninsula, shows very strong southward movement of sediments.	Study methodology	Richard Lewis: Yeah. And actually that was another really interesting piece of the study that we just didn't have time to go into today. But if you look at the period of record over the last 40 years or so, there's actually been a reversal of drift from kind of net northerly transport in from the '70s and '80s to post 2000 and has transitioned more towards southerly transport. And that seems to be linked to very minute changes in the wind climate that's driving the waves. And the fact that the shoreline orientation is very close to equilibrium within region one, particularly along places like Bolivar and Galveston Island. So it was quite an interesting piece that we didn't really get to talk about today, but yes, happy to have further discussions about that.
David Burkett	How detailed of information and is there a data set that shows anything of the sediment movement in the Bolivar Peninsula area?	Sediment movement	Richard Lewis: From that we can drill down into specific areas in the regional model and look at some of those convergence points, divergence points that have been identified. And I believe that area was, as you described, building sand. So, yeah. We just haven't had time to really talk about that in any detail today. But like I say, if there are certain areas that you want to look into closer detail, I'd be happy to have a discussion about that.
Tim Dellapenna	When is the report associated with this presentation available?	Report availability	Richard Lewis: I believe they will be in time. We're just finalizing everything and wrapping up the project with the GLO at the moment. So we're working on what's next and the ways to make that data available.
Kevin Frenzel	A couple things, first to comment, over the years, I've been attending the Army Corps' dredge conferences, looking at their planned dredge projects that are going out to bid. And currently, many of the ports here in Texas are getting close to doing their deepening and widening projects. Some of them are already underway. So obviously a tremendous need for capacity just to meet the Army Corps' dredging needs. And for the states, such as the Gulf Coast states, Texas, Louisiana, obviously, Alabama, Mississippi, are obviously needing dredges for doing restoration work. So I was encouraged to hear from Great Lakes, Manson, and Weeks that there are additional dredgers coming online to help with the capacity. Certainly, I think as soon as they're out of the ship, they're obviously going to be 100% under contract. So that was encouraging to hear that you guys are investing in additional dredgers. But a follow-up question I have is we're obviously out, investigating offshore sand bodies. Clearly, we're trying to focus on nearshore and shallow sand bodies as being the ideal, but we're also looking into deeper water. And so my question is if y'all can share what would be a depth that would be the limiting factor and where is that break forward, where that's just too deep to get to, or just not economical? Could you just share what limitations we might have in offshore dredging?	Dredging industry capacity and offshore dredging technological limitations	Henry Schorr: From Manson's perspective, the Glen Edwards is capable down to 90 as currently configured. It can be changed to go much deeper, but we have not done that at this point. My new dredger is also currently configured to go to 90. So 90 plus going to 120 is not difficult.
			David Johanson: I just want to remind everybody that we put a man on the moon in the 60s. And so if you want to dig deep, you just have to say, and then we can figure out how to do it. We are not, but Weeks is currently digging in the Mississippi River at a 90 foot depth with a cutterhead dredge that's plus river stage so they're probably getting down to about 115 feet, no problem. We have a design where we can do the same also on our cutterhead dredges. We can get as deep as what Henry was saying with our hopper dredges. There's an emerging market and offshore need. We made an announcement that we're entering into that market. Some of that requires some deep digging. We have a drag-arm extension design waiting on the project to dig 200 feet deep with a hopper dredge. So it's all possible. The technology's there. It's just a question of what's the cost.

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Carl Sepulveda	Is there a current practical overburdened thickness that you can currently deal with or does that just depend on expense and having a place for that overburden?	Marsh creation design constraints	Michael Poff: In terms of the placement and where you're going with it, if you have a marsh creation component and you have a large enough cell that you can deal with the overburden and the fluidity of it, then if you can beneficially use it, that's preferred. For the distributary channel sources that I've been working with though, the quantity of that material is equal to or greater than what the marsh creation cell's going to hold on these island projects that we've done. So the two where we've stripped the overburden, we've gone ahead and disposed of it offshore. And as far as the thickness goes, it depends on the equipment. Both projects we did were cutterhead-direct pump. So we tried to design the thickness to be on about a 10-foot elevation, which the mud may have ranged anywhere from eight to 12. And so we did a 10-foot with a two foot over dredge. That was a cost effective cut for that cutterhead fleet. If it's a hopper dredge, you might be able to cut it thinner, but you'll start getting less than six or seven feet of face, then those cutterheads really are going to be inefficient and it's going to cost you a lot more.
			Henry Schorr: Generally from a contractor standpoint, we can deal with almost any overburden you have, provided you have a place to put it that's within reason. And you have to recognize that the cost impacts of creating two different disposals and removing that material. We can deal with almost anything, but you just have to recognize the cost that goes with that.
			David Johanson: I agree with both parties here. The face thickness doesn't matter. The location to put it matters. I just want to emphasize something Michael said, because dredging material, whether it's overburdened or shipping channels or any dredge material has value. And I challenge everyone on the call to try to connect with someone who wants it. So whether it's marsh restoration with overburden, or if it's sands in a channel to build beach renourishment, that's the goal, to try to get the right people connected because somebody likely wants it for something and could do some cost share. There is a little bit of a challenge with overburden with regard to a cutterhead dredge because of the inaccuracies in the process, the angle of approach of the ladder and the cutterhead into the bottom. You could get into good sediment if you're trying to take too much overburden and that's why Michael said there was a tolerance there on what was allowed to be taken, because these are big machines.
			Henry Schorr: Yeah. One, more point on that and Dave touched on it briefly. There is a tolerance there both in cutterheads and in hoppers. And digging in an offshore environment, you have to make sure that you have the material tested and classified well below what you require for digging. Make sure you don't have a permit violation. We've seen areas that they don't give you any kind of tolerance or buffer before a permit violation and that really gets expensive. Because we really have to monitor and it costs a lot of money to do that and to maintain that and to make sure you have enough material for your bill.
Jessica Mallindine	BOEM currently manages mineral resources up to 50 meters in depth as potentially viable for extraction. Does this still seem like a reasonable management depth? And when would you expect to start seeing utilization of resources at greater depths based on expanding dredge technology?	Offshore dredging technological limitations	David Johanson: I think you've asked a question that it's difficult to answer. There has to be a project associated with it and there has to be funding. I think once those things happen, then I think the industry will follow suit with a way to extract the material. That's the short answer to that. So when would we expect to use it? I think when a contract that comes out and says, "Hey, we want you to use this source."
			Henry Schorr: I think Dave hit it right on the head. So it's market driven from our standpoint. And you see all this new work coming, as I mentioned earlier, all these additional dredge requirements. So you'll see industry stepping up and building dredges to requirement that's going to take us down to 150 feet. You'll see industry step up and adapt and be able to achieve that. But again, there's got to be a project, there's got to be a market and there's got to be funding available for it.
Jessica Mallindine	If a project were to identify that they wanted to use something at a much deeper depth that was maybe closer to shore, I could see the applying more maybe in the Atlantic where the shelf is a lot closer. But if a project did identify that they had a borrow area that they wanted to access at 200 plus, what's the amount of time that industry needs to then respond to that? I assume it's not immediate, things have to be built, engineers have to do things. So what kind of advance warning is needed for industry? Thankfully BOEM does not actually build projects, we leave that to other folks. But from my perspective, we do try and make sure that we're projecting what we see happening in the future and then manage other resources and infrastructure restrictions accordingly. So like I mentioned, right now, we're at 50 meters just because it seems to be, there hasn't really been anything that we've hit much deeper than that. I don't even think we've come close to 50 quite yet for sand, but I do see the potential for it at some point in the future. So it's just trying to sort out when to start expecting to see that on the horizon. And when it comes to projects, we are looking at sand resources, at what point do we suggest, "Hey, maybe we should look a little deeper and talk to industry about whether or not they can access it or not."	Offshore dredging technological limitations	Henry Schorr: Well, I think you just had to hit it right where it needs to be. So if you see a potential for that coming, I would suggest an Industry Day, go through it with industry and talk about the particulars and talk about the timing. Industry would then look at designing and developing a timeline to implement a solution. But the more notice you can give, the better off you'd be.
			David Johanson: I agree 100% with Henry. I will just repeat something I said earlier that we see a market to go 200 feet deep with hopper dredges and offshore winds. So we did the engineering part to extend the drag arms to get to 200 feet on one of our dredges. That takes time to figure out. We haven't built the drag arm system. We haven't built it, but we have the engineering done. And we think we can turn that on if there's a contract and build it. We had another job we were hearing about that wanted to go to 100 feet deep with the cutter dredge. So we did the engineering on that. That install may take four to six months to be able to do that. So you'd have to provide the contractor enough time to be able to modify their equipment. So the more upfront talking via Industry Day or talking to dredging contractors, there's five of us, we'll all field calls about that. The sooner we can start, the sooner we could perform that work.

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Cameron Perry	On channel maintenance projects, where there are sand deposits that could be beneficially used for beach nourishment, what depth of cut or thickness of sand layer is the needed for hopper dredges for efficient work?	Dredging best practices	Henry Schorr: In general, I think we'd like to see at least three foot of face, but it could be less. We are working right now in Galveston, taking material from the inner of our channel in the Houston Ship Channel and putting it at up on Dave's beach and we're about finished with that pump off. But in some of those sections, it was very little material. So at least a couple feet of face would make it much more suitable in just cleaning up the tow lines.
			David Johanson: Yep. I agree with Henry. I'll also add another dimension for you to think about. When you're designing projects, it's not just face, which is depth of cut available. You're going to also want to make sure you have a reasonable quantity because to set up for beach renourishment projects, it's a high expense to install the pipelines, bring in all that land equipment like you saw on the video, a pump out station, things of that nature. So you'd want to have the greatest quantity available, the more you can spread that mobilization and demobilization over the project. So you wouldn't want to just do a tiny beach fill job, the unit overall price would be too high.
			Michael Poff: I would add, you'd still need a tolerance on whatever face of cut you're trying to remove because the hopper's still going to have some penetration below the design cut.
			Henry Schorr: True. But if it's a maintenance striking channel in the channel, you've already got that.
			David Johanson: Well, Michael brings up a point about tolerance. Whether it's a paid tolerance or a non-paid tolerance, the dredge is going to take material. If you have to dig to a level, it's going to take some material below that level. So that tolerance, meaning quality of material tolerance is important. Whether or not you pay for it or don't pay for it, you may not realize you're paying for it either way because Henry and I both know dredges are going to take some of that material.
Cris Weber	In addition to depth limitations in the OCS, are there offshore surface distance limitations, either through technology constraints or transit time costs?	Offshore dredging technological limitations	Henry Schorr: There really aren't any distance constraints, but it costs more. Bottom line is, the longer the distance, the more it's going to cost. I know we've looked at projects and Dave is aware that if you're talking whole distances of 60, 70 miles, it's not out of the question. It can all be done. It's just a matter cost.
			David Johanson: Yeah. Agreed. And Michael, thanks for highlighting that project we did together. We pumped 22 plus miles with a hydraulic dredge. We converted another hydraulic dredge to a booster to be able to pump further. We would do that again. There's a lot of booster capacity out there in addition to dredge capacity so that for a connected pipeline dredge, that's how you could do that. So I don't know if there's a distance limitation, but you might price yourself out. But the hopper dredge can sail around the world so there's no distance restriction at all.
			Michael Poff: How about on cutterhead direct guys? Obviously at some point, you're going to say, "I'm going to switch to the scow bars or to the hoppers." Is there a general rule of thumb you could share with the audience? I think that's an important point when we design these projects to make sure we cover ourselves if it's beyond the comfort level where you have direct pump.
			David Johanson: It depends. I say that because when you do a scow-loading operation, you have some limitations regarding weather that you don't necessarily have on a direct pump, that you might want to look at it both ways. And there could be, like the one project you highlighted, you might want to do part of the job direct and another part of the job you might want to load scows. So I can't give a good rule of thumb. It depends. It also depends on material. Some material loads better in scows than others, just like a hopper dredge, some material loads better than others. So I can't say, there's so many variables.
			Henry Schorr: And a lot of it will depend on, as they said, the material type, but also the environment around where you're putting it. Can you actually run a pipeline or not? Do you have to transport it around by borrow? And if you remember the Deepwater Horizon emergency dredging, you had material coming from a number of different areas, both by cutterhead load and scows and hopper. It really depends on what you can configure and what other concerns you have and what other risk factors you have in moving the material and getting it to its final place.
			David Johanson: I might offer that sometimes if folks have an idea of what they want to do, don't constrain the contractor. I think Henry and I are really good at building mouse traps to solve problems. And so don't restrict the contractor with what you can or can't do. Maybe open it up to see what the possibilities could be because we'll come up with some really creative solutions to move materials.
Carla Kartman	During the design phase when we're trying to figure out how to move all the sediment over to the beach from wherever, how early should we start coordination?	Dredge project scheduling/coordination	Henry Schorr: Earlier the better. I'd suggest we have a number of ideas, have an Industry Day, then break off each industry representatives separately and have one-on-one conversation with each contractor, then make the best decision for your project.
			David Johanson: CPRA has a really good model for engaging industry. They'll tell what their outlook is several years in advance of upcoming projects. They update regularly as they're designing projects and it really actually asks for a lot of industry feedback. And then when they can, they incorporate it into the designs. And I think what that does is it just makes for a better project for everyone. It makes for a more reasonably constructive project, and more importantly, it's a lower cost solution. So I think they're a good model for contracting.
			Henry Schorr: Yeah. Mobile District has done the same. Allison has not quite done as much with it. They haven't had done as much with it, of course they've had this situation here lately where the ports have taken over a lot of deepening projects.
Jennifer Steele	How does the dredge industry feel about borrow area conservation/management plans? Borrow areas are often designed for multiple events, but the material left isn't always dredgeable for the next event, either too thin or left too far afield in multiple small pockets.	Long-term borrow area management	Henry Schorr: In general, we are all for borrow area conservation, but we would ask that you look at configuring the borrow area where it's efficient. Example, if you have a hopper thread, you want a reasonable trail length, want a reasonable width when you have both frag arms on the bottom. And we've seen multiple instances where you have to clean one area before moving to another area within a borrow area, but then you have varying depths that are allowed and challenging configurations of each cell that really make it difficult and more expensive. Dave, anything from your end?
			David Johanson: I think you hit all of the things I was thinking about when I saw the question. The one thing that we haven't really talked about that I think is important, and it impacts offshore borrow sources is the minefield of pipelines offshore. Some are active. Those aren't the ones that I'm so concerned about, but it's the abandoned, maybe decommissioned, maybe not, pipelines that really can restrict available sand sources. It's my opinion that some of this sandfall shortage gets resolved if the pipeline mess gets cleaned up. So it's a sand source limitation, because you can only dig so close to them, but it's also a hazard to dredging and the environment. So I just wanted to toss that out there for everyone. If you're looking at an area, the sooner you can identify the pipelines and try to figure out who owns them and make them responsible for removing them, the more sources you'll have.

Commenter Name	Comment/Question	Comment/Question Topic	Comment/Question Response
			Michael Poff: And BOEM has been really good about clearing those, as well as culture resource anomalies. So we have these archie hits, mag hits and, and side scan targets that can't be discerned. And so I know Jessica and Jennifer and their predecessor Mike Minor, were very active in getting their dive teams out there and clearing some of these anomalies and enforcing some of these pipeline buffers. CAED, CAEL, and CPRA have been adamant trying to get certain pipelines removed and that did open up new pockets of sand on Ship Shoal. And these projects I showed you today all have been built upon each other, and we've used the same bar area three times using that bar area management plan methodology. And certainly with the cutter head, just like the lawnmower, you can put the patterns in there and you can follow very closely. But when you open up for the cutters, it does get a little more diverse in the cuts and what you leave behind. Definitely costs go up when we try to use these small pockets to finish out of borrow and move to the next one, but in the case of Louisiana and, and the sentiment deficit there, it's just something that we do.
Cameron Perry	For cutter head dredges working in offshore areas, what are typical weather or wave restrictions? Does timing of work seasonally, summer versus winter, have a significant impact? If so, there will likely need to be coordination with regulatory agencies on endangered species and work during various seasons.	Dredge project scheduling/coordination	David Johanson: There's some technology out there that the cutter head guys and gals have where previously people would work on fixed buds with cutterhead dredges. We call it a Christmas tree, but the stern spud is replaced by a three point mooring system. So then it can dig in greater seas. It depends on the direction, the wavelength, the wave height period. But you can dig a cutter head dredge in six-plus-foot seas. I've done it in eight-foot seas if the wave period is correct. But does timing of work seasonally, summer, winter, have a significant impact? It certainly does. We do an analysis of looking at the 20-year history of weather in the area. You can get that from NOAA and you can make a projection on how much time you'd be working versus not working. And then, if it was a rougher period of the year, a contractor would factor in more downtime for weather and it would just push the pricing up. But we work year-round in many places and we're familiar with the environmental restrictions. Just know rougher months equals higher or cost because you're actually dredging less. Your cost doesn't change per day, but the number of days it takes to perform the work is increased.
			Henry Schorr: Yeah, I'd agree with everything David said. While you can put a dredge on a Christmas tree, which really helps the hull, you have to remember in those sea conditions, it's a function of the lateral pounding into the bottom and what the train, which is on the dredge, can actually withstand. And that becomes your critical component. But yeah, obviously working in the calmer weather, even with the hoppers, we've seen this over the years, there's been a push to make all hopper dredging in the winter time. Well, that's not as safe for the crews, not as safe for our support equipment, particularly if it's going on the beach and it's more hazardous. So we have to be real cautious about that. Whereas if it was done in summertime, you'd have less weather time, less downtime, less cost, and less hazards to the people working on the job site.
Juan Moya	At the first sediment workshop in 2018, we put together a meeting focused on the possibility of regional permits and several federal agencies were in favor of that regulatory option. And this is for Kristi specifically. What is the status of that recommendation?	Recommendations from previous sediment workshop	Kristi McMillan: Well, the corps of engineers and the General Land Office met and discussed the concepts a couple times about creating a regional general permit for beach nourishment activities. And one of the things that we saw quickly that was going to be what we call one of the main focus of, I want to say roadblocks, but maybe speed bumps. Something to really take in consideration of beach nourishment regional general permit would be the endangered species aspect. Our beaches are highly utilized by many different endangered species. In addition, good portion of our beaches are designated critical habitat or proposed to be designated critical habitat. So we engaged the Fish and Wildlife Service, and we started some conversations with the Clear Lake office of the Fish and Wildlife Service to create ideas or processes, or just some pathways to kind of streamline and align the endangered species act process with creating a regional general permit for something that's such as broad as the content of beach nourishment, along Texas beaches. And some of the concerns from Fish and Wildlife, they listed out to us and the General Land Office. And the last I spoke, the General Land Office is going to continue working with the Fish and Wildlife to create some, maybe some standard work plant, some standard concepts to help facilitate that conversation when it comes to endangered species because you have anything from nesting sea turtles to habitat for birds. So some of those general baseline type concepts of work timing, also some of the data needs that Fish and Wildlife needed. They weren't really concerned about benthic habitat and benthic creatures and their survivability and recovery after beach nourishment activities. So we're in conversations. We have not officially started creating a regional general permit for beach nourishment activities along the Texas beaches. We're still in what we would consider the how stage. How do you go about something that large, that complex, when it comes to creating a regional general permit? So, that current status is that we're working out some issues and some general concepts for endangered species, having even gotten into the broad concept of sediment sources. We think that's going to be... need to be handled separately for the regional general permit. I don't think I can just broad or give an authorization for under a regional general permit for every concept of a sand source and for the entire Texas Gulf Coast. But I think we're trying to still figure out the data needs, the parameters and trying to create relatively consistent process when it comes to that regional general permit.
			Dianna Ramirez: And I can just add that, yes. The GLO is still working on coordinating all of that as part of our sediment management plan. So we have already started some benthic and geo tech surveys under that sediment management plan that will provide some of that data that Kristi mentioned that we're trying to figure out. What all is needed and that type of thing. So we do have some great people at GLO working on that.
Jong-Won Choi	Can you give us some clarification about geo tech properties of sediment that GLO is interested in?	GLO sediment needs/requirements	Dianna Ramirez: Sure. As Michelle Culver pointed out in her presentation earlier, if it's going to go... If the material's going to go on a beach, it needs to be beach quality sand, and Kristi will correct me if I'm wrong here, but I believe that's a requirement of the corps as well. So, a lot of our requirements are the same or similar to the other agencies. We're not trying to make it more difficult. We try to coordinate all that when we make those regulations. It also needs to not have a lot of clay material so you won't have that cementation that she mentioned. The correct coarseness and things like that. And then if you're doing a marsh restoration, you kind of want the exact opposite types of material. You want a lot more silty types of material. Stuff that'll actually be good for those plants. We don't want to create a beach where there's a marsh and vice versa. So we want to make sure that whatever sediment you're putting in the location is the appropriate type for that specific location. We also want it to be clean so there's no contaminants in it which I know there's very strict testing that most of the material has to go through anyway for all your other permits. So, we'll look over those and reach into our different divisions for all the different expertise that everyone in GLO has as needed on those, to make sure that we're not signing off on something that shouldn't have been signed off on.

Commenter Name	Comment/Question	Comment/Question Topic	Comment/Question Response
			Rhonda Gregg Hirsch: Most geo technical firms have this protocol down. A good geo technical firm is used to having someone ask them to perform the borings to test material for beach quality sand, and key to that is having samples of the location where the material is going to land. You want an in kind material, the sand grain size in the upper reaches of the coast in Galveston and, and up near Jefferson County, they're not the same as they are down on South Padre Island. And that's really important for the critters, for nesting turtles and for the birds. So it's more than just the geology of it, but it also goes into endangered species and all of the critters that are going to use that beach for habitat. So a good geo technical firm can help you with that. If you get the slides from Michelle Culver inside the tach, it does give clarification. It still sounds a little ambiguous, but again, it's because you're matching sand to sand. You want the right grain size and mineralogy for the area that you're going to do work. And so again, a good geo technical firm can help you with that. And as far as the material testing, that comes from the corps manual, and I always like to tell clients, "You got to be able to let your kid eat the sand." That's the whole point. We don't want anything going out there... Amy... That your child couldn't put in their mouth because what do kids do? They eat the sand. And all the years I've been doing this, like I said, I've been doing it a bit. I've never had material that didn't meet. Most, all the time the material that we're looking at is... maybe not grain size, but as far as toxicity testing, I've never had anything that didn't meet those criteria. But it's super important for that. We're not trying to hang anybody. When you're looking at sand sources it's not about trying to hang somebody up because they have something in the nastiest in the material they're trying to let you use or sell you. It's all for good purpose. We want to make sure it's clean and we want to make sure it matches the receiving area that it's going to, whether it's a marsh or it's a beach.
Christopher Allen	If the placement area has known contaminants, how important is it that the borrow area be contaminated or contaminant free? This is specific to areas other than beaches, such as a marsh.	GLO sediment needs/requirements	Kristi McMillan: One aspect of the Clean Water Act that a lot of this chemistry talk comes from is the fact that the Clean Water Act does not allow for further degradation of the Waters of the United States. So, when we're looking at putting material back into the waters, we acknowledge that water is not perfect. Our segments are not perfect. If you really want to get into the chemistry, there's no uncontaminated anything. Almost any piece of dirt you have has something in it and it's all relative. So, if the material that's being proposed to be placed on the beach has something in it, if there's certain levels that we're looking at and the Clean Water Act does not allow a further degradation. So we're not going to put material or allow material to be put back into the water that's going to further degradate the Waters of the United States. So that's what we're looking at. It's not about how clean can you be. I'm not going to ask you to completely sanitize sand, but we need to make sure that the material being placed back into the water is not going to violate that basic premise of the clean water right that no further degradation. So I think that's what you should really be focusing on. Not asking, "Well, the site's not that clean so could I continue to make it not very clean?" No, we need to make sure that we're not furthering degradating the waters as a whole because construction is messy and when you put these materials on the beaches or marshes or any of these areas that you're trying to restore elevations, it's not perfect. Sediment does get up in the water. Turbidity happens. And we don't that want that turbidity to carry down stream or upstream or wherever we're at and create a further degradation of waters. So that's the important part I think we should be focusing on is making sure that the materials being placed, wherever you place them, is not going to further those chemistry concept of degradation. Hopefully that answers your question.
Christina Munoz	How does South Padre anticipate their needs growing or changing in the future? And are there plans for expanding beyond the use of the channel dredging for sediment needs?	Anticipated dredge project needs	Kristina Boburka: So we definitely anticipate our needs growing for sediment. Especially within most recent years, material has had to get placed offshore, which does not help our beaches, but it's still hopeful it's within that depth of closure, and that it reaches our beaches eventually, but we are looking at expanding and looking at different efforts rather than relying on the dredging, and that's part of what the Regional Sediment Management Plan is going to do. We were on site earlier this week with Corragio, our team, Cameron County and his team, looking at different sites, and the big thing we're going to look at is bypassing and bypassing sediment at various areas near the channel.
Carla Kartman	Is there any collaboration between the different counties, cities and other regions, so that we make sure that we don't capture sediment from our neighbors. So if South Padre Island is doing a sediment management plan and then another county is also doing a sediment management plan, are we collaborating with each other to make sure that everyone's needs are met?	Dredge project scheduling/coordination	Kristina Boburka: In our case with the city, we are working with our county. So that is a collaborative effort that we're doing.
			Brandon Hill: And Carla, I'll jump in on that one as well. When I was with AECOM over the last several years, I had the opportunity to see the great work that was accomplished by the BUG, the Beneficial Use Group that's associated with the Houston Ship Channel Project in finding beneficial uses for that material, and one of the things that really struck me as valuable about that group was that you saw how much could be accomplished when you got these, oftentimes, very cooperative stakeholders, but when you actually got them all around a single table, the cooperation and the ability to accomplish things increased exponentially. Everybody tries to work well with each other, but the amount of coordination that can be done when there is effort put into it to bring people together and to have these discussions is really impressive. And something that I've begun nurturing since coming on board here with the city of Galveston is actually a regional group that will involve not just the resource agencies, but also the various counties, cities, municipalities, the stakeholders here within region one, in opening up those lines of communication. Because I find that even the smallest of projects... Oftentimes, what breaks my heart is sometimes I'll hear a applicant or a resident come to me and say, "I'd really love to-", and then they say a good thing, like, "Build a dune or plant some dune vegetation." And then they say, "But-", and then they mention a hurdle that they feel like is just going to be too much for them to overcome on their own. And I think we as coastal community managers should try our best to nip that in the burden. There has to be a significant amount of coordination between not just the regional stakeholders, but also the resource agencies who facilitate these good projects. We need to coordinate enough that when an applicant or an individual resident or a business comes forward and has an idea or has a development concept, that they have a place to go to start gaining some ground with that idea. And so that's something that we're working on creating up here in the Galveston region.

Commenter Name	Comment/Question	Comment/Question Topic	Comment/Question Response
			Coraggio Maglio: I want to jump in here. There's a few other activities going on within the state that I think everybody should be aware of, and some of them are larger than the state. There's a Institute for Water Resources effort, which is a entity of the Corps of Engineers out of Virginia, that has a national purview, and they're putting together a shoreline management study for the entirety of the Gulf of Mexico. As of this week, that I plan is at 80% complete, so that'll be coming out shortly. So that's the overall master plan that shows all the different things going on in the Gulf. And then the other thing that I wanted to mention that Carla asked about was, are all these different plans nesting together? As much as we conceivably can do, yes. The GLO, through the separate group with Kevin Frenzel, they're doing a bunch of sediment management plans as well for the entirety of the state. Their effort's going to take several years to come to fruition, but we're coordinating as much as we possibly can. The Corps of Engineers, we're trying to do things in a little bit more of a discreet manner working with local municipalities to basically give them the tools they need to make the right decisions and leverage funds from the state or whomever, to actually get dirt into the system, so that we have a more resilient coastline. And in terms of what the Corps is trying to do with all these different sediment management plans that I mentioned, my selfish goal is to get sediment management plans from Louisiana to Mexico, and basically I'll fill in all the gaps and have everybody talking together. So when we update one that impacts its neighbor, we will go ahead and modify that plan as well. That being said, there's just a lot of things happening in the state, and we just all have to continue the dialogue, and I know it's hard to keep this going, especially in a completely virtual environment, but I think things like the ASBPA conferences, if we can get some national conferences like that to come to Texas that would allow us all to get together. And there's just a lot of information and a lot of data sharing that needs to continue. We have to keep connected. That to me is the path of success for the state. The Coastal Texas Study is wrapped up now, and there's going to be projects down at South Padre Islands that are going to be federal beach projects. There's going to be projects up in Galveston area that are in Follets Island, as well as over in the peninsula. So going over towards Texas Point, there's going to be other projects all along the coast of Texas that are all going to stem from a lot of these big projects that we're all working on. And as those move forward, they're going to change people's thought processes. When I moved here in 2016, we never had had a federal beach project. We still haven't, but we are on the cusp of having several in a very short period of time. And as those occur, it's going to show everybody in the state that they've been missing out. So as part of this new infrastructure bill, there was almost $100 million set aside to re-nourish beaches that were damaged by hurricanes over the past two years. So if there is a federal project in Texas, a federal beach project, that would be getting re-nourished at 100% federal expense. So these are the things that the state of Texas really needs to consider and move forward and push really, really hard to get coastal Texas implemented, as well as other places that were not part of that effort, they need to get themselves into the feasibility study process so that they can get projects on the ground for their own coastal resilience.
Juan Moya	This is to Carla and GLO staff and the Corps. It looks like some of these sediment sources are going to be on the state waters and some are going to be in federal waters. How different do you think these approaches will be?	Sediment source jurisdiction	Carla Kartman: Well, we're going to look at the nearest place possible, just speaking of coastal Texas alone, and the master plan which is complimentary to coastal Texas. When it's time to work at the Corps and design the borrow area and the placement area, we're going to look at all this data that we've gathered through CEPRA and some of the other work that's being done. And we're going to try to prioritize and identify whatever source is the most optional. Like you brought up earlier, should we consider for the smaller beach, should we consider going inland or the bays or just right off shore still in state waters, we'll be working with the Corps on that to try to determine which sediment sources are going to work the best, and which ones are going to make the most financial sense at the time. That's all I have for that.
			Thomas: I might jump in here and address a couple things. First, let me talk a little bit about some more of GLO's longstanding relationship working with both the Army Corps of Galveston District, and then the city of South Padre, and I wanted to just ask Seth for his thoughts on this. As he alluded to, there is an opportunity to partner with the Corps when they undertake federal maintenance dredging, to beneficially utilize material that would do beach quality for beach nourishment purposes. GLO has enjoyed the benefit of having a longstanding open-ended contract as an MOA dating back to 2001, that is for administrative stream lining purposes that allows us to execute support agreements per event with the Galveston District for beneficial use. What Seth was mentioning was, when the bid specs are written, there's an option or several options for the diversion of beach quality material to an alternate disposition site, separate from what's known, normally the government standard disposition site. That alternate disposition is typically for the nourishment on the beach. Historically, Kaplan, when Rollover Pass was opened in South Padre City Beach, Pa Five needs La Blanca Pa One, adjacent to the [inaudible] Island Harbor channel. GLO has partnered with the City of South Padre for years, and with Galveston County for GIWW, row of a bay UDM events, to help compile the incremental cost payment made to the district, and Seth, what I wanted to ask you was in recent years with the ever increase in dredge costs, as far as the bids that the Corps received in response to maintenance dredge solicitations, we've run into a problem where, because of... I've never been clear if it was Department of the Army, DOD, or Corps specific. Part of the army, DOD or Corps specific procurement regulations. But if the bids come back in and they are awardable, we've found that in recent cases, it has not been possible for the district to award the contract with the beach placement option, even though we've had the additional funds to provide the incremental cost because of procurement regs. So I wanted to get your thoughts on that, number one. Number two, with the City of South Padre, their Corps permit long has had some additional, optional possibilities for sediment number of offshore bar sources that we have identified under prior CAPRA projects. That also includes, parallel to that, school landlord leases to the city in the event that partnership with the Corps is not possible and we needed to harvest through submerge source. More recently, we are looking at the potential duty to use beach quality material from the Braws Island Channel improvement project being led by the next decade with the Port of Brownsville. And we currently actively have regulatory work ongoing for the city's permit to update it to consider the use of material that would be beach quality that could arise from that, either the new work or the perceived follow on maintenance prep. So that's kind of a potential opportunity that we're doing all we can to avail ourselves of that, should that be a viable option. So that's really all I wanted to say regarding that. Seth, I just wanted to, again, ask if you've had any further thoughts on these challenges we've seen recent years with high dredge cost and the inability to award with direct beach placement option.

Comment/Response Database
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Commenter Name	Comment/Question	Comment/Question Topic	Comment/Question Response
			Seth Jones: Yeah. Okay. Thanks, Thomas. First of all, I'm glad here that there's been progress on using some of that next decade material beneficially since that was not part of their original plan and over many years of coordination and urging them to pursue that. I'm glad to see that that's hopefully coming to some kind of fruition. The question about awardable bids, just a little clarification. So when, in that particular instance, which was a couple years ago, you were talking about that the GLO happened to have, so the GLO, the partners, the GLO of the city, the county, happened to have sufficient funds to cover a bid for that option that came in above our awardable range. In this case, just want to make it clear that since you had... If an entity has sufficient funds to award a high bid, a higher outside of our awardable range, doesn't automatically make it awardable. So when we are talking about in the Corps contracting community and our judging contracts, when you're talking about awardable versus unawardable, when we receive a bid, it has to be within 25% of the government estimate. If it's outside that range, we're unable to make an award. So even this, I don't remember the exact numbers, but it was outside the awardable 25% range. And we discussed it with our contracting office and they made a decision that it's not awardable. So in those cases, there are opportunities you can convert to negotiations, but that is a lengthy, time consuming process. And you may not even get to a bid within the awardable range. So that's just a brief explanation of what is awardable for the Corps. And I don't know, Thomas, if it's DOD wide, I'm assuming it's the same contract regulations that applied to everyone, but I can just speak into the Corps of Engineers contracting office. And so for those of you who are not familiar, how we arrive at these costs. And Thomas did touch on briefly that we have a long, longstanding, good working relationship with the Texas General Land Office, going back to Ray Newby, and he has since retired. I think he's on the line and been working with Thomas Durnan for almost 10 years, and now working with Angela Sunley after Ray Newby. So, we do partnering with the General Land Office in various cities and counties along the coast. We have a memorandum agreement that allows us to pretty... With as minimum as bureaucratic red tape as can be possible in a situation like this, it allows us to work with entity. It will find a project as long as they can work with the General Land Office and what we do is we determine what the, what they call incremental cost, which are the cost above what a typical federal standard dredging project may be. For an example, if we are going to dredge a section of a channel and it goes to placement area X, the incremental cost would be the cost to take it an additional two miles, for example, to beneficial use site, and then any cost associated with contouring or levy work or dike work for construction of a particular marsh cell, for example. So those are incremental costs. So those incremental costs are contributed by the folks that are partnering, working through the General Land Office. And then if we're able to award an option to do the beneficial use, then that marsh or beach or bird island work, whatever it is, is administered by the Corps of Engineers through our resident offices in the fields. So if you have an option on a contract, another benefit is you get the Corps' contract management experience, managing the particular contract or beneficial use portion of it. So that's incremental costs, and they have to be same as the other one. They have to be within the awardable range.

Appendix I: Workshop Follow-Up Survey Response Database

Texas General Land Office Virtual Sediment Workshop No. 2
Workshop Follow-Up Survey Results

Response #	I found the Sediment Workshop to be beneficial.	I was provided with the proper details to attend the Sediment Workshop virtually.	How would you rate your experience using WebEx for the Sediment Workshop?	I am likely to attend subsequent Sediment Workshops.	What part of the Sediment Workshop was most beneficial to you?	What would you like for us to improve at the next Sediment Workshop?	Do you have any information that you can share in the development of the Texas Sediment Management Plan?	Do you have any discussion topic suggestions for the next Sediment Workshop?	Would you like to schedule a follow-up meeting with the GLO to discuss your organization's sediment uses and/or sediment needs?	Do you have any additional comments or recommendations for the next Sediment Workshop?
1	Strongly Agree	Strongly Agree	Excellent	Strongly Agree	Really enjoyed the panel sessions. Also enlightening to see all the offshore sediment searches going on — do you think all parties are talking to each other?	—	—	—	—	—
2	Strongly Agree	—	Good	Strongly Agree	Format, content, and diversity of participation.	Provide presentation materials as soon as available.	No	—	—	—
3	Strongly Agree	Agree	Very Good	Strongly Agree	Beneficial use	Maybe face-to-face	—	—	—	—
4	Agree	Strongly Agree	Good	Agree	The presentation of the geology, i.e., the conceptual geologic stratigraphic model, followed by the offshore geophysical/geotechnical data collection and analysis investigations.	No suggestions	Nothing you are not already aware of.	—	—	—
5	Strongly Agree	Agree	Good	Strongly Agree	Listening in the industry is very important. As in other states, the agencies need to keep in perspective that not all the restoration efforts require dredging. Too bad only a few members of the industry attended the panel.	GLO should provide questions in advance to the speakers. For example: What does the GLO need the public to know about the project or the study? Why the study or project is relevant to GLO partners? What is the final goal of the project? Etc.,	Yes. I have a long list of needs.	Yes.	Yes. Juan.moya@mottmac.com	Yes, I'll share them with the GLO project managers.
6	Agree	Strongly Agree	Good	Strongly Agree	Hearing from the dredge industry on their capabilities. Making sure the data is being shared (upcoming investigations, needs, G&G data).	More involvement and realistic discussion from the construction/ dredging side of restoration projects. That understanding is important for those doing the planning and design.	Nothing additional at this time.	Update on sediment resource investigations. Update on dredge technology.	Not necessary at this time. BOEM and GLO are involved on many projects.	Not at this time.
7	Strongly Agree	Strongly Agree	Very Good	Strongly Agree	Updates on new resources along upper Texas coast.	Presentation timing was too short for the subject matter. Long presentation times would be better. Went nearly an hour over schedule.	No additional information.	Would like to see further work to delineate resources on upper coast and also the recon surveys further down the coast in mid and lower regions. (2-4)	—	None
8	Agree	Strongly Agree	Excellent	Strongly Agree	—	—	—	—	—	—
9	Agree	Agree	Fair	Undecided	—	Better time management and facilitation	—	—	—	—
10	Strongly Agree	Strongly Agree	Excellent	Strongly Agree	—	—	—	—	—	—
11	Agree	Agree	Very Good	Agree	—	Need to try to stay on schedule.	—	—	—	—
12	Agree	Undecided	Very Good	Agree	Dune restoration, SMP, Sed budget	Make sure the agenda for the workshop is given to all well in advance, as we were not provided it until in the workshop, which made planning very difficult	No	No	No	No
13	Strongly Agree	Strongly Agree	Good	Strongly Agree	Panel discussions	More time for questions after presentations.	Pre- and post-placement of sediment need surveys done. There was not a mention of this.	Beach surveying for pre and post placement	Yes	—
14	Strongly Agree	Agree	Very Good	Agree	—	It was all very good - good presentations and panel discussions.	No	No	—	Obviously, 15 minutes was not enough time for a number of presentations. Need to make it at least 20 and/or terminate presentations when time expires.
15	Agree	Agree	Very Good	Strongly Agree	Chip seismic and dredge capabilities.	Add a section on current and future plans such as advanced coring and dredge testing.	No	Role of North Jetty in sediment movement.	No	Not now
16	Undecided	Strongly Agree	Very Good	Undecided	I didn't realize what the presentations were really going to be like. The information wasn't really relevant to my work, even though I am generally interested in learning about the topic. I didn't stay with the workshop all the way through.	—	—	—	—	—
17	Strongly Agree	Strongly Agree	Excellent	Strongly Agree	Understanding what new data is being collected to inform future planning decisions.	Would suggest allocating 20 minutes per presentation in future workshops. 15 minutes for speakers to present and 5 minutes for questions. Trying to accomplish both in 15 minutes was too optimistic which led to overruns and having to push through planned breaks to stay on track. This made it very difficult to stay focused/engaged with all the good content throughout the day, having a bit more flexibility in the schedule to accommodate small delays would help the overall flow of the event.	Yes, results from the longshore sediment transport modeling and sediment budget work.	It would be helpful for the GLO to provide a high level overview and timeline of the sediment management projects they are currently progressing and those they plan to get started on soon.	—	—
18	Strongly Agree	Agree	Very Good	Agree	—	—	—	—	—	—
19	Agree	Undecided	Good	Agree	—	—	—	—	—	—
20	Strongly Agree	Strongly Agree	Excellent	Strongly Agree	I really enjoyed the depth of discussion. We got past the high level, and were really able to understand more of the nuance.	To coordinate a little better to ensure speakers are not too repetitive. Ultimately, several people ended up talking about very similar topics.	No	No	No	Great job! Very informative. Good things will come from upping the collective understanding of our interested stakeholders and practitioners.

Texas General Land Office Virtual Sediment Workshop No. 2
Workshop Follow-Up Survey Results

Response #	I found the Sediment Workshop to be beneficial.	I was provided with the proper details to attend the Sediment Workshop virtually.	How would you rate your experience using WebEx for the Sediment Workshop?	I am likely to attend subsequent Sediment Workshops.	What part of the Sediment Workshop was most beneficial to you?	What would you like for us to improve at the next Sediment Workshop?	Do you have any information that you can share in the development of the Texas Sediment Management Plan?	Do you have any discussion topic suggestions for the next Sediment Workshop?	Would you like to schedule a follow-up meeting with the GLO to discuss your organization's sediment uses and/or sediment needs?	Do you have any additional comments or recommendations for the next Sediment Workshop?
21	Agree	Strongly Agree	Good	—	Technical presentations	Fewer number of presentations and allocation time for Q&A after each presentation.	I am new to GLO sediment work but I have been practicing in this area for many years as a consultant and currently as a faculty with the University of Texas at Arlington so I'd like to be more involve in GLO sediment initiatives.	Not at this moment.	I am not a sediment user but I am a researcher in the area of sediment transport. So, I'd like to work with GLO on their sediment projects.	No
22	Strongly Agree	Strongly Agree	Excellent	Strongly Agree	Everything thing was enlightening.	Continue to go virtual.	—	Sediment budget studies along the Texas coastline.	—	—
23	Strongly Agree	Agree	Good	Strongly Agree	The morning presentations, especially ones about current research and surveys regarding sand resources.	Presenters should have been kept on schedule. Nearly every presenter went over their allotted time, and some significantly so. This made it difficult for people targeting specific talks from seeing those talks, and resulted in reduced attendance because of missing breaks and an abbreviated lunch break.	—	No	No	No
24	Strongly Agree	Strongly Agree	Excellent	Strongly Agree	The panel discussions.	Hopefully it can be in person.	—	—	We would appreciate an opportunity to discuss partnering opportunities with GLO. Michael Poff, President, Coastal Engineering Consultants. mpoff@cecifl.com	—
25	Agree	Agree	Fair	Agree	Updates on GLO studies.	Better presentations	No	Economic aspects	No	No
26	—	—	—	—	—	—	—	—	—	Recommend that when the user registers it automatically creates a calendar link with all needed information.....agenda was sent out late
27	Strongly Agree	Agree	Very Good	Strongly Agree	The discussions that followed each talk when that happened and the panel discussion. Would be great to have a round table-like meeting with key discussion point recommended by attendees (Coraggio mentioned something like this also. I am big fan of virtual meetings. Allows everyone to participate no mater what their situation is. Full inclusion event due to virtual event. Thank you for that. Also the meeting was well organized. The moderator maintained control while fostering discussion. Break out groups for discussion would be cool in future to allow more free discussion.	See previous also. 1. Break out options for more detailed discussion on topics of shared interest 2. Prepared points of discussion introduced after a talk to stimulate discussion 3. Time at the start of the meeting to meet and greet ....mimic in person exchange at live meetings.....Missing that and I think it could happen virtually (we do this at our meetings and presentation at CBI....maybe in break out like if seated a table together.... Thanks for asking this question This was a very enjoyable meeting. Few audio issues nothing to complain about!	Yes. CBI monitors 11 CEPRA beaches for the TGLO (2007 to 2020) https://cbi.tamucc.edu/CHRGIS/ https://sandy.tamucc.edu/chrgis/maps/ https://sandy.tamucc.edu/chrgis/profiles/ CBI also monitors Nueces County Gulf facing beaches from Port A to PINS, initiated 2020 post-2020 storm season Packery Channel Monitoring Program: Gulf facing beaches adjacent to Packery Channel along Mustang and North Padre Island (2003-2020)	1. Post-2020 Storm Season Beach Erosion (Bays and Gulf facing) 2. Success stories PAS and CAP and other opportunities? 3. More invited talks on successful sediment management plans in other states (Florida, east coast) Success, cautionary tales and what they have learned 4. New options in technology for separating fines from beach quality sand (worldwide?). Using "less than" beach quality sand for beach nourishment. Demo projects? 5. Beach Quality Sand. Expanding the dialog. Reasons for application of coarser than native quarry sand for bayside beaches defining what beach quality sand means for bayside and Gulf (and should this be expanded and what that would look like- Coraggio may have ideas). Ways to target creative sources of recovering beach quality (inland) sand for both types of beaches with different systems along the coast. 6. Non-traditional "living shoreline" options for bayside beaches. Not just about plants anymore..... vertical living shorelines for highly dynamic shorelines. Hybrids such as Packery Channel Nature Park (CBI conducted preliminary research on historic erosion along the park adjacent to Packery Channel May send more in email if contacted....	Could meet to discuss how CBI can best support plan development please contact as appropriate CBI supports Nueces County in dialogs on developing plans for sand management (Scott Cross and Meagan Jones). Deidre.williams@tamucc.edu	Thank you for the opportunity and for making it virtual. Great workshop and looking forward to the next. Happy to present on shared topics of interest.
28	Strongly Agree	Strongly Agree	Excellent	Strongly Agree	The amount of networking and cross-communication was stellar. I didn't feel like I was watching a show, everyone was comfortable enough to have meaningful discussions despite the virtual methodology. I think we are all getting the hang of this virtual thing.	Interactive polls	Yes, I'd be happy to volunteer the City of Galveston and the Galveston Park Board to be involved.	—	—	Great job everyone.
29	Agree	Agree	Good	Agree	The talk by the City of Galveston employee - Brandon Hill	Allow presenters to click through their own presentations. Having to hear the word "next" so much was painful.	No	Increased focus on practical information	No	Maybe coordinate presentation order so topics are grouped and cohesive
30	Agree	Agree	Good	Undecided	It was an interesting dig deeper into the information about sediments that I was not familiar with.	Keeping people at the allotted time for talks. Since it was virtual, missing the AM break and getting a much shorter lunch was ok, but I think it is rude to the other presenters who kept their talks to the allowable time and also rude to the speaker that came after the people who spoke too long.	Not sure at this time.	—	—	—
31	Strongly Agree	Strongly Agree	Very Good	Strongly Agree	Learning about dredging technologies and studies of sand/sediment deposits.	Better adherence to time limits for speakers. It got a bit out of hand.	—	—	—	—
32	Strongly Agree	Strongly Agree	Excellent	Strongly Agree	The variety of agencies who presented on various topics was very beneficial to see what work is going on.	—	—	I think the workshop turned out great, thank you for all your work on this. Hopefully we can do the next one in person!	—	—

Appendix J: Workshop Presentations

WELCOME

Texas General Land Office Sediment Workshop 2

November 10, 2021

Texas General Land Office Sediment Workshop 2

The Sediment Workshop is funded by a Texas Coastal Management Program Grant approved by the Texas Land Commissioner pursuant to National Oceanic and Atmospheric Administration award No. NA21NOS4190136.

Texas General Land Office Sediment Workshop 2

AGENDA

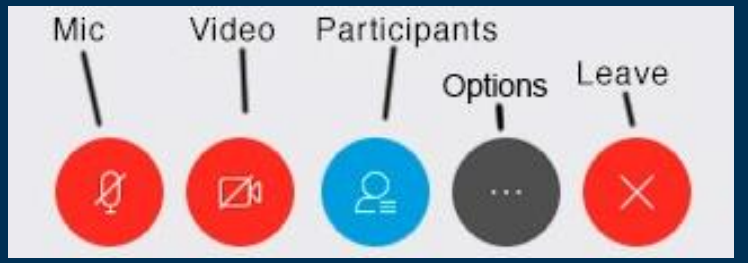
8:00 – 10:00 AM	**Presentations**
10:00 – 10:15 AM	*BREAK*
10:15 – 12:00 PM	**Presentations**
12:00 – 1:00 PM	*LUNCH BREAK*
1:00 – 4:00 PM	**Panel Discussions**

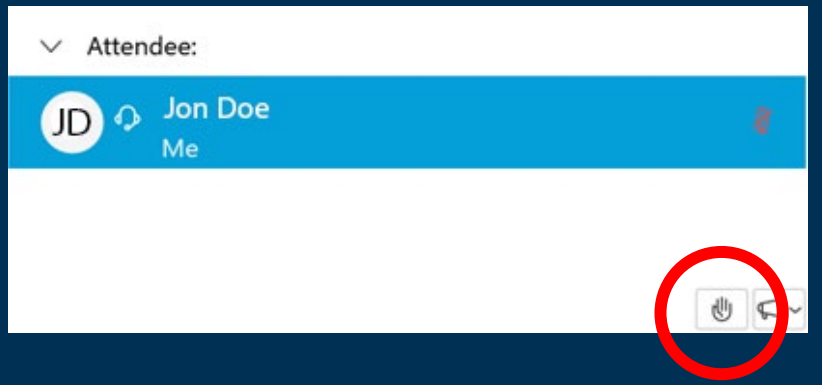
Texas General Land Office Sediment Workshop 2

HOW TO PARTICIPATE

There will be a brief Q&A after each presentation:

- ***Use the "Raise Hand" feature*** *– facilitator will prompt you to ask your question to the presenter/panel*
- ***Use the Chat feature*** *– facilitator will read questions verbally to the presenter/panel your behalf*





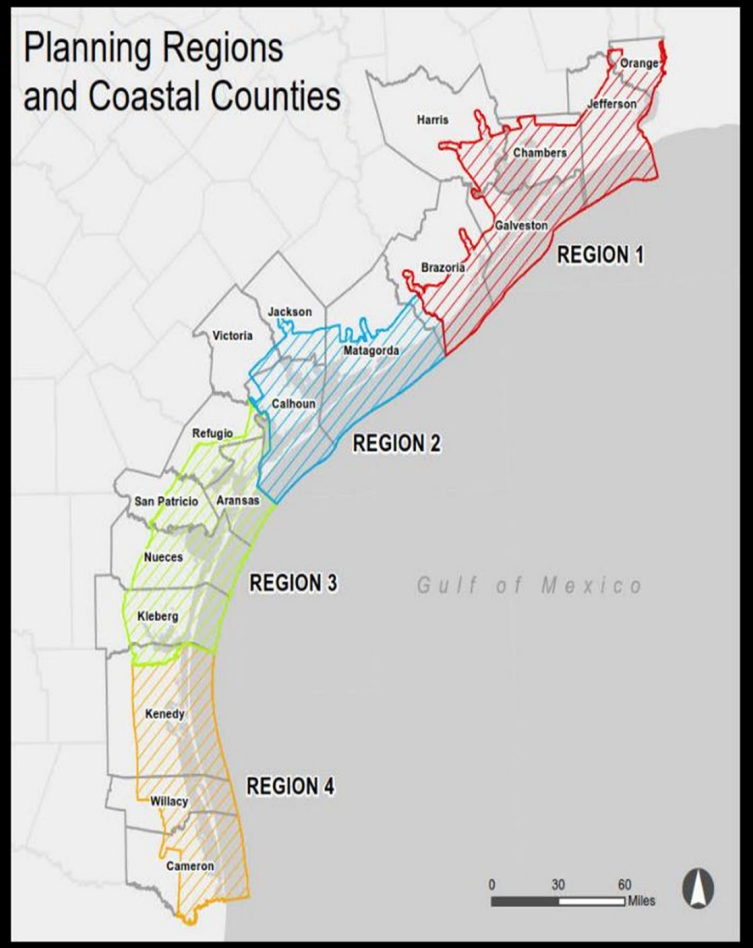
Please mute your microphone when not speaking

Texas Sediment Management Plan

Texas General Land Office • George P. Bush, Commissioner

SMP GOAL

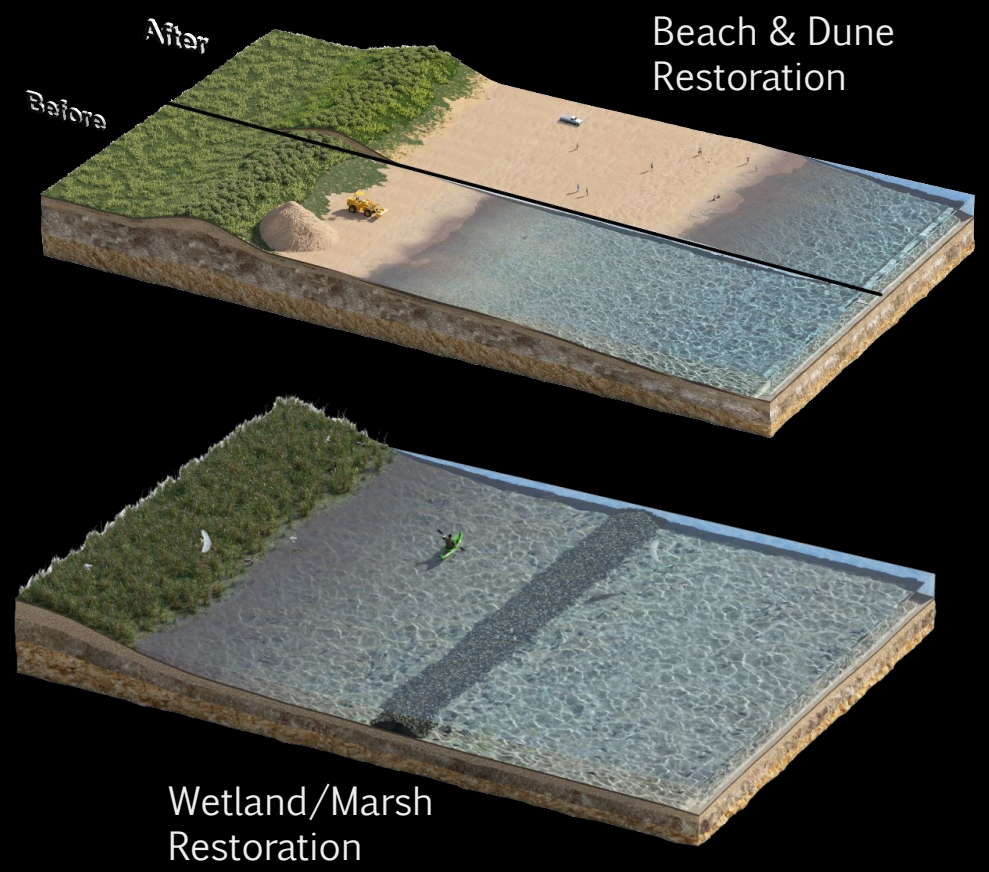
Create guidance to aid in future coastal resiliency and restoration efforts on the Texas coast



Texas General Land Office
George P. Bush, Commissioner

SMP GOAL

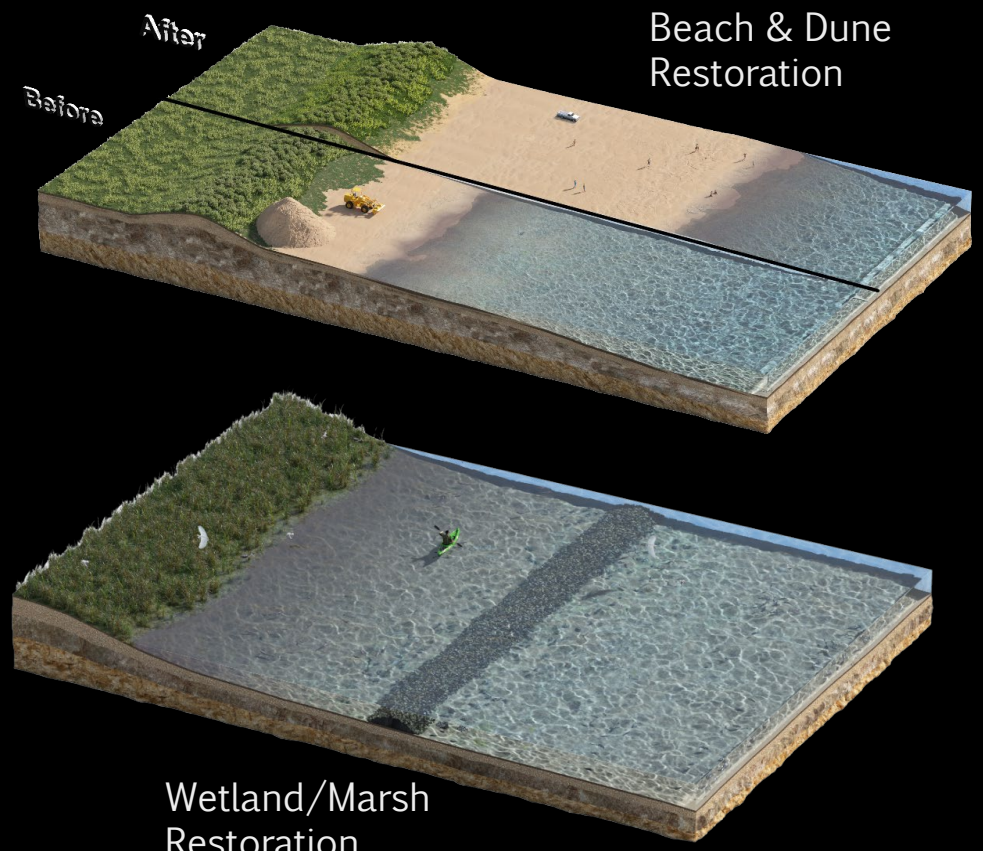
- **Identify** sediment needs and available resources
- **Develop** borrow areas
- **Permit** borrow areas and placement areas
- **Inventory** sediment resources
- **Allocate** sediment resources
- **Monitor** sediment resources, budgets, and transport
- **Develop or Modify Policy** for sediment resources



Texas General Land Office
George P. Bush, Commissioner

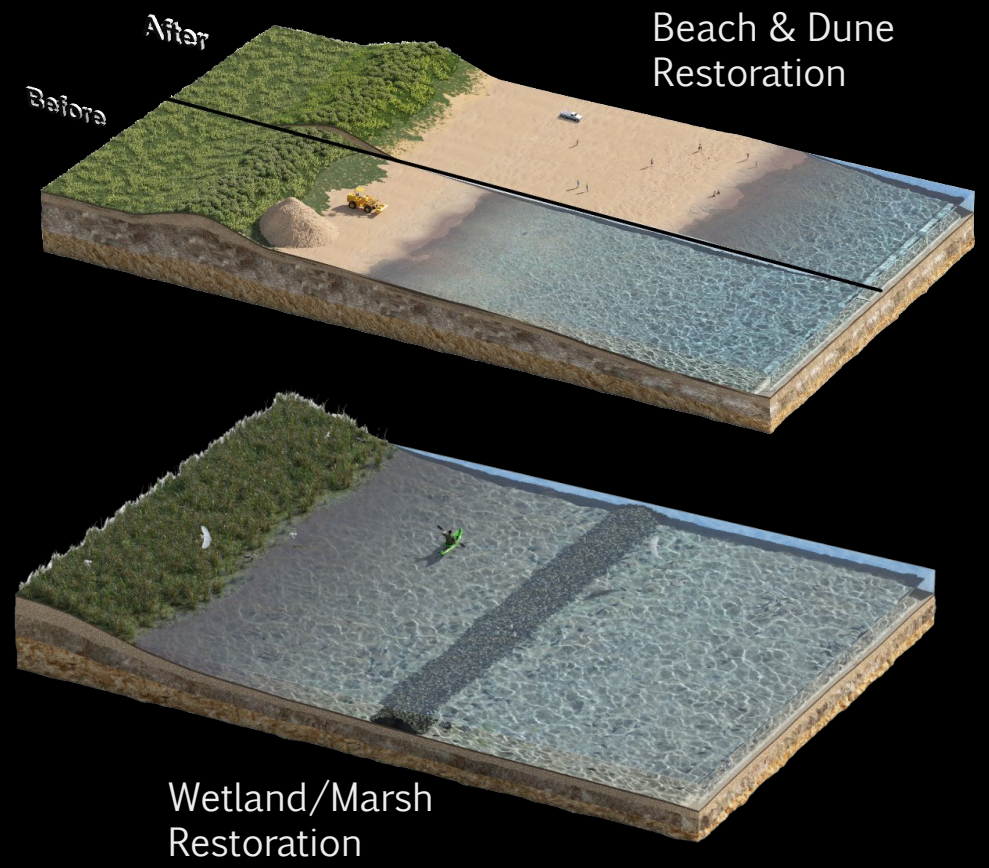
SMP GOAL

- **Identify** sediment needs and available resources
  - Geological history
  - Critically eroding areas
  - Programmatic needs
  - Data gap analysis



SMP GOAL

- **Identify** sediment needs and available resources
- **Develop** borrow areas
  - Guidance on identification and characterization of borrow areas
  - Guidance on beach nourishment with beach quality sand



Texas General Land Office
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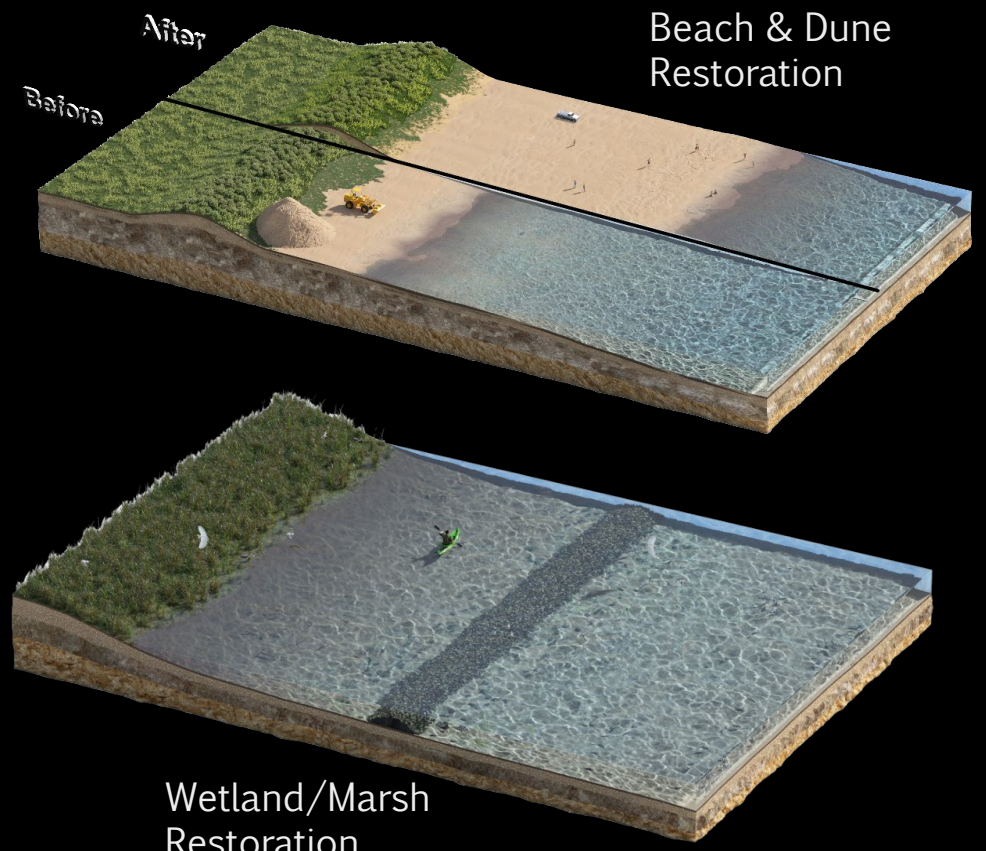
SMP GOAL

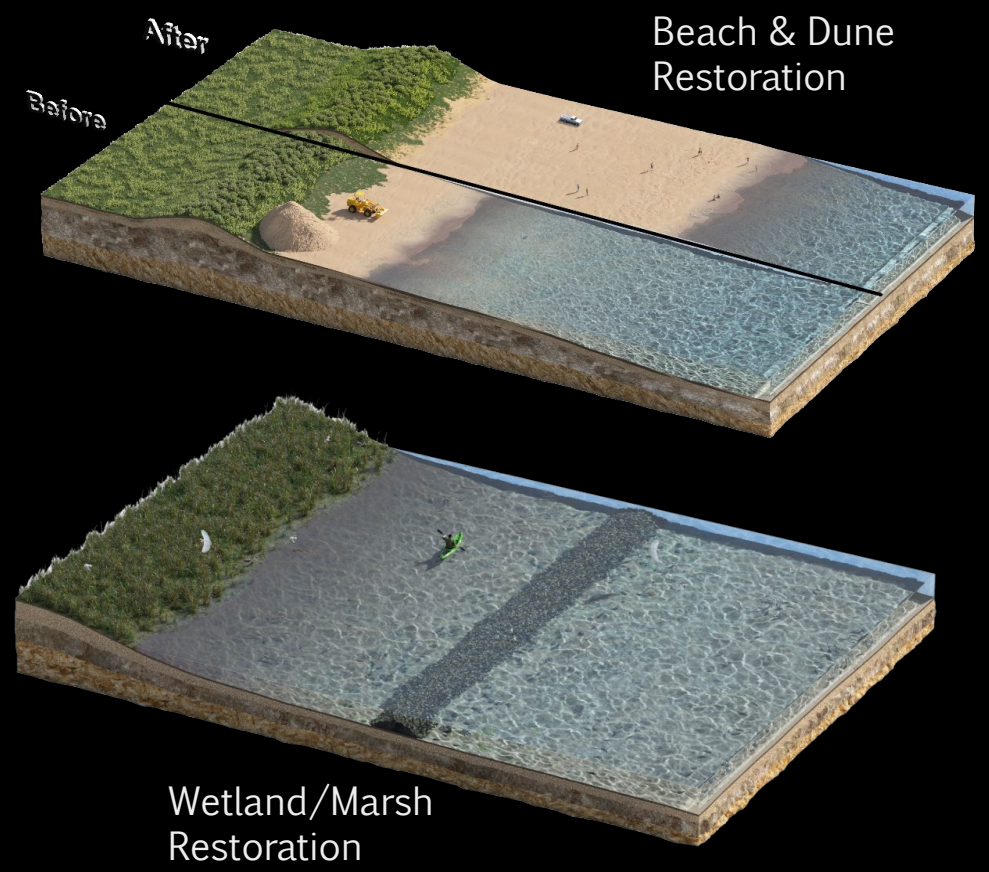
- **Identify** sediment needs and available resources
- **Develop** borrow areas
- **Permit** borrow areas and placement areas
  - Guidance for leasing and approval of both placement and borrow areas
  - Guidance for securing nationwide, individual, and regional general permits



Texas General Land Office
George P. Bush, Commissioner

SMP GOAL

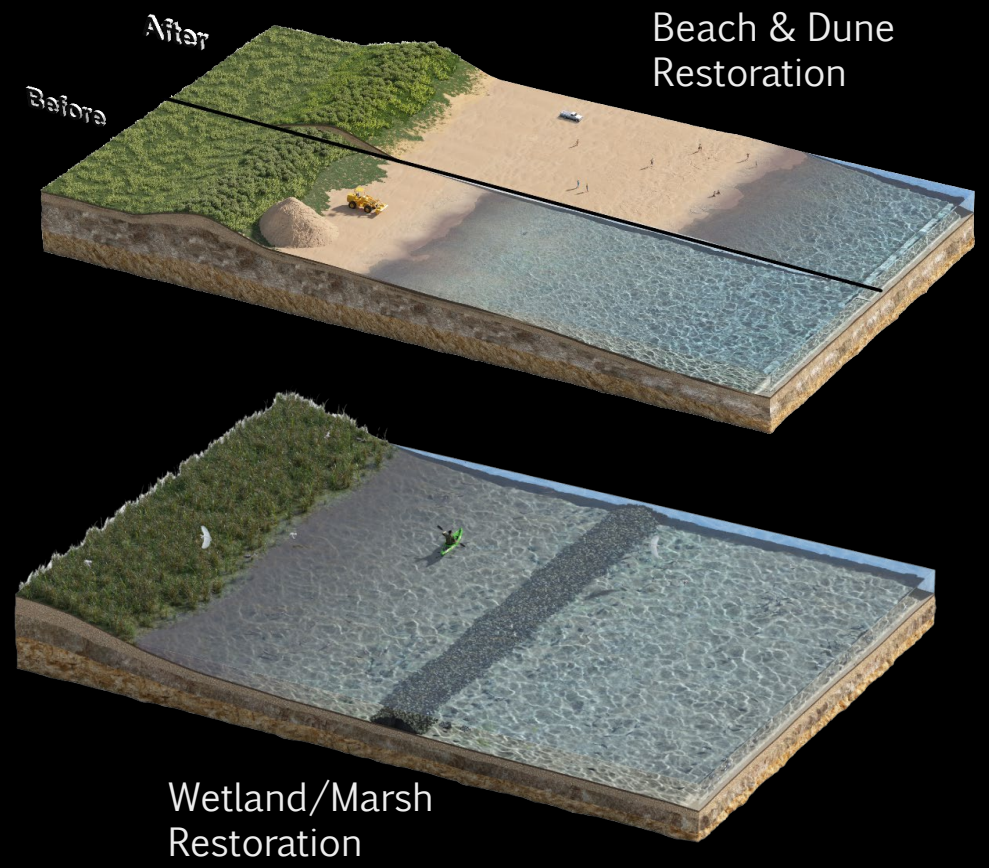
- **Identify** sediment needs and available resources
- **Develop** borrow areas
- **Permit** borrow areas and placement areas
- **Inventory** sediment resources
  - Overview of the functionality and ongoing updates of tools available for sediment resource inventory and visualization



Texas General Land Office
George P. Bush, Commissioner

SMP GOAL

- **Identify** sediment needs and available resources
- **Develop** borrow areas
- **Permit** borrow areas and placement areas
- **Inventory** sediment resources
- **Allocate** sediment resources
  - Development of a sediment allocation matrix



Texas General Land Office
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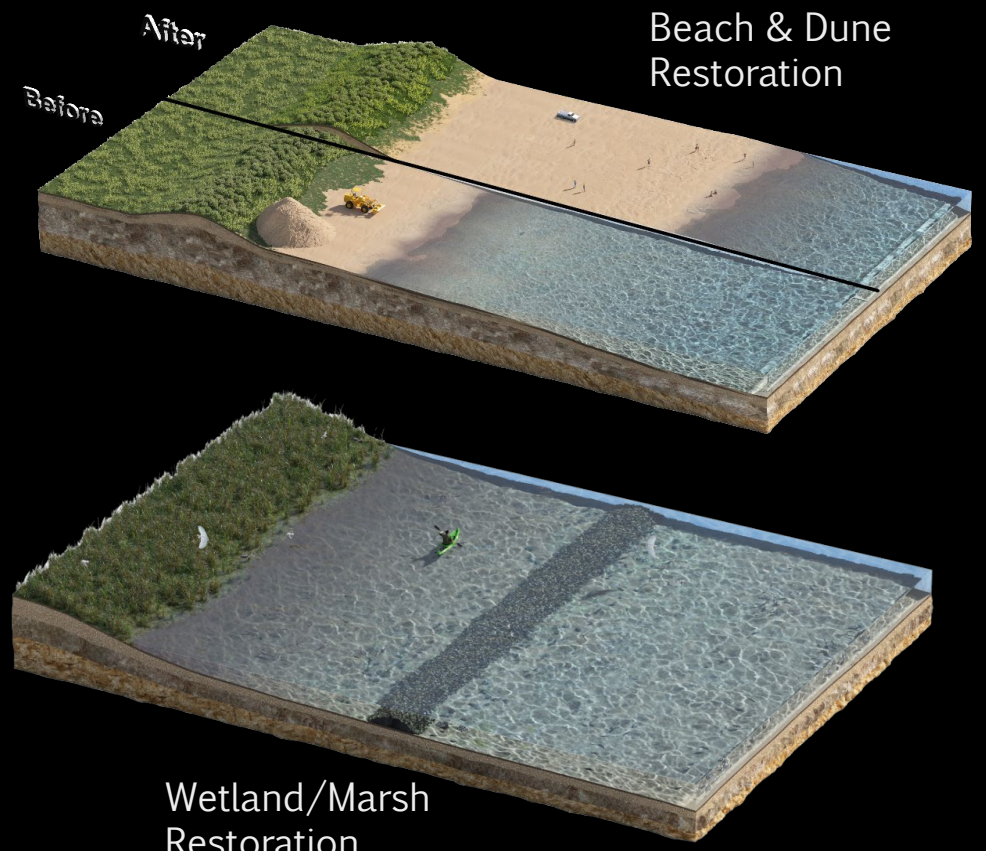
SMP GOAL

- **Identify** sediment needs and available resources
- **Develop** borrow areas
- **Permit** borrow areas and placement areas
- **Inventory** sediment resources
- **Allocate** sediment resources
- **Monitor** sediment resources, budgets, and transport
  - Post-placement beach monitoring protocols
  - Borrow site monitoring protocols
  - Sediment budget and shoreline change monitoring
  - Recommendations for local erosion response plans and local sediment management plans



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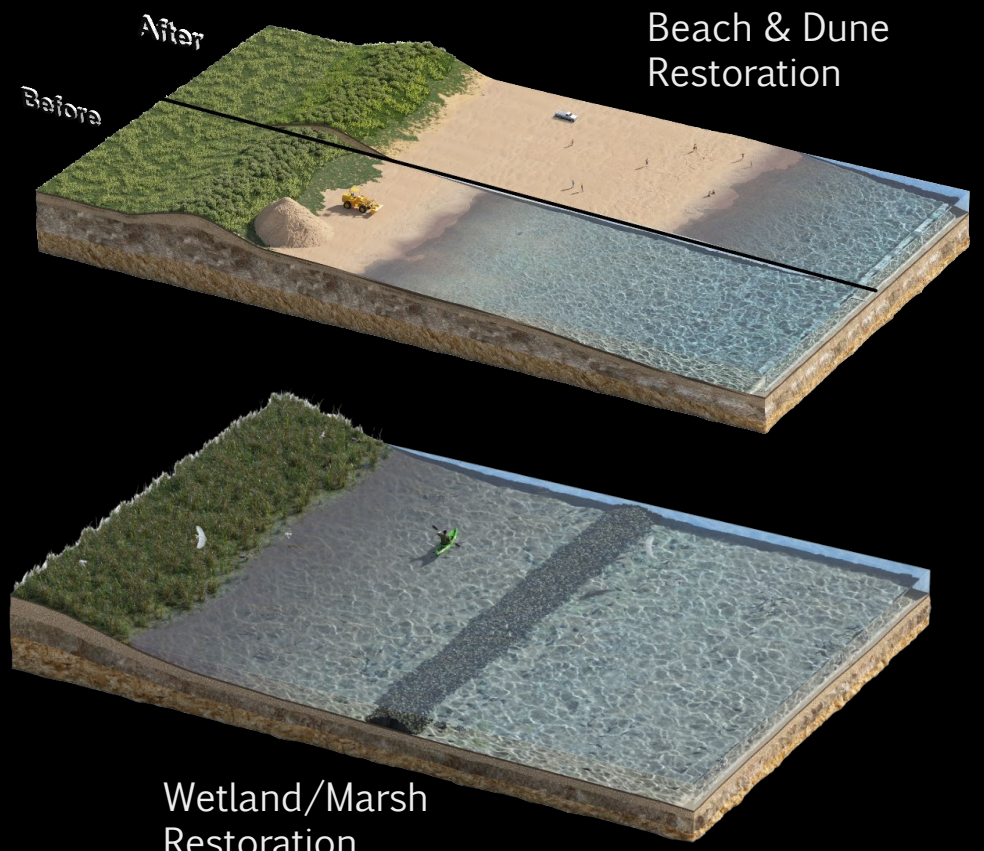
SMP GOAL

- **Identify** sediment needs and available resources
- **Develop** borrow areas
- **Permit** borrow areas and placement areas
- **Inventory** sediment resources
- **Allocate** sediment resources
- **Monitor** sediment resources, budgets, and transport
- **Develop or Modify Policy** for sediment resources
  - Recommendations for oil and gas infrastructure policy
  - Recommendations for coordination and data sharing
  - Recommendations for outer continental shelf policies



Texas General Land Office
George P. Bush, Commissioner

GLO Sediment Management Plan

Developing the SMP will involve heavy coordination. We look forward to learning from you all today and hope to continue to coordinate in the future!

Overview of the National Offshore Sand Inventory and the Marine Minerals Information System

Jennifer Steele/ Lora Turner

BOEM

Bureau of Ocean Energy Management

OVERVIEW OF THE NATIONAL OFFSHORE SAND INVENTORY AND THE MARINE MINERALS INFORMATION SYSTEM

November 10, 2021

Jennifer Steele | Jennifer.Steele@boem.gov | 504-731-1465

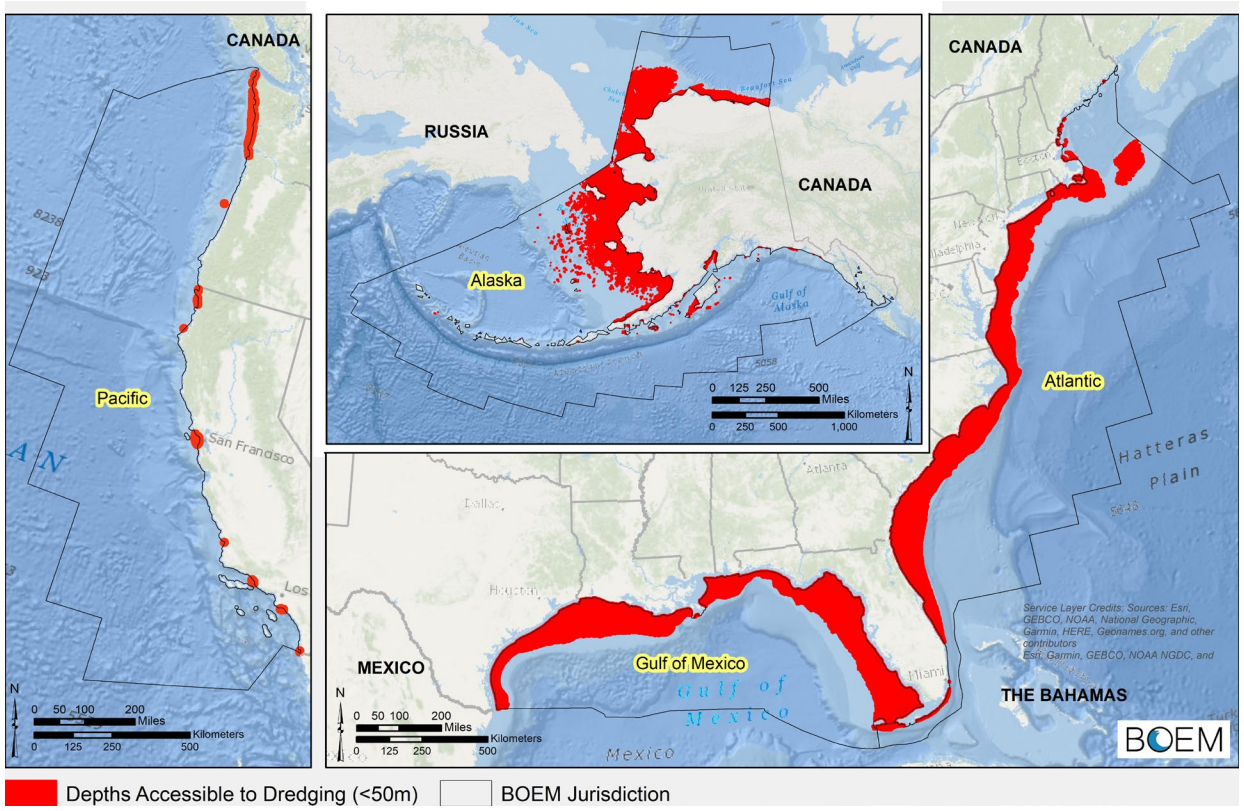
Marine Minerals Program

MISSION

Facilitate access to and manage the Nation's Outer Continental Shelf (OCS) non-energy marine minerals through environmentally responsible stewardship, prudent exploration and leasing activities, coordination with governmental partners, stakeholder engagement, and mission-focused research to improve decision-making and risk management.

Noncompetitive Leases- OCS Sand and Sediment

- Leasing authority - Section 8(k) of the Outer Continental Shelf Lands Act (OCSLA)
- Negotiate agreements with federal partners (e.g., U.S. Army Corps of Engineers) and localities (e.g., counties)
- Most projects 3-8 nautical miles off the Atlantic and Gulf of Mexico
- Current Statistics available at https://www.boem.gov/current-marine-minerals-statistics



63 negotiated agreements executed

50 coastal restoration projects completed

Nearly **172** million cubic yards of material authorized

Nearly **433** miles of shoreline restored in 8 states

Effective Oct 2021

MMP GOMR Summary

The Gulf of Mexico OCS Region's Marine Minerals Program

- focuses on **coordination and collaboration** to build robust partnerships with stakeholder groups, other Federal agencies, States, and communities;
- is **forward looking** in resource management to ensure that Gulf Coast restoration and community protection programs with sediment needs can be successful; and
- is a science-based program that responsibly manages the development of America's **offshore non-energy resources**.

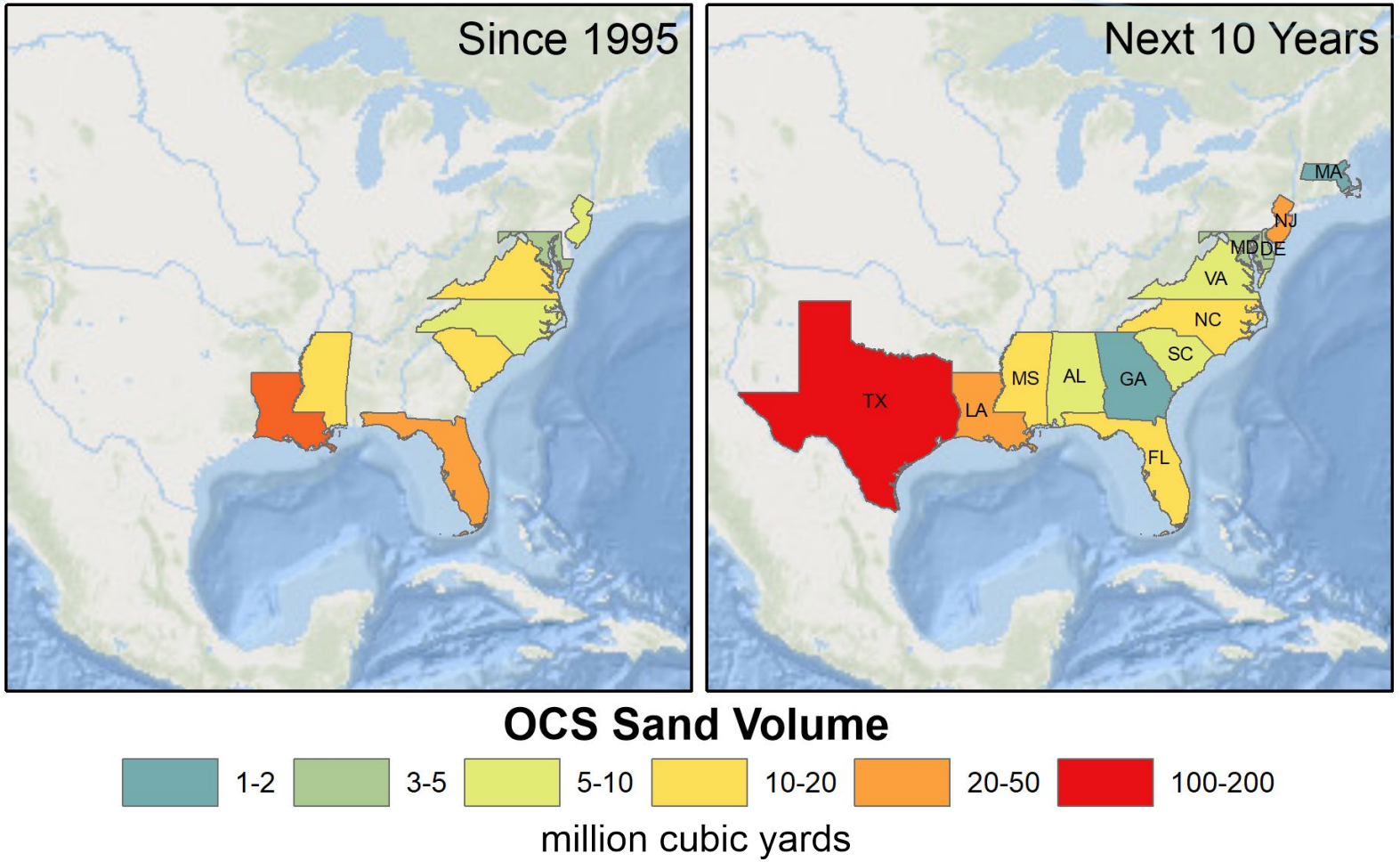
MMP GOMR Summary- Texas

BOEM's focus in the GOM for FY22 is Texas!

- **No leases** have been issued offshore Texas to date but interest in OCS material is growing in Texas.
- **Limited geophysical and geological data exists** on the OCS off Texas that can be used for sediment resource identification
- Ongoing **new data collection** as part of cooperative agreements and interagency agreements with UTIG and GLO (e.g., UTIG's work on Trinity Valley paleochannel)
- Actively involved with GLO, USACE, and USFWS on **planning and investigation efforts** for upcoming projects (e.g., USFWS/ GLO Texas Point project)

National Offshore Sand Inventory (NOSI)

National Offshore Sand Inventory (NOSI)



- Identify location and character of OCS sand resources
- Respond quickly to emergencies
- Collaborate with local and federal partners to identify data gaps, collect and share new/existing data, and inventory data for future use
- Support stewardship role and coastal resilience
- Sand volume needs from "Projected OCS Sand Resource Needs and Effort" (Baird, 2018)

Investments in NOSI **protect billions** in national resources and **reduce** emergency response time.

National Offshore Sand Inventory (NOSI)

BOEM National Offshore Sand - Sediment Resources

- Proven
- Potential
- Unverified
- Unusable

BOEM Wind Planning and Lease Areas

BOEM New York Bight Proposed Wind Energy Areas for 2021 Lease Sale

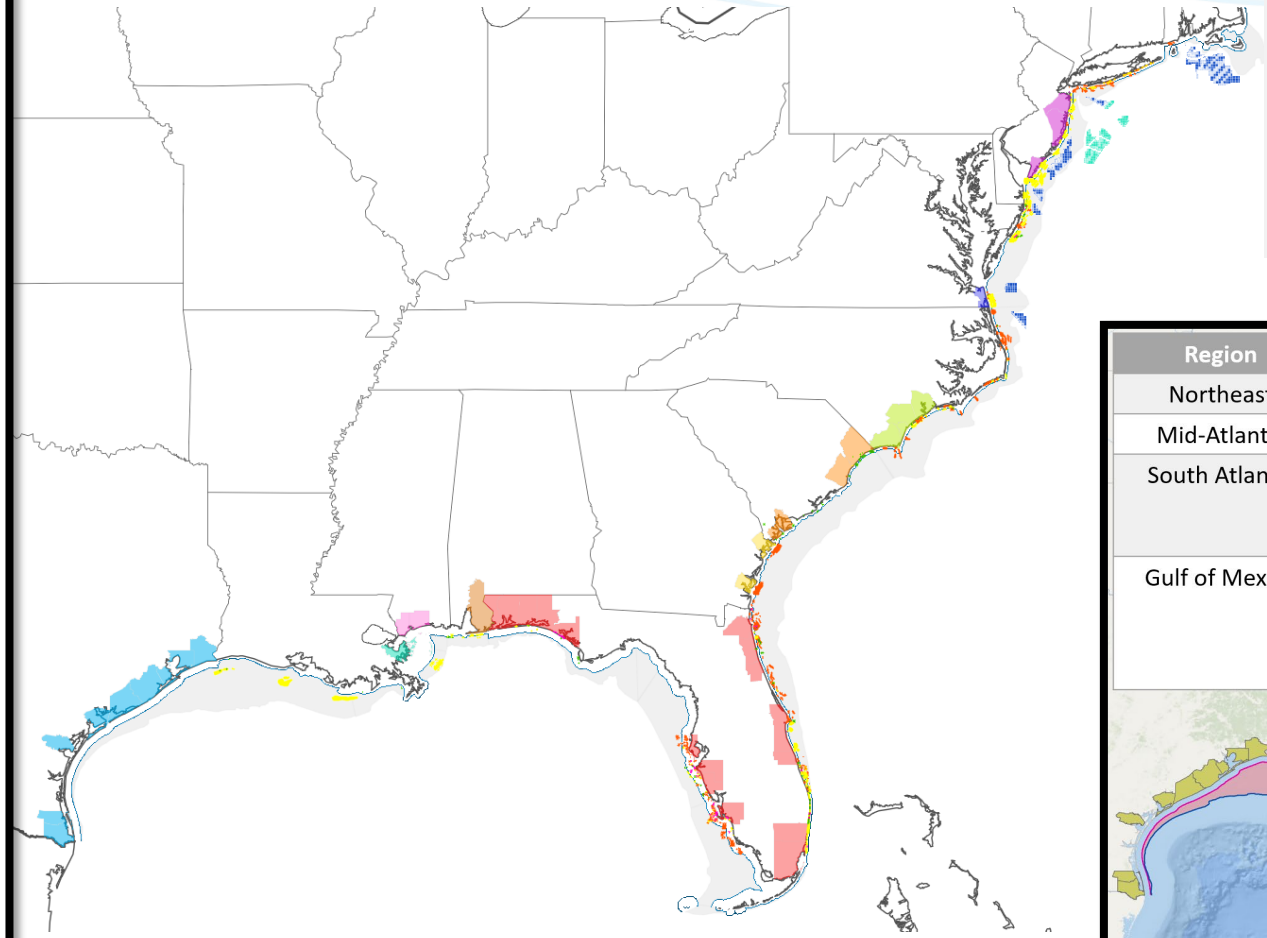
NOSI Focus Areas (water depths less than 30m)

State Priority Areas (by county)

- FL
- TX
- NC
- NJ
- SC
- GA
- MS
- AL
- LA
- VA

Marine Cadastre Layers

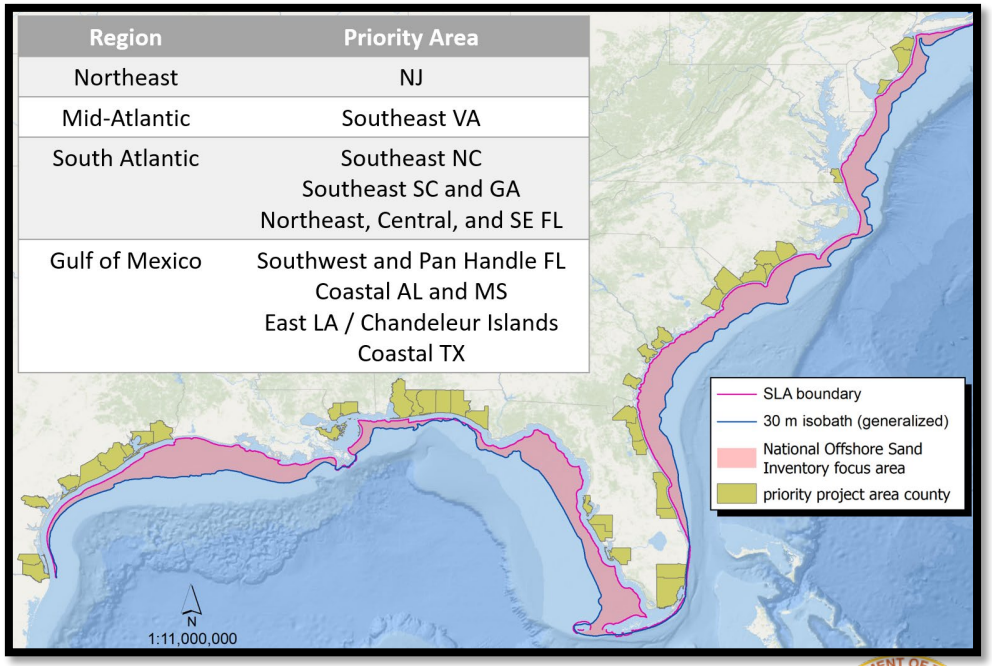
Submerged Lands Act Boundary



Contracts and Agreements

- National Indefinite Delivery, Indefinite Quantity Contract - Geophysical, Geological and Environmental Data Collection and Analysis supporting Outer Continental Shelf Marine Minerals Stewardship
- Atlantic Cooperative Agreements – Virginia, Delaware, New Hampshire
- Gulf Cooperative Agreements – Texas GLO, USACE SW Florida, GSA, USACE Galveston and South Atlantic District, Louisiana CPRA, Florida DEP
- CPS Grant Cooperative Agreements

Region	Priority Area
Northeast	NJ
Mid-Atlantic	Southeast VA
South Atlantic	Southeast NC Southeast SC and GA Northeast, Central, and SE FL
Gulf of Mexico	Southwest and Pan Handle FL Coastal AL and MS East LA / Chandeleur Islands Coastal TX



Gulfwide Offshore Sand Inventory

- Coordination with the Gulf Coast States and other Federal agencies (i.e., USGS, USACE, etc.) concerning offshore sediment management efforts and priority needs

- Understanding shelf geologic evolution important to locating discrete sand bodies (not just “low-hanging fruit” bathymetric highs)

- Beyond the project scale, long-term management as stewards of OCS mineral resources (i.e., managing use conflicts, decreasing restoration planning uncertainty, etc.)

Gulfwide Inventory Conclusions

- **Well established for decades that sediment resources, particularly sand, are scarce**
- **BOEM and partners taking a regional approach to managing offshore sediment resources to inform future project planning and to identify multiple-use conflicts**

  Requires
  - Quality geological and geophysical data
  - Structured data management tool to inform decisions
  - Close coordination with State partners and other stakeholders
- **Refined geologic interpretations are important to identify new viable sediment resources and increase planning confidence at the project scale**
- **BOEM and partners pursuing a Gulfwide Sand Inventory as part of a larger National Sand Inventory**

Gulfwide Sand Inventory Strategy

Near Term

- Implemented cooperative agreements in all five Gulf States with academic institutions and State agencies.
- Interagency agreements established with USGS and USACE- South Atlantic Division

2022-2024

- Continue to incorporate data into MMIS, fill identified data gaps, and prioritization direct new data collection, particularly in areas of identified need and increasing risk.
- Improve functionality and use for data managers, planners, and other users.
- **Texas is the major focus** for FY22 funding due to anticipated needs and lack of data.

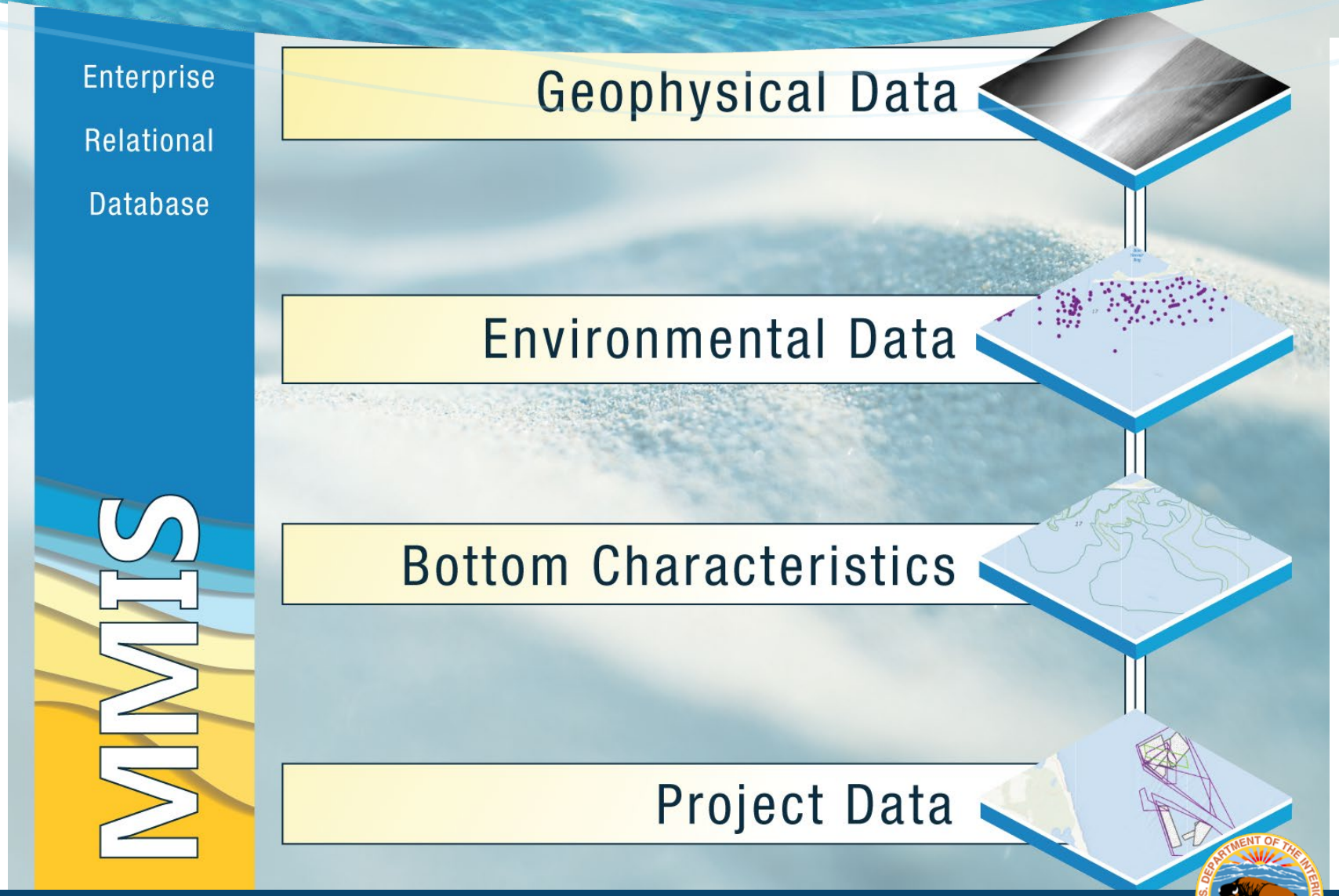
2024-2030

- 8- to 10-year program that funds the Gulfwide Sand Inventory for new data collection, sand resource delineation, ore-quality assessments, and quantified reserves estimates.

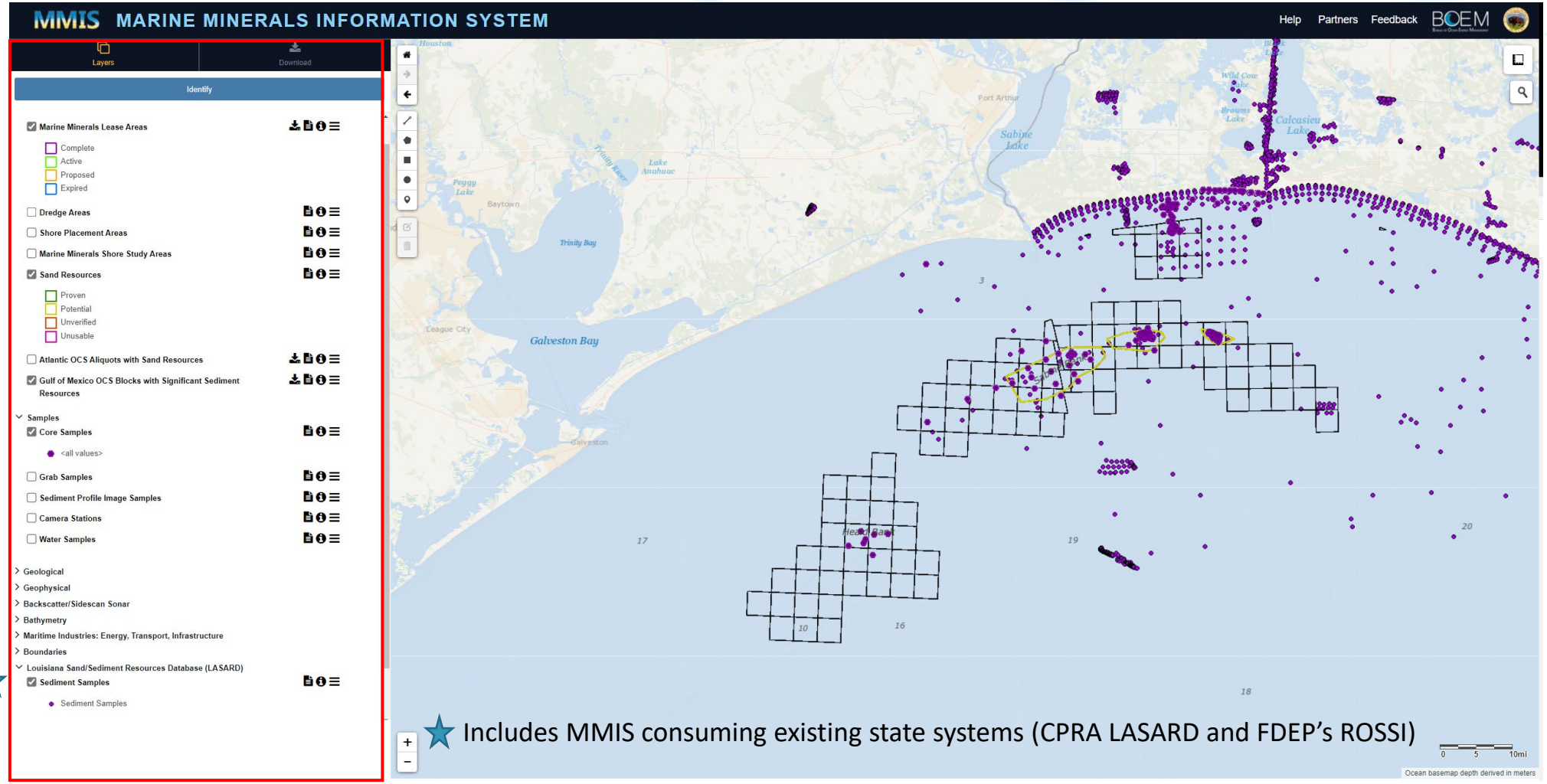
Marine Minerals Information System (MMIS)

Marine Minerals Information System (MMIS)

*Home to usable, accessible, and trusted **characterized marine mineral resource information** that is accessible to all who need it*

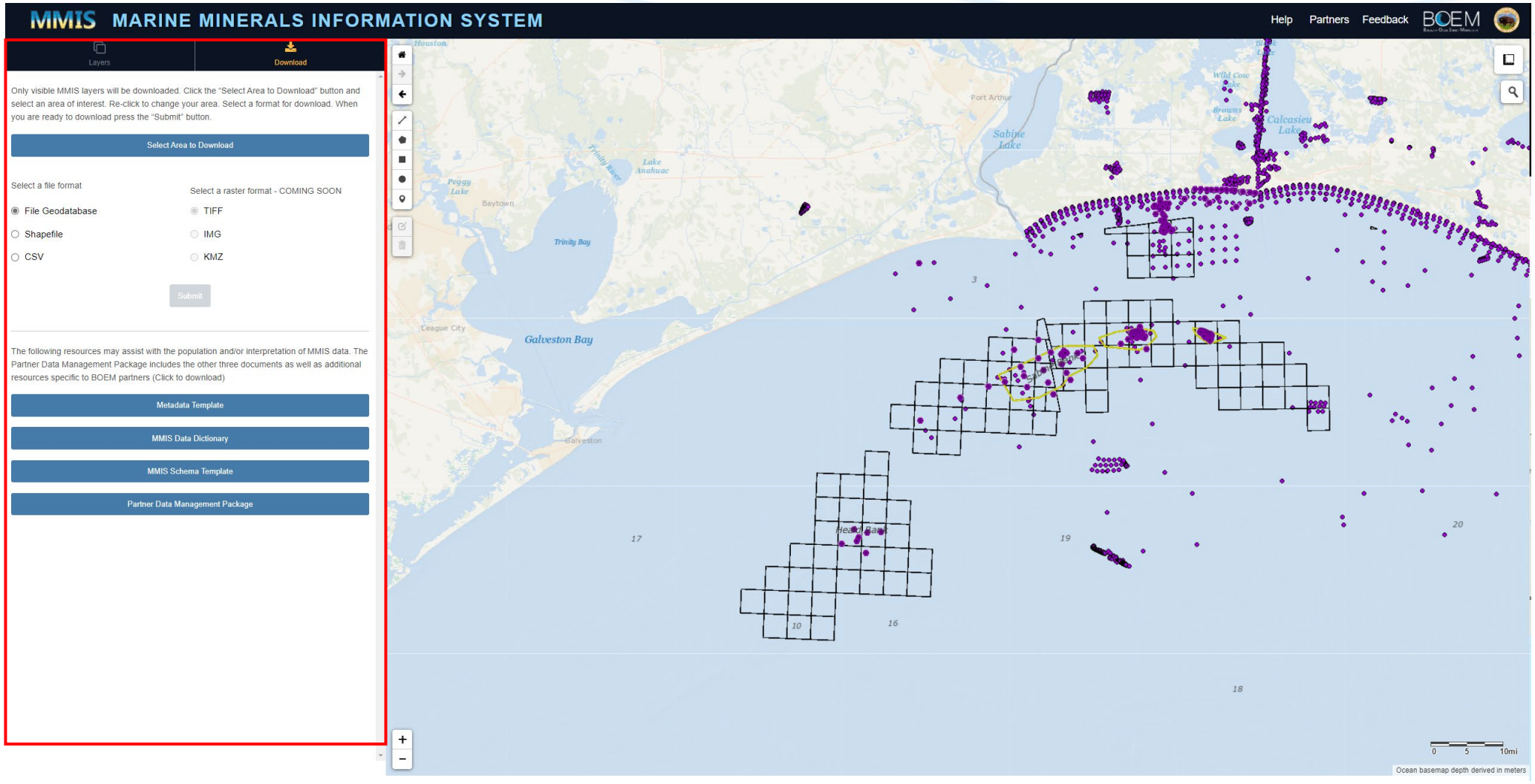


MMIS Viewer Data Layers



★ Includes MMIS consuming existing state systems (CPRA LASARD and FDEP's ROSSI)

MMIS Viewer Downloads

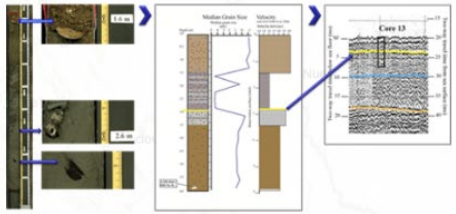


BOEM Bureau of Ocean Energy Management

https://mmis.doi.gov/boemmmis/

Where is there offshore characterized marine mineral resource data for Texas?

Core Samples - Sediment Characterization



Texas Data Gaps

Bathymetry - Seabed Characterization

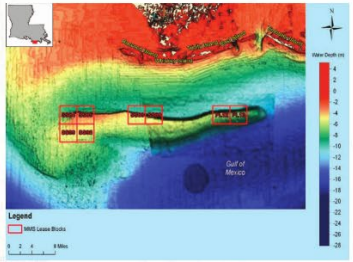


Image Credit: Khalil, Syed & Finkl, Charles & Roberts, Harry & Raynie, Richard. (2010). New Approaches to Sediment Management on the Inner Continental Shelf Offshore Coastal Louisiana. Journal of Coastal Research. 26. 591-604. 10.2112/10A-00004.1

Texas Data Gaps

Geophysical

Survey Tracklines (3)

Study ID	State	Cruise ID	Line ID	Collection Date	Time	Data collected during S	Web Link	Length
UTIG_M16AC00020	TX	LS9001	r90-09	1/1/1990	Null	Seismic	http://www.marine-geo.org/tools/search/entry.php?id=LS9001	96.161

MGDS MARINE GEOSCIENCE DATA SYSTEM

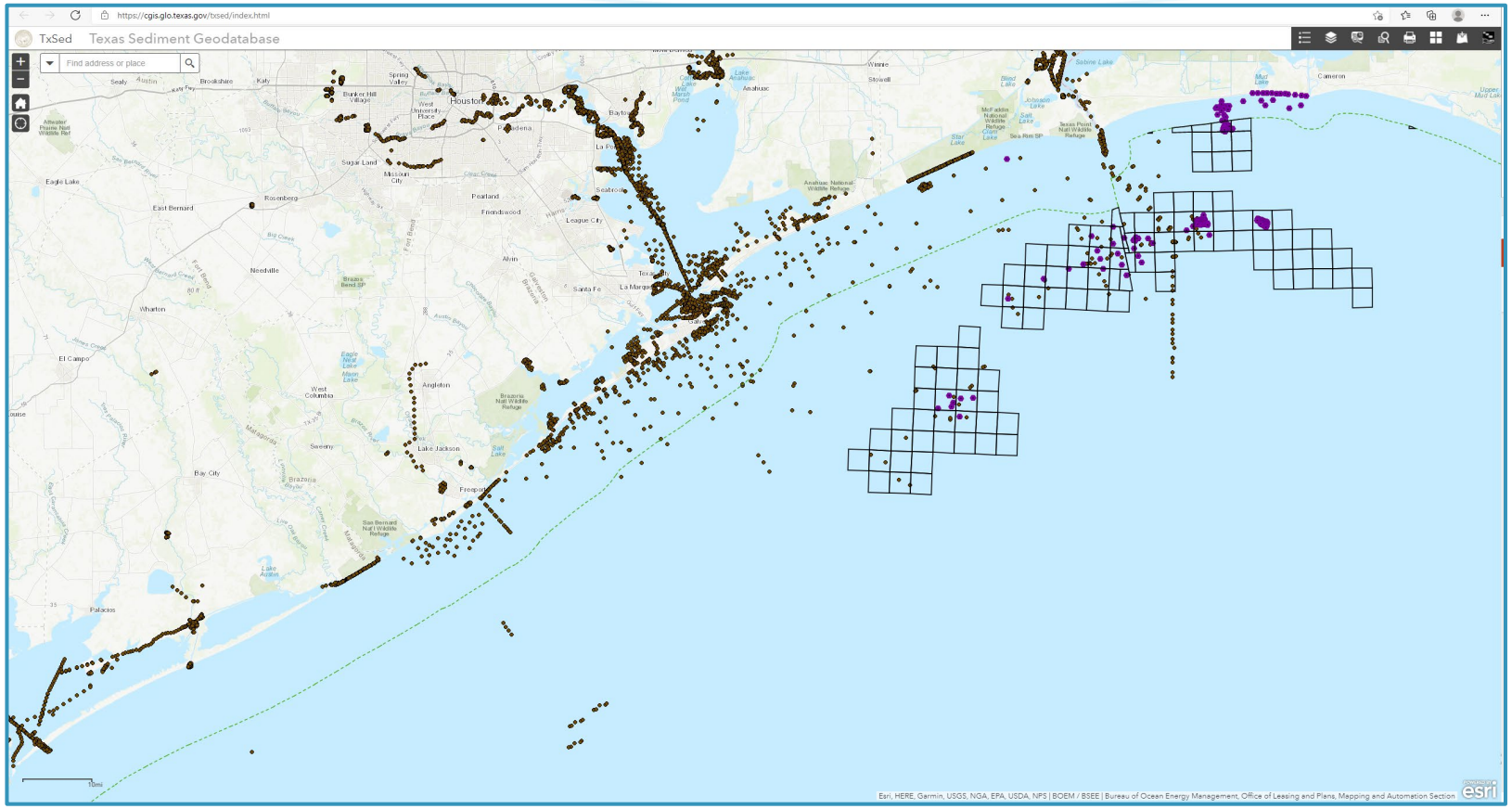
Gulf of Mexico Significant Sediment Resource Areas

Texas Data Gaps

MMIS MARINE MINERALS INFORMATION SYSTEM

Next Steps – Incorporating Existing Data

- MMIS group is working now to incorporate the TexSed data.
- Once fully reviewed, it will be available on the MMIS viewer.
- Next step is improving the interpreted products.



Next Steps – Coordination with Stakeholders

MMIS/MMP Next Steps

- Continue to advance and maintain a repository of applicable offshore marine mineral data of BOEM's investments of historic and current project data
- Continue to work with our partners to improve meaningful data to support planning and operational needs, data discovery and accessibility, and partner usability

Facing the Future

- **Compile new geophysical, geological, and project data** in the Marine Minerals Information System
- **Manage current and future resources** with the National Offshore Sand Inventory
- **Efficient and responsible use of OCS sand resources** to meet increasing demand

BOEM

Bureau of Ocean Energy Management

BOEM.gov

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Sediment Characterization on the Texas Continental Shelf using 3D Geological Models: the Case of the Sabine Bank

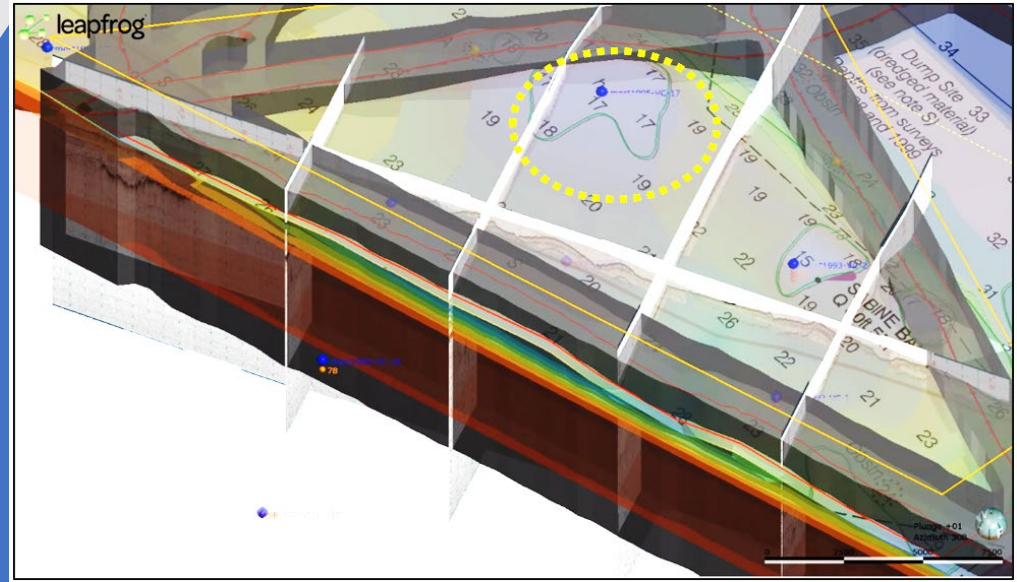
Juan Moya

Sediment Characterization on the Texas Continental Shelf Using 3D Geological Models:

The Case of the Sabine Bank

Juan Moya, Dafydd Chandler, Jessica Flannery, Josh Carter, Arpit Agarwal (Mott MacDonald)

Kelly Brooks (GLO)



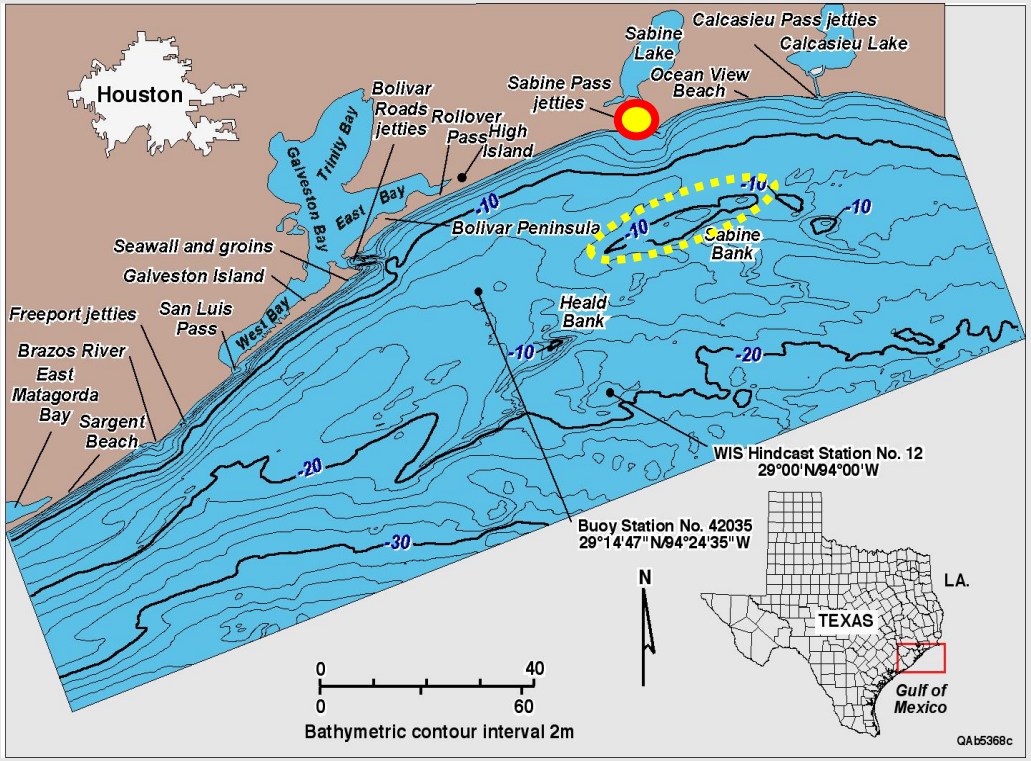
Texas Point National Wildlife Refuge (USFWS)

Introduction

- Texas Point has been impacted by several storms and shorelines have retreated drastically
- GLO & USFWS developed an agreement for the shoreline protection and restoration of the Texas Point Shoreline
- GLO hired Mott MacDonald for the Feasibility Study
- Task Order called for the development of a template, plans and specs to renourish 6 miles of shoreline at Texas Point using sediment from Sabine Bank
- Project being managed by Kelly Brooks, project manager with GLO

Goals

- Use the Sabine Bank as the offshore borrow site for the restoration of the shorelines at Texas Point
- Collect the available geological and geophysical information on the Sabine Bank to reduce uncertainties in the data
- Develop a conceptual 3D geologic model for a better understanding of the conditions at the potential borrow site
- Identify areas with the potential to provide the sediment (quality & quantity) needed for the project

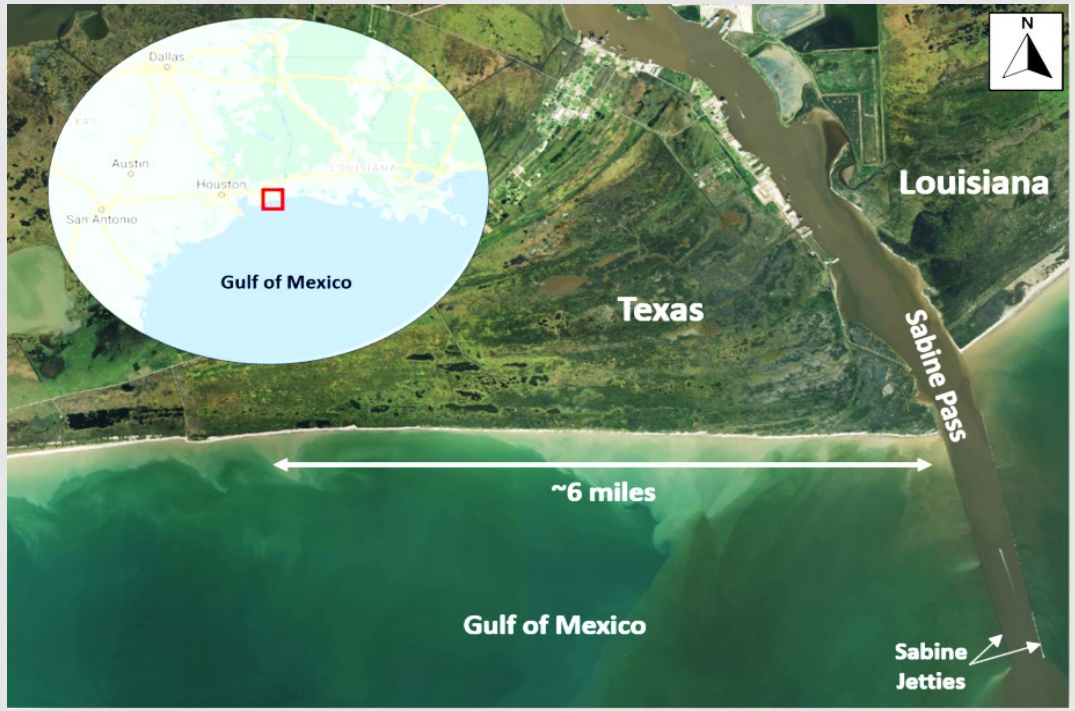


Texas Point National Wildlife Refuge (USFWS)

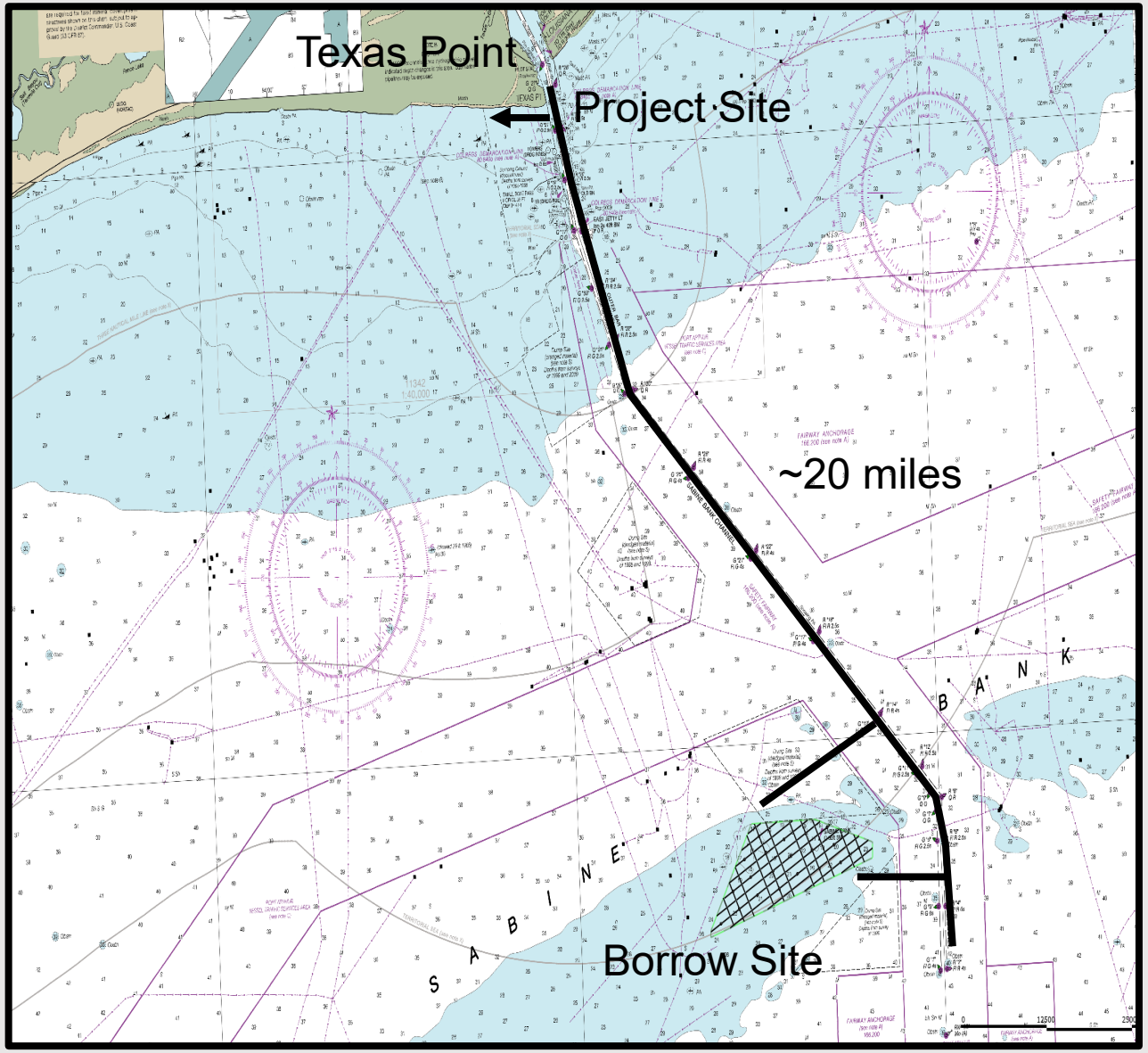
Engineering Goals

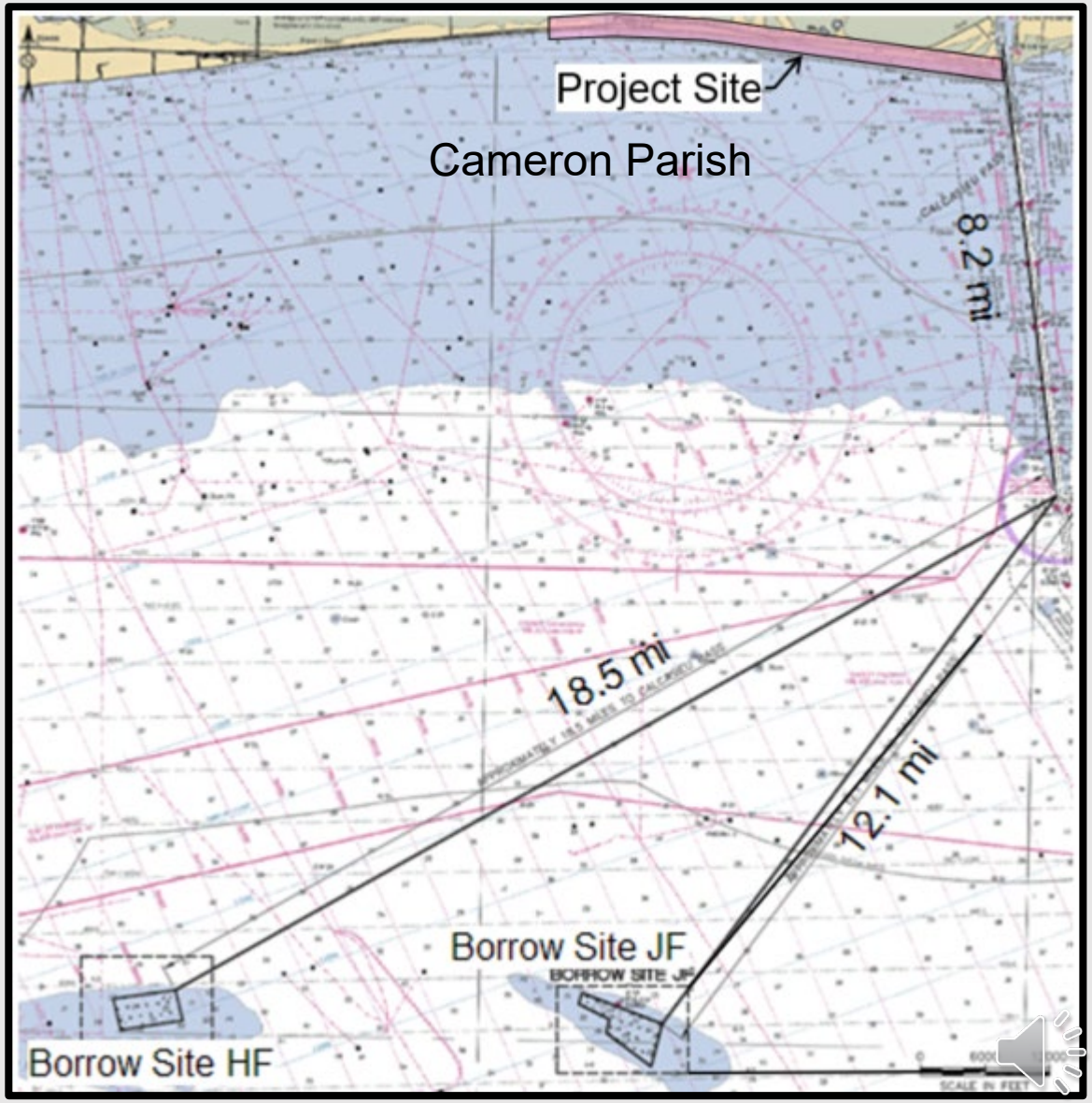
- Evaluate preliminary sediment delivery alternatives to determine potential fill volumes for **six miles of shoreline restoration**
- Develop a plan and a dredge template alternative(s) to dredge the sand from the Sabine Bank
- Model the Sabine Bank to confirm template would not adversely impact wave conditions landward of the borrow source
- Develop a sand placement template at Texas Point

- Interagency Coordination: TGLO, USFWS, BOEM, USACE



Cameron Parish and Texas Point Borrow Sites: Similar Scenarios from Sabine Bank as Borrow Site





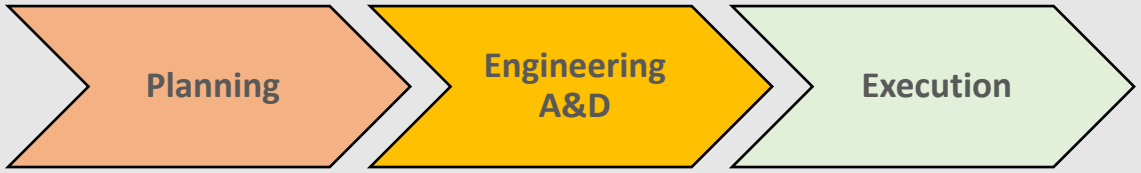
Coastal Sediment Management Project Development

Phase 1. Planning: Data Collection and Interpretation
(Geoscientists or Geotechnical Engineers)

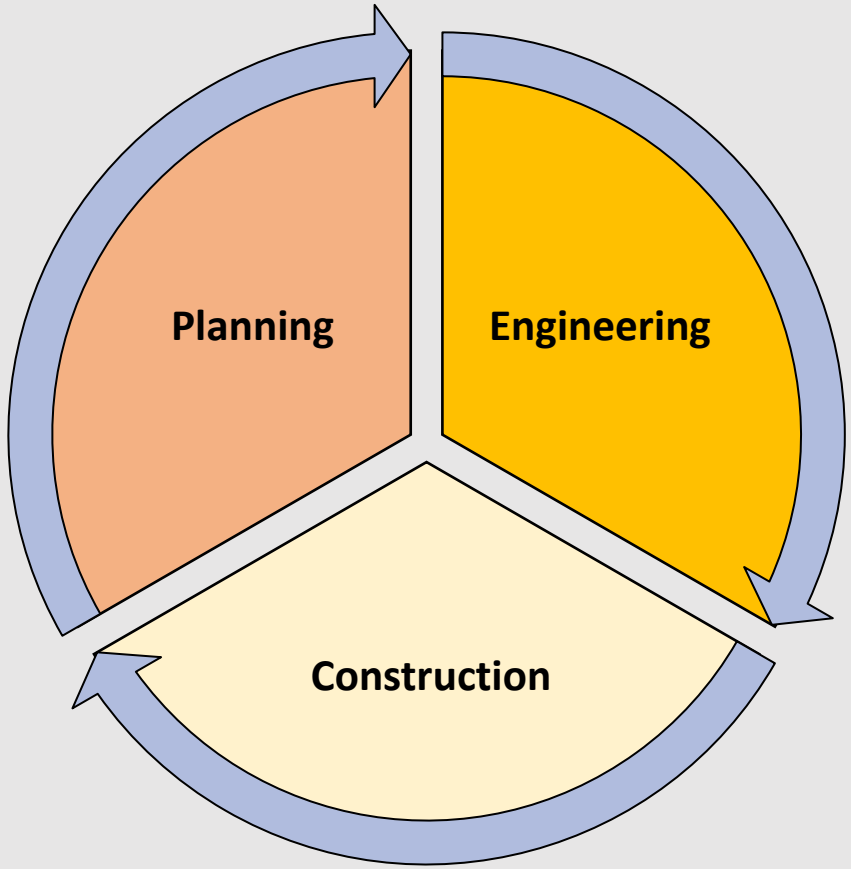
Phase 2. Engineering Analysis & Design: Specs
(Engineers)

Phase 3. Execution: Dredging/Construction
(Engineers-Contractors)

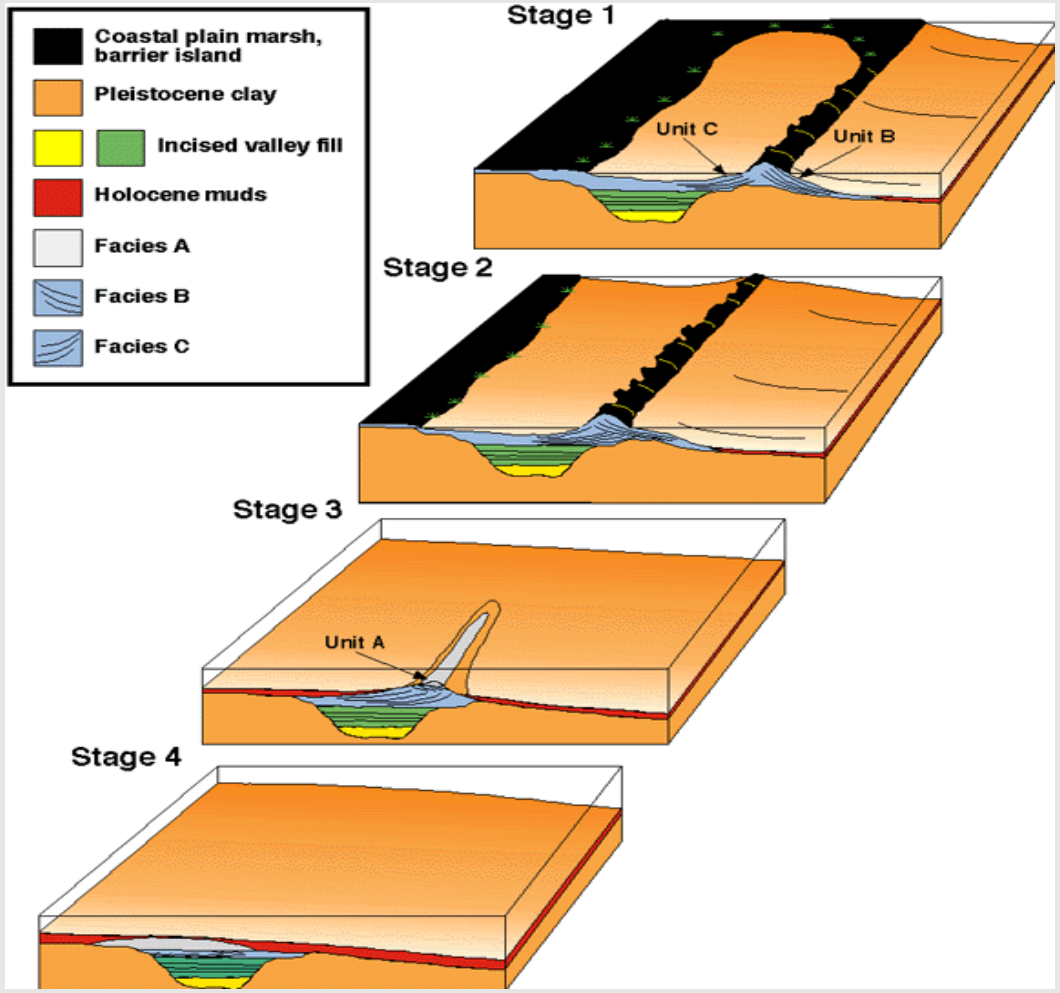
Traditional



Tools to Make Interactive Approaches

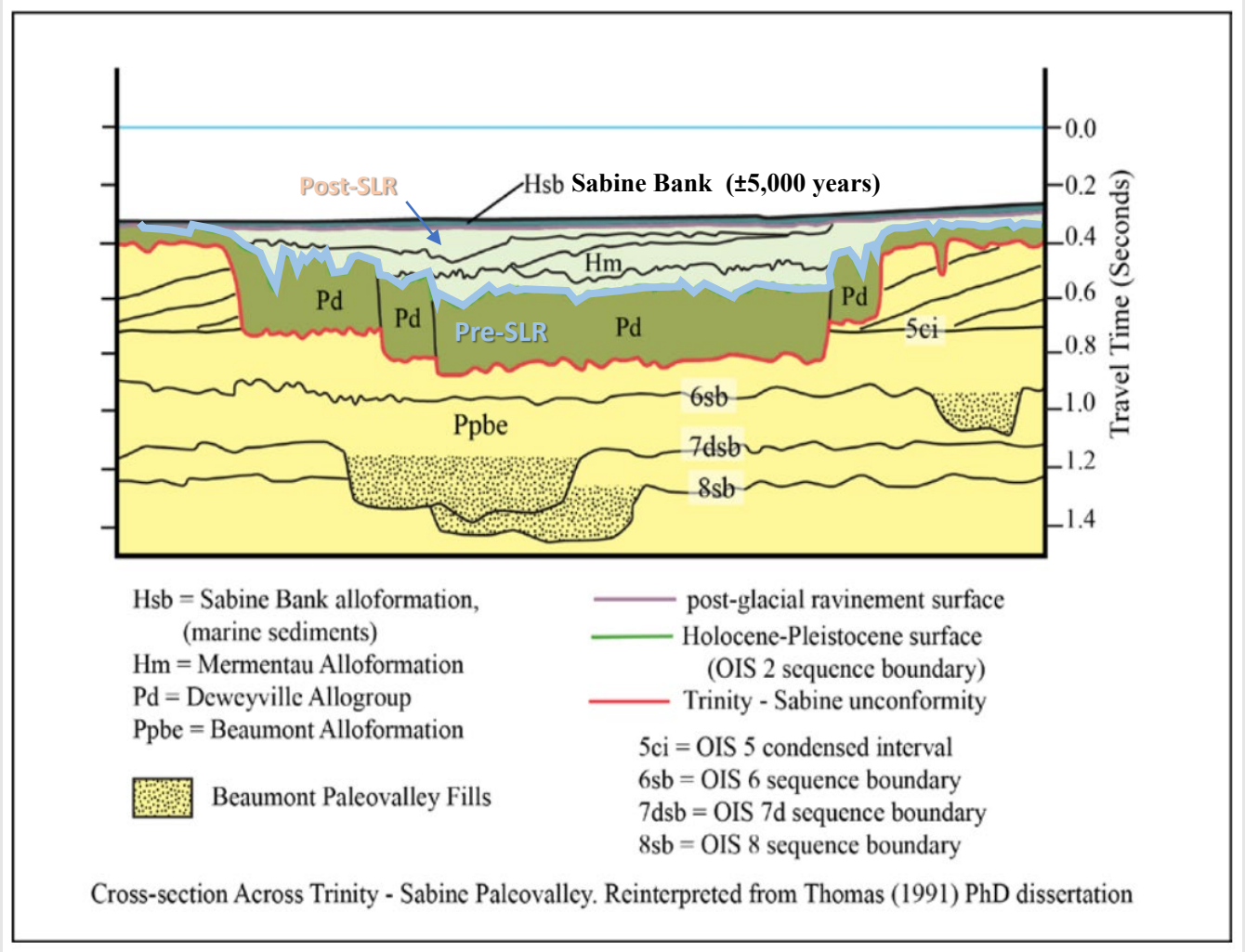


Origin and Evolution of Sabine Bank



http://gulf.rice.edu/gulf/ETexas/facies.html

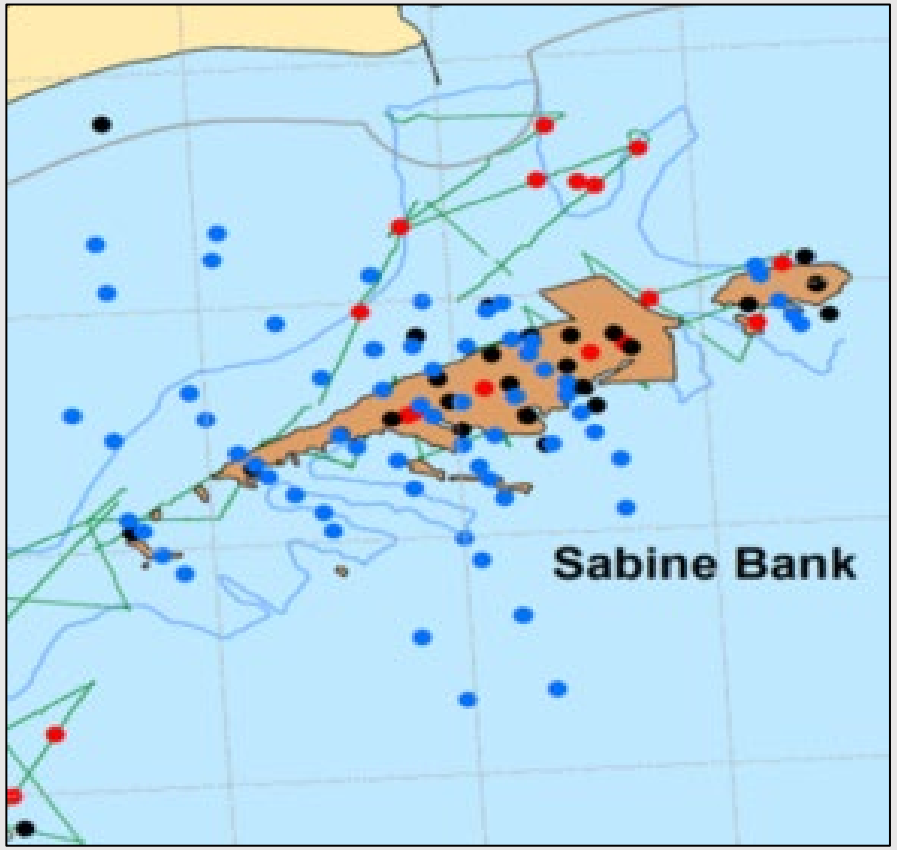
(Heinrich et al. 2020)



Sabine Bank Data Available

Previous Sediment Studies (Cores):

Morton and Gibeaut (1993) & Morton and Gibeaut (1995)
Rodrigues et al. (2004).
Dellapenna et al. (2009).



Uncertainties:

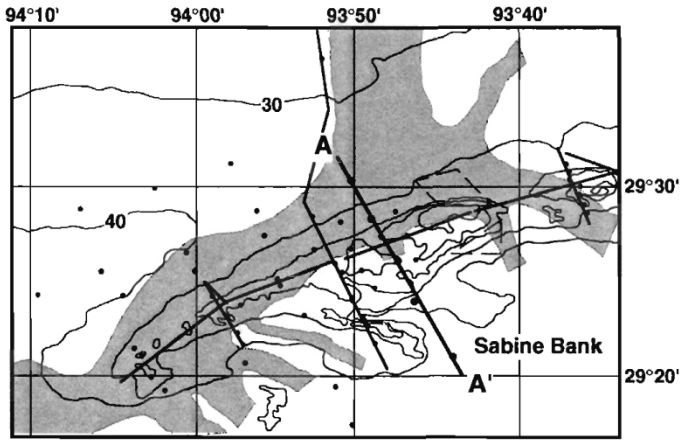
- Old Bathymetric data (~2000)
- Limited vertical datum information on the existing surveys
- Geologic cores under different format and randomly distributed
- % of sand in cores available under different format
- Limited geophysical data
- Energy related infrastructure limiting areas for analysis

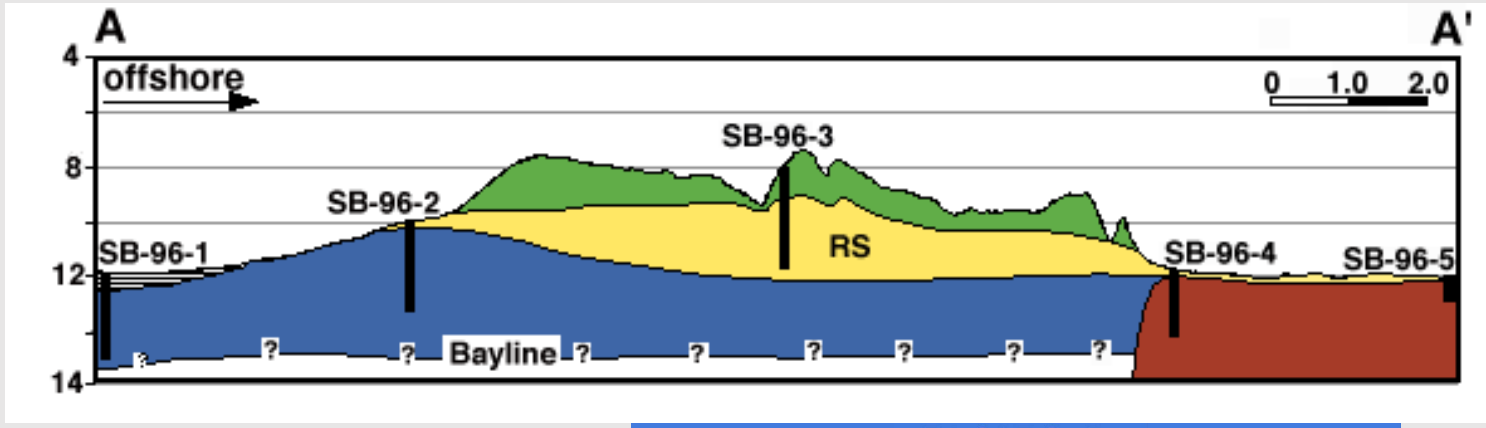
Plan:

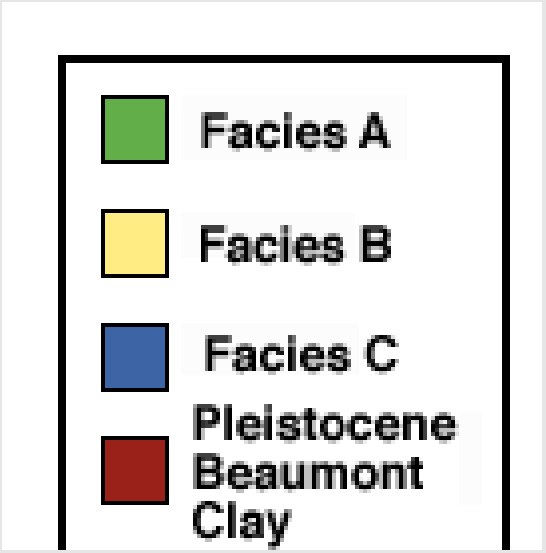
- Improve the analysis of the vertical and horizontal distribution of high-quality sands

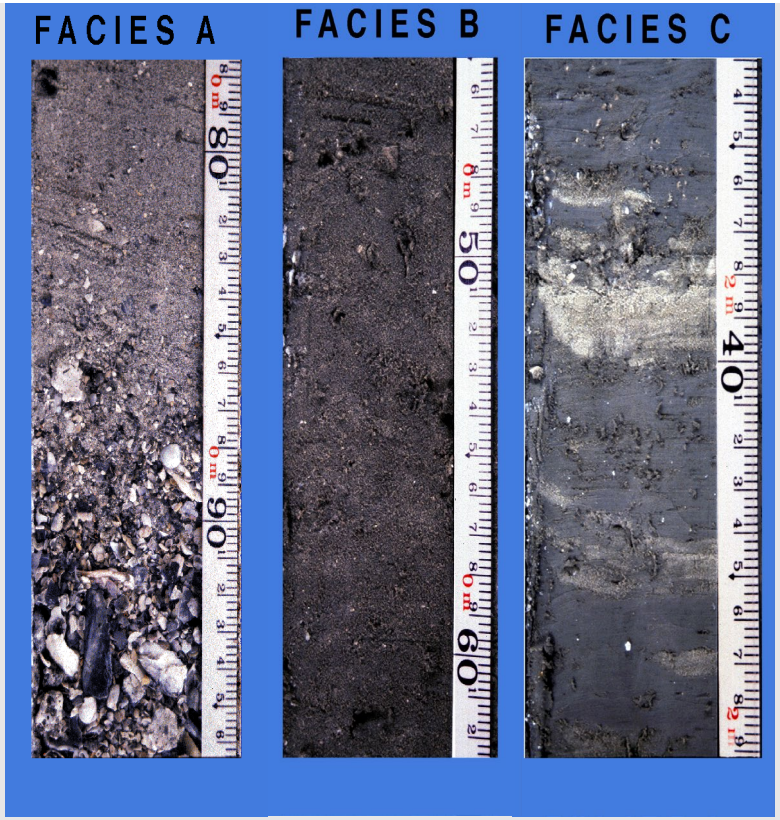
Rodrigues et al. (2004).

Confirmed Facies A, B and C
(Morton and Gibeaut 1995)







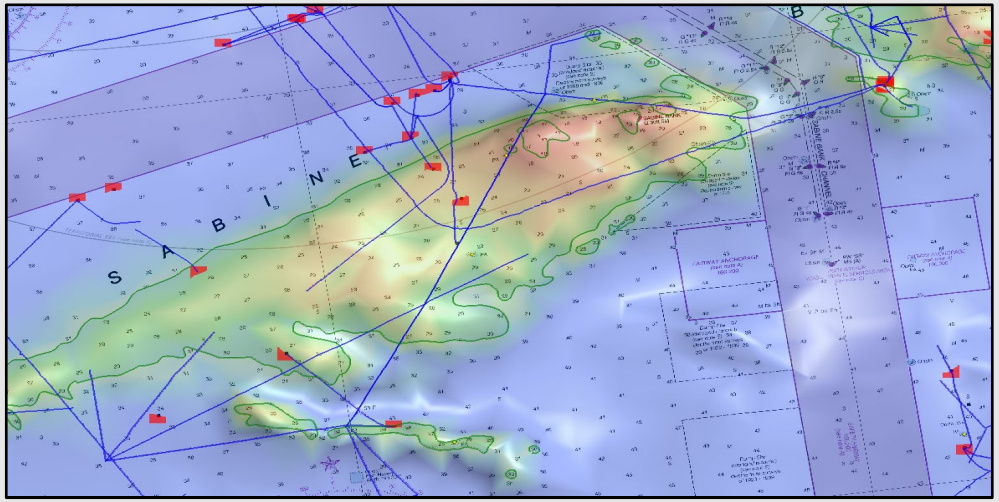


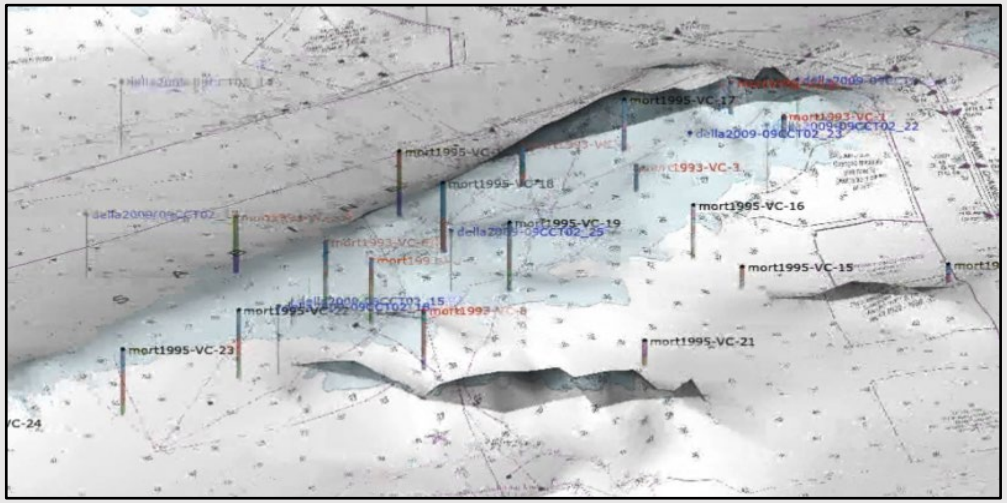
Typical Lithologic Facies
Sedimentary units that make up the banks:
Facies A. An inter-bedded shell hash and sand unit
Facies B. A muddy-sand unit characterized by a seaward prograding and chaotic seismic facies
Facies C. An inter-bedded sand and mud unit characterized by landward dipping seismic reflectors

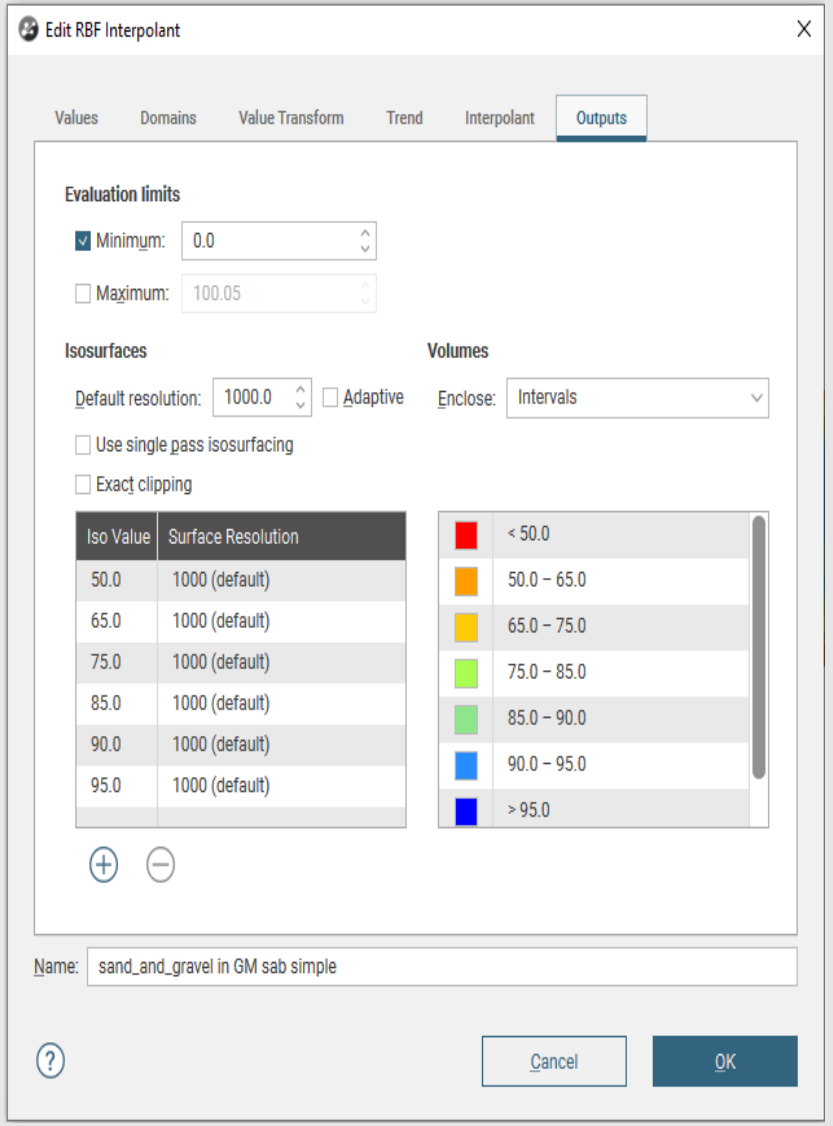
http://gulf.rice.edu/gulf/ETexas/facies.html

Sabine Bank in Texas: Heat Map Model

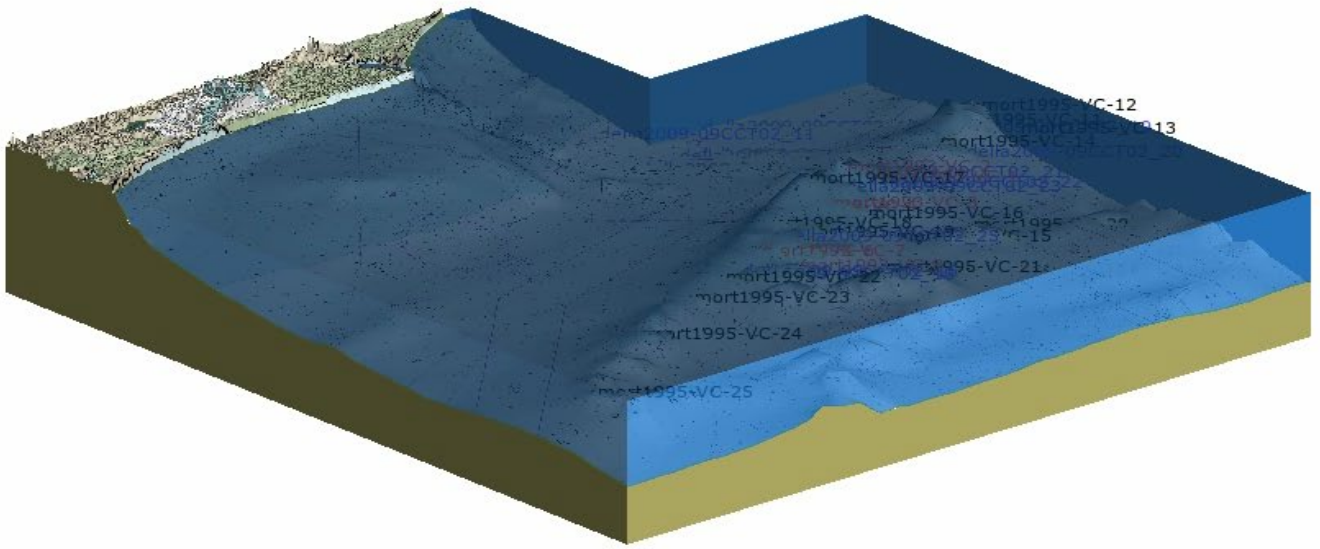
- Created a numeric model illustrating sediment percent intervals as color-coded stratigraphy



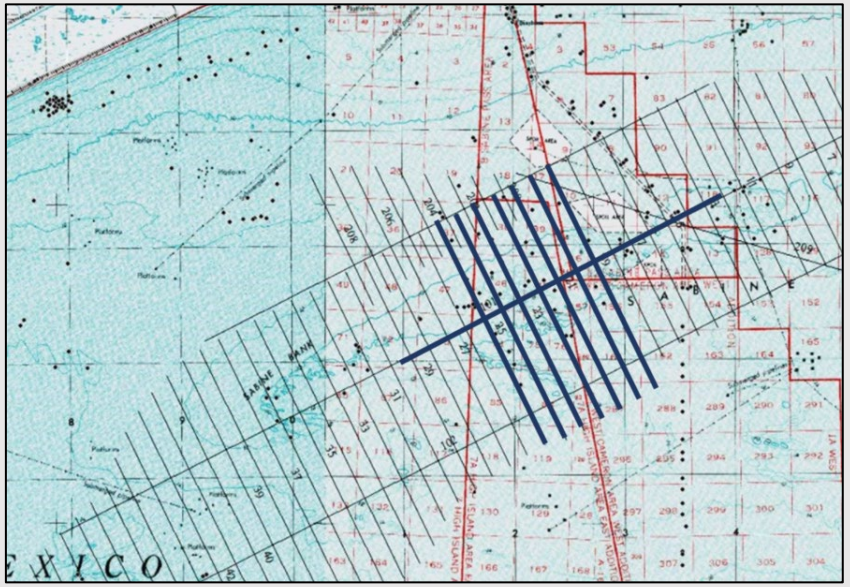


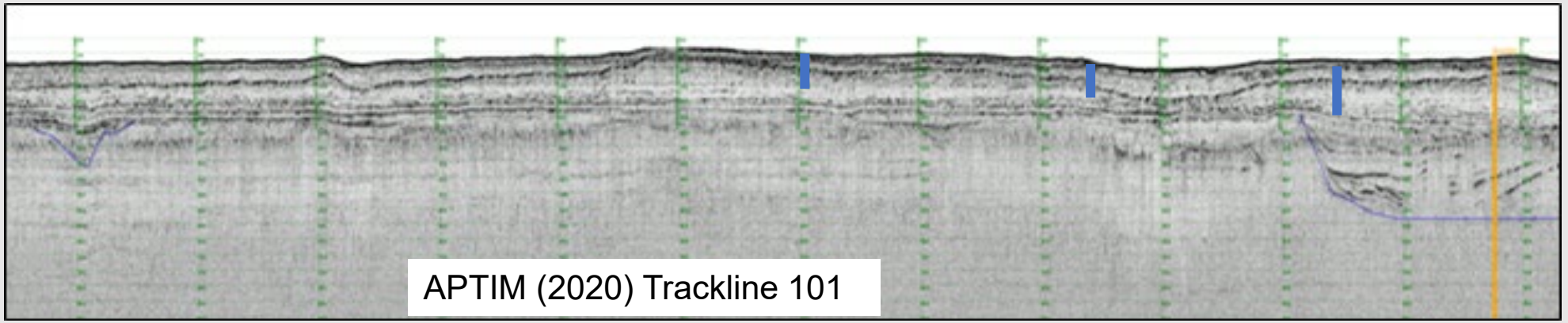


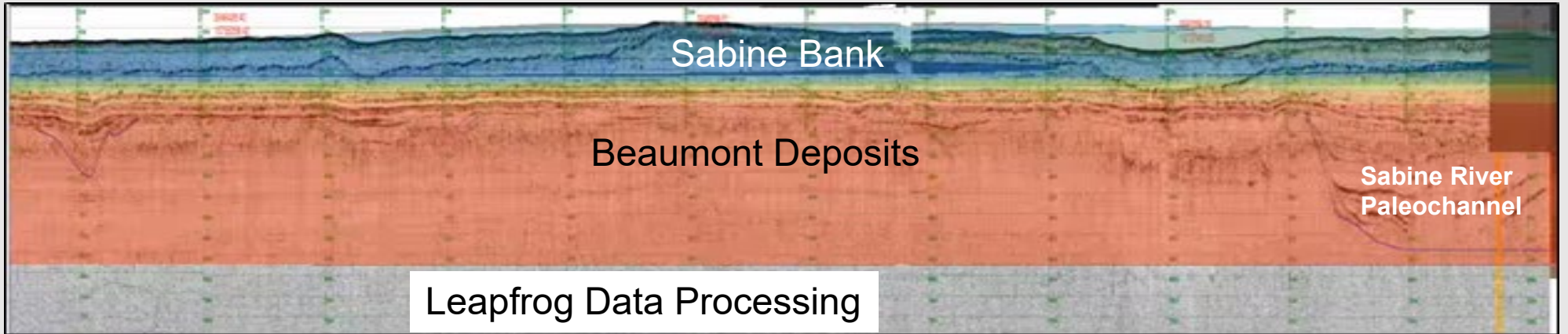
3D Leapfrog® Model -- Core Stratigraphy



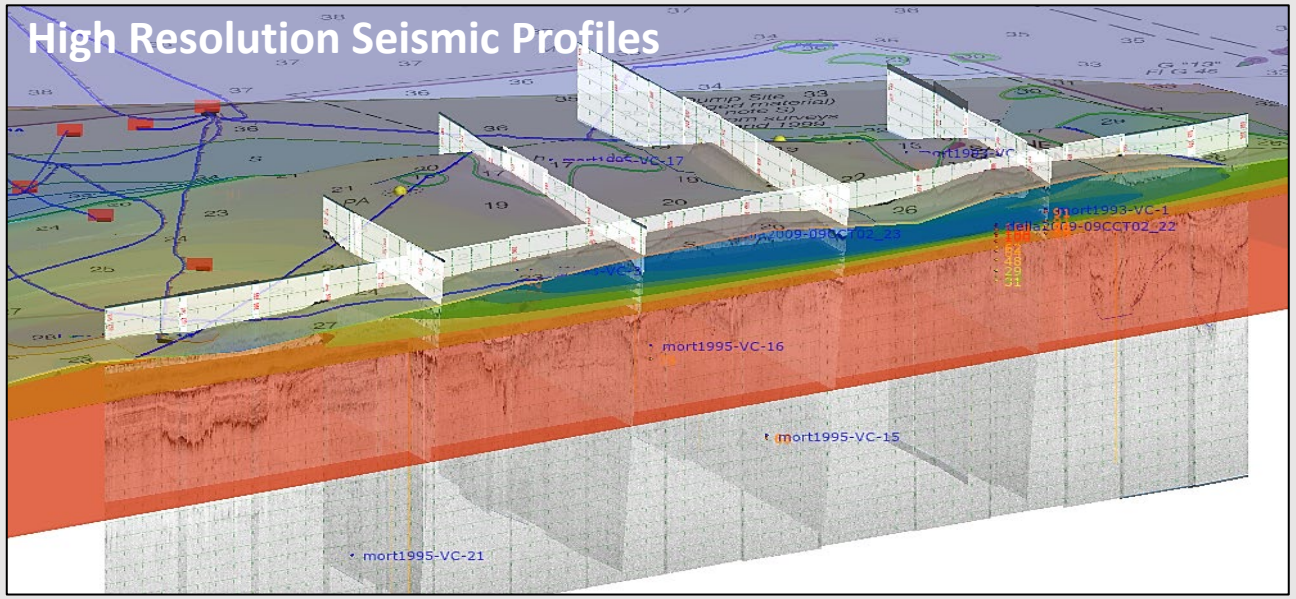
Geophysical tracklines collected by APTIM (2020)

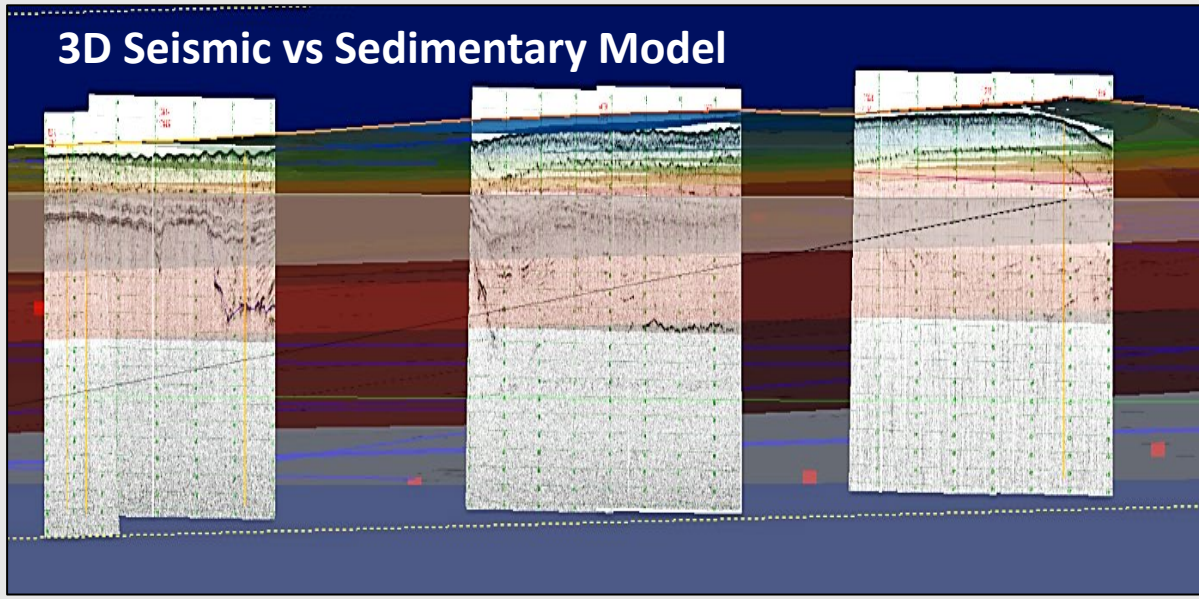


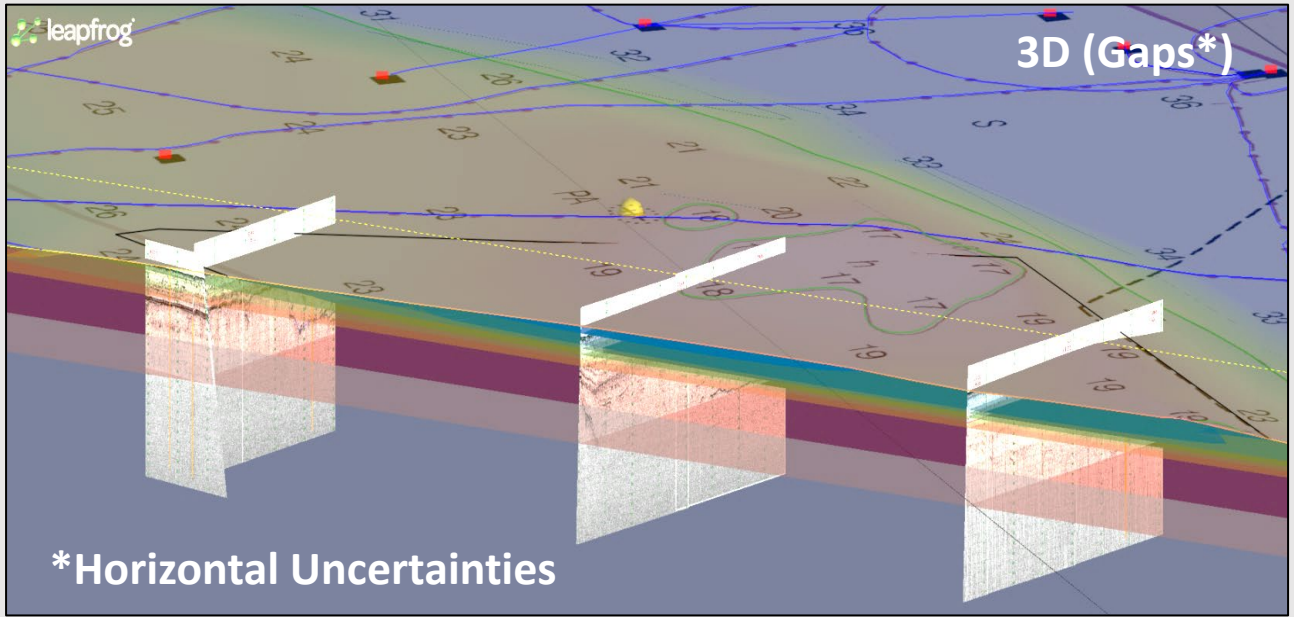


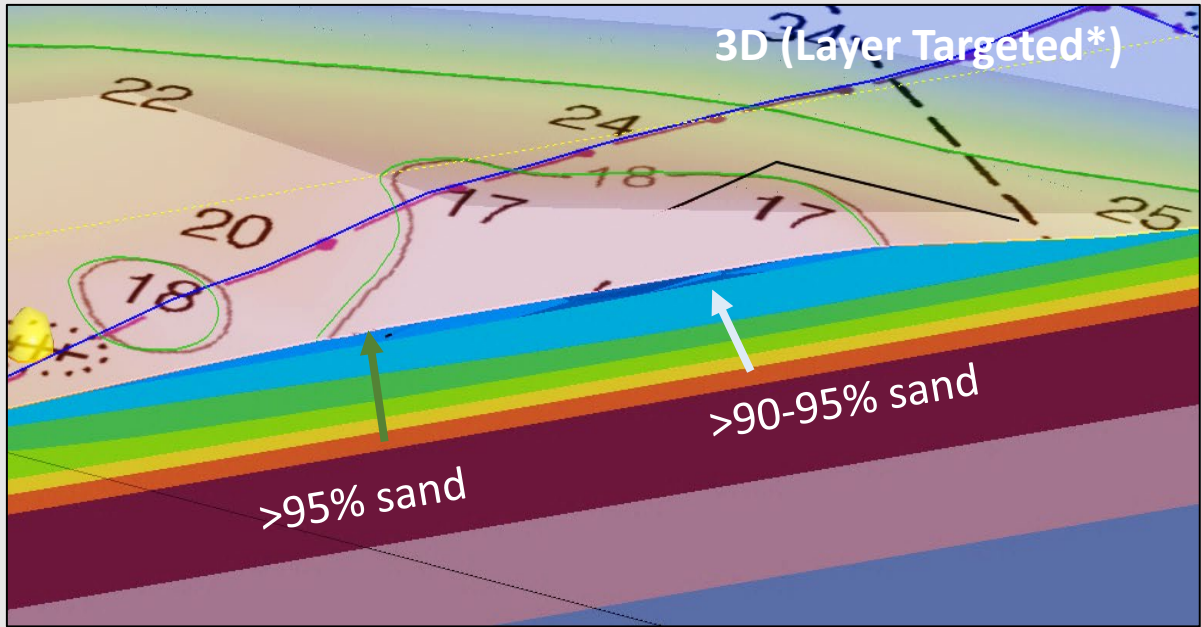


3D Seismic Analysis



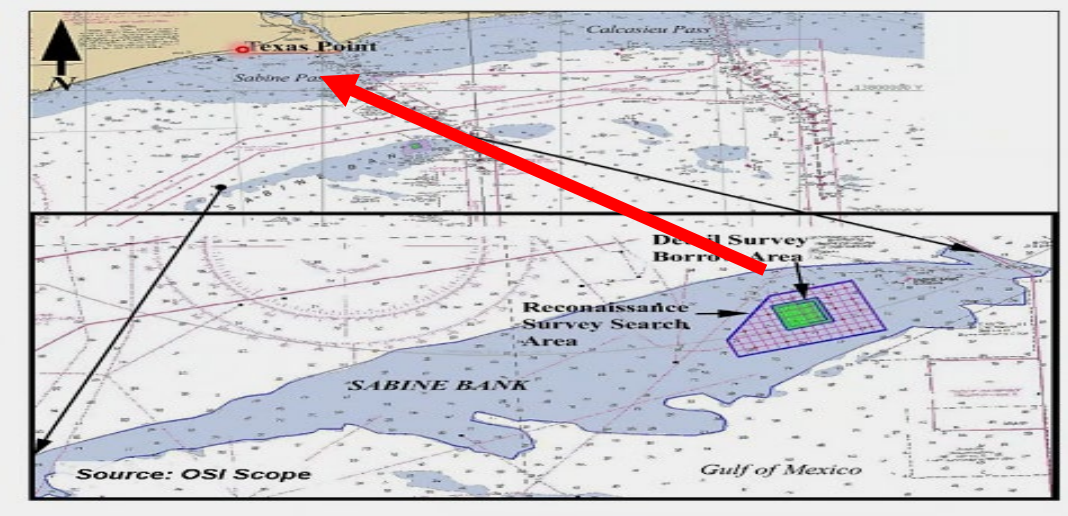




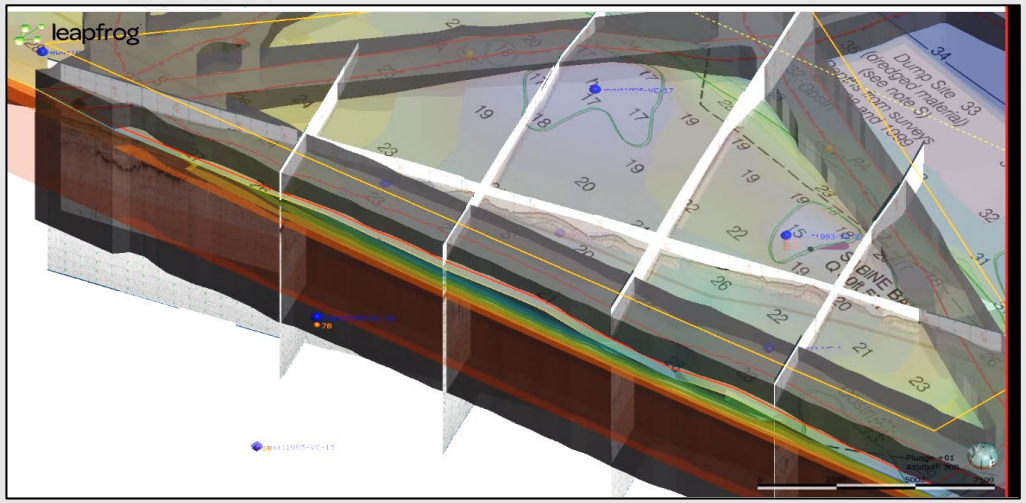


Conclusion: Benefits of the 3D Geological Analysis

1. Improved Original Sediment Plan



2. First 3D Sediment Model with Existing Cores

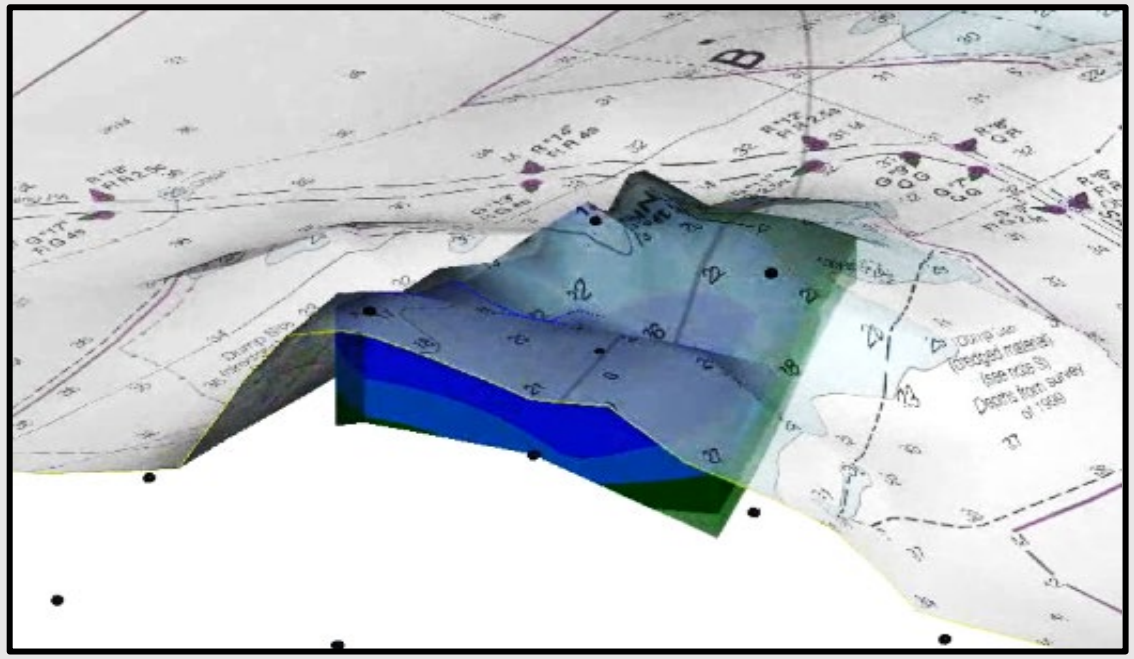


3. Proposed investigation area shows potential 2 M cy of sand (< 10% fines)

4. Next Planned Surveys Based on 3D Analysis

5. Preliminary Investigation Plan

- 40 nmi geophysics followed by 20 borings @ 20 ft
- Identify the localized area for borrow source



Thanks.

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*Mott MacDonald Acknowledges the contributions:
- APTIM by providing the seismic profiles
- Kelly Brooks (GLO Manager) provided inputs to this project
- USFWS is supporting the team for the development of the project

Borrow Material Search for Swan Lake

Philip Blackmar, PE

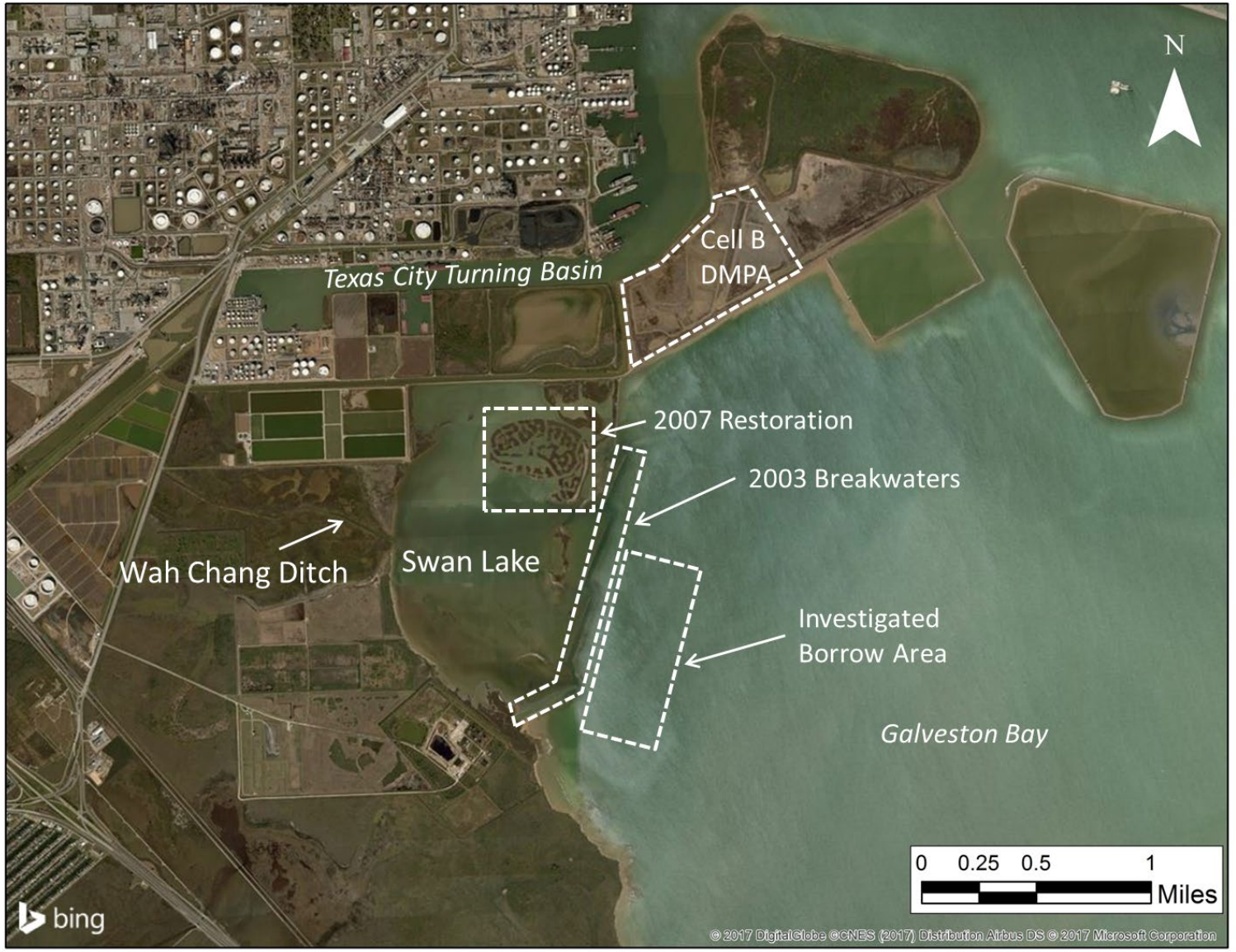
Borrow Source Searching for Swan Lake

Philip Blackmar, PE

01 Project Location
02 Project Goals
03 Construction Methodologies
04 Borrow Area Investigations

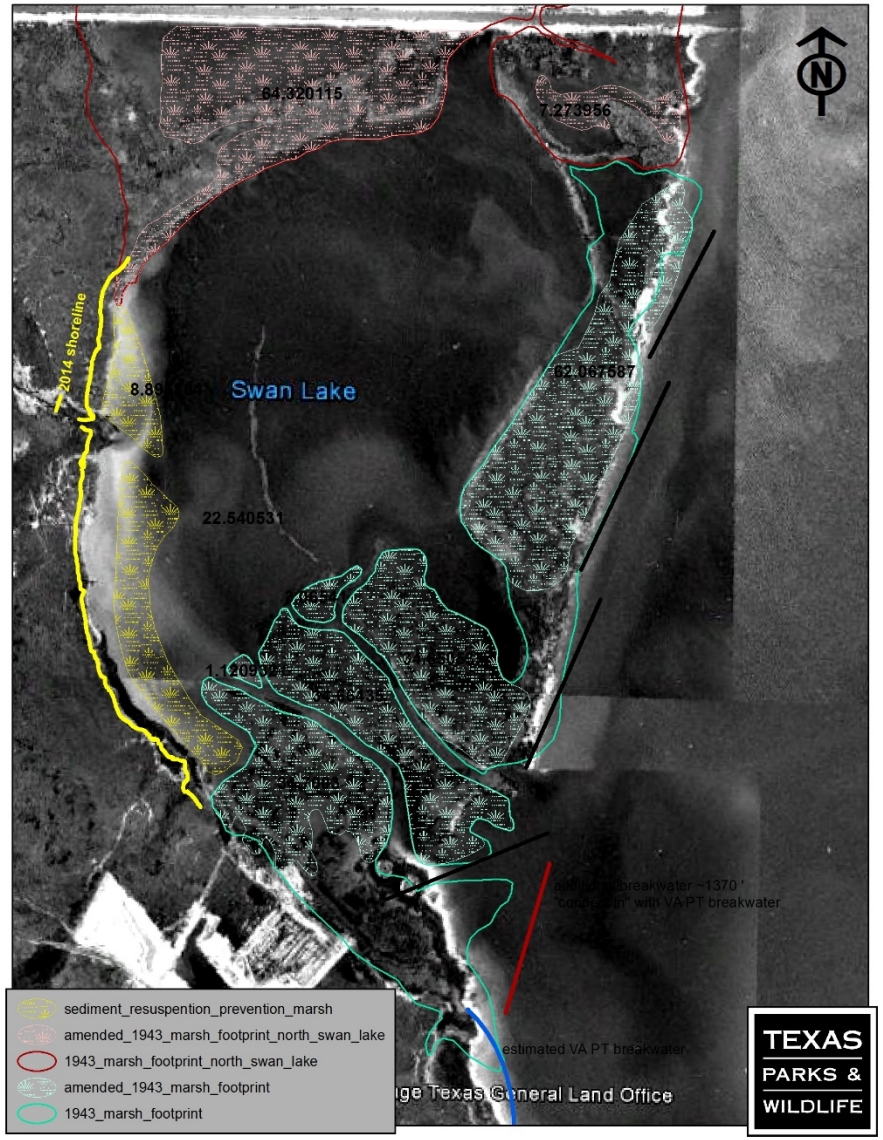
Project Location

Project Location – Swan Lake



Project Goals

- Restore historical marsh
- Create new marsh along eroding shoreline



Marsh Restoration Methodologies

- Hydraulic Dredging
  - Unconfined discharge
  - Contained discharge
- Mechanical Placement
  - Mechanical dredging
  - Truck Haul
  - Barging material
- Scraping – Not discussed

Hydraulic Dredging – Unconfined Discharge

- Material Needs
  - Sand
  - Borrow area free of natural resources and debris
- Benefits
  - Cost efficiency / Larger Projects
  - Construction duration
  - Greater fringe area
- Challenges
  - Silt fence to protect natural resources

Hydraulic Dredging – Confined Discharge

- Material Needs
  - Silt is less desirable
  - Borrow area free of natural resources and debris
- Benefits
  - Cost efficiency / Larger Projects
  - Large marsh platform
- Challenges
  - Construct containment berms
  - Waiting for material to consolidate
  - Less control of end geometry

Mechanical Placement

- Material Needs
  - Capable of maintaining slopes after handling
    - Sand and clay
    - Not silt
  - Site access (barge or truck)
- Benefits
  - Geometry
  - Immediate planting
- Challenges
  - Cost
  - Access
  - Construction duration
  - Emissions and trucking impacts

Borrow Areas

- Preferences
    1. Unconfined Discharge
    2. Mechanical Placement (if duration and cost are feasible)
    3. Confined Discharge
    - Beneficial use of material if possible

Beneficial Use Sites

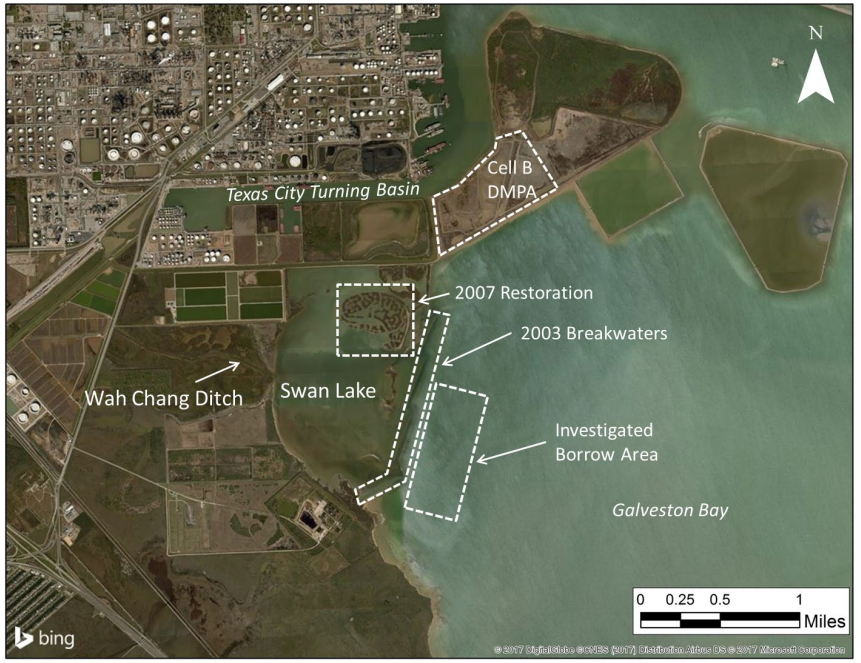
- Challenges
  - Location
  - Production Rates
  - Permitting
  - Schedule

Beneficial Use Sites Considered

Site	Approximate Distance to Swan Lake Project	Anticipated Soil Type	Anticipated Material Volume
Gulf Intracoastal Waterway (GIWW) Maintenance Dredging	3+ miles	Unconsolidated Silt with Some Sand	Unknown
Gulf Coast Ammonia (Port of Texas City)	3 miles	Consolidated Clay	650,000 CY
Oiltanking Texas Independent Deepwater Expansion (Port of Texas City)	1.5 miles	Consolidated Clay and Sand	6,000,000 CY
Dredging at Ryan Marine	4 miles	Sand	Unknown

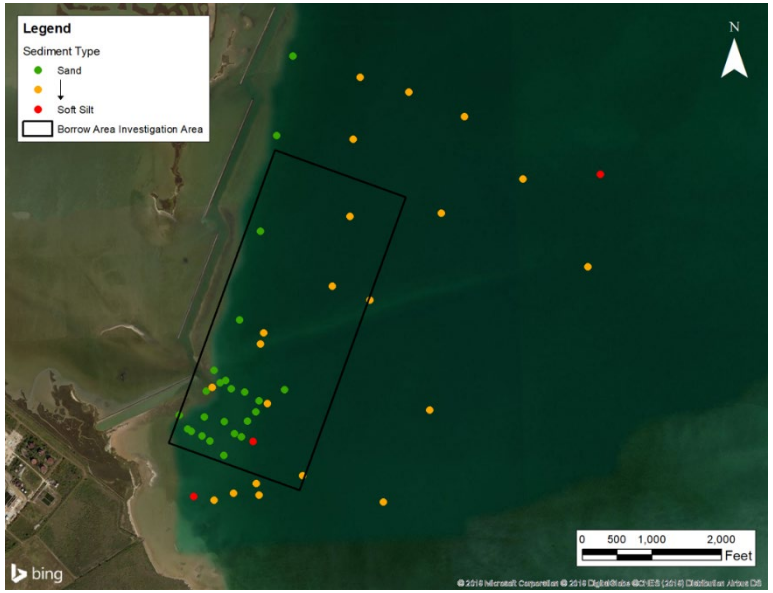
Cell B DMPA

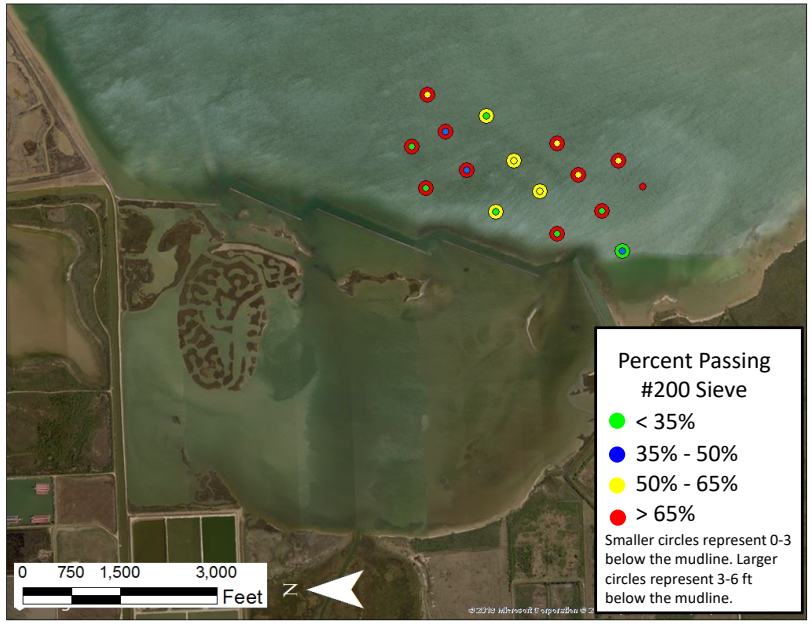
- Challenges
  - Haul route length (approx. 2.5 mi)
  - Construction duration
    - 2-3 years
    - Approx. 40,000 truck trips
  - USACE coordination
    - 408 review for levees
    - Potential conflicts with use



Dedicated Borrow Area

- Reviewed maps and historical aerials for potential sand areas
- Field investigation to generally understand area
- Grab samples and sieve analysis part of later field work
- Sandy material suitable for unconfined discharge not found – recommend confined discharge





Summary

- Project focused on building elevation to restore marsh
- Borrow source investigation
  - Considered different construction types
  - Evaluated possible beneficial use sites
  - Looked for dedicated dredging borrow areas
  - Project is moving forward with confined discharge
- Future work for borrow areas
  - Sand is a limited resource
  - Transporting material and construction type are important considerations
  - Permitting critical for beneficial use projects

Questions

Potential Sand Sources within submerged Pleistocene Terraces along the upper Texas Coast

Timothy Dellapenna

Pleistocene Terraces and Bayside Sand Resources

- Tim Dellapenna[1&2]
- Lindsay Critides[1&3]
- Paul Laverty[1&4]
- Joe Carlin[1&5]
- [1]Department of Oceanography, Texas A&M University
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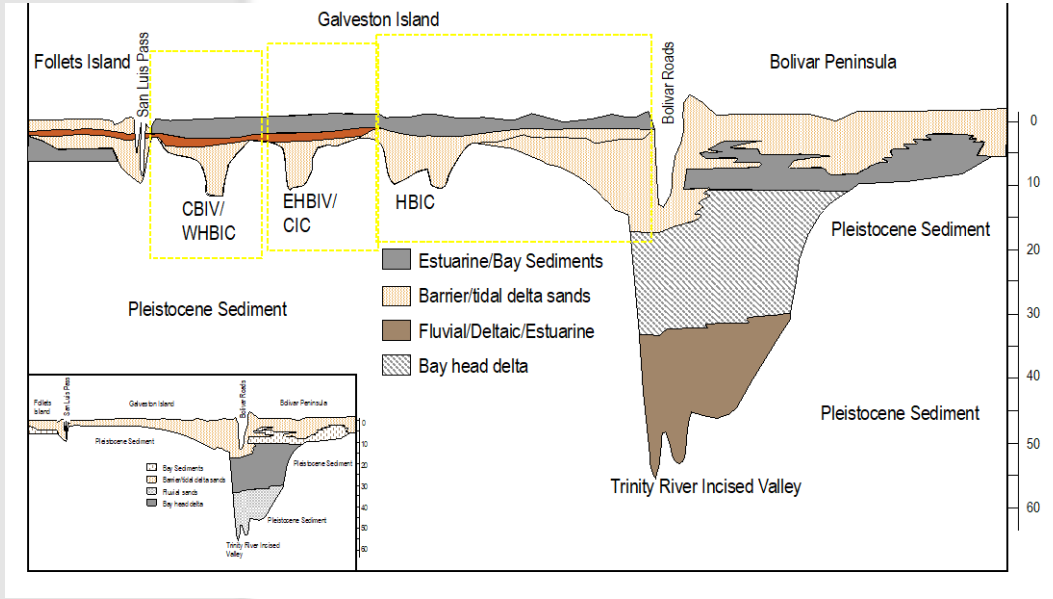
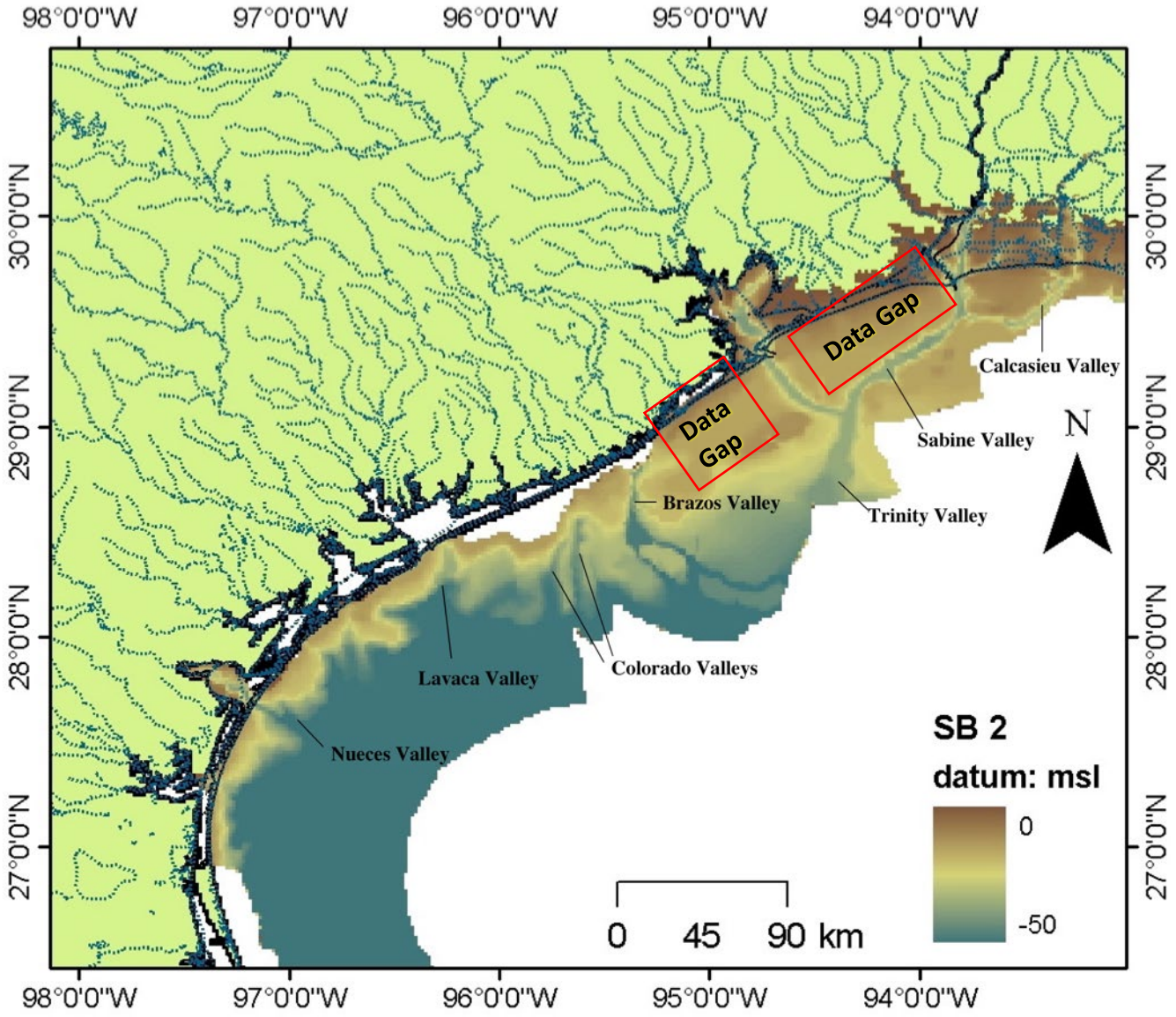
- [3]OARS, Houston, TX
- [4]Fugro, Lafayette, LA
- [5]Department of Geological Sciences, California State University-Fullerton



- Much of our focus on sand resources has been on Holocene Filled Incised Valleys
- Little effort has been spent on the spaces between these valleys
- Within the coastal plain, most of the sand is in the fluvial terraces and flood plains.



Anderson et al., 2016

Within the coastal plain, most of the sand is:

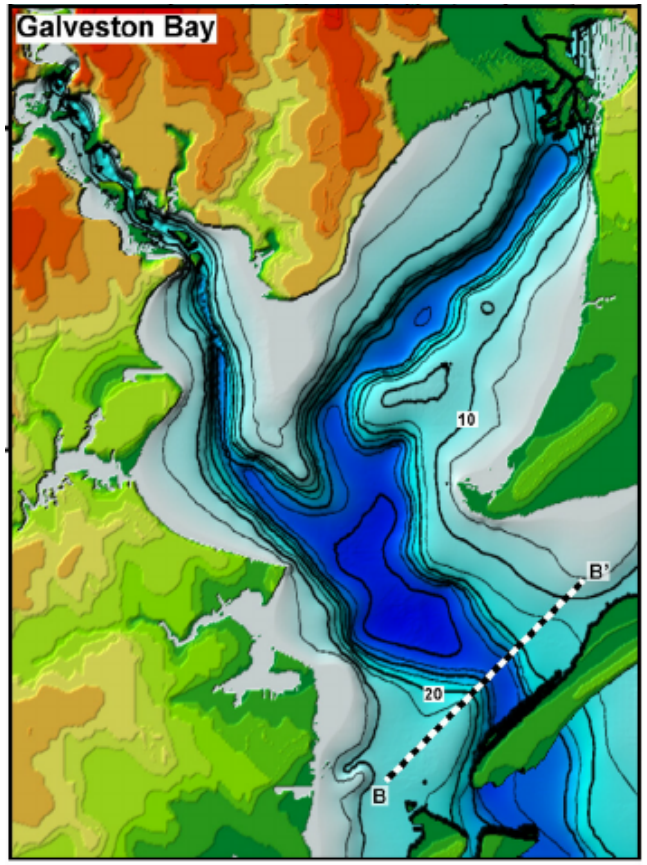
- in the flood plains and
- fluvial terraces

Modern Fluvial Terraces of Brazos River

Flood Plain of San Jacinto River

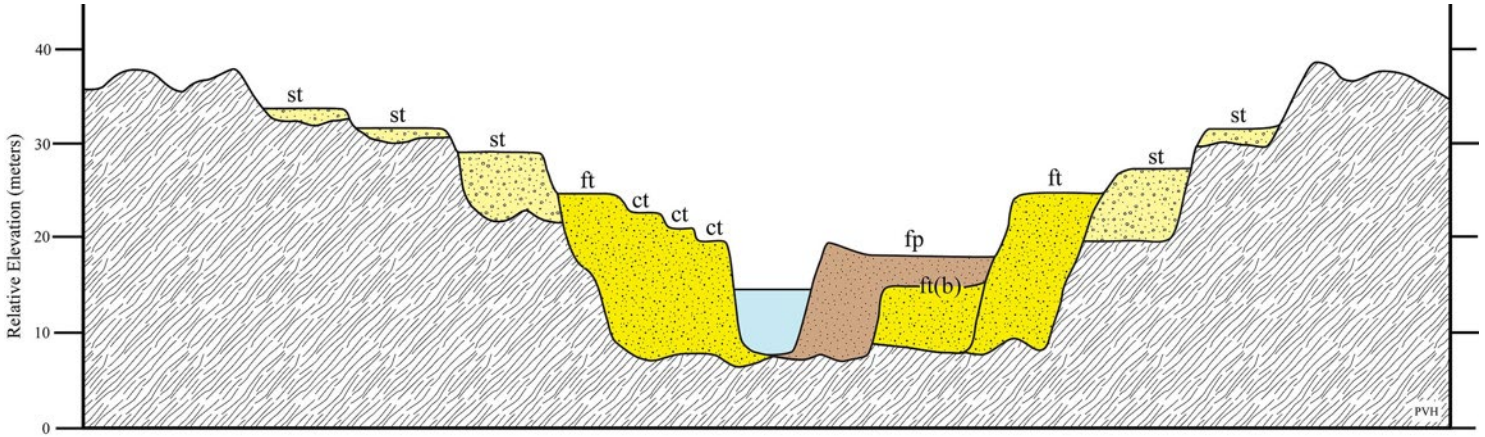
Fluvial Terraces

A

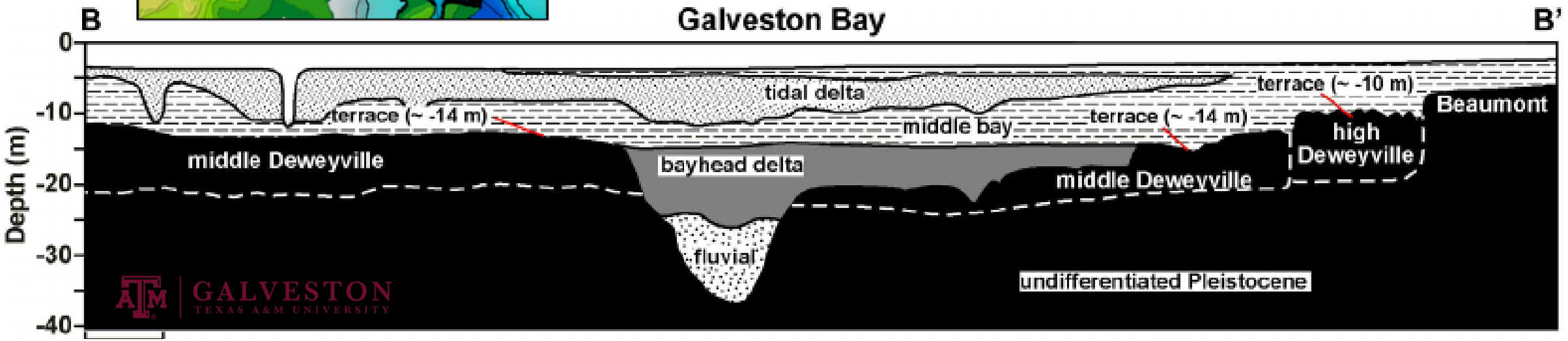


C

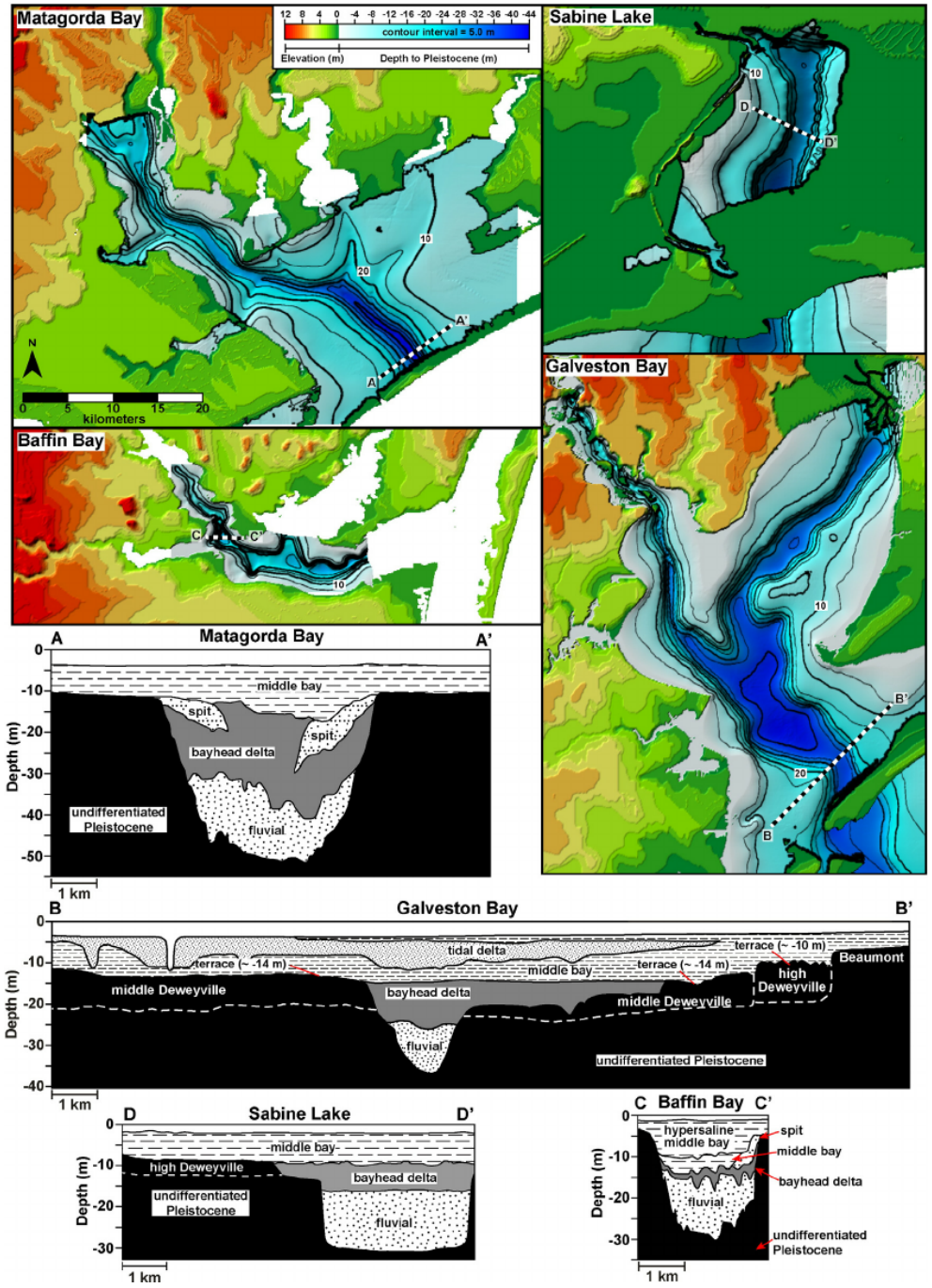
Fluvial terraces are the remnants of earlier floodplains that existed at a time when either a stream or river was flowing at a higher elevation before its channel downcut to create a new floodplain at a lower elevation.

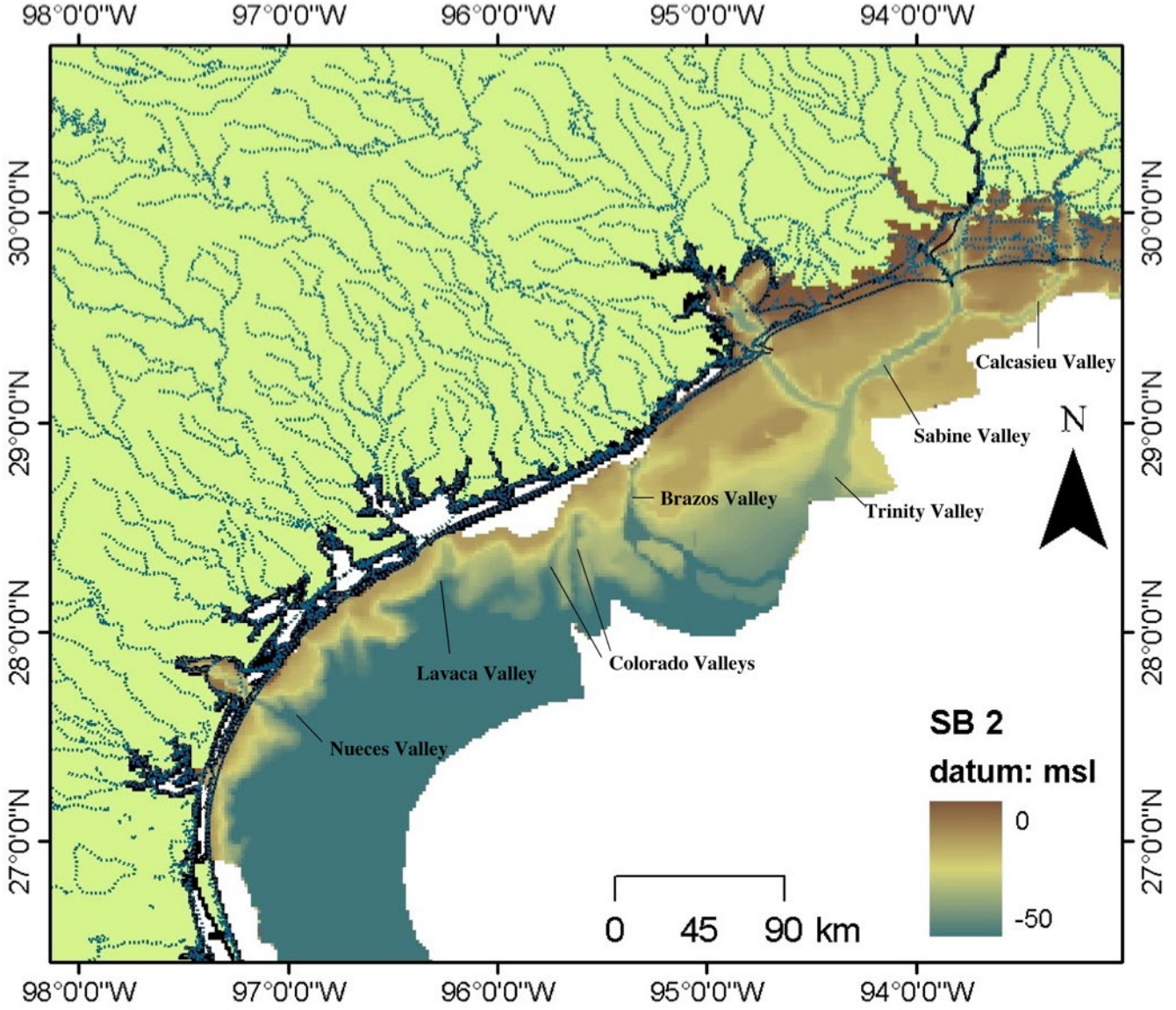


Hypothetical valley cross-section illustrating a complex sequence of aggradational (fill) and degradational (cut and strath) terraces. Note ct = cut terrace, ft = fill terrace, ft(b) = buried fill terrace, fp = active floodplain, and st = strath terrace.



Anderson et al., 2016





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Anderson et al., 2016

Field Techniques

- **Edgetech 216 CHIRP Seismic Sub-bottom Profiler**
- **Swept Frequency:** 2-16 kHz
- **Vertical Resolution:** ~1-5 centimeters
- **Penetration Depth:** ~6- 80 meters

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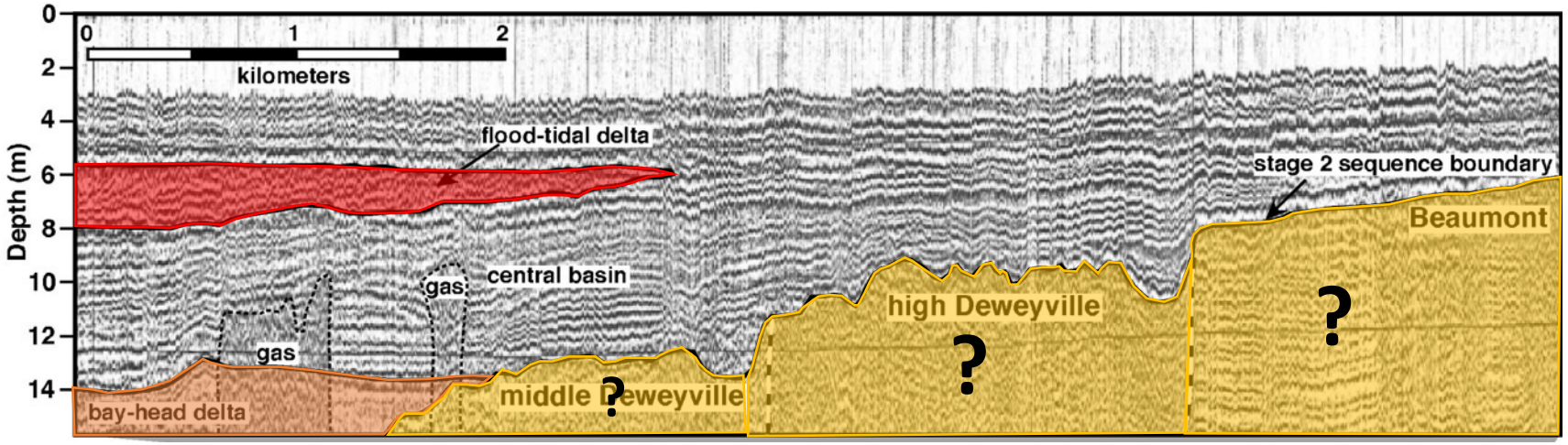
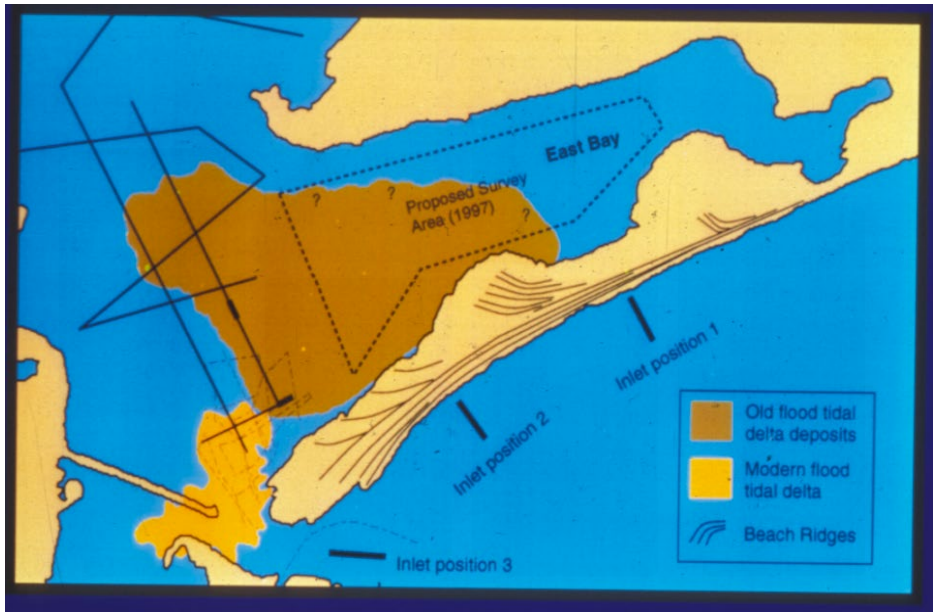
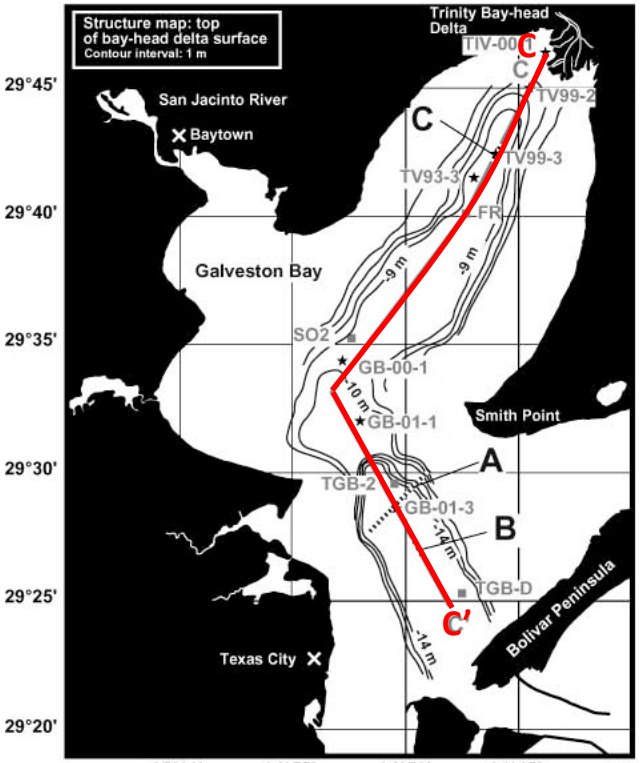
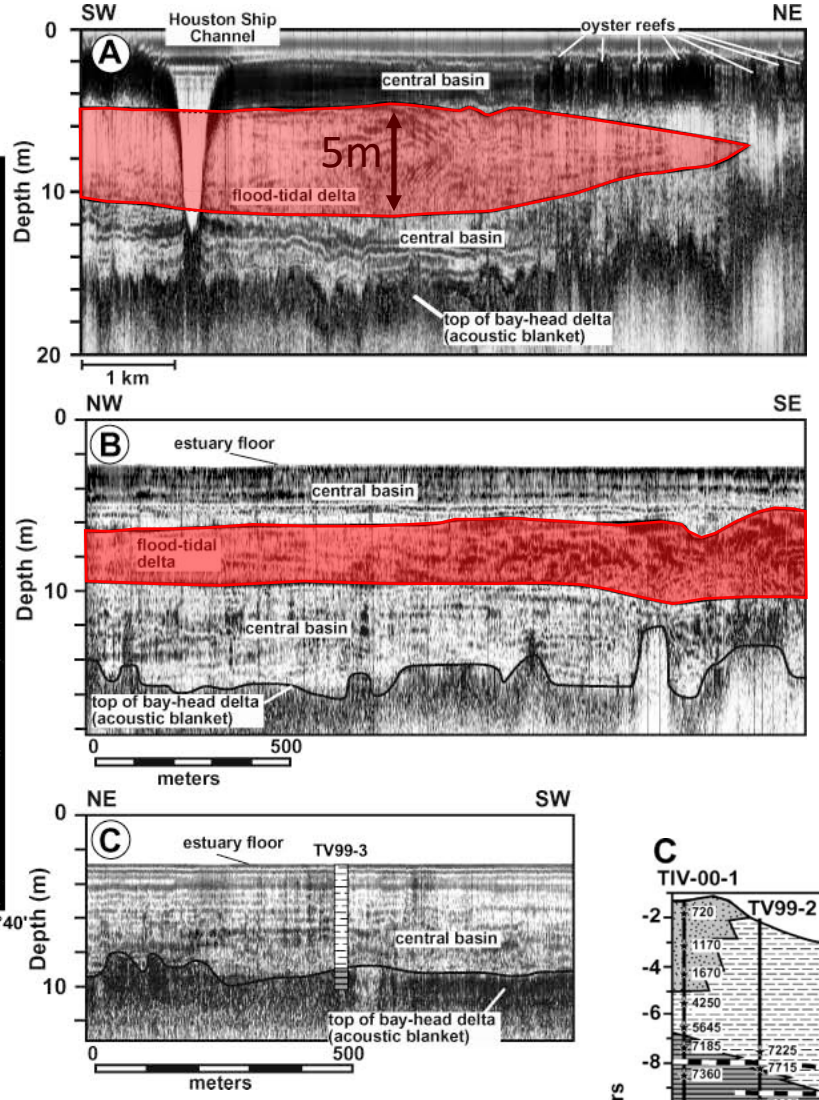
Cross-Section of Middle Reef Area
East Galveston Bay

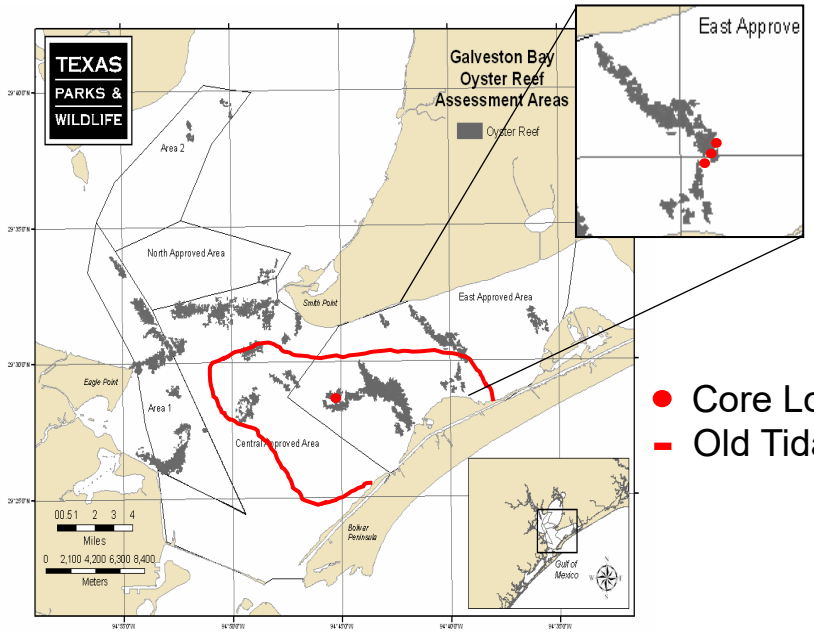




Anderson, 2006
http://rice.gulf.edu

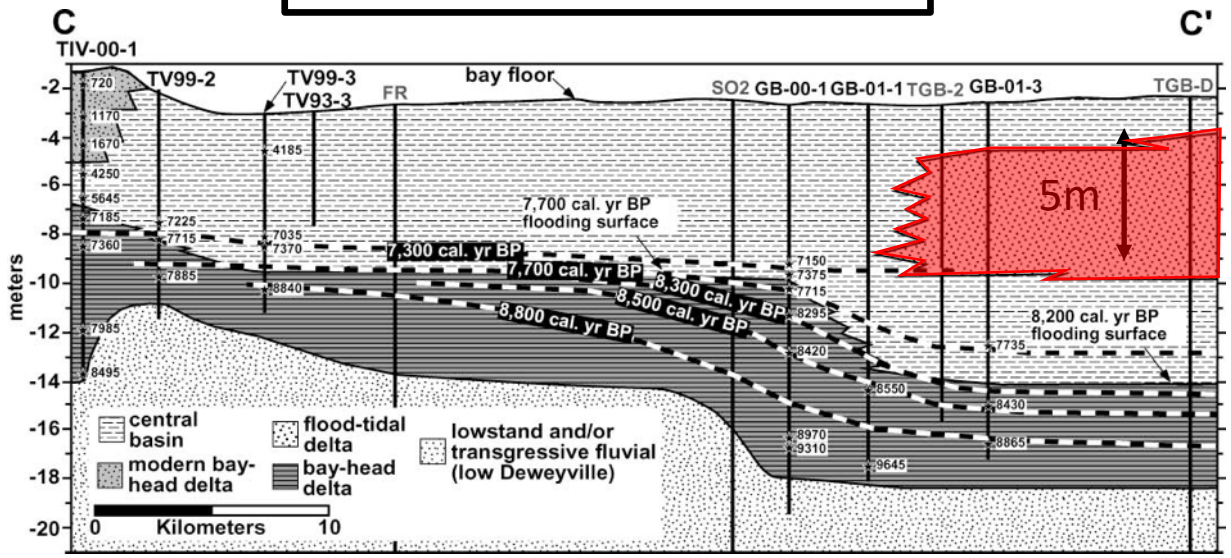






- Core Locations
- Old Tidal Delta

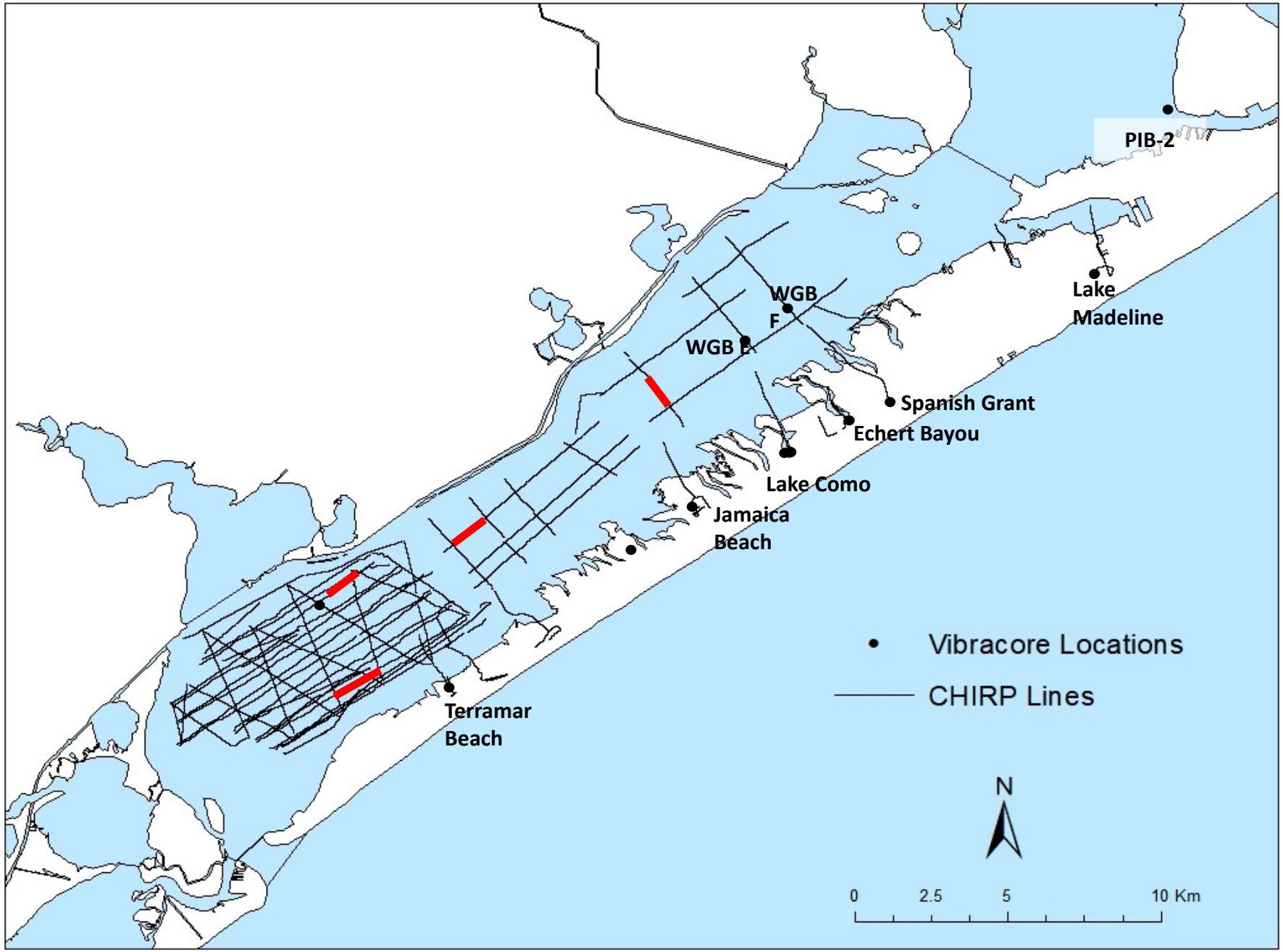
14 km x 10 km x 5 m=
~915.6 million yd^3 total



Anderson, 2006
http://rice.gulf.edu

TAMUG CHIRP lines:

2012-2018



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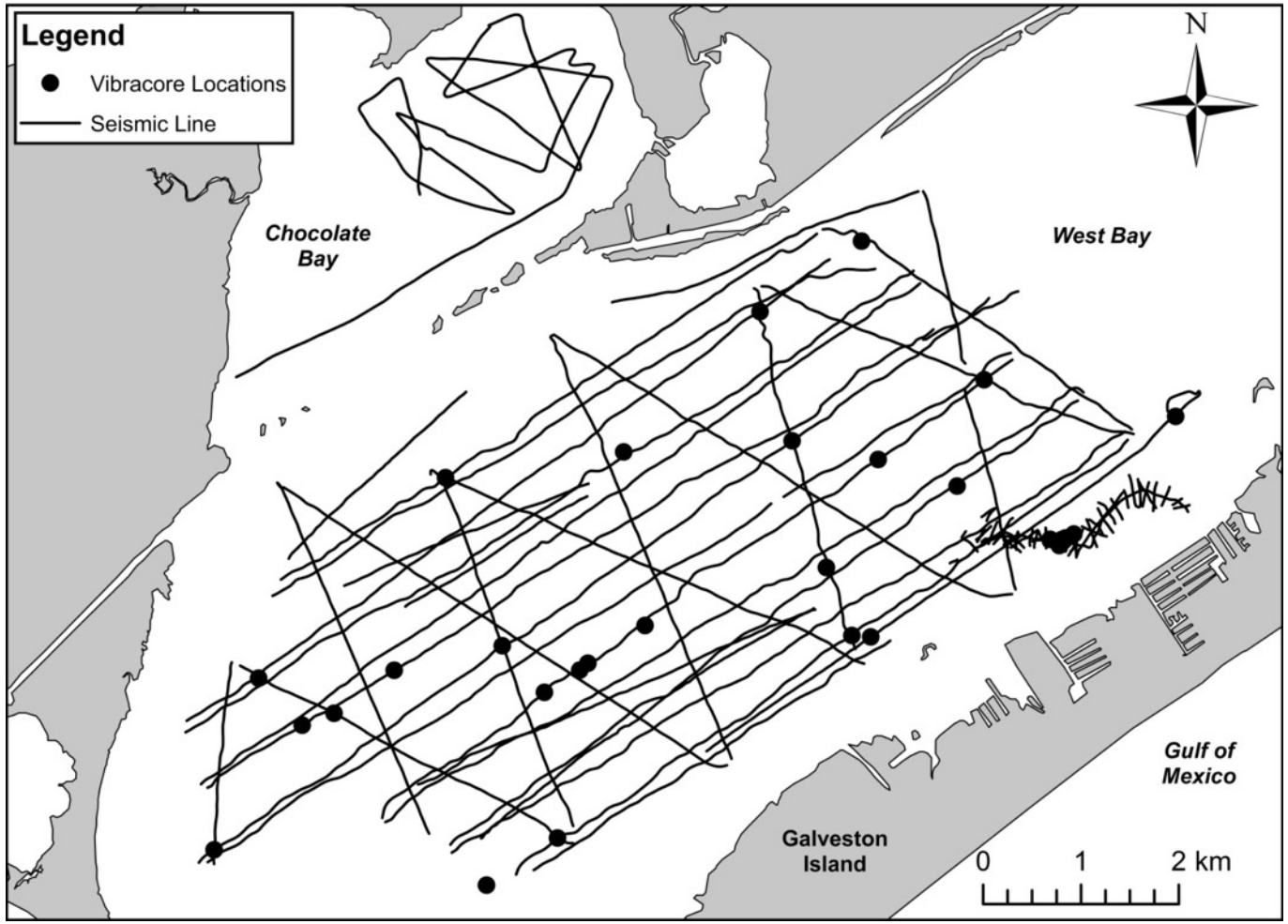
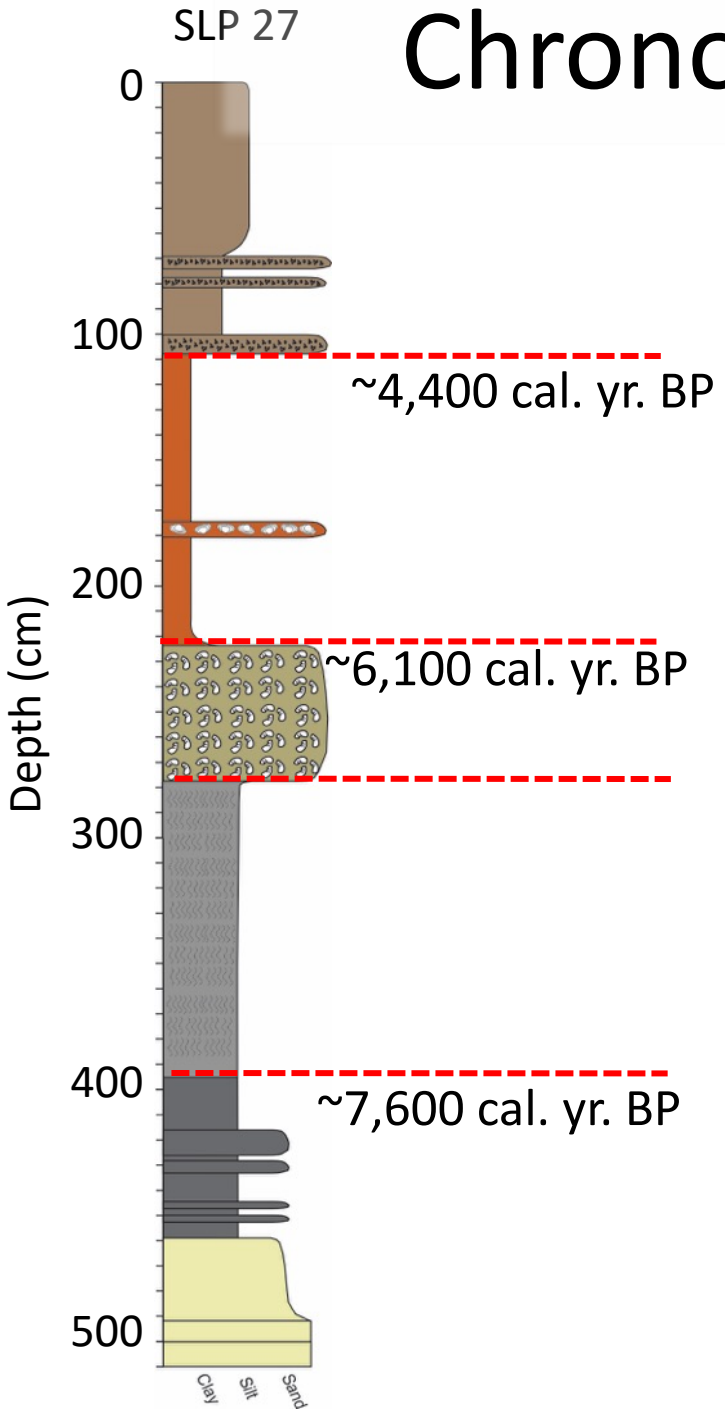
Sampling Coverage



- 30 Cores
- 160+ km Seismic Data

Chronostratigraphy

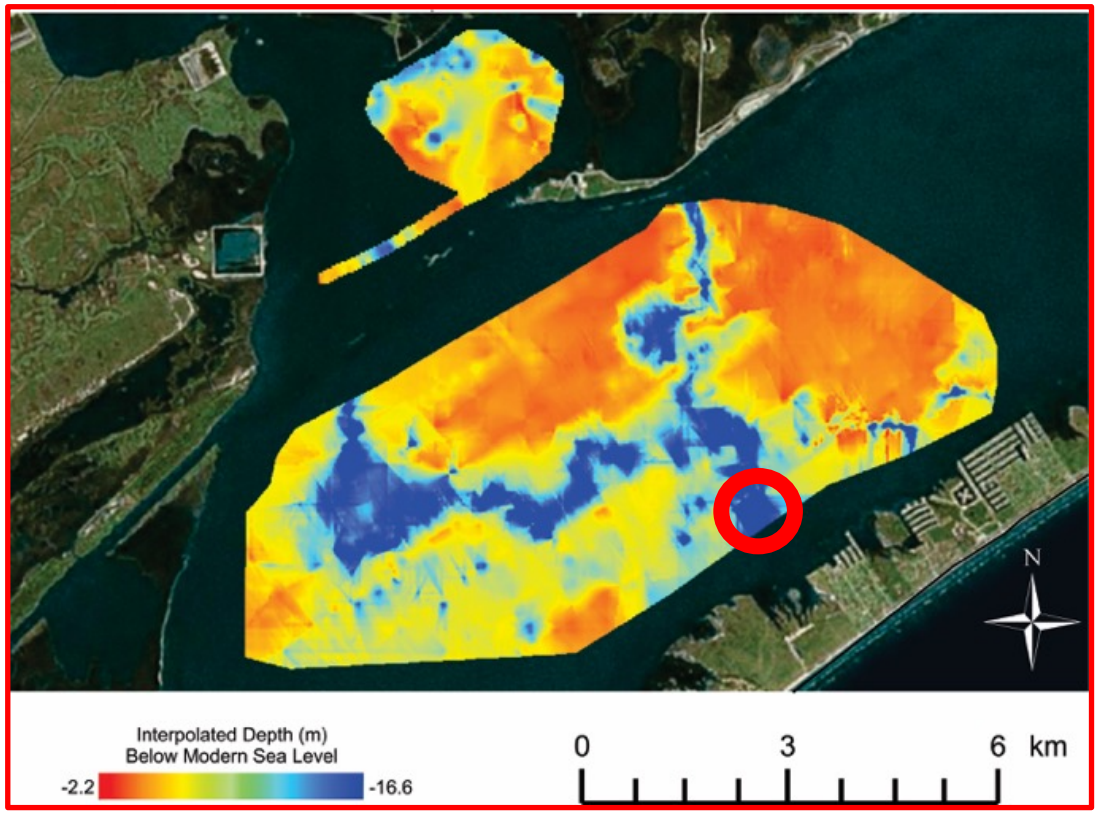


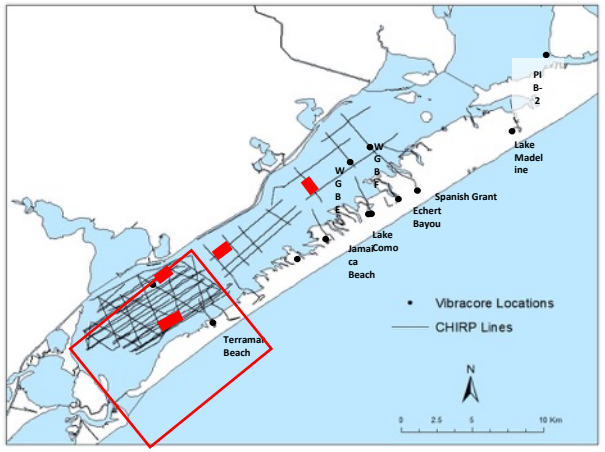
Back Barrier Lagoon

Paleo-Brazos

Upper to Middle Estuarine

Fluvial Deposition to Estuarine





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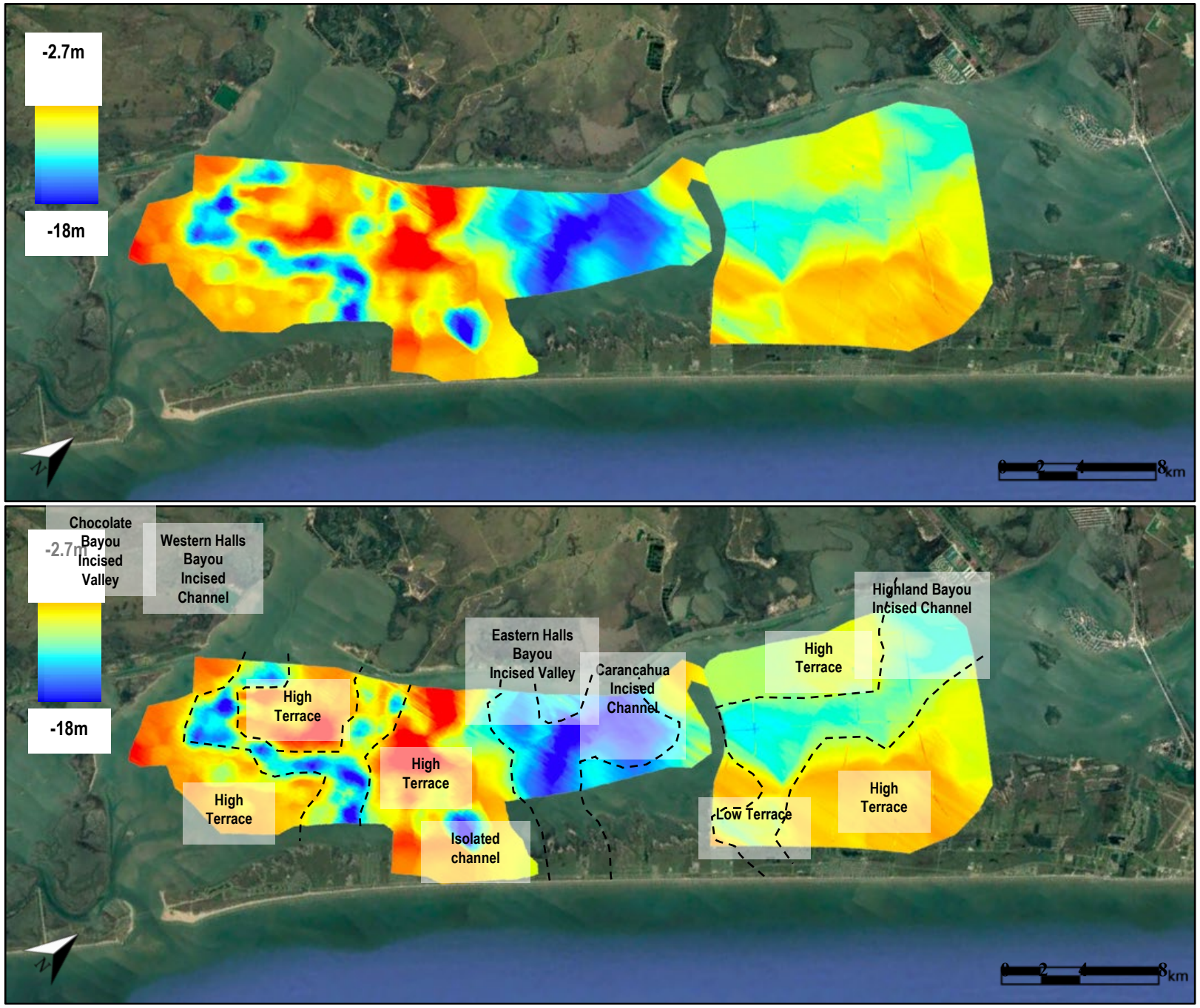
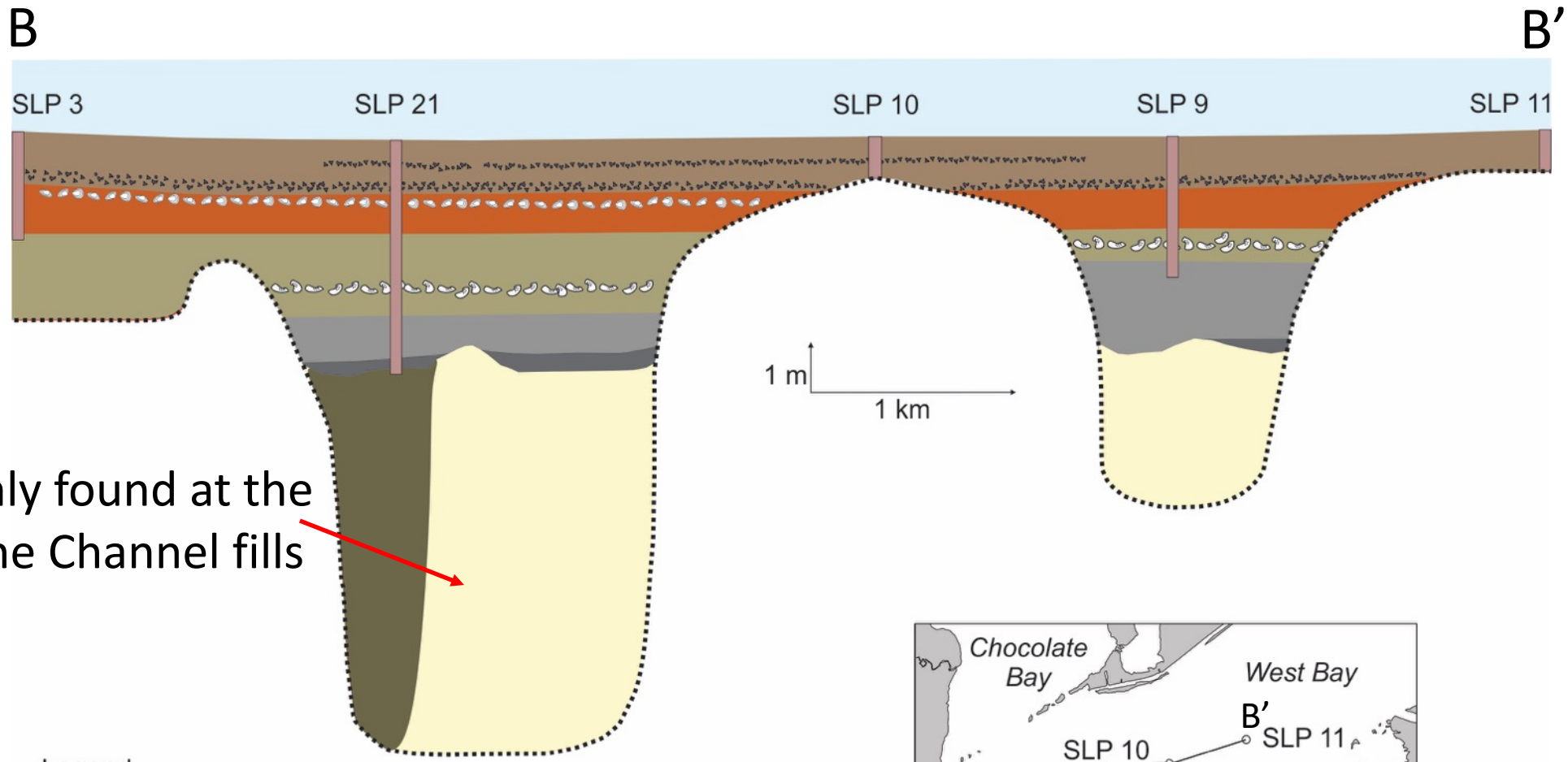
Pleistocene Fluvial Terraces- lighter tones

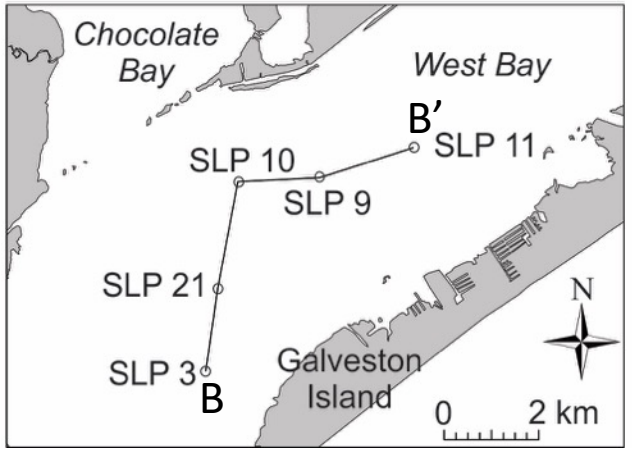
Channels- darker tones



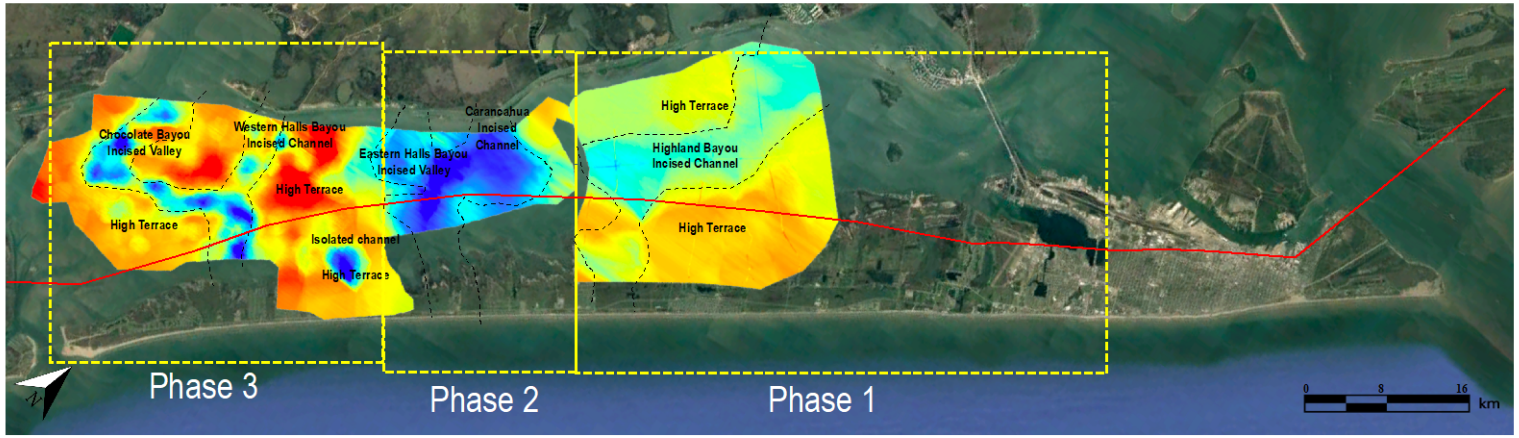
Stratigraphic Cross Section Showing Lithological Changes Throughout the Study Area



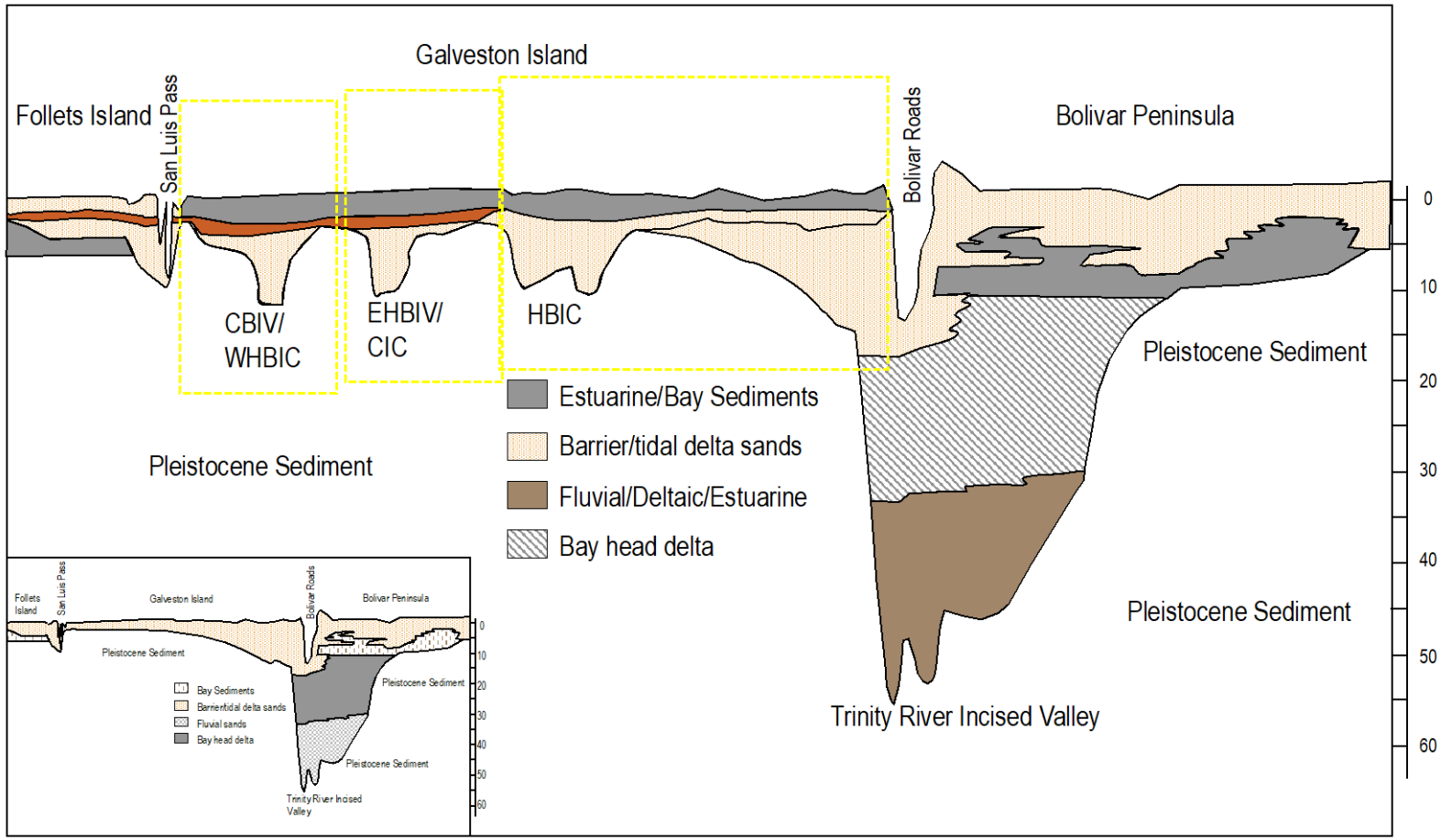
Sand is generally only found at the base of the Holocene Channel fills



A

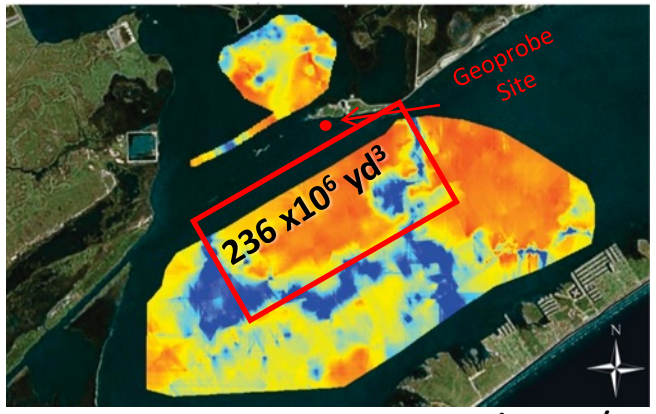

Chocolate Bayou Incised Valley
Western Halls Bayou Incised Channel
Eastern Halls Bayou Incised Valley
Carancahua Incised Channel
High Terrace
Highland Bayou Incised Channel
High Terrace
High Terrace
Isolated channel
High Terrace
High Terrace
Phase 3
Phase 2
Phase 1
0 8 16
km

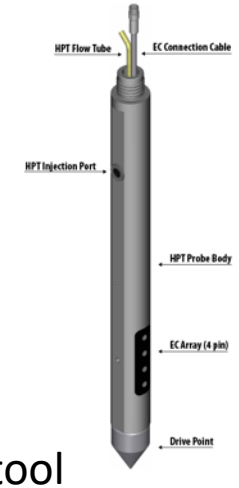
B


Galveston Island
Follets Island
San Luis Pass
Bolivar Roads
Bolivar Peninsula
CBIV/ WHBIC
EHBIV/ CIC
HBIC
Pleistocene Sediment
Pleistocene Sediment
Estuarine/Bay Sediments
Barrier/tidal delta sands
Fluvial/Deltaic/Estuarine
Bay head delta
Pleistocene Sediment
Trinity River Incised Valley
0
10
20
30
40
50
60

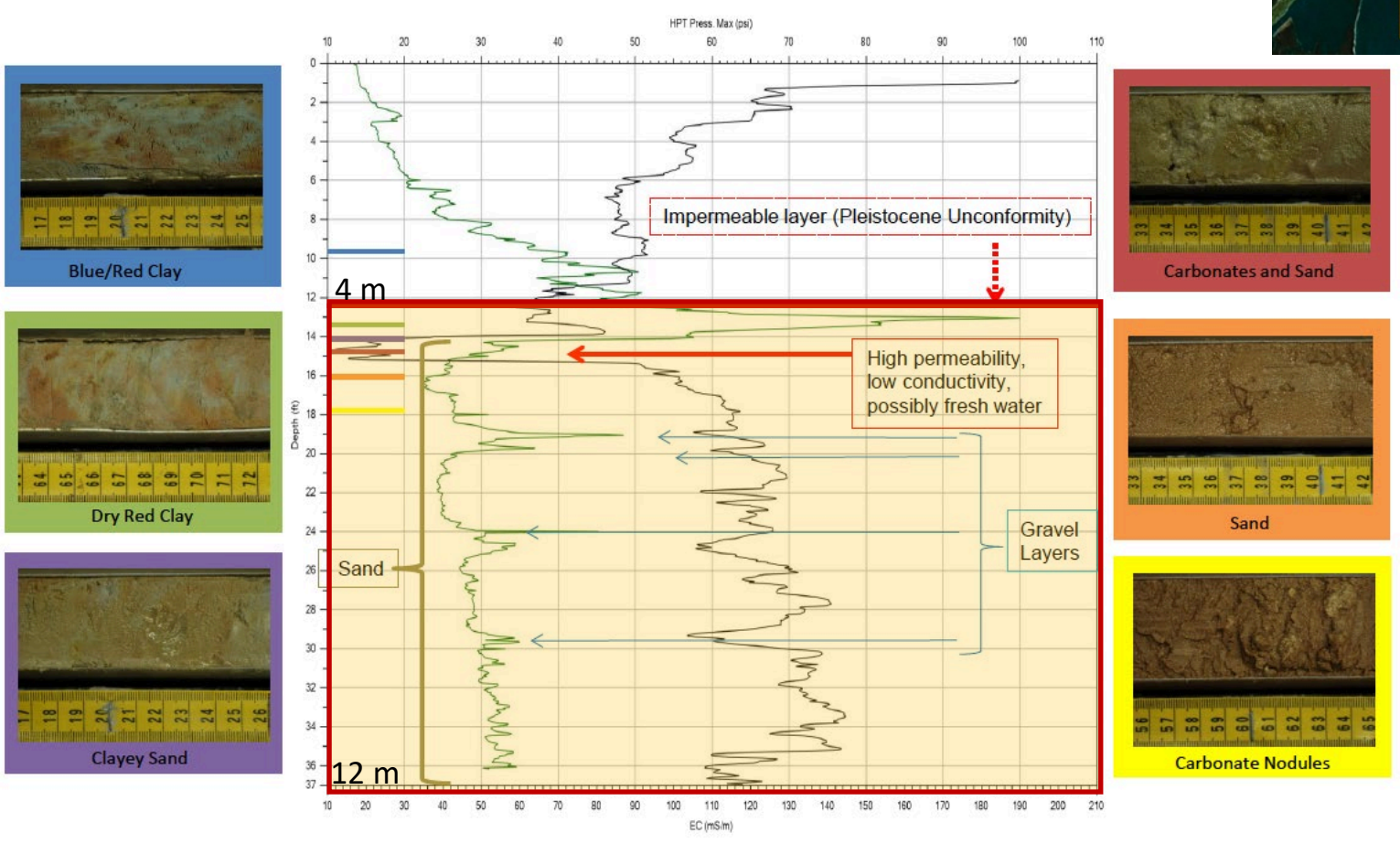
Pleistocene Sand Terrace Deposits- West Galveston Bay

Potentially ~236 million cubic yards sand



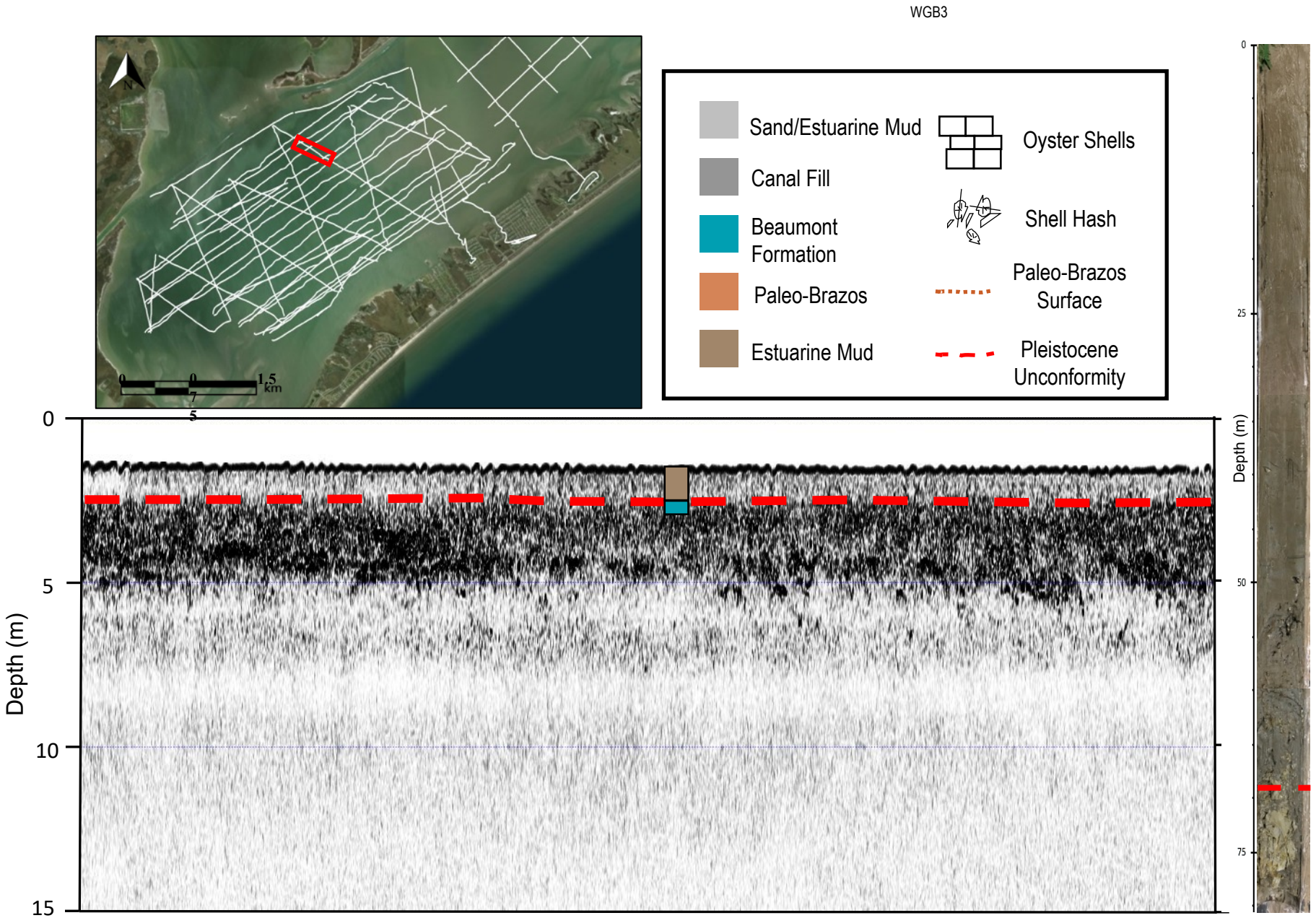


Geoprobe w/
Hydraulic Profiling tool



Note- overburden is less than 2 m further south

Geoprobe 420M



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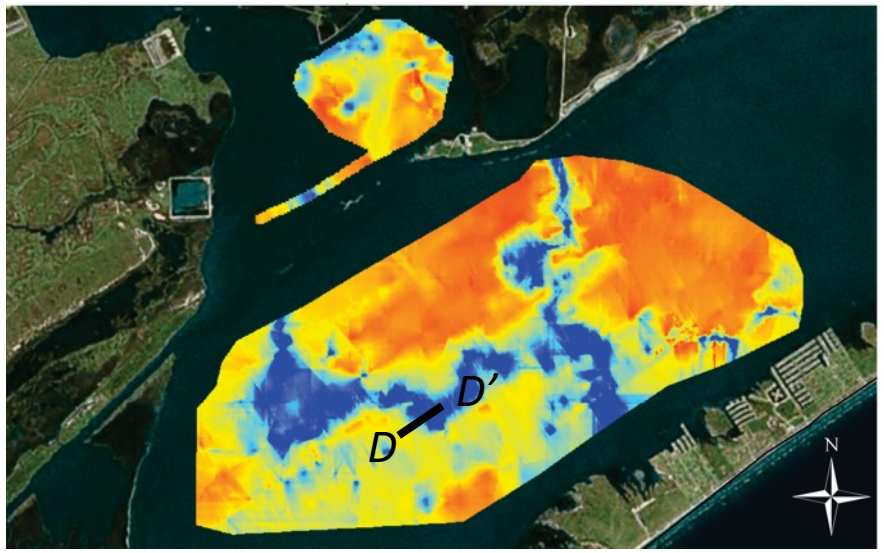
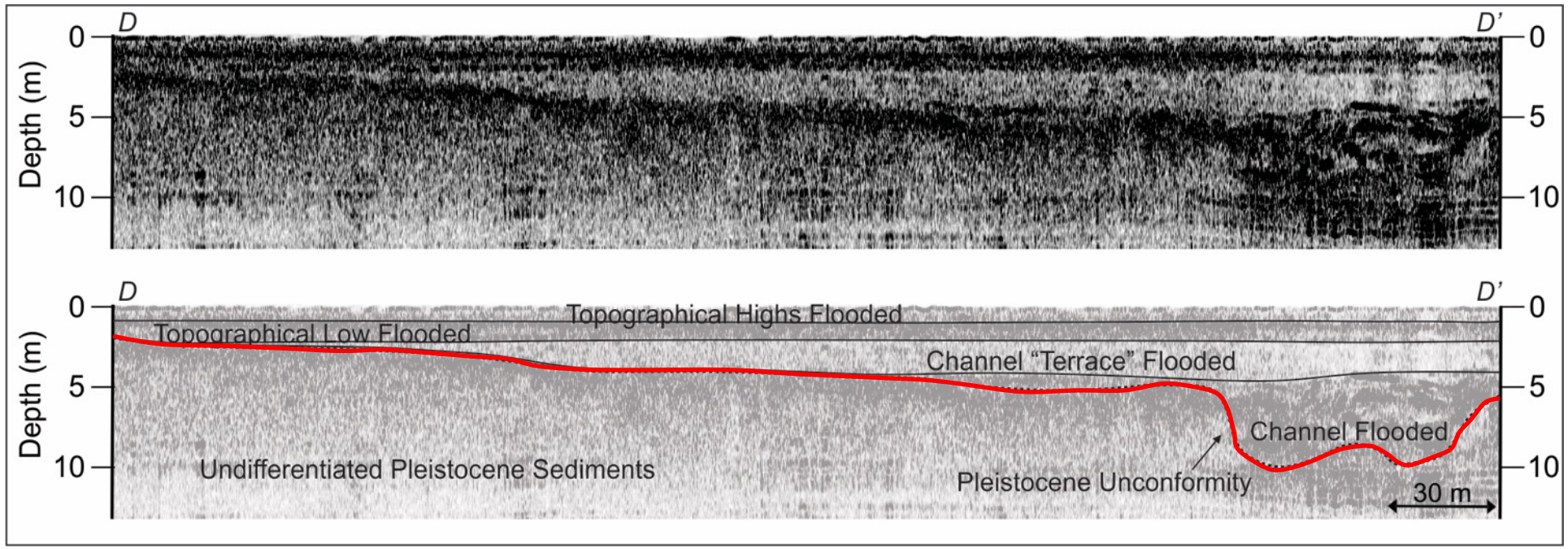
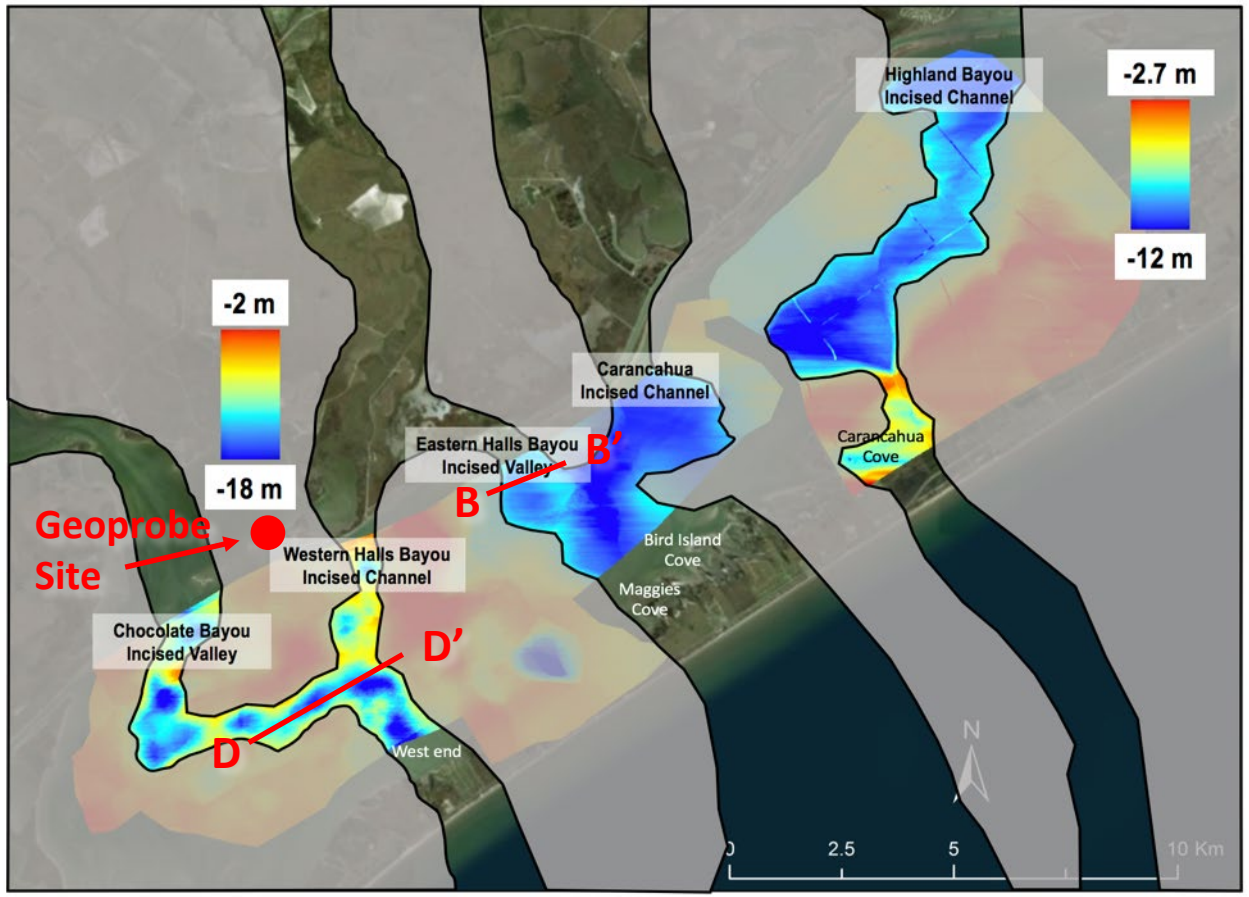
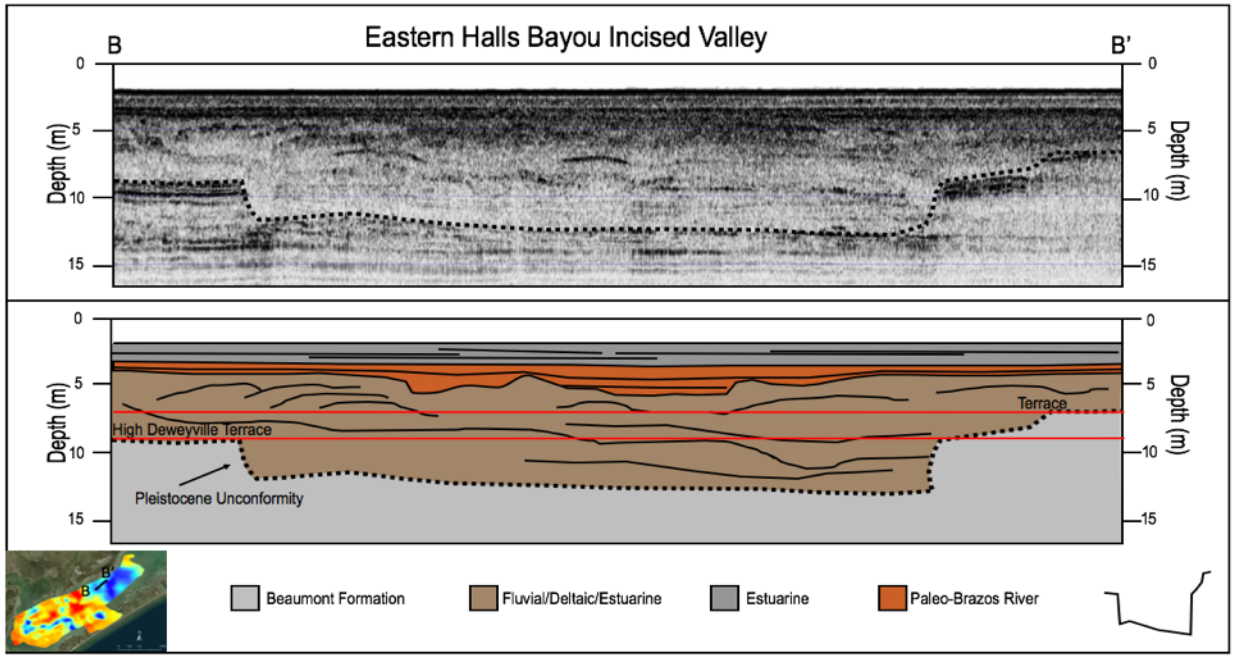
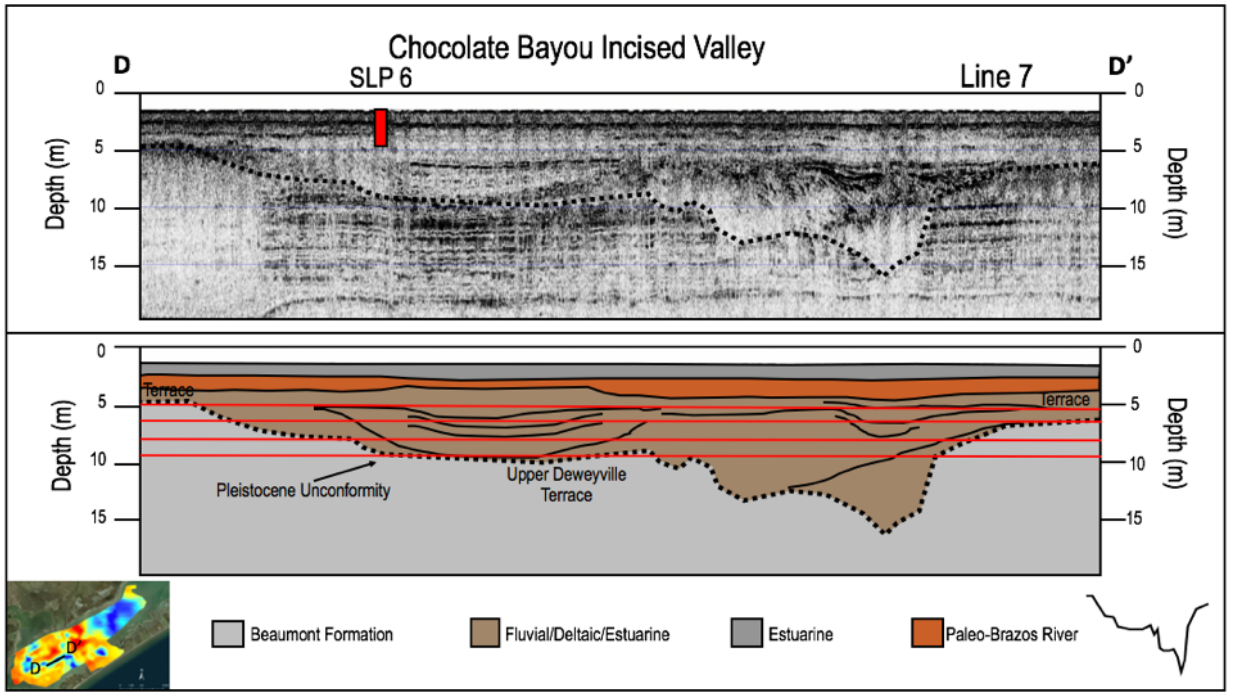
Seismic Facies and Flooding Surfaces











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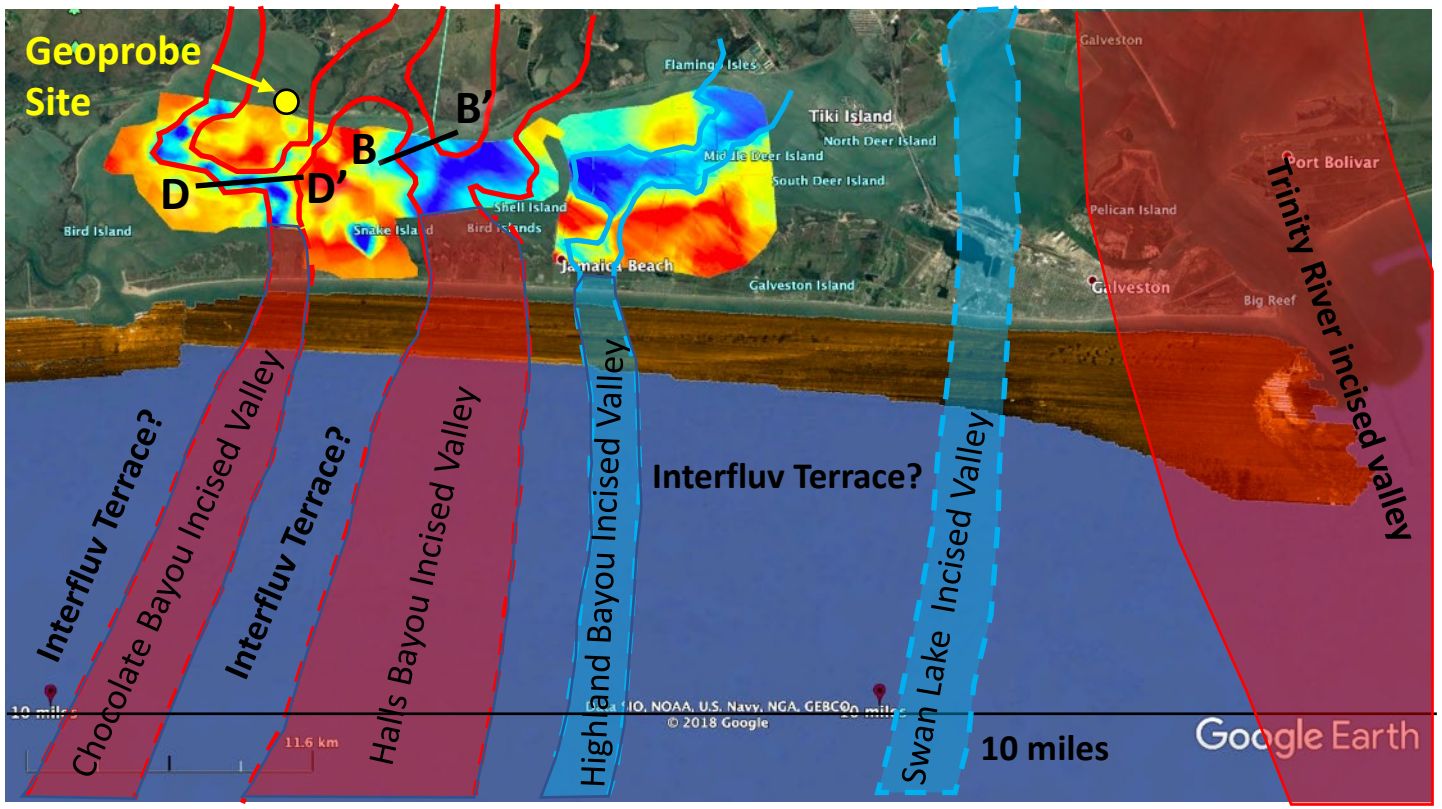
A

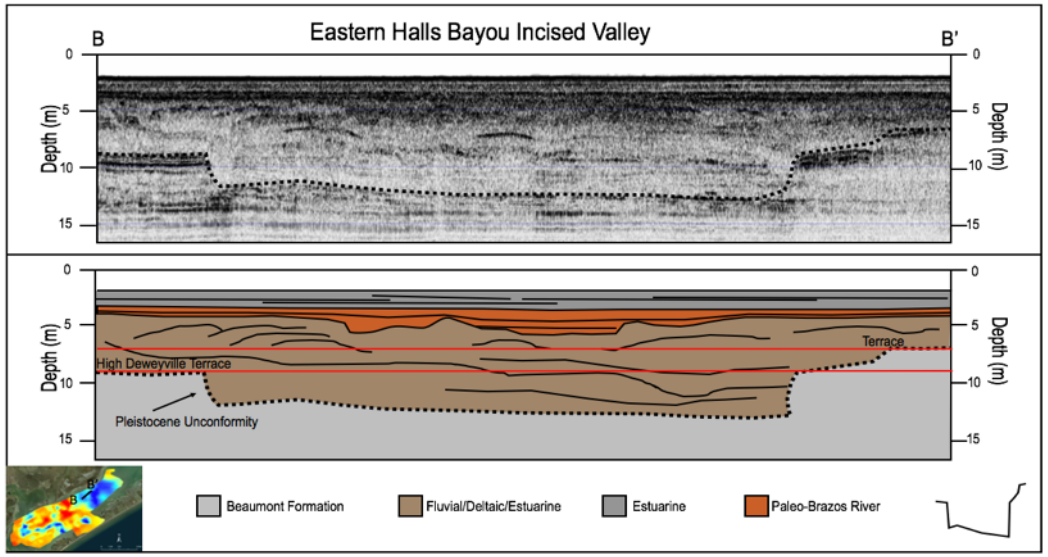


B

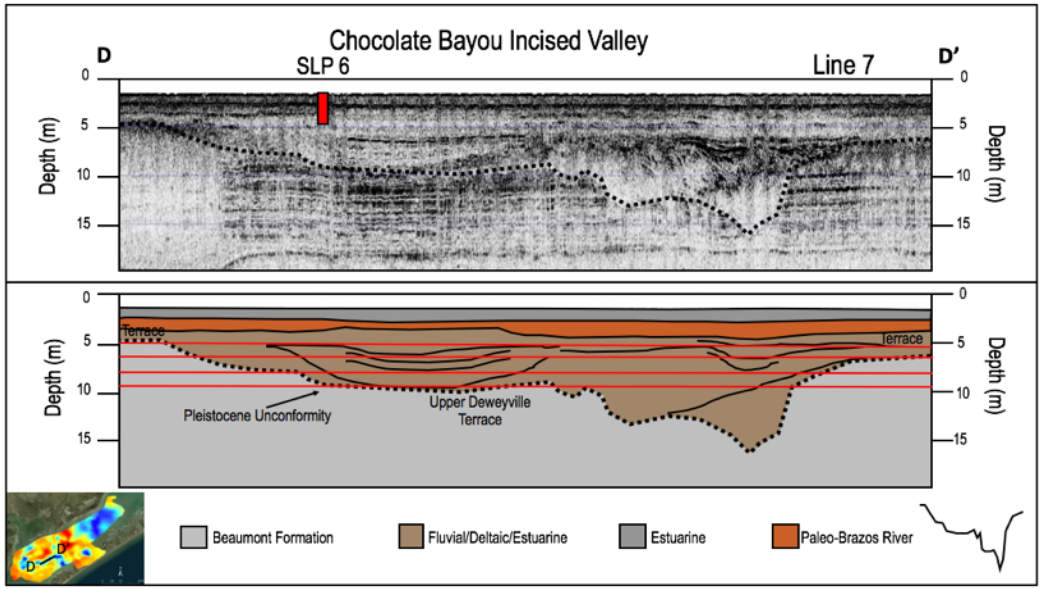
Compound Piedmont Incised Valley with terraces

Simple Coastal Plain Incised Valley without terraces
Note: these valleys may be incised into terraces

C



D



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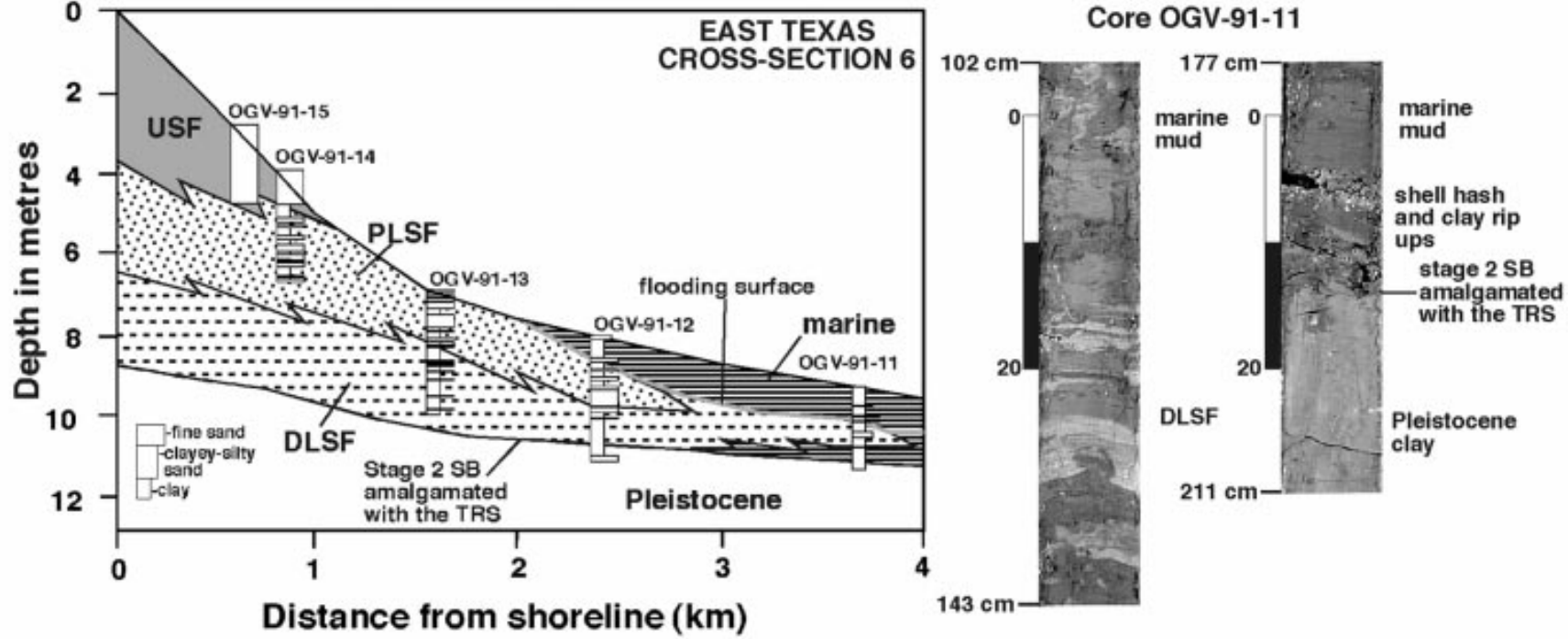
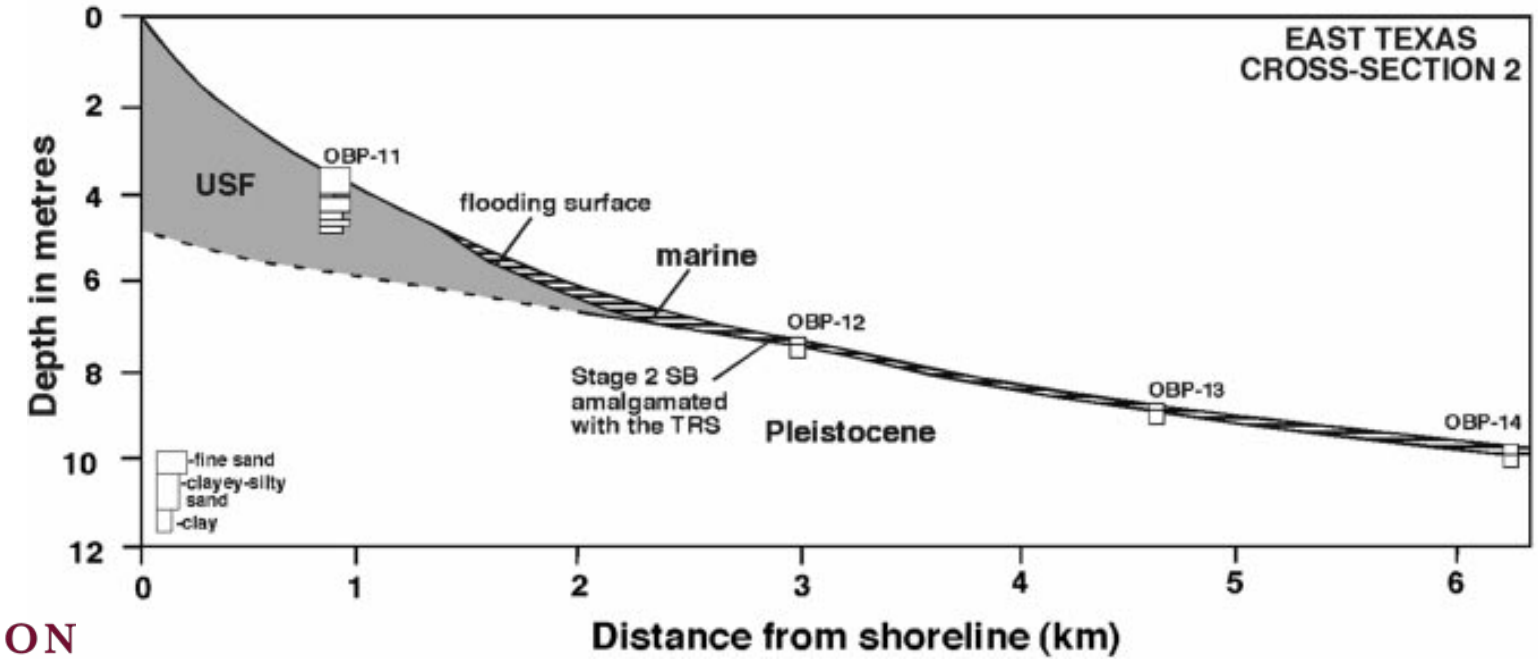
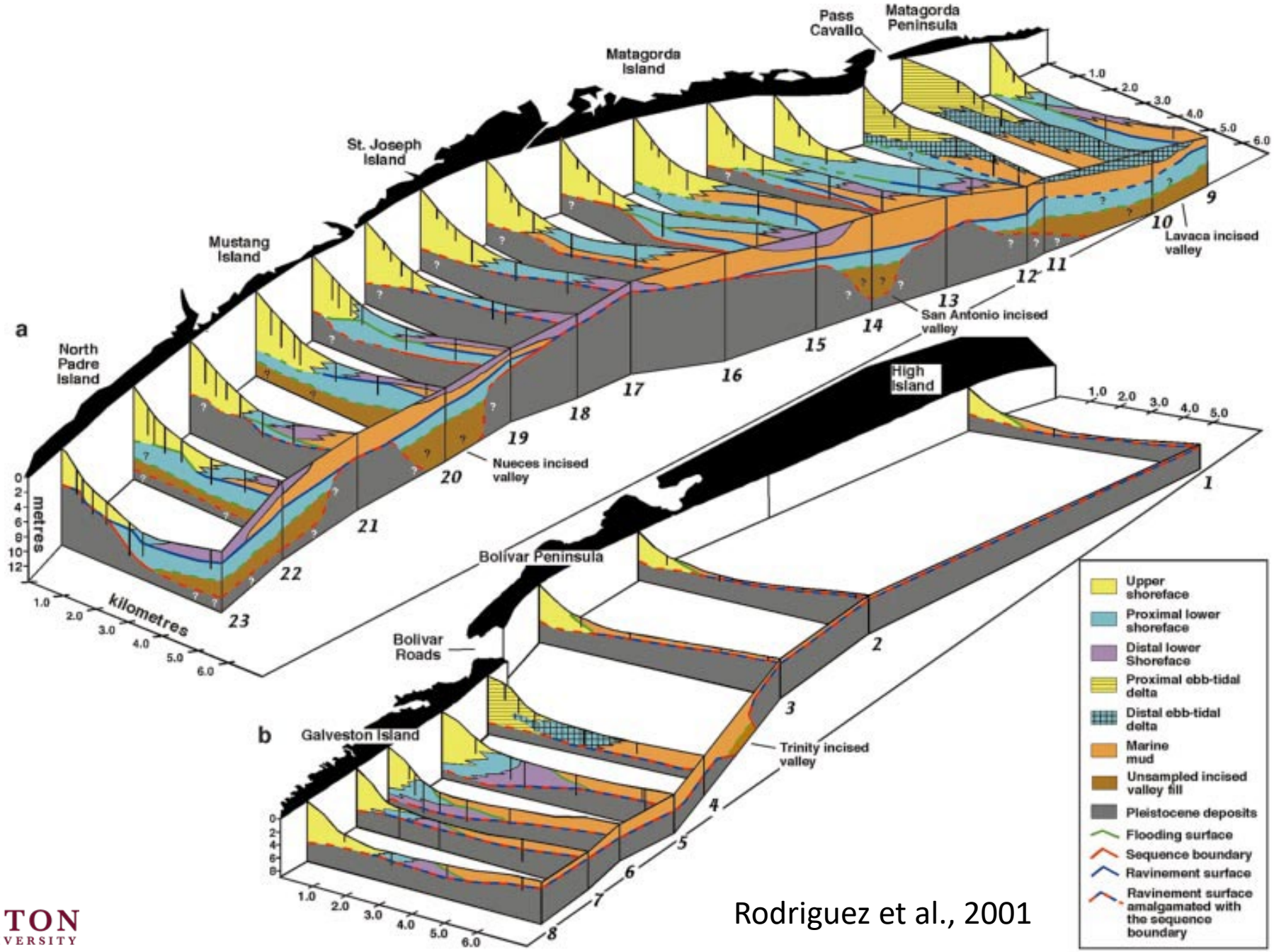
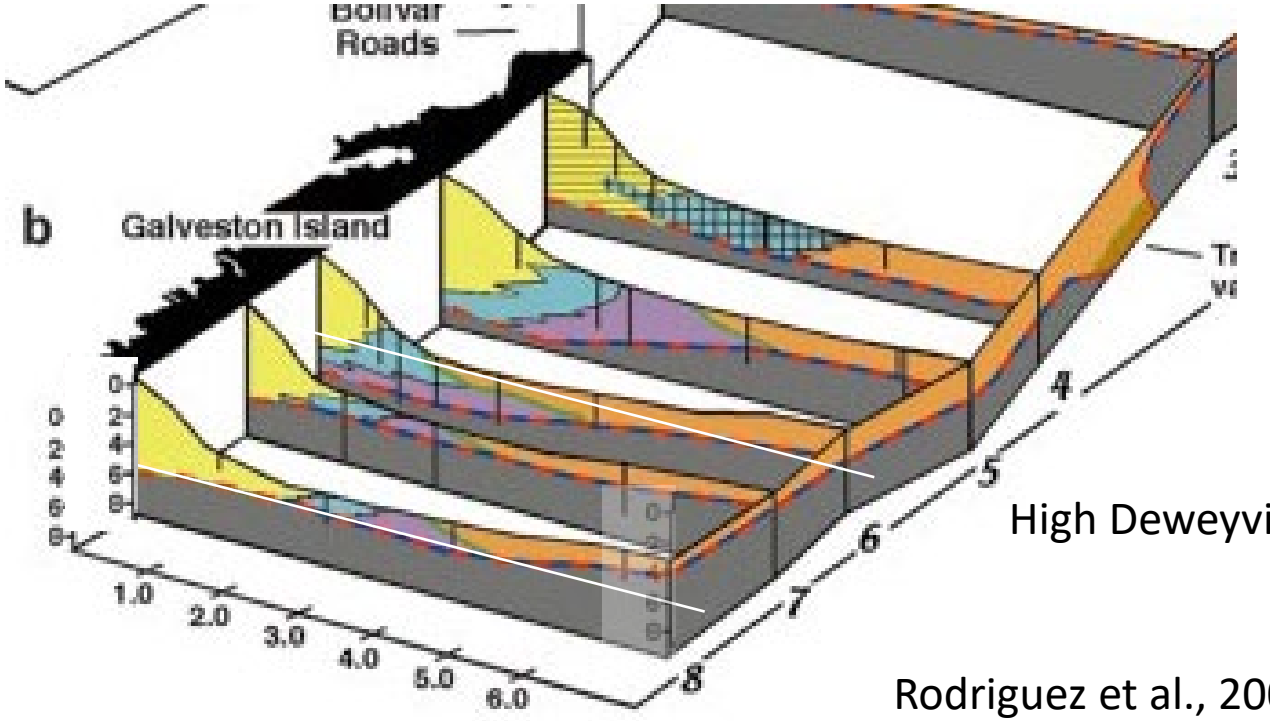

EAST TEXAS
CROSS-SECTION 6
Depth in metres
Distance from shoreline (km)
USF
OGV-91-15
OGV-91-14
PLSF
OGV-91-13
flooding surface
OGV-91-12
marine
OGV-91-11
DLSF
Stage 2 SB
amalgamated
with the TRS
Pleistocene
fine sand
clayey-silty
sand
clay
Core OGV-91-11
102 cm
0
20
143 cm
177 cm
marine
mud
shell hash
and clay rip
ups
stage 2 SB
amalgamated
with the TRS
Pleistocene
clay
211 cm


EAST TEXAS
CROSS-SECTION 2
Depth in metres
Distance from shoreline (km)
USF
OBP-11
flooding surface
marine
OBP-12
Stage 2 SB
amalgamated
with the TRS
Pleistocene
OBP-13
OBP-14
fine sand
clayey-silty
sand
clay



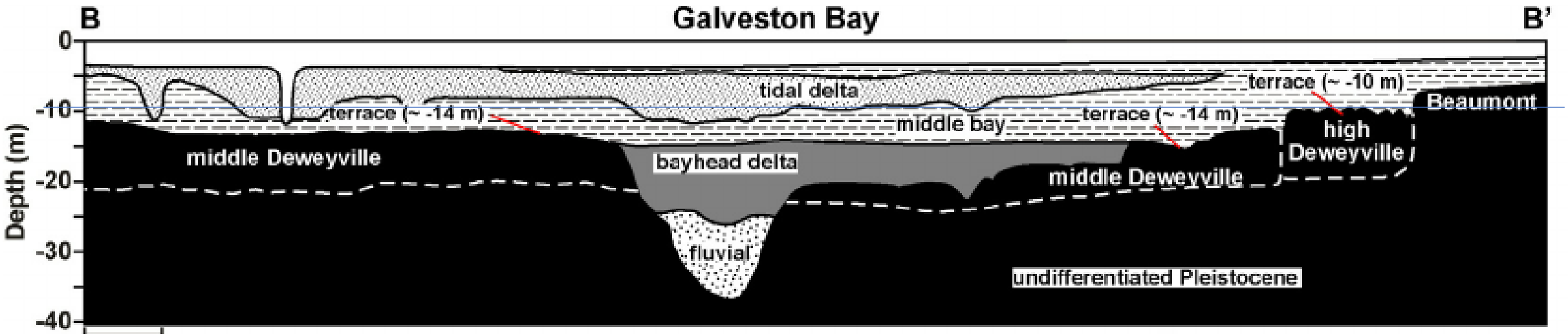
Rodriguez et al., 2001



- Rodriguez et al. (2001) documented the presence of the terraces
- Did not core them
- Could not core with tools being used at the time

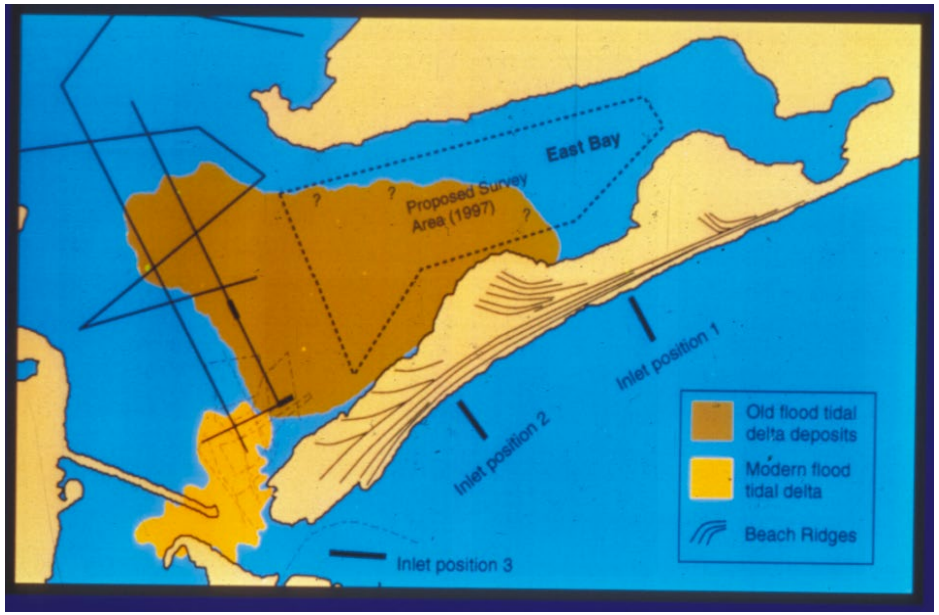
High Deweyville Terrace?

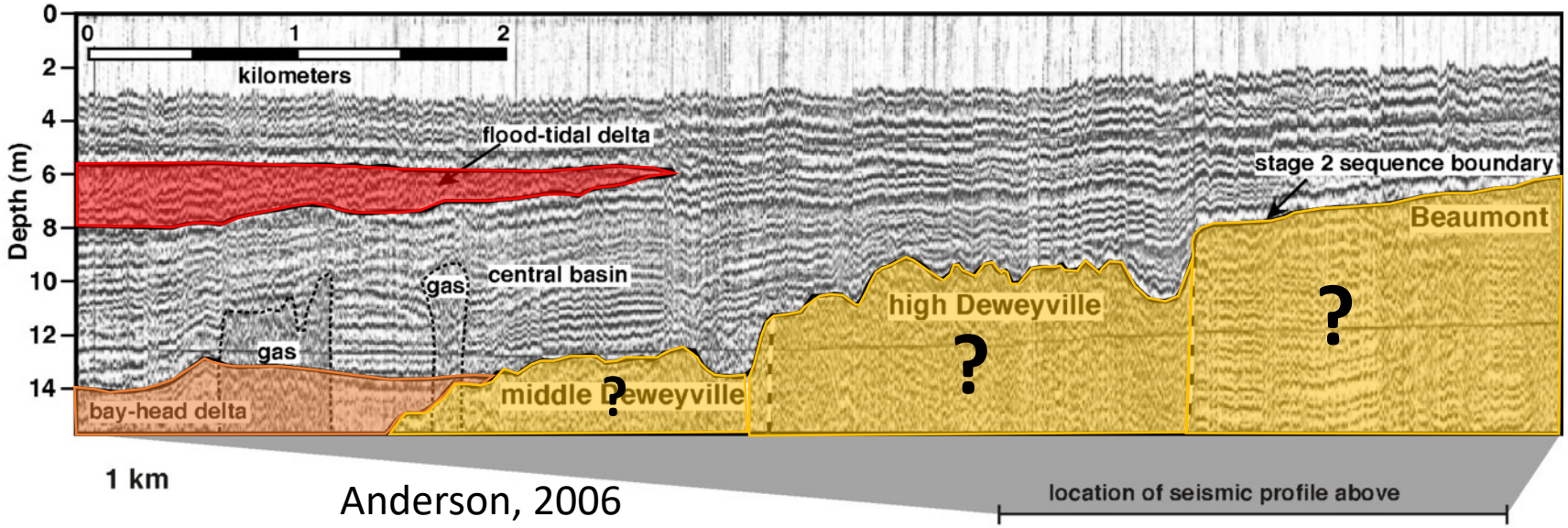
Rodriguez et al., 2001



Bayside Sand Sources

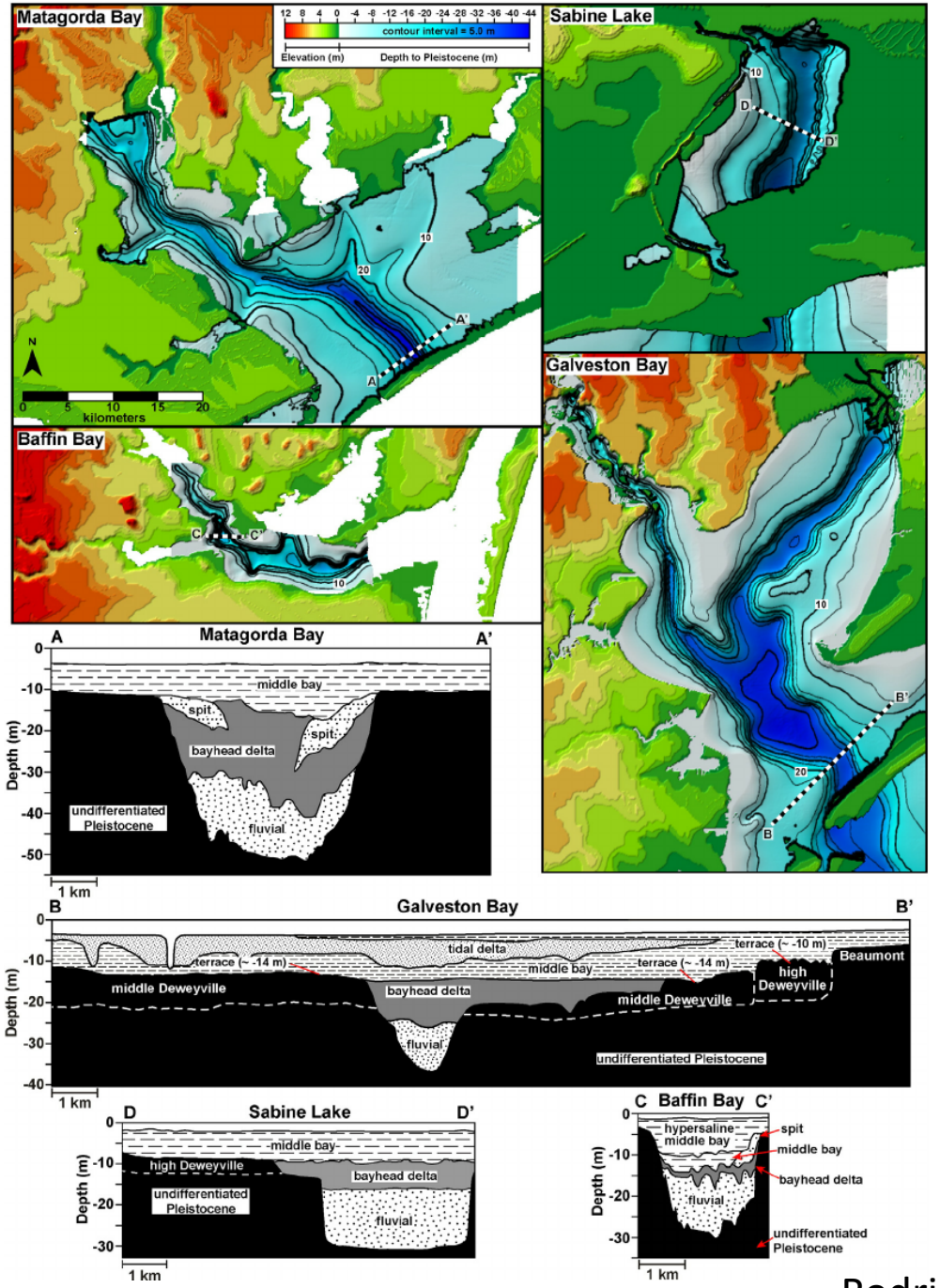
- Relict Holocene Flood Tidal Deltas
  - E.g. East Bay Flood Tidal Delta
- Holocene Bayhead Delta Deposits
- Pleistocene Fluvial Terraces
  - Deweyville Terraces





Anderson, 2006

http://rice.gulf.edu



Not Unique to Galveston Bay

Bayside Sand Sources

- Relict Holocene Flood Tidal Deltas
- Holocene Bayhead Delta Deposits
- Pleistocene Fluvial Terraces
  - Deweyville Terraces

Rodriguez et al., 2001

Incised valley systems and connections with barrier islands: Insights from the Mississippi/Alabama Shelf

Davin Wallace

Incised valley systems and connections with barrier islands: Insights from the Mississippi/Alabama Shelf

Davin Wallace
Associate Professor
School of Ocean Science and Engineering
University of Southern Mississippi
davin.wallace@usm.edu

BOEM
Bureau of Ocean Energy Management

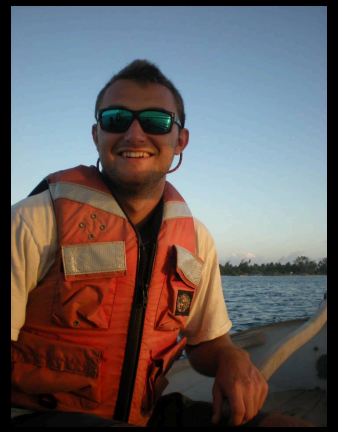
The University of Southern Mississippi

And of course...

Clayton Dike
Ph.D.
Student

Nina Gal
M.S.
2018

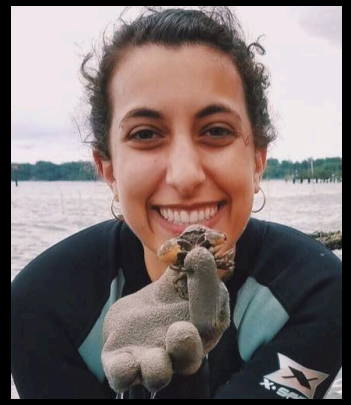
Shara
Gremillion
M.S. 2019,
Ph.D. Student



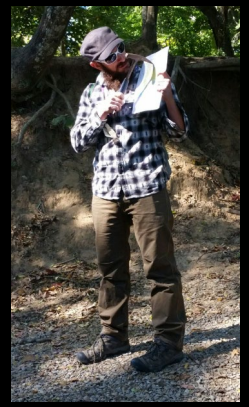
Robert
Hollis
M.S. 2018

Carrie Miller
Ph.D.
Student

Erin Miller
Ph.D.
Student



Sarah Monica
Ph.D.
Student



Dr. Michael
Miner
Water Institute

James
Flocks
USGS

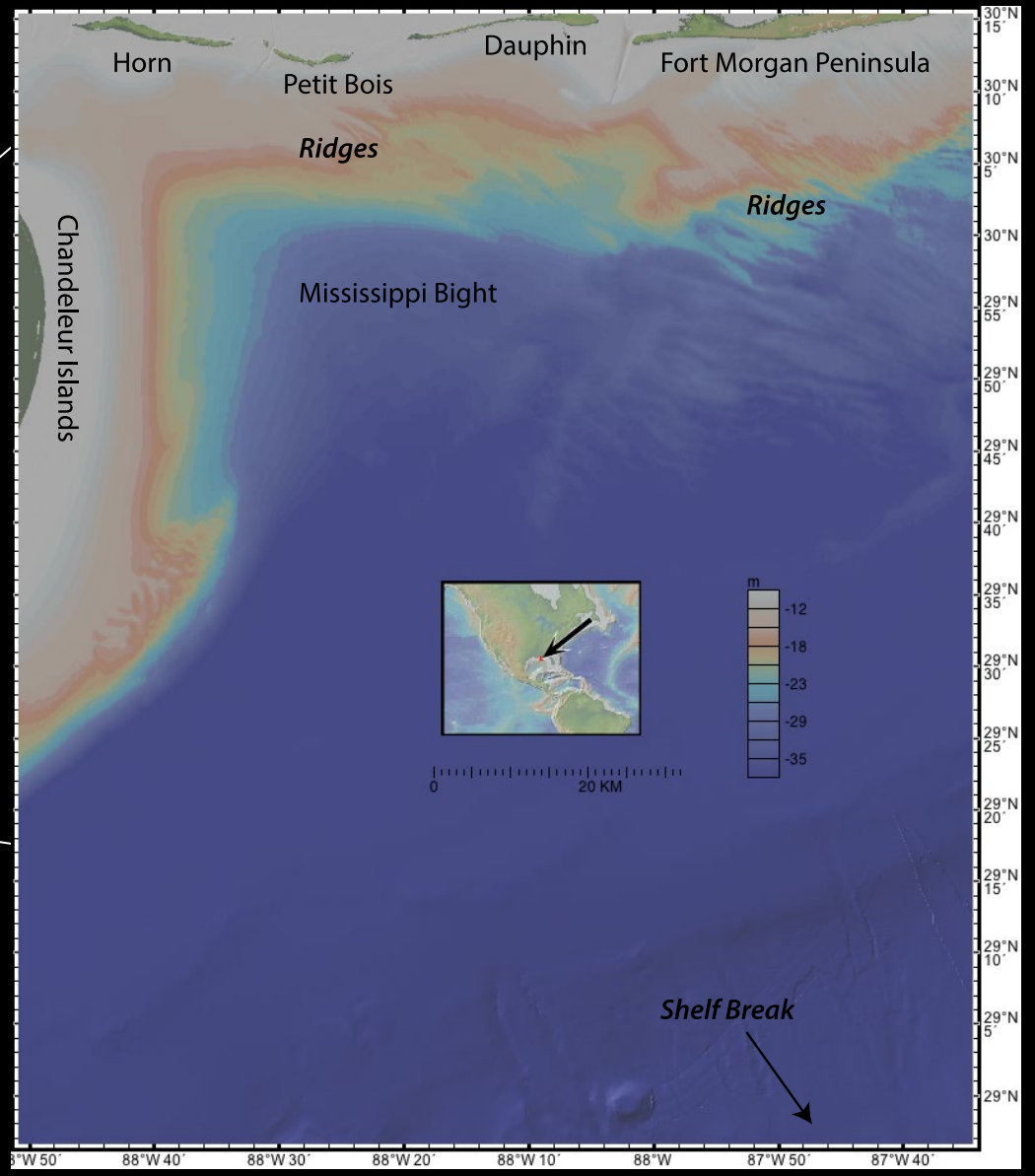
Dr. Rebecca Totten
UA

Dr. Emily
Elliott
UA

Ana Rice, Tershara Matthews, William Shedd, Nicholas Ferina, Angela Guidry, Jessica Mallindine (BOEM)

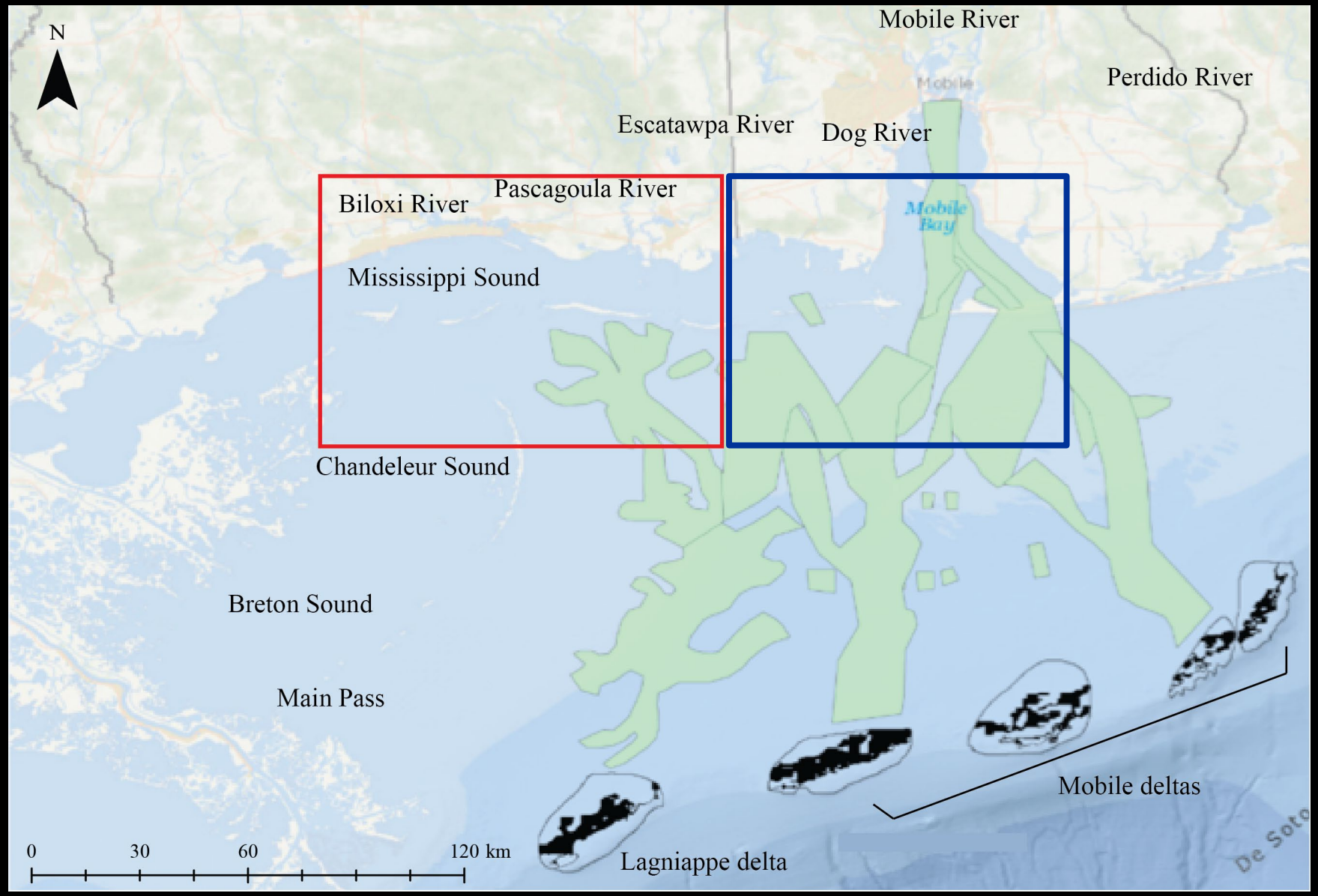
Study Area NGoM

Study Area NGoM



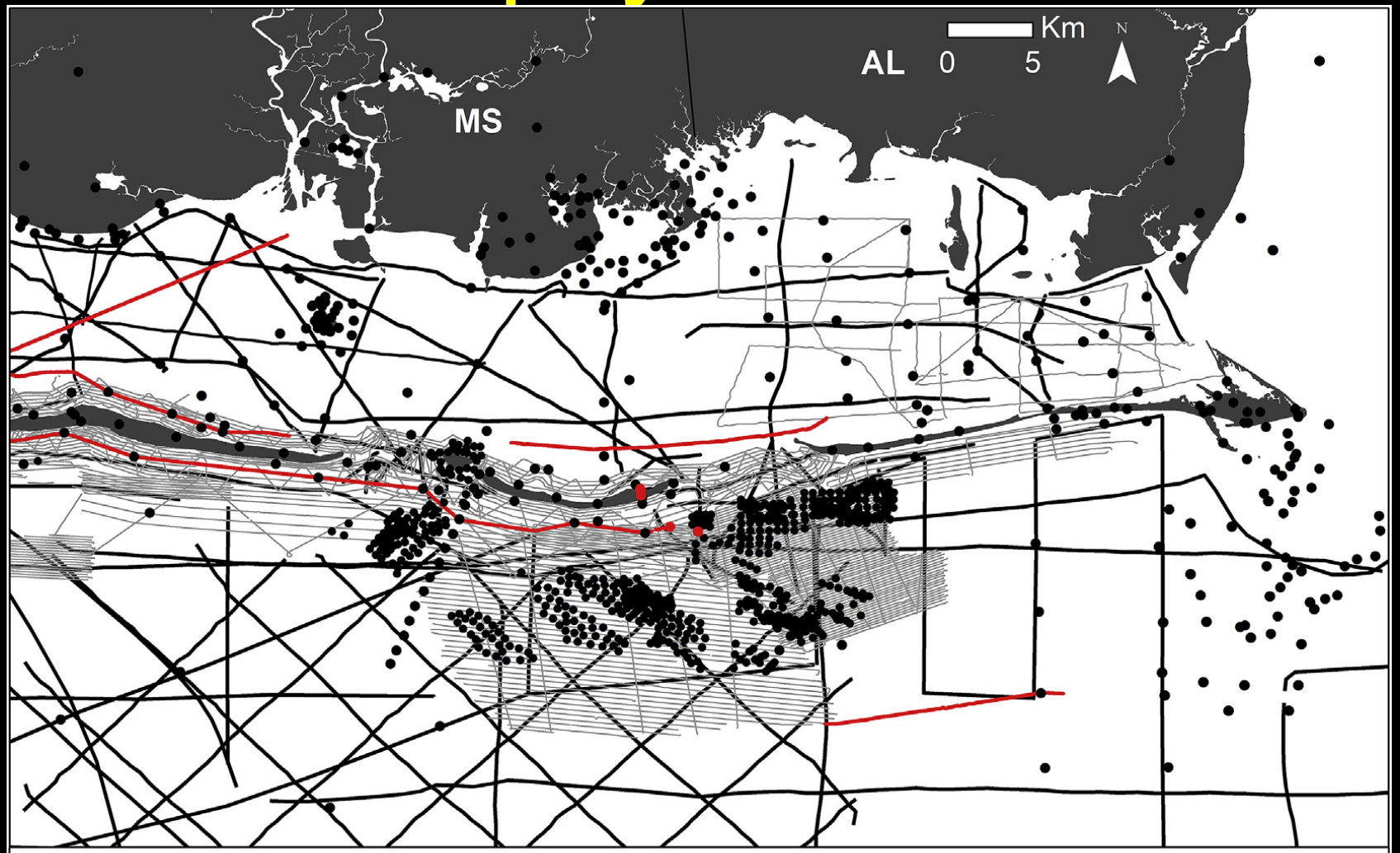
GeoMapApp

Previous work (MIS 2 valleys)



From Greene et al.,

Geophysical Data



Seismic

Bosse et al. (2017a)-R/V Erda 91-3 1991
Bosse et al. (2017b)-R/V Acadiana1987
Sanford et al. (2016a)-R/V Erda-1 1992
Sanford et al. (2016b)-R/V Kit Jones 1991,92
Sanford et al. (2016c)-R/V Gyre 1981
Sanford et al. (2016c)-R/V Carancahua 1981

This study

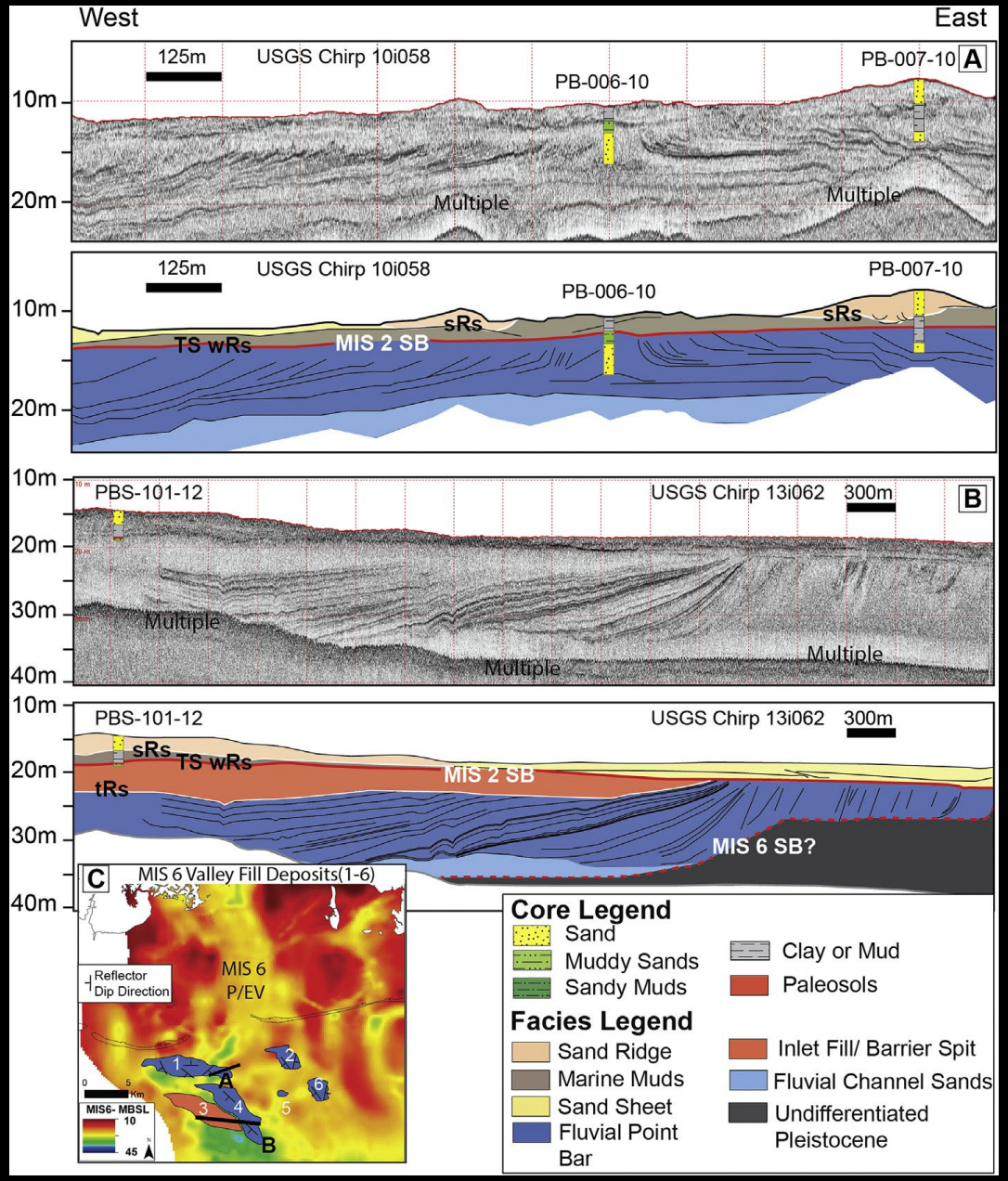
Chirp

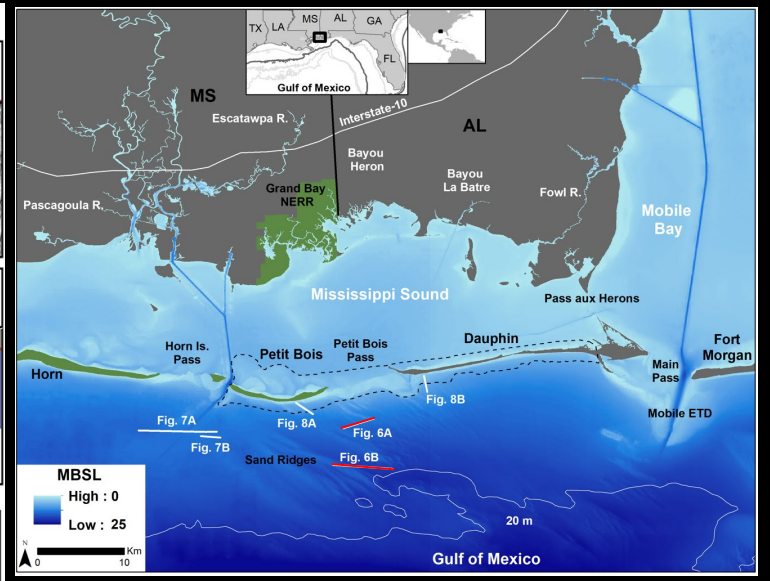
Forde et al. (2011a)-09CCT03,04
Forde et al. (2011b)-10CCT02, 03
Forde et al. (2015)-13CCT04
Greene et al. (2007)

Sediment Cores

Greene et al. (2007)
Hummel & Parker (1995)
Hummel & Smith (1996)
Kelso & Flocks (2015)
Kramer (1990)
McBride et al. (1991)
Otvos (1979)
Parker et al. (1993)
USACE (2014)

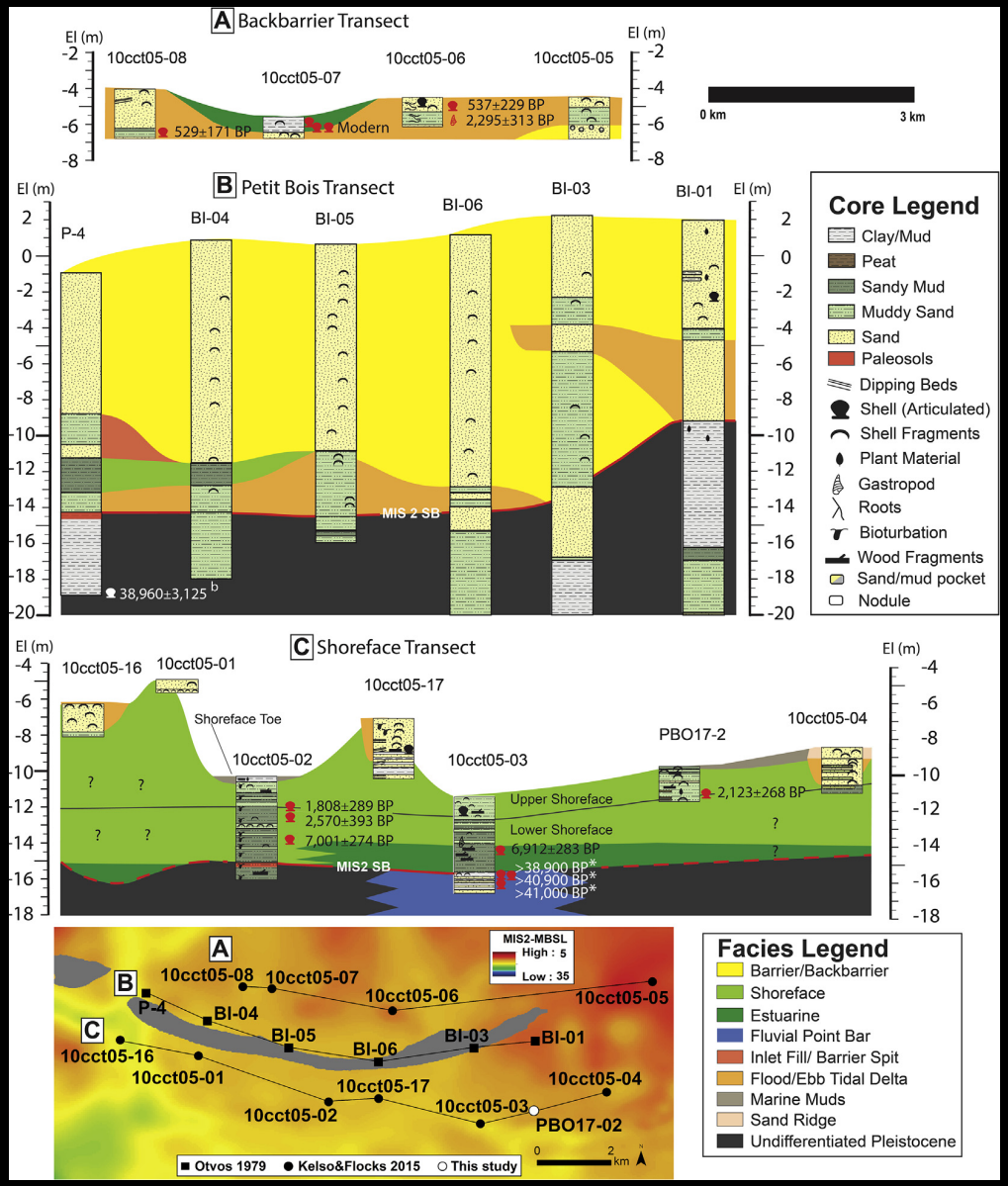
Geophysical examples





Hollis et al., 2019, Quaternary Science Reviews

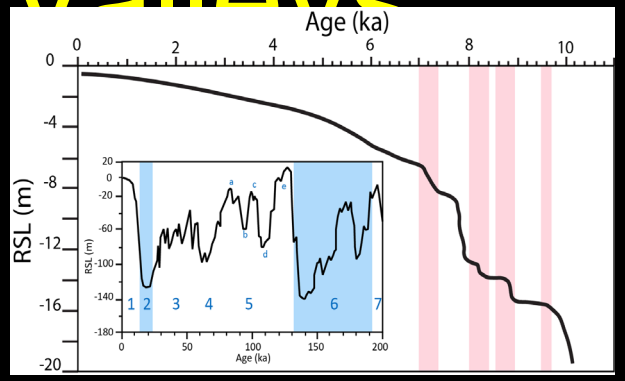
Petit Bois Island Holocene Evolution



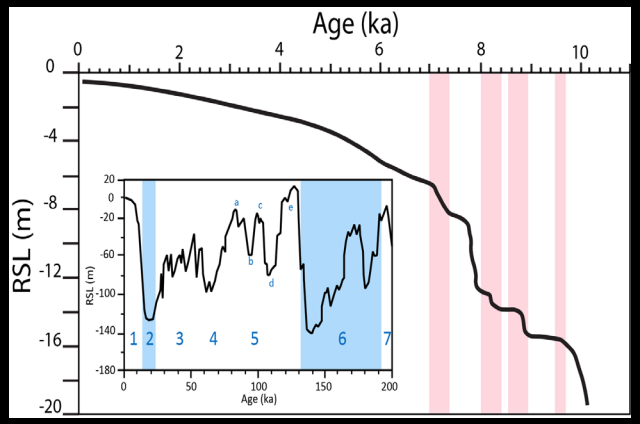
Hollis et al., 2019, Quaternary Science Reviews

Incised valleys

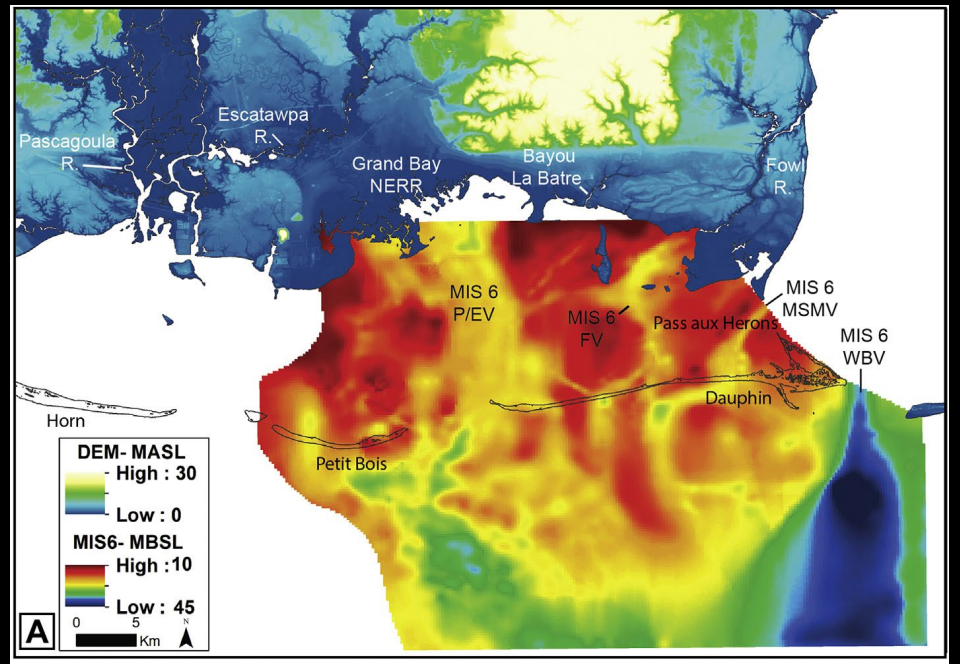
MIS 6

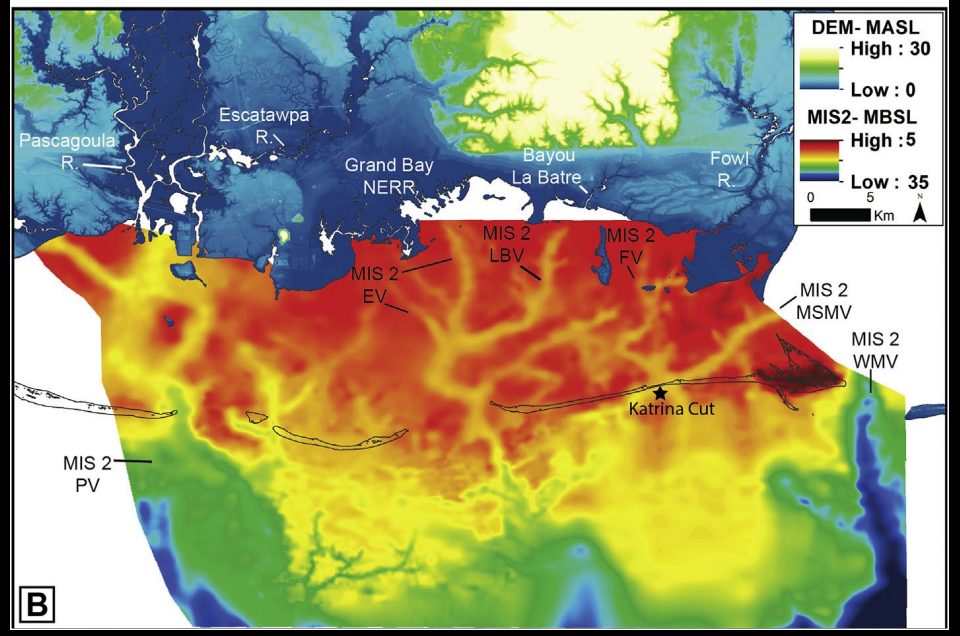


MIS 2

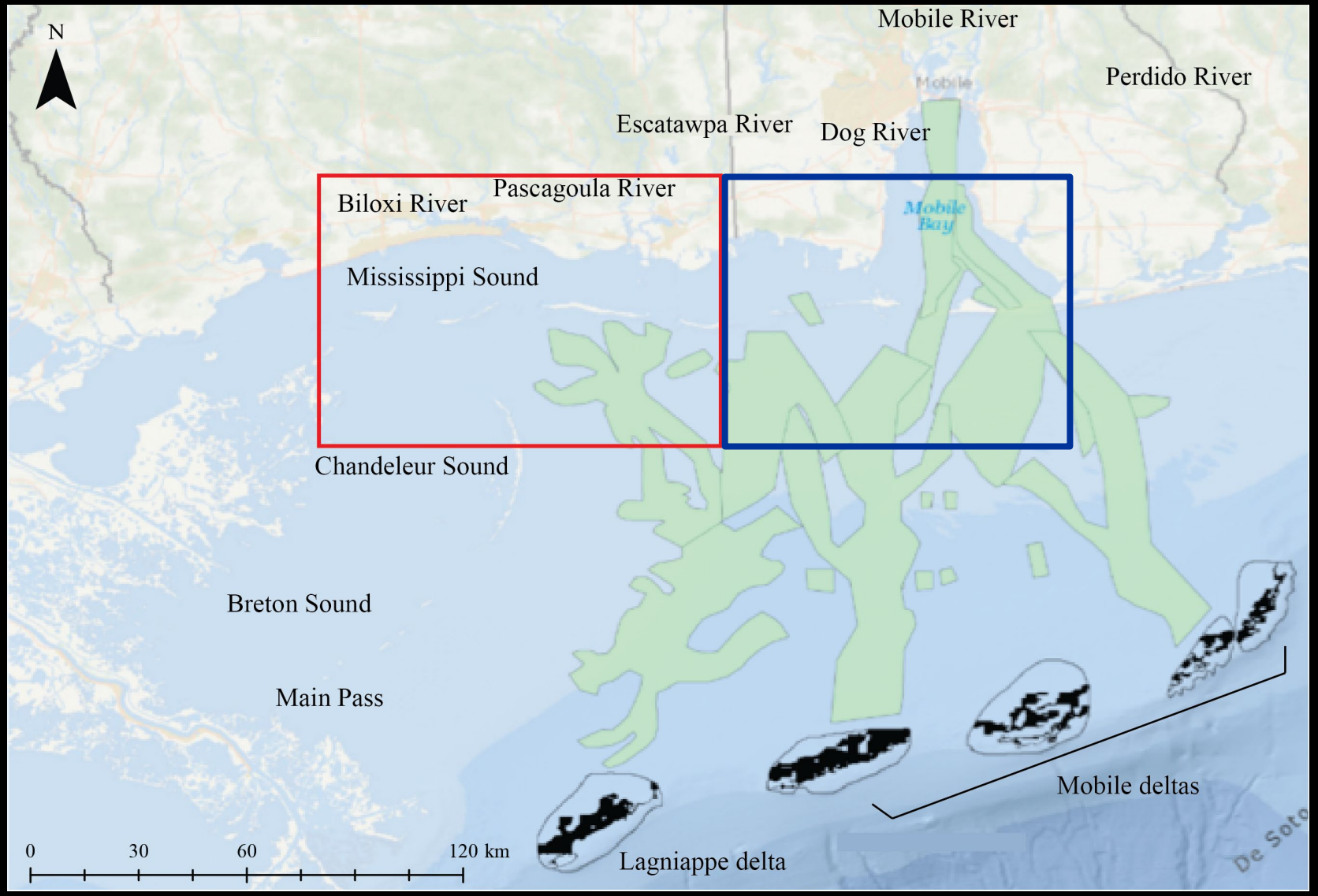


Hollis et al., 2019, Quaternary Science Reviews



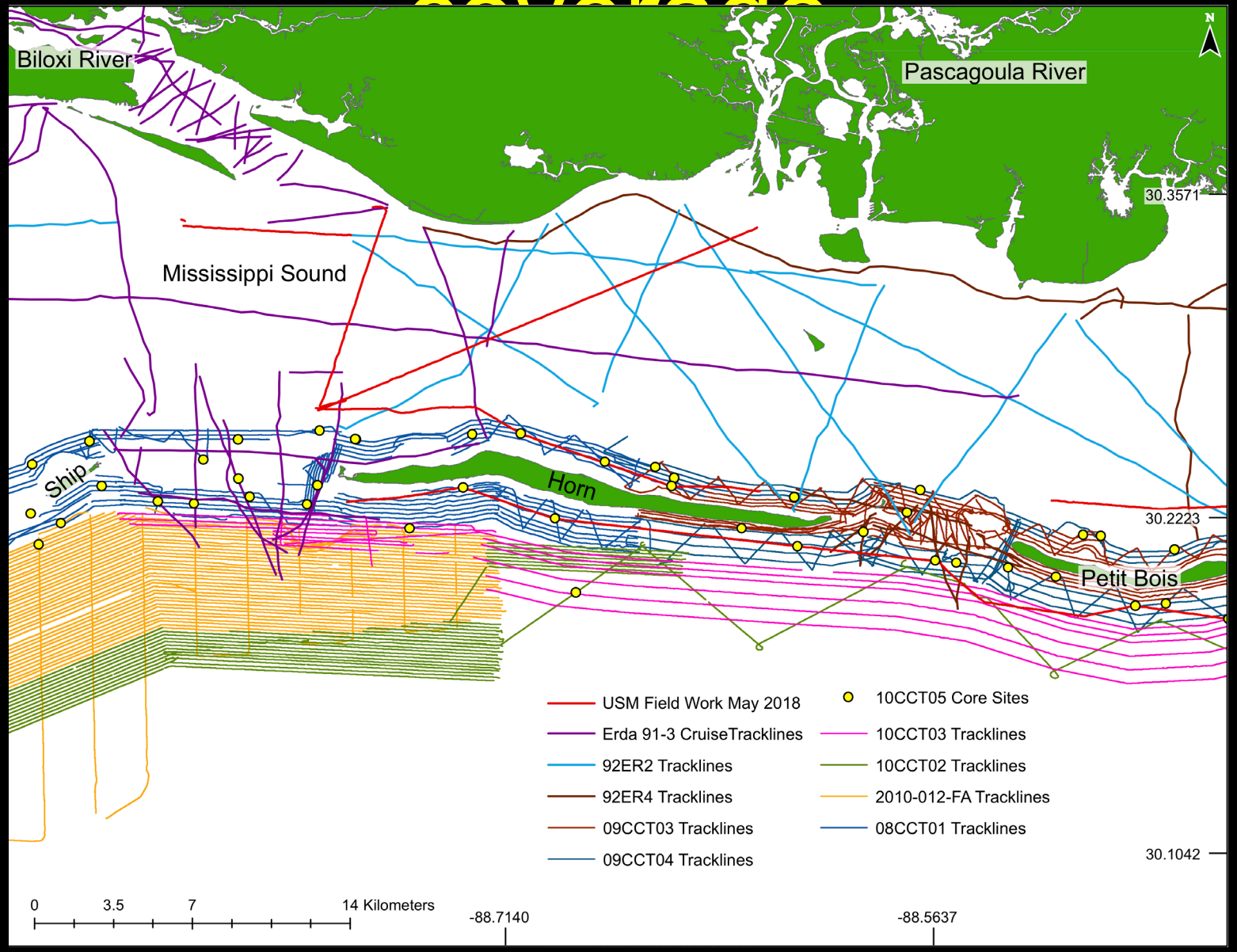


Previous work



Greene et al., JSR

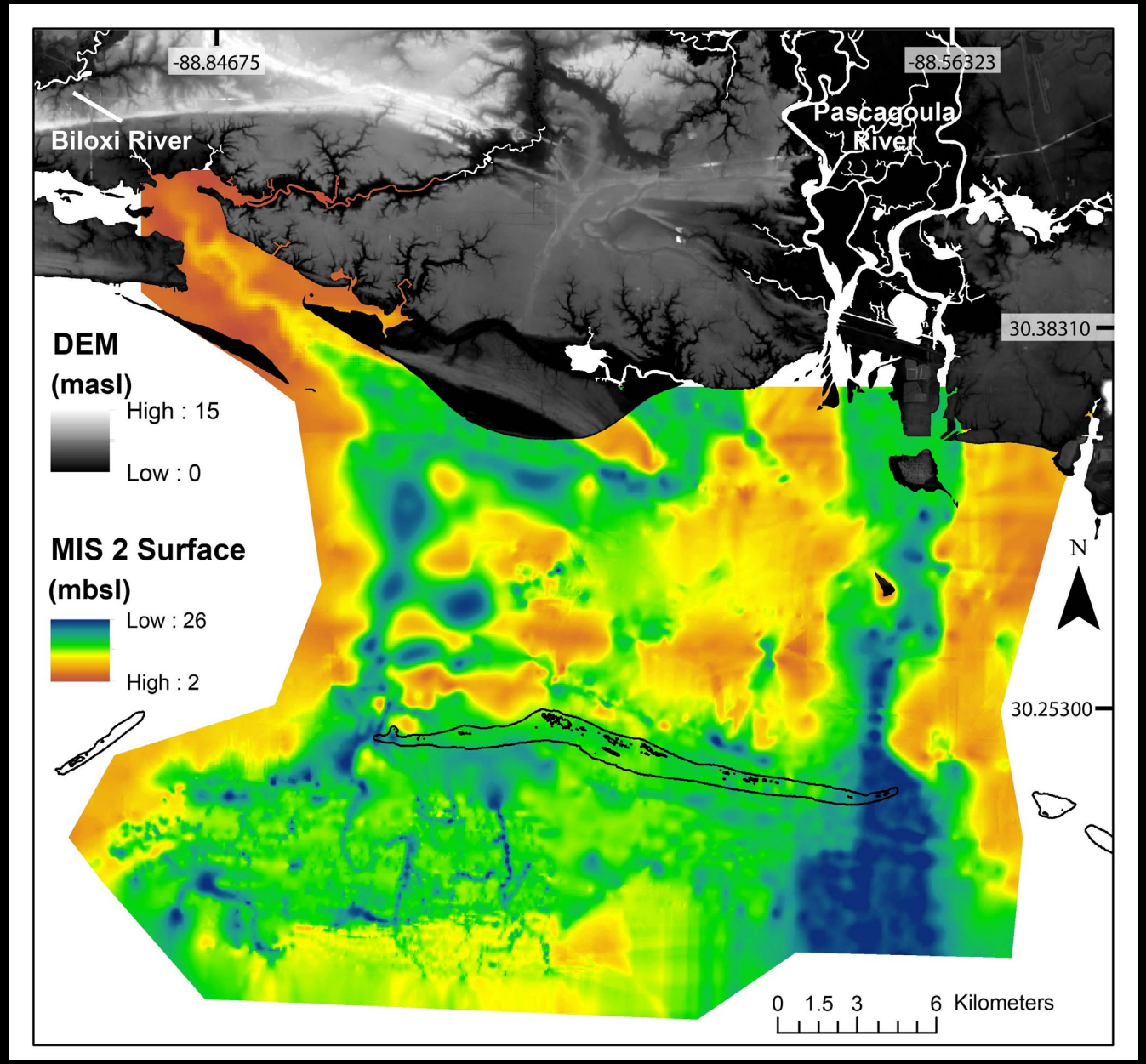
Geophysical data coverage



(Bosse et al., 2017, 2018; Sandford et al., 1991; Forde et al., 2011a, 2011b, 2011c; Pendleton et al., 2011)

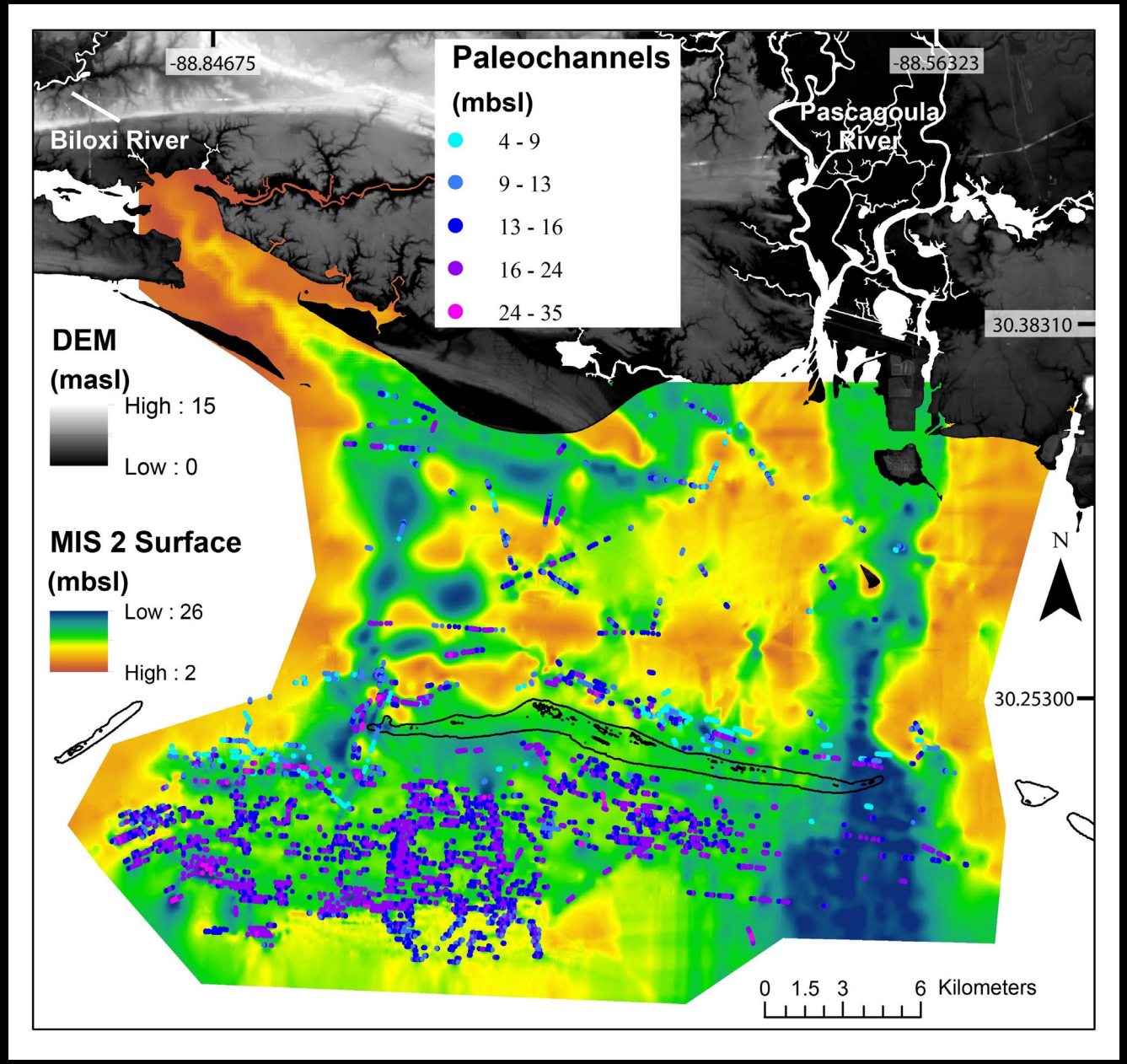
Gal et al., 2021, Marine Geology

Biloxi and Pascagoula MIS 2 incised valleys



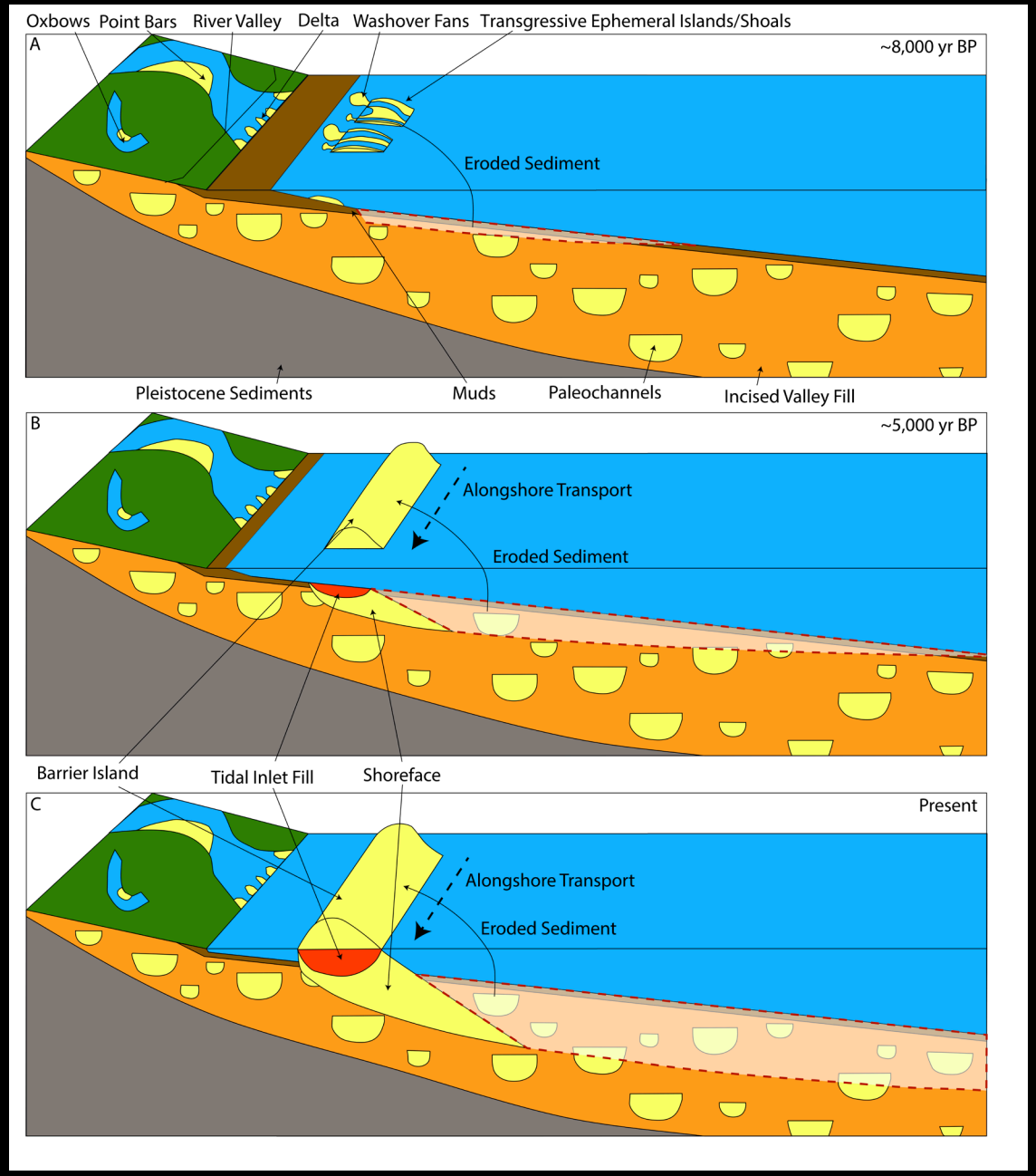
digital elevation model (Taylor et al., 2008) *Gal et al., 2021, Marine Geology*

Biloxi and Pascagoula MIS 2 incised valleys



digital elevation model (Taylor et al., 2008) *Gal et al., 2021, Marine Geology*

Ravinement



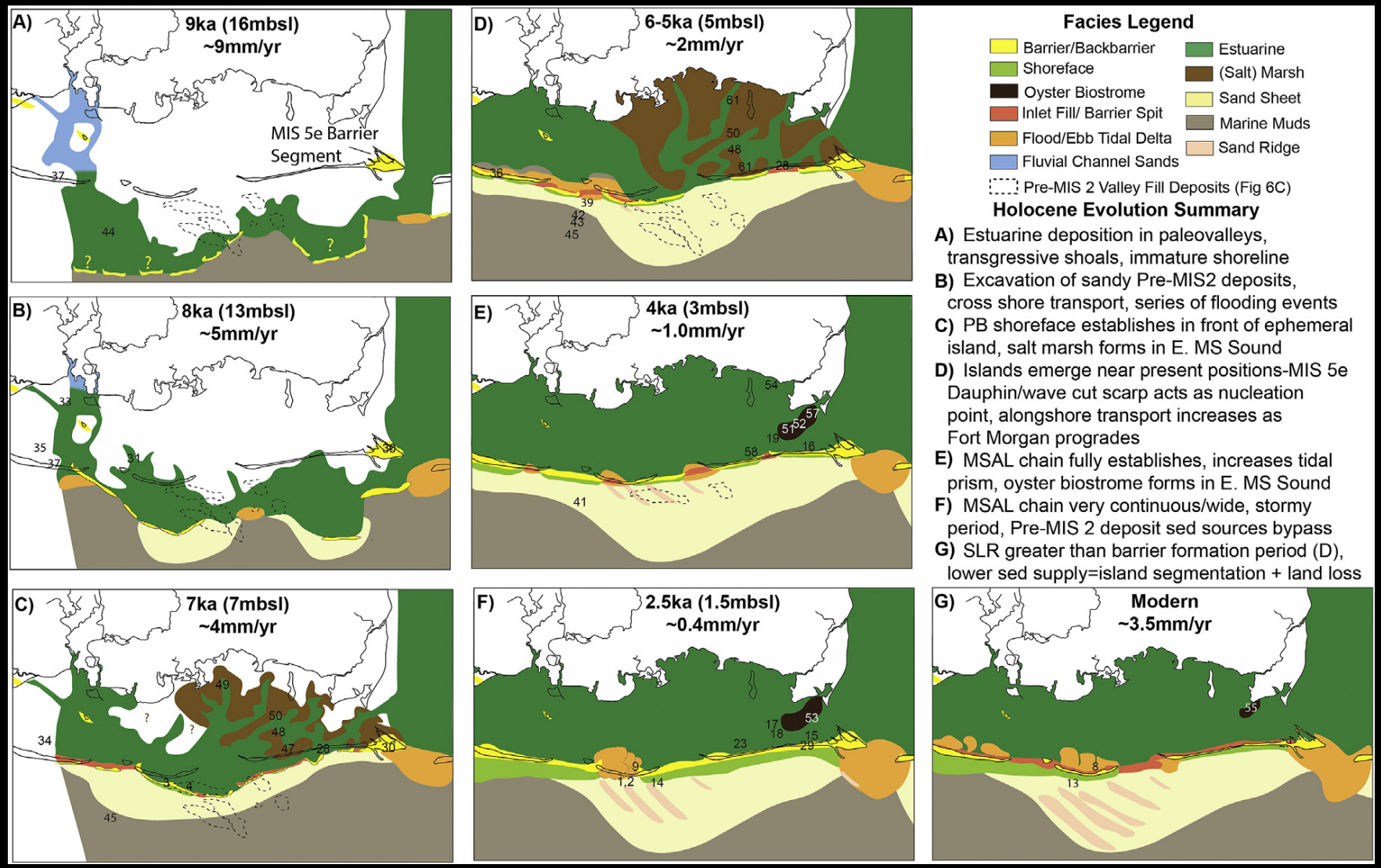
~8,000 yr BP

~5,000 yr BP

Present

Gal et al., 2021, Marine Geology

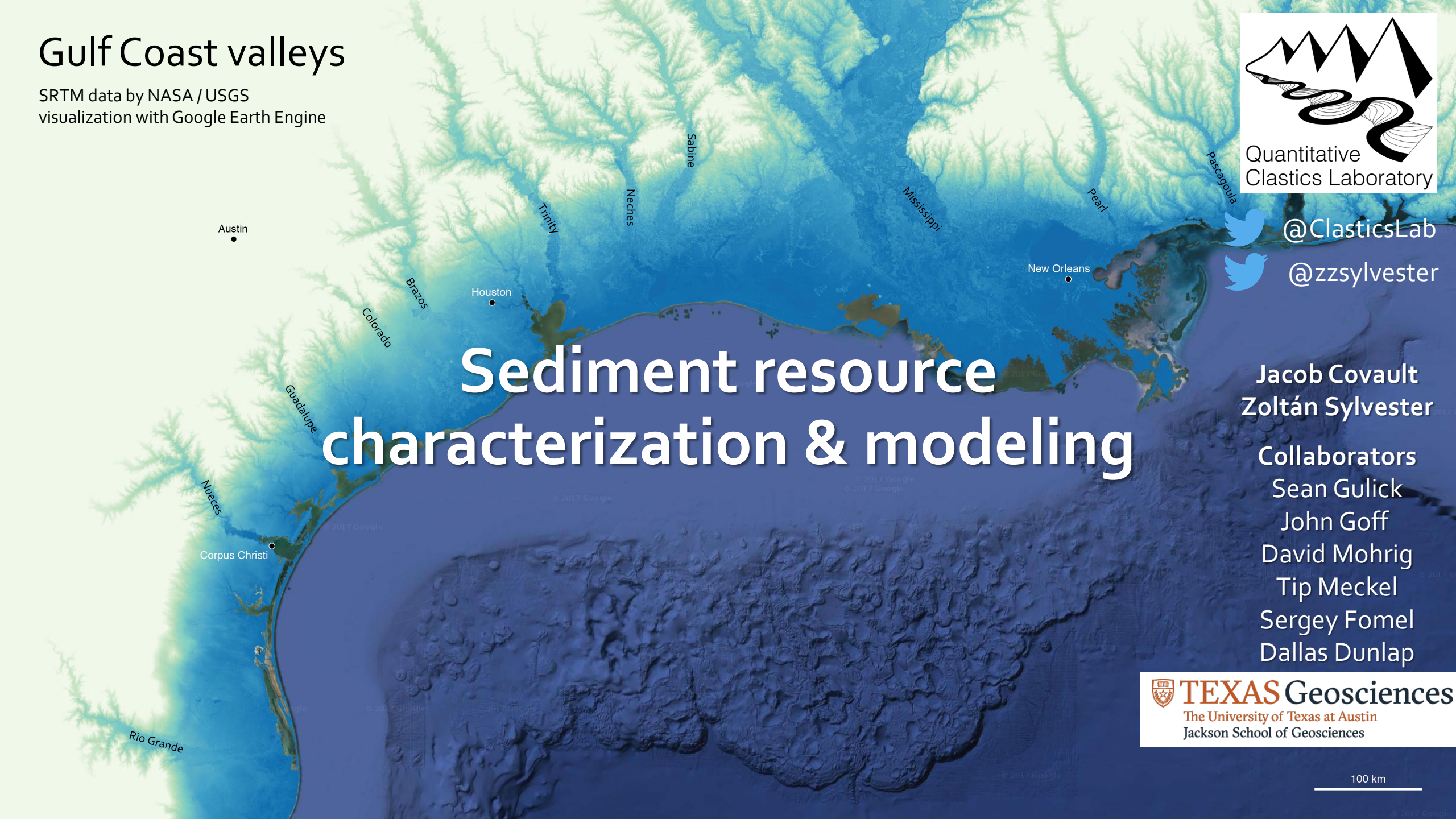
Paleogeography



Hollis et al., 2019, Quaternary Science Reviews

Automated machine learning/artificial intelligence approaches to sediment resource characterization and modeling at UT-Austin

Jake Covault/ Zoltan Sylvester



Sediment resource characterization & modeling

Quantitative Clastics Laboratory

@ClasticsLab

@zzsylvester

Jacob Covault
Zoltán Sylvester

Collaborators
Sean Gulick
John Goff
David Mohrig
Tip Meckel
Sergey Fomel
Dallas Dunlap

TEXAS Geosciences
The University of Texas at Austin
Jackson School of Geosciences

Gulf Coast valleys

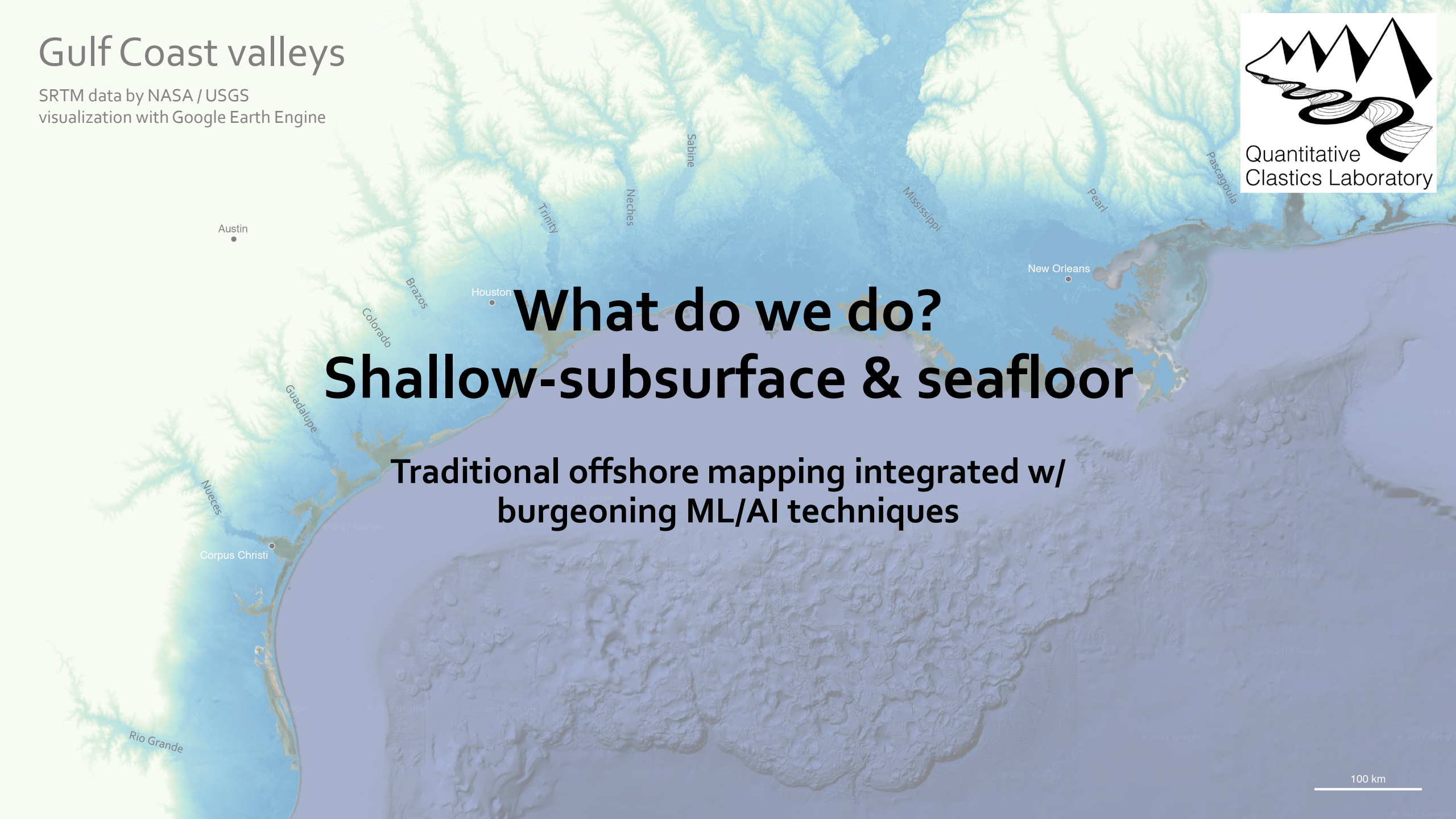
SRTM data by NASA / USGS
visualization with Google Earth Engine

Quantitative
Clastics Laboratory

What do we do?

Gulf Coast valleys

SRTM data by NASA / USGS
visualization with Google Earth Engine



Quantitative Clastics Laboratory

What do we do?
Shallow-subsurface & seafloor

Traditional offshore mapping integrated w/ burgeoning ML/AI techniques

Thank you 2021 sponsors

Quantitative Clastics Laboratory

BOEM Bureau of Ocean Energy Management

bhpbilliton

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DIAMONDBACK Energy

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UNIVERSITY LANDS

USGS science for a changing world

Gulf Coast valleys

SRTM data by NASA / USGS
visualization with Google Earth Engine

Quantitative Clastics Laboratory

Opportunity

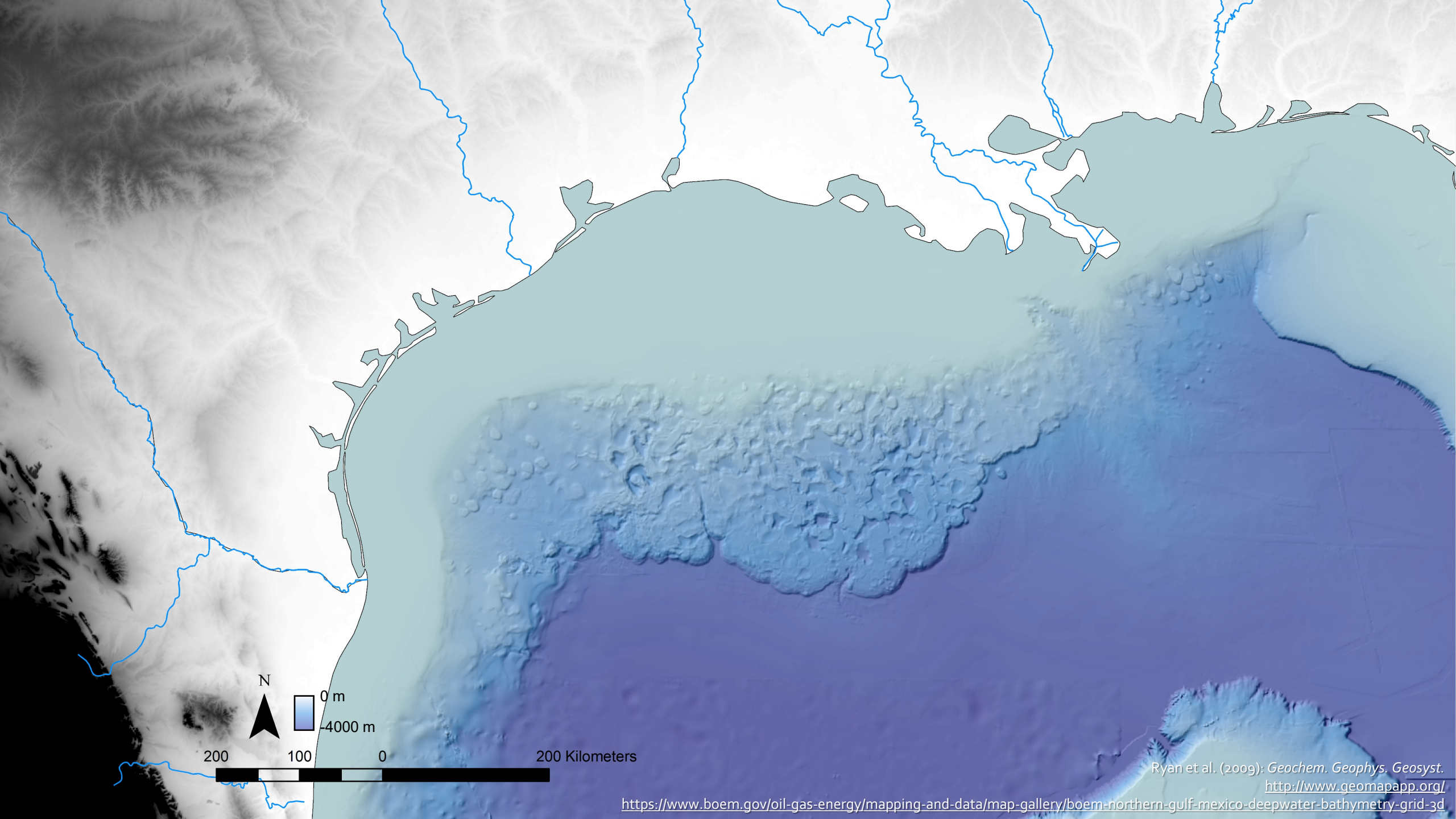
Regional sand resource characterization

Focus on state waters but reach limit of OCS

What are the large sand bodies?

How deep? Priority=nearshore, shallow, less overburden

Are the deeper opportunities?



Ryan et al. (2009): *Geochem. Geophys. Geosyst.*
http://www.geomapapp.org/
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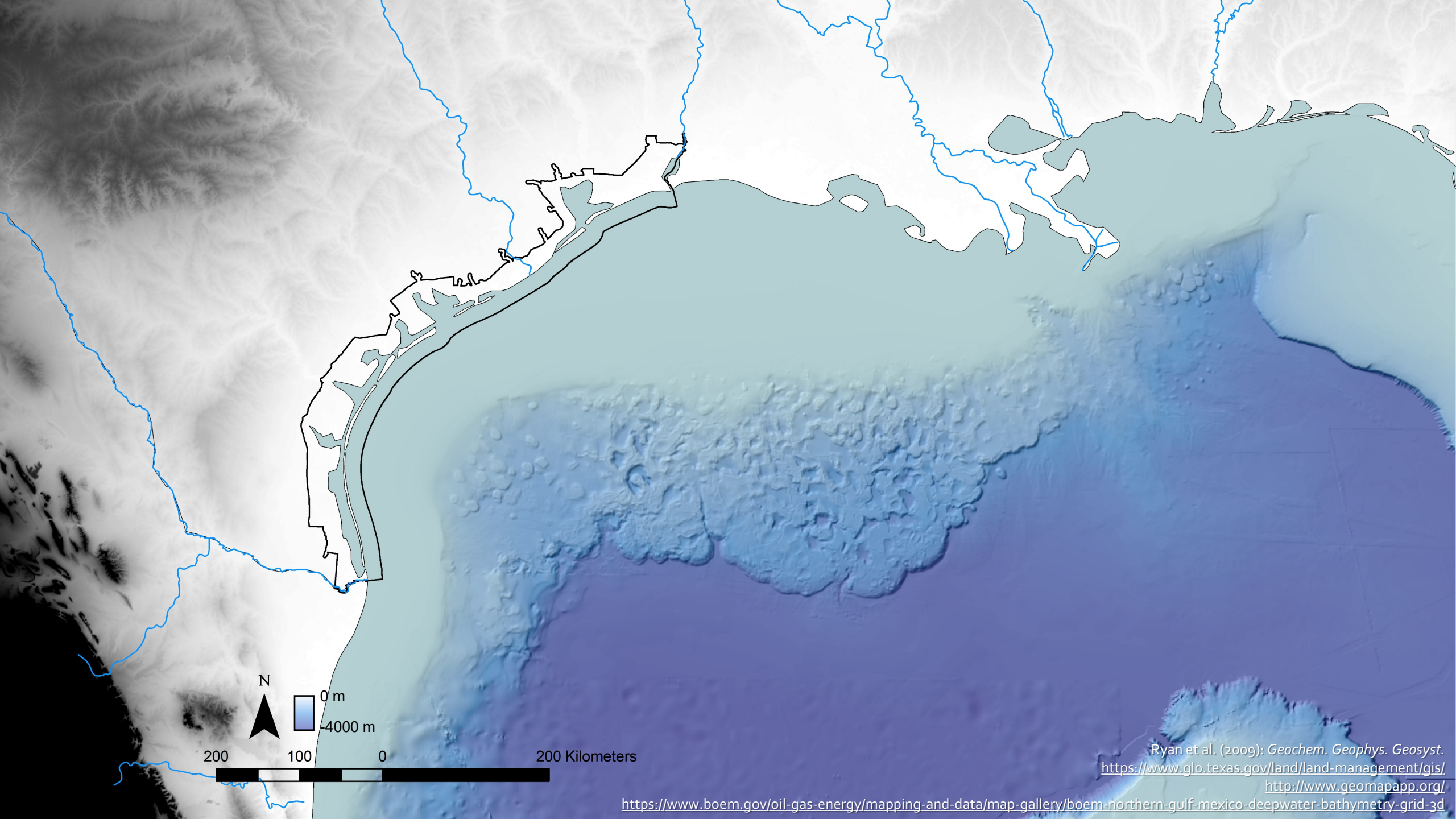

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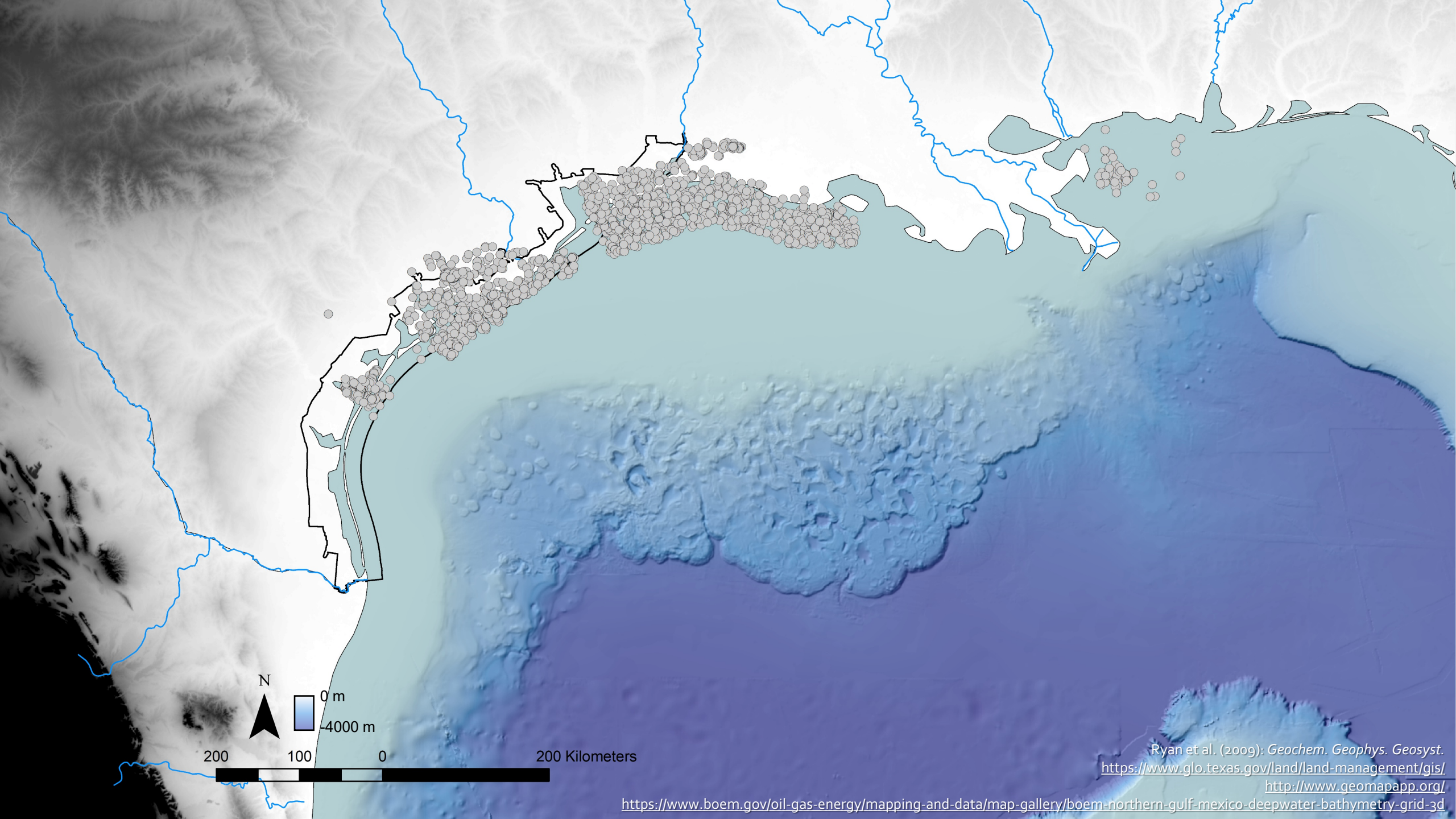

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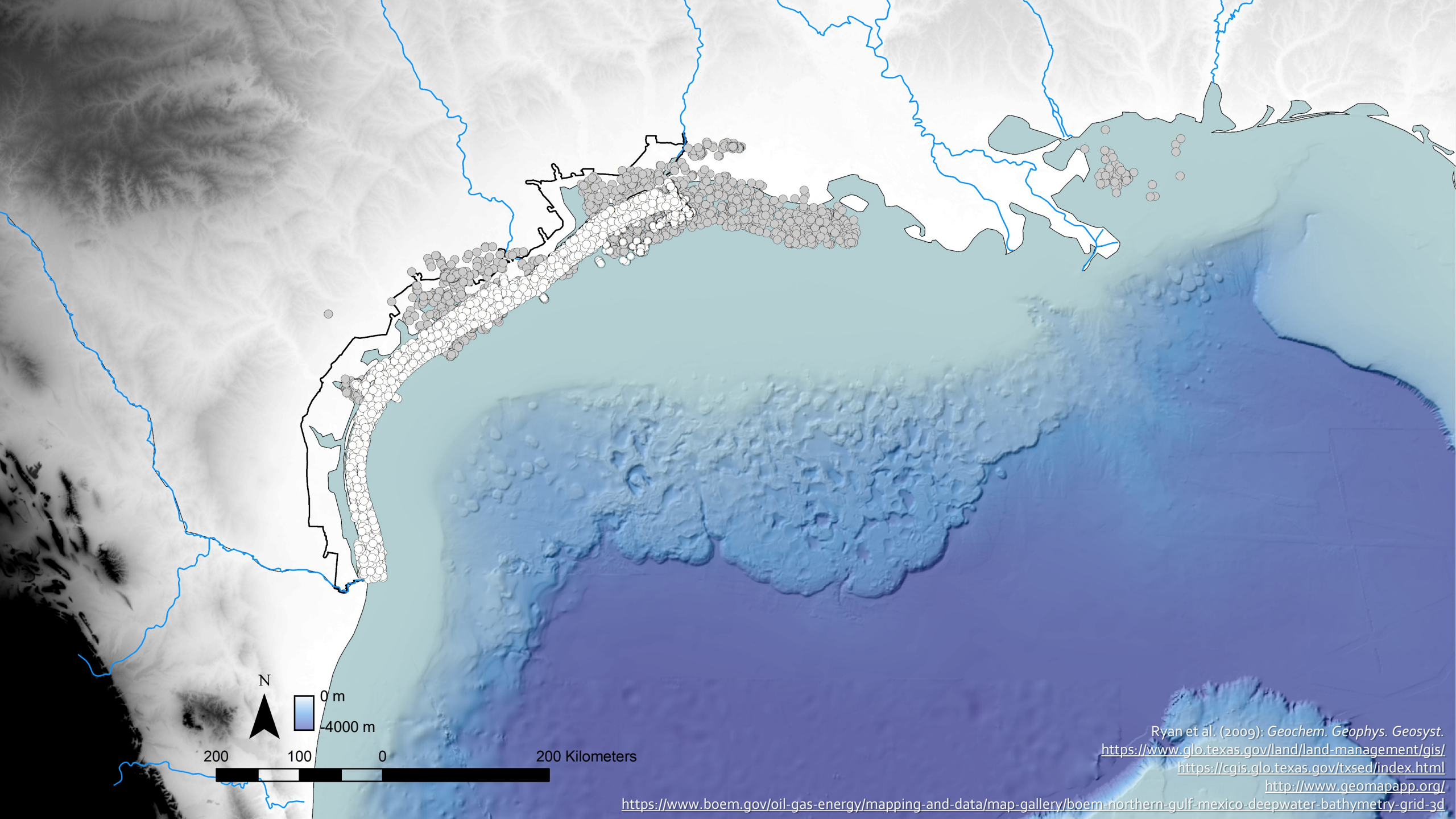

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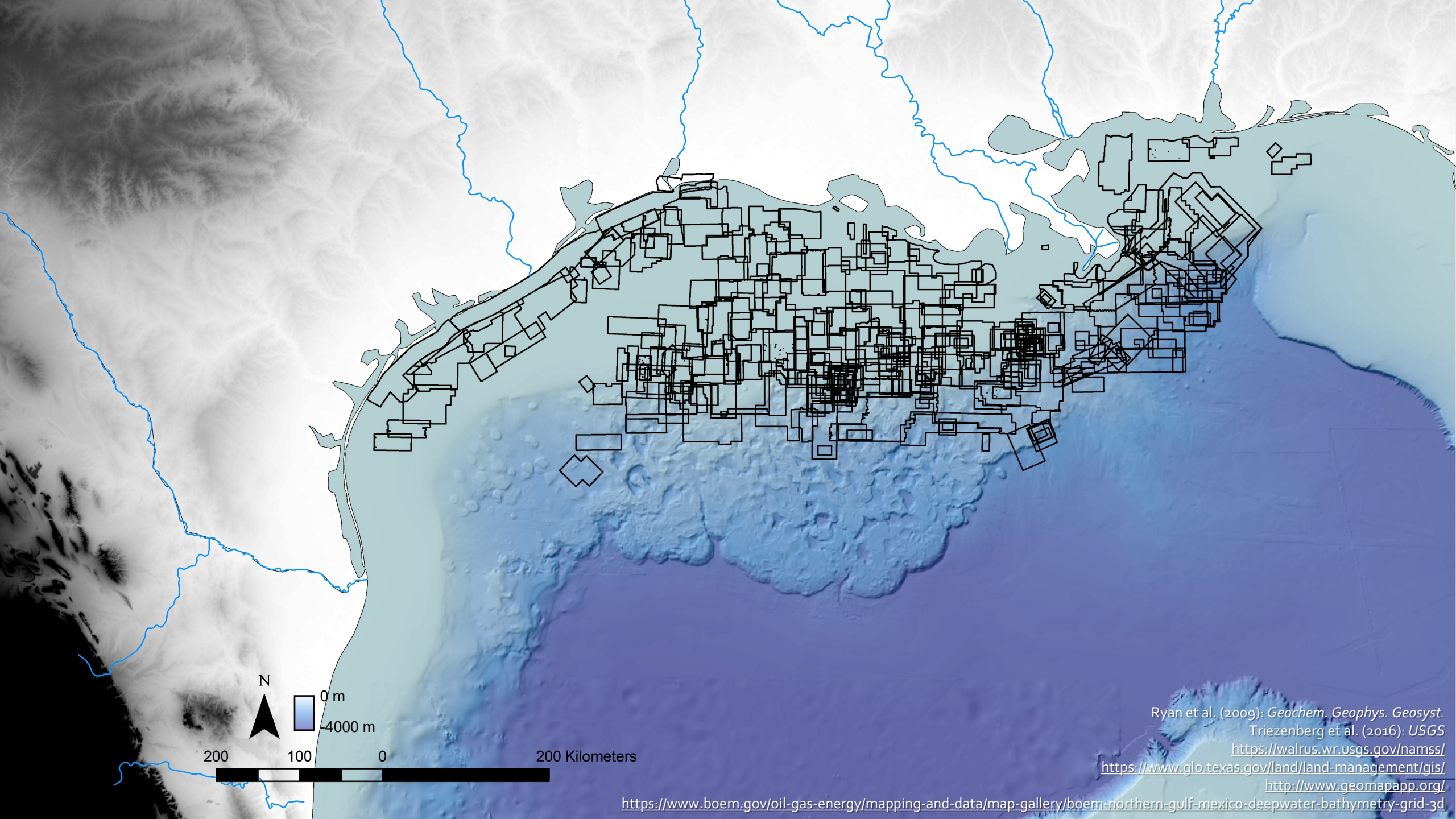

Ryan et al. (2009): *Geochem. Geophys. Geosyst.*
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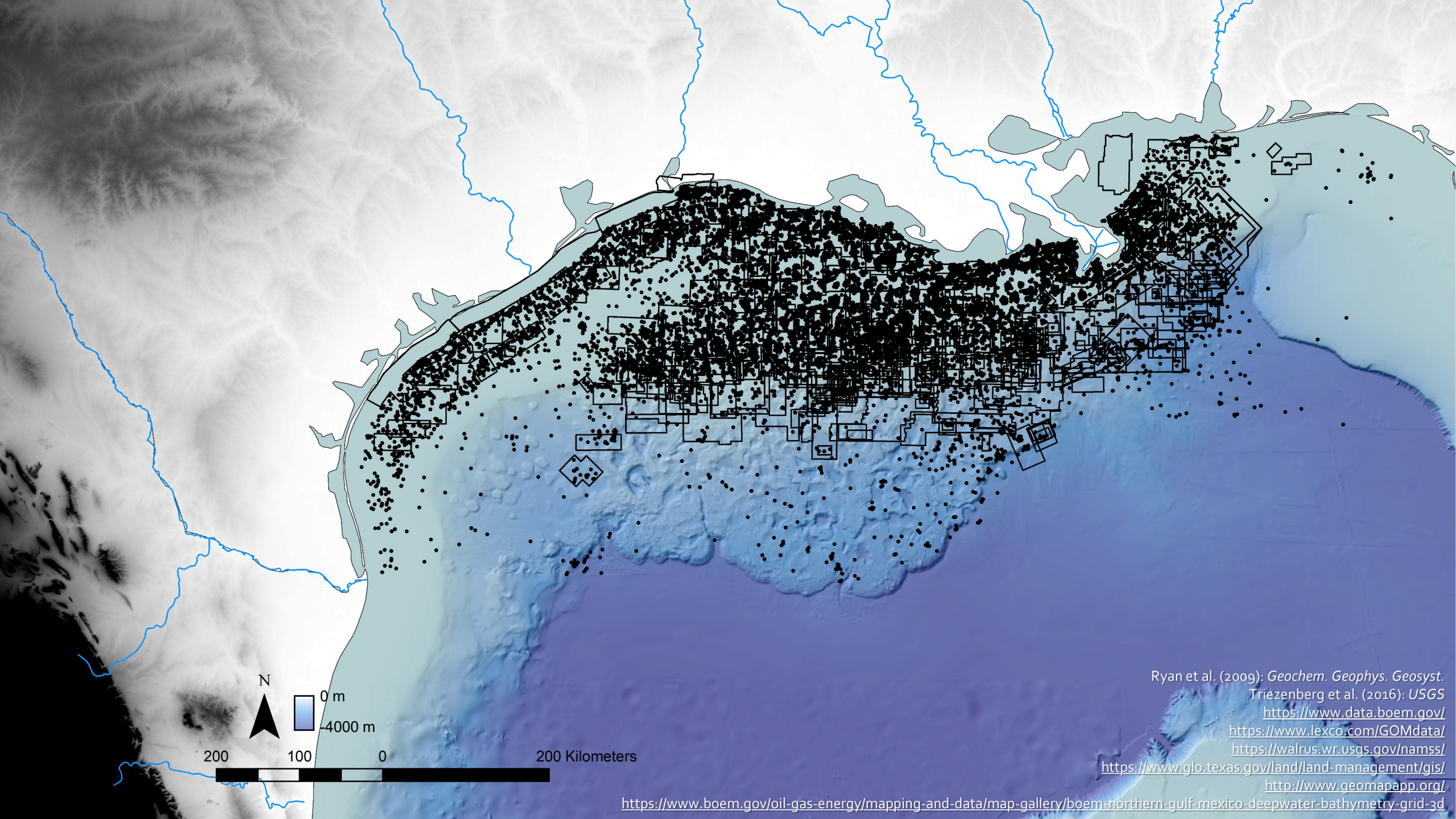

Ryan et al. (2009): *Geochem. Geophys. Geosyst.*
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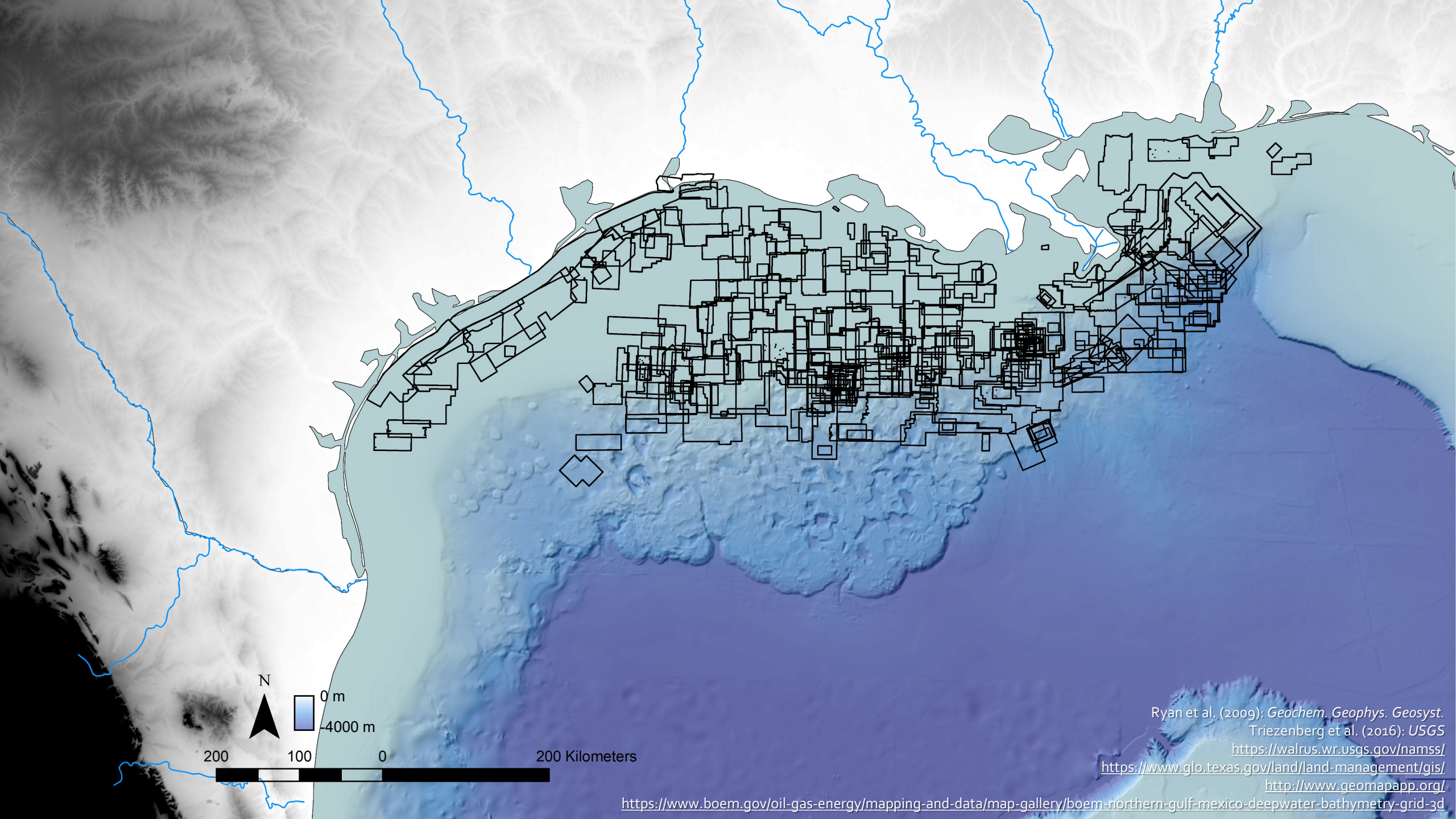

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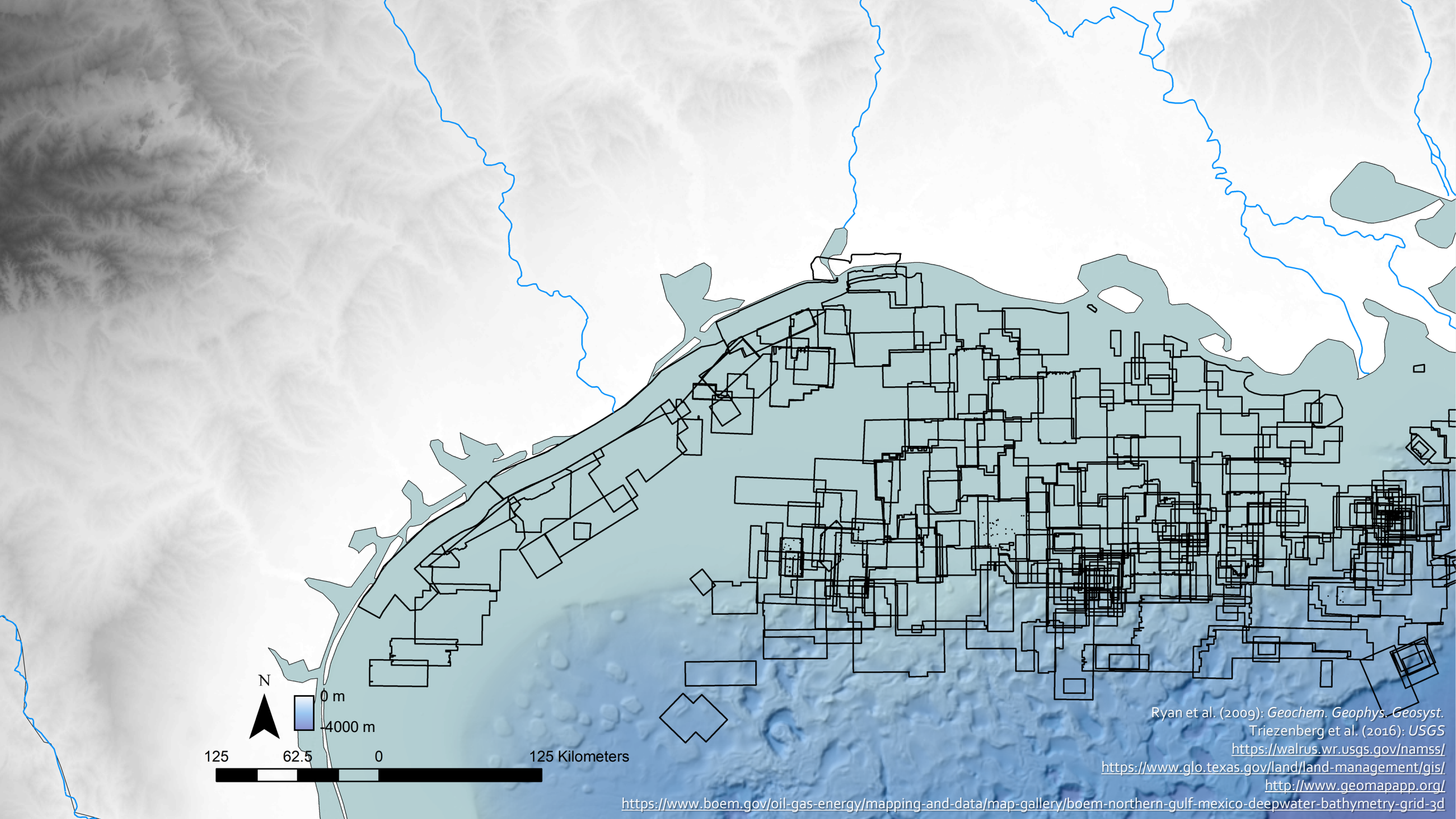

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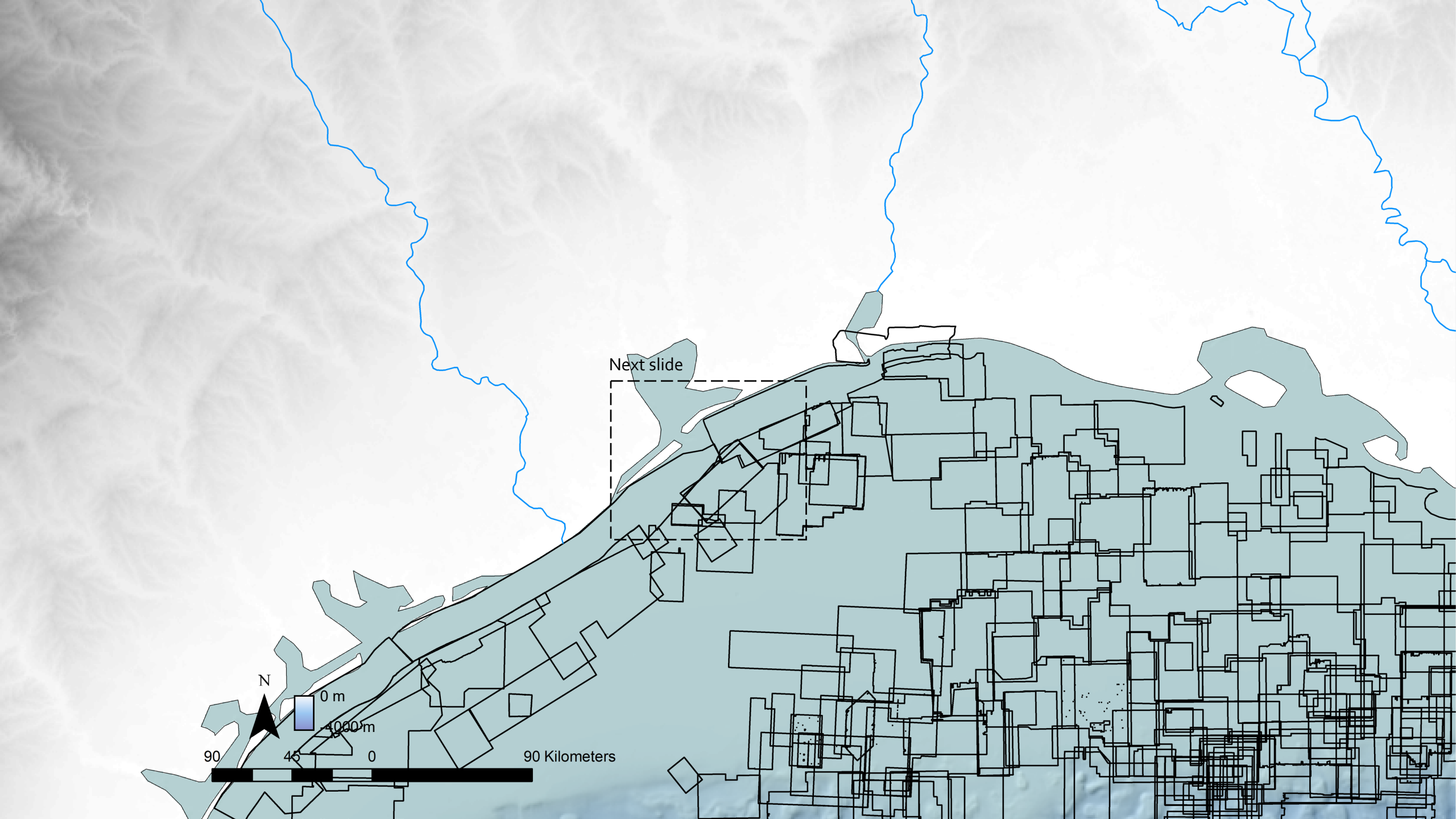
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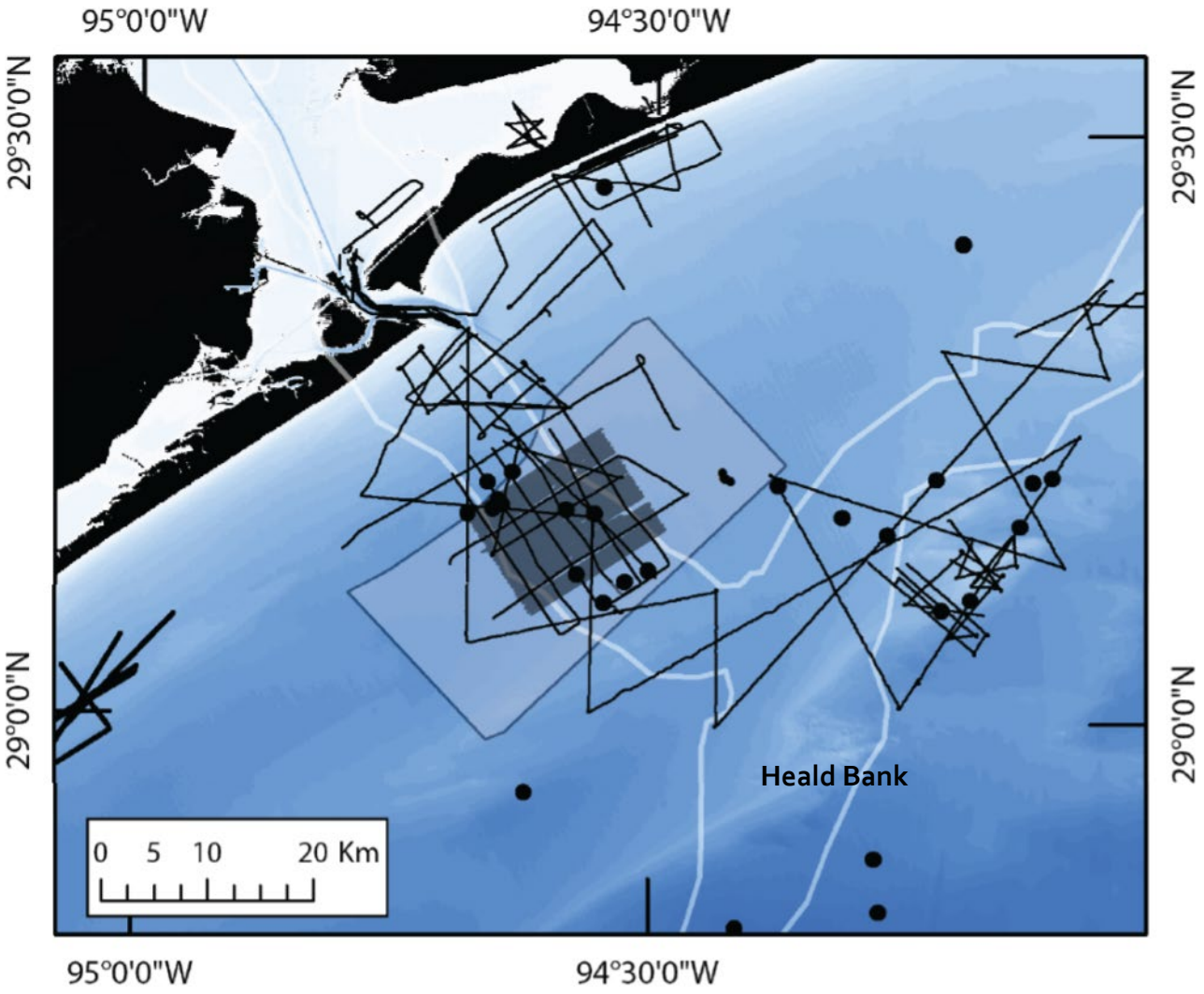
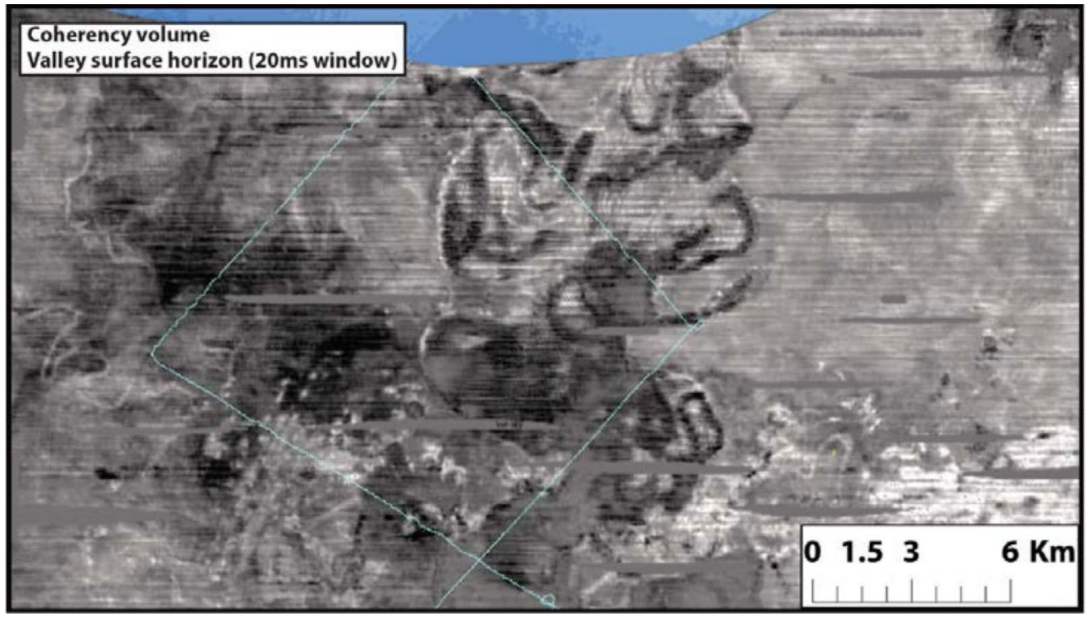
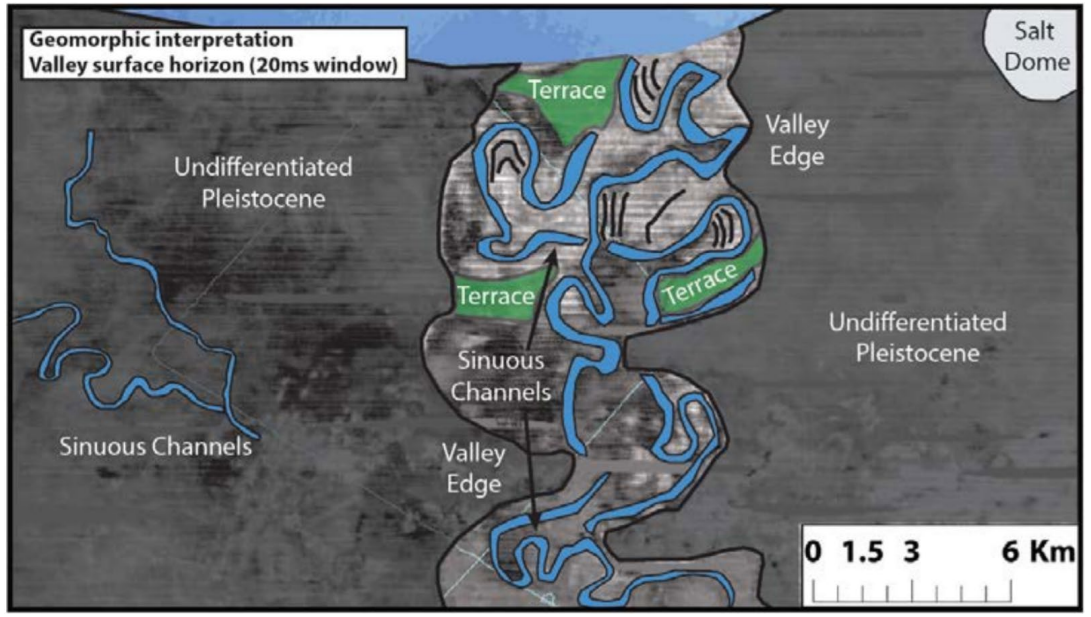






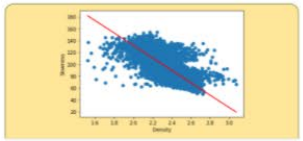
Swartz (2019): UT-Austin PhD dissertation
Burstein et al. (2021): *EarthArXiv*

Machine Learning Applications

in Geosciences

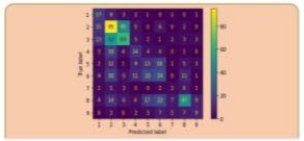
Introduction

What is ML good for?



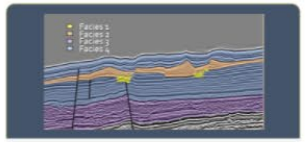
Regression

Linear regression and sonic log synthesis



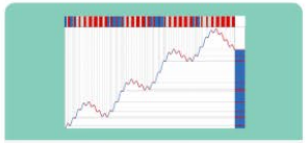
Classification

K-NN classification and lithofacies prediction



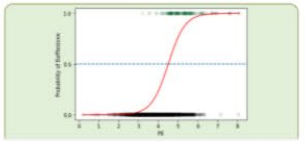
Seismic Interpretation

Creating labels for machine learning



Quantitative Stratigraphy

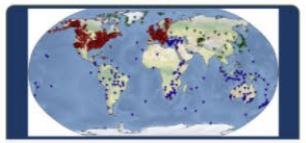
Analysis and modeling



Logistic Regression

Path from classification to neural networks

Neural Networks
Learning to pick seafloor horizons in seismic images



Deep Learning
Earthquake detection using convolutional neural network

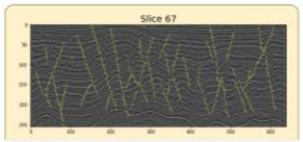
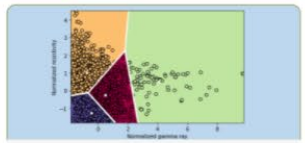


Image Segmentation
Detecting faults in seismic images using U-net CNN



Unsupervised Learning
Learning data patterns by clustering and autoencoding

Time Series Correlation
Aligning well logs using dynamic time warping

Machine Learning Applications

in Geosciences

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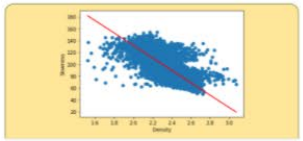

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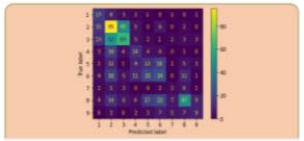

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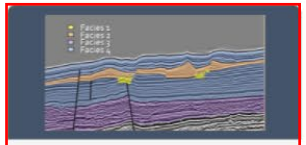

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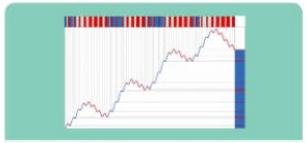

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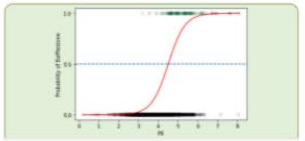
Analysis and modeling



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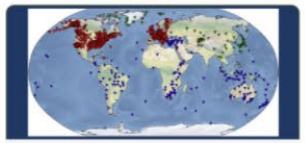

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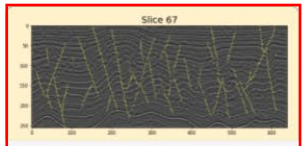

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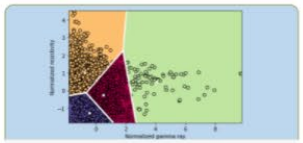

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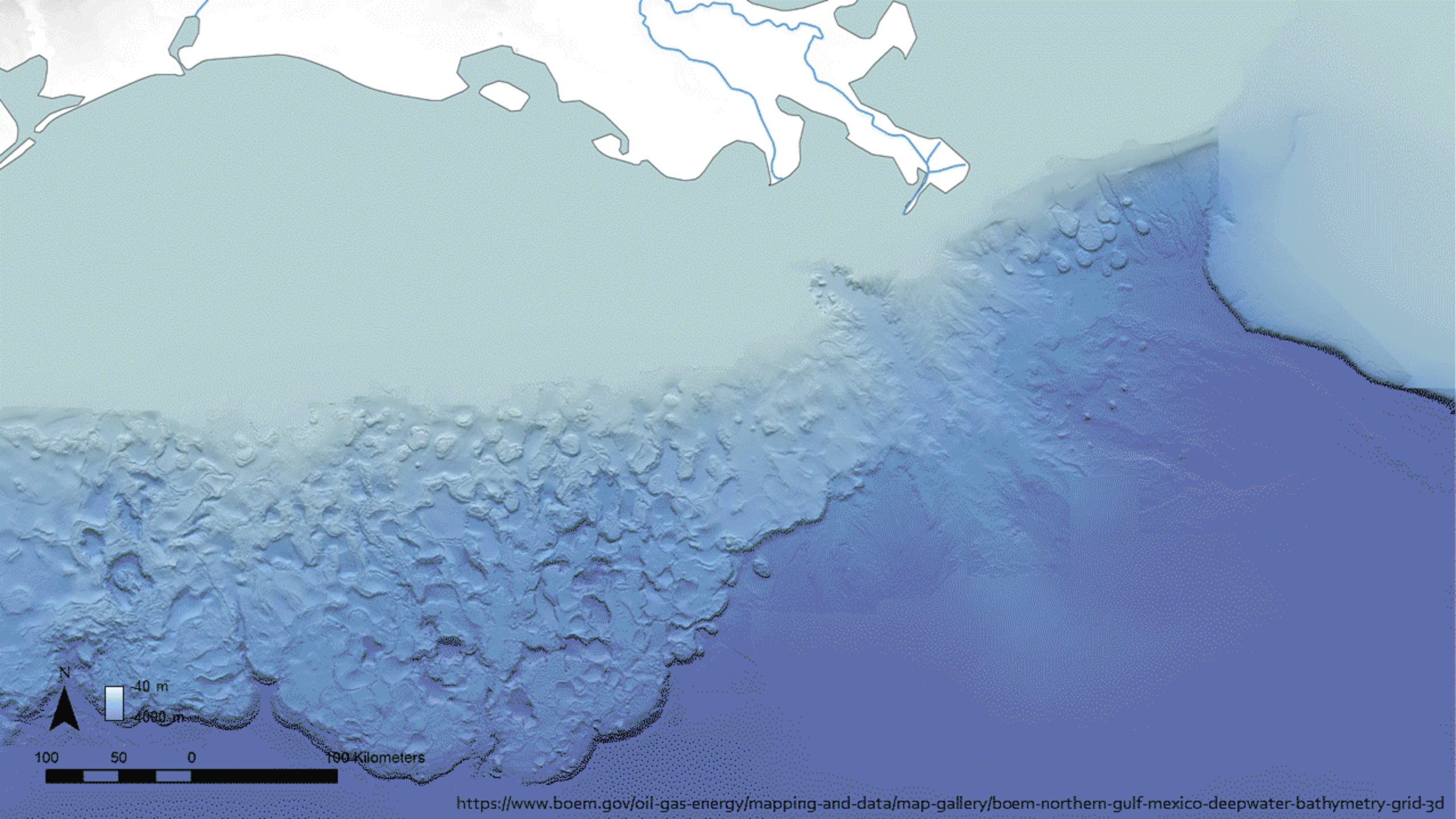

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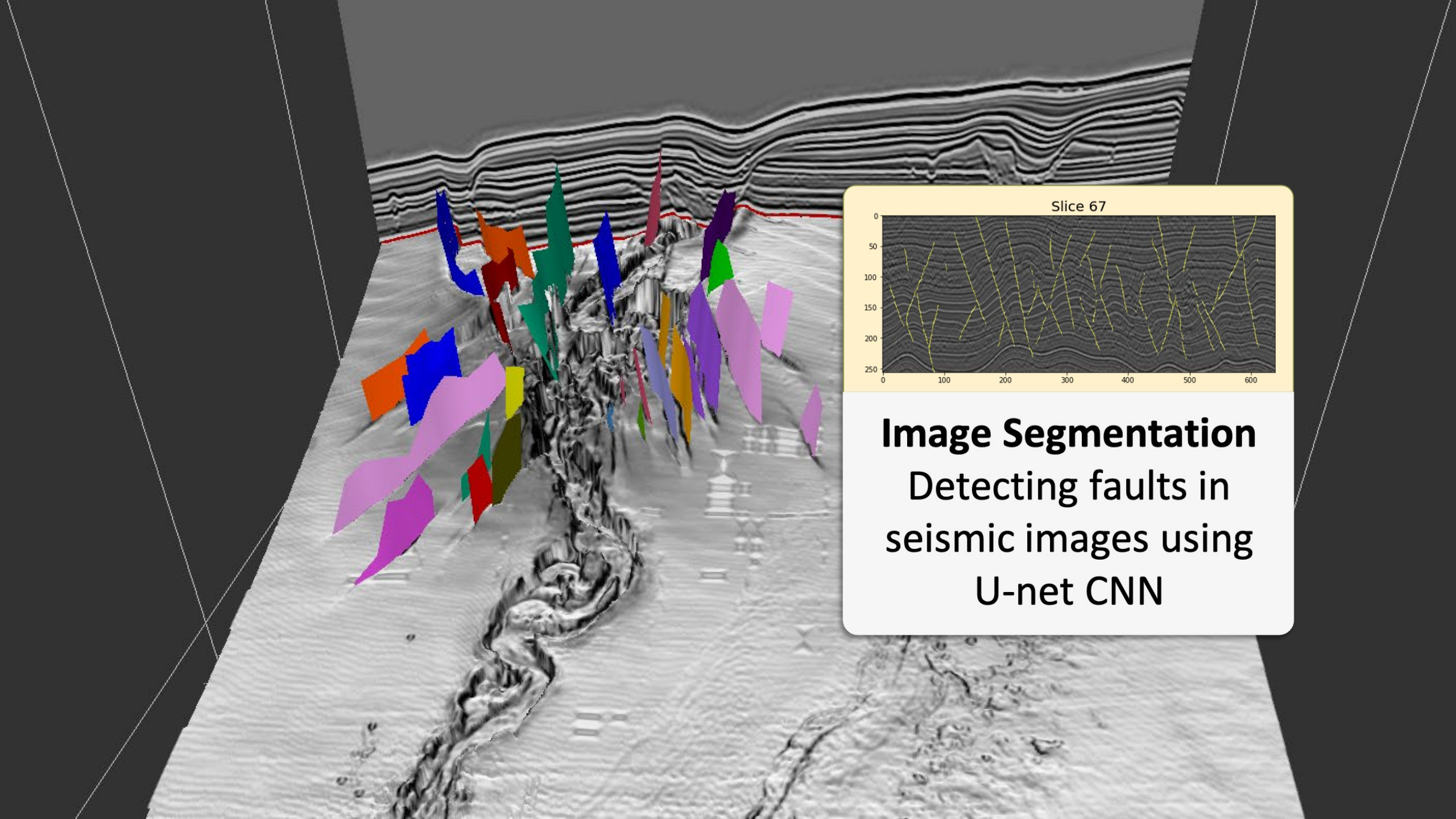

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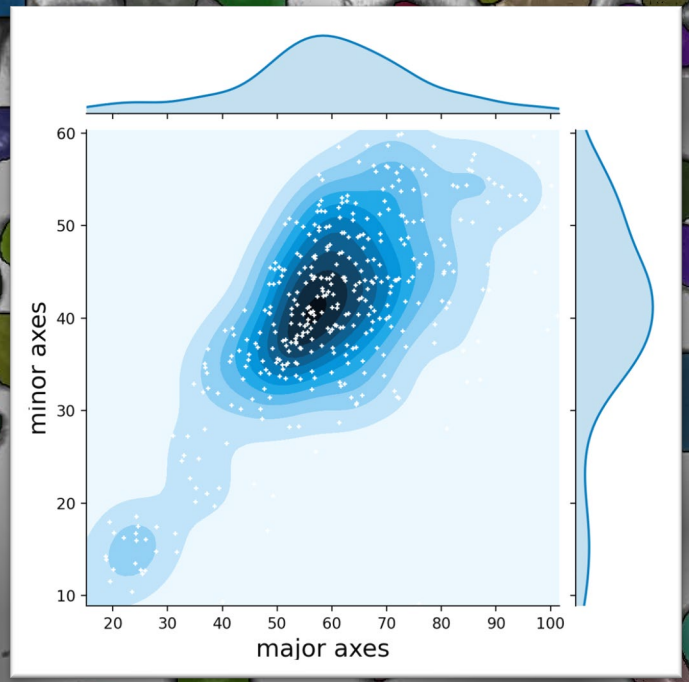
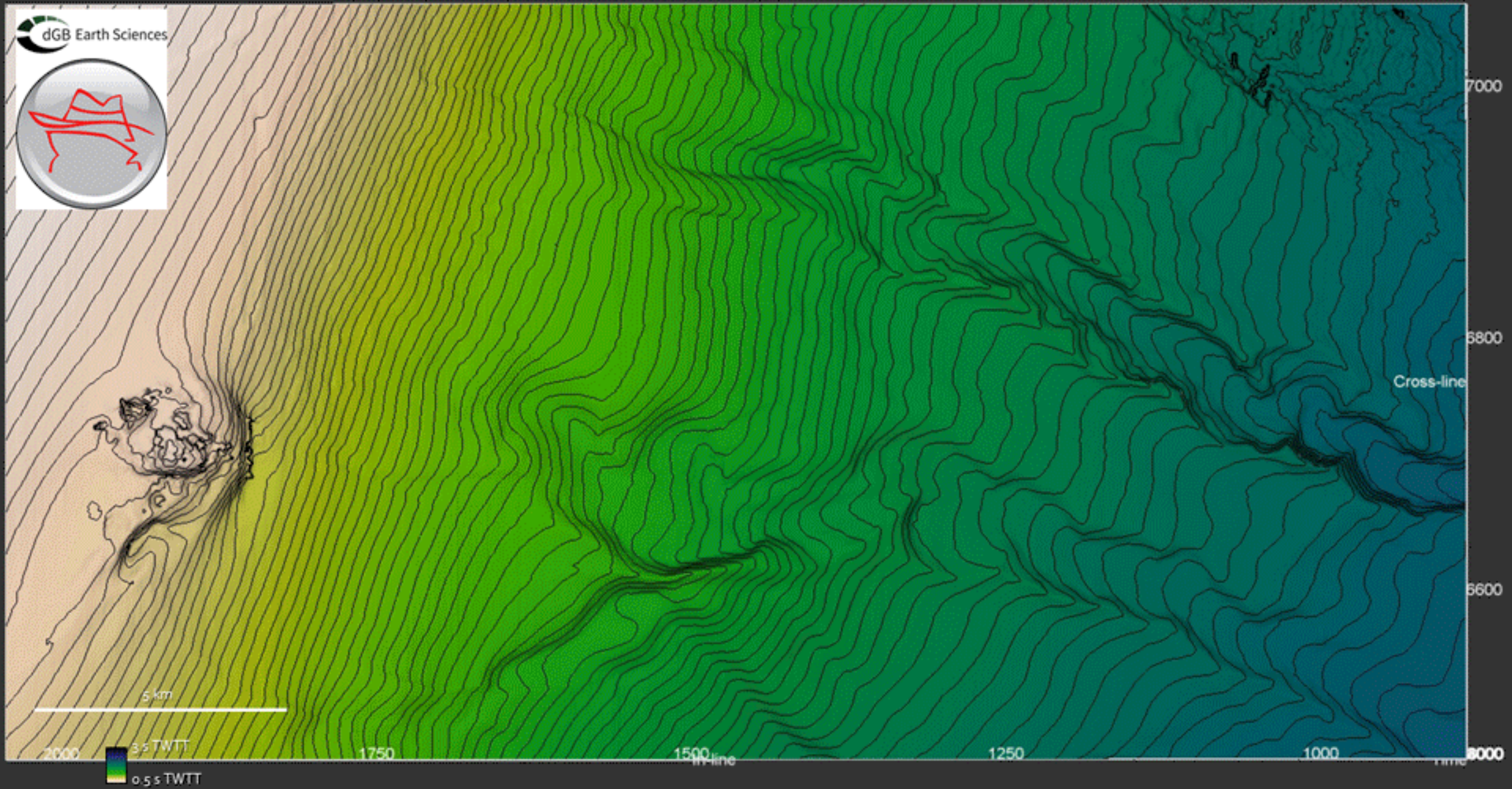
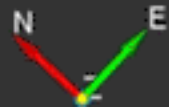
CNN for segmentation of zircon grain images





Thanks to Dallas Dunlap & Zoltán Sylvester

https://www.dgbes.com/

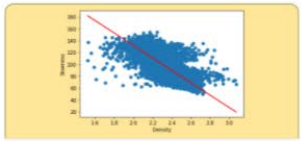


Machine Learning Applications

in Geosciences

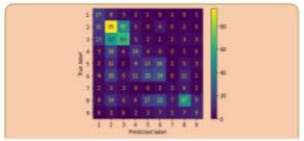
Introduction

What is ML good for?



Regression

Linear regression and sonic log synthesis



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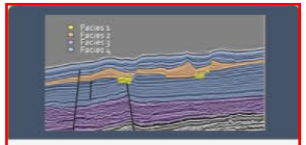

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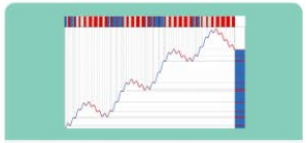

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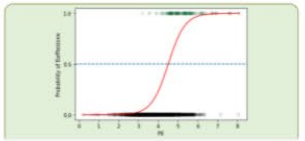

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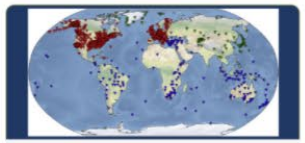

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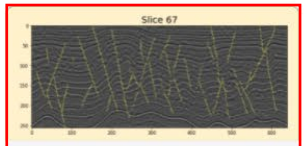

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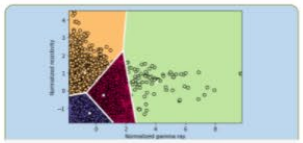

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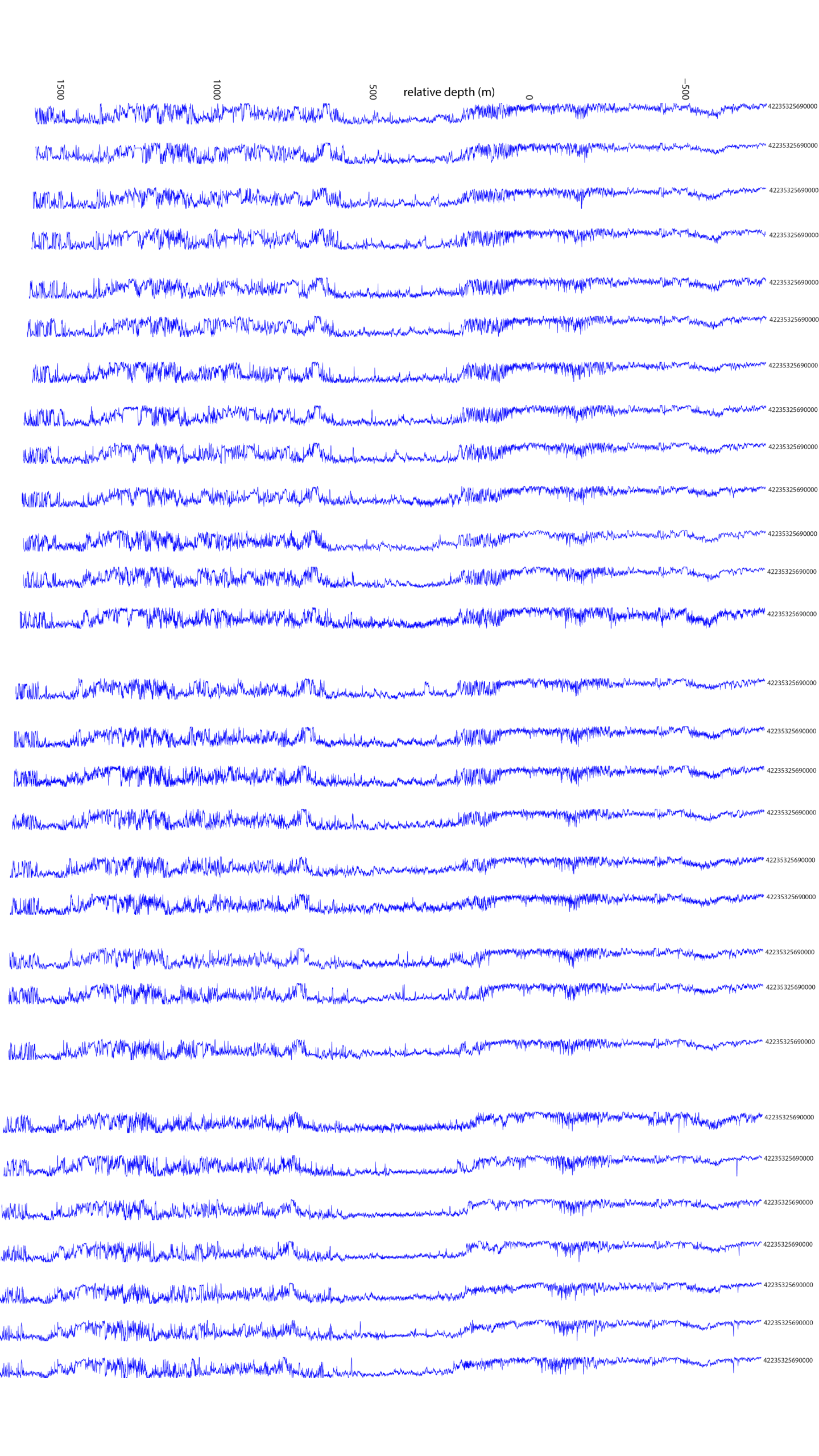
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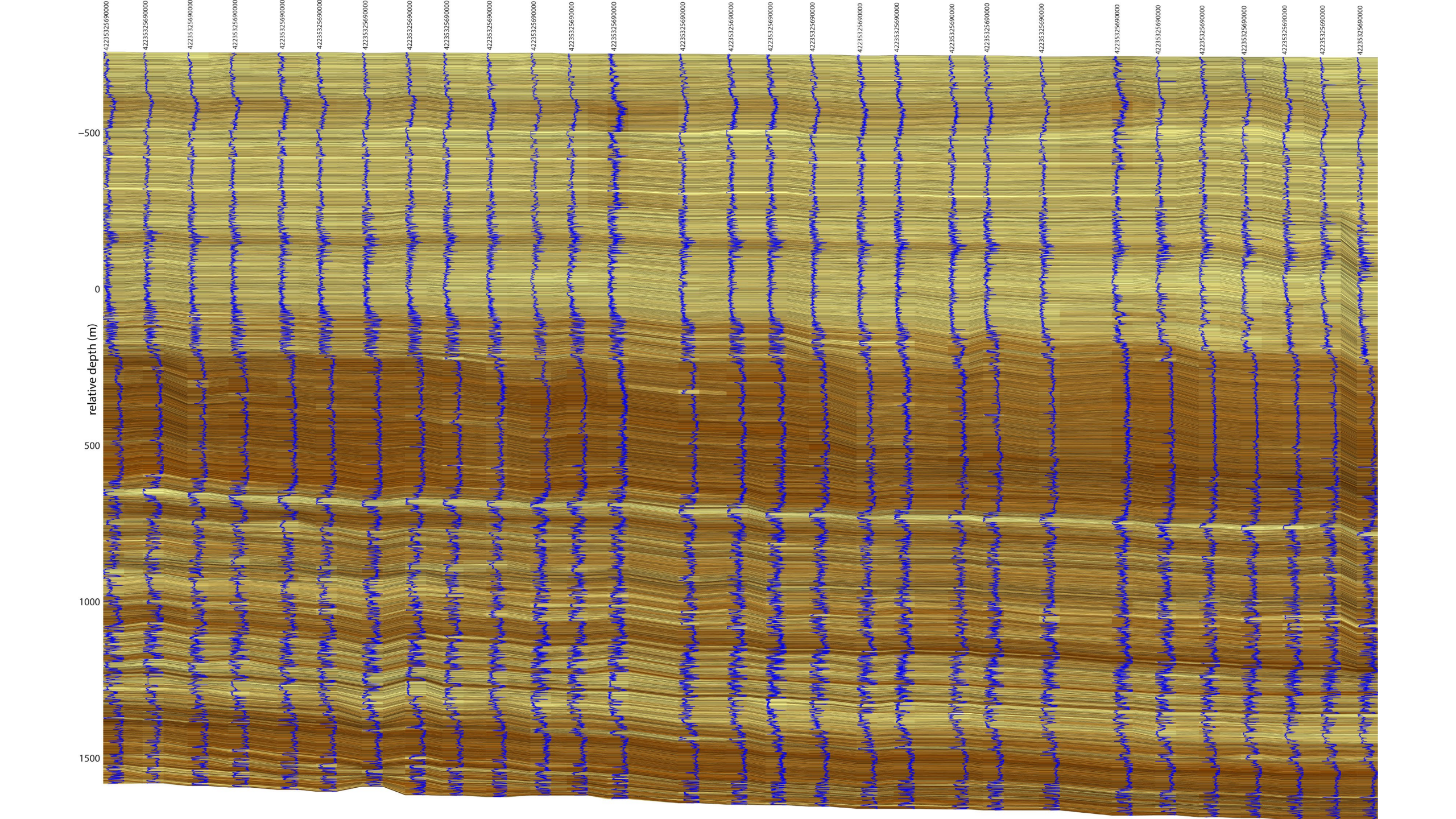
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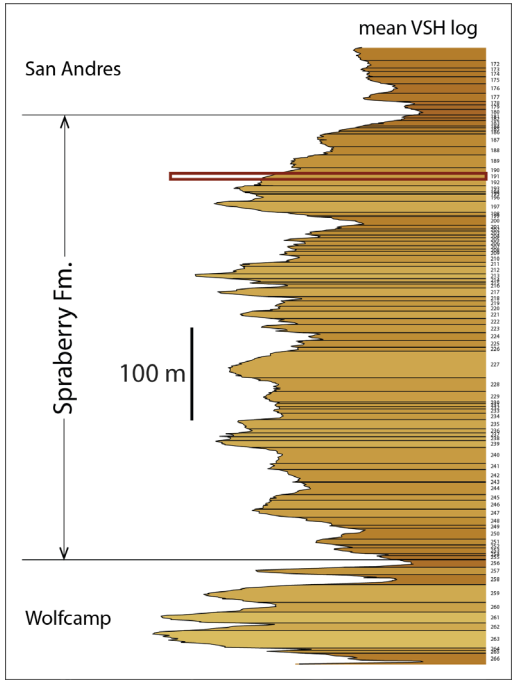
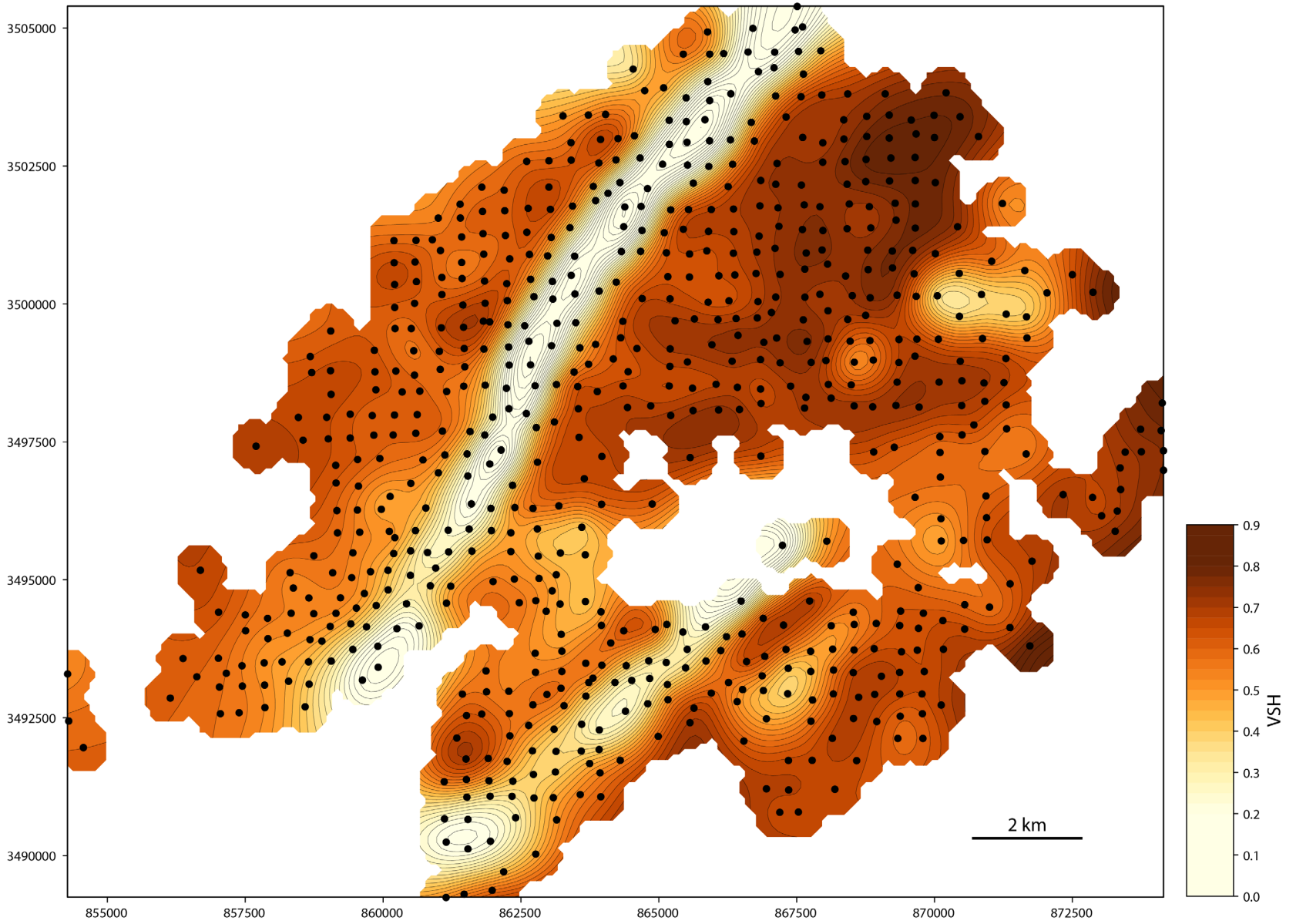
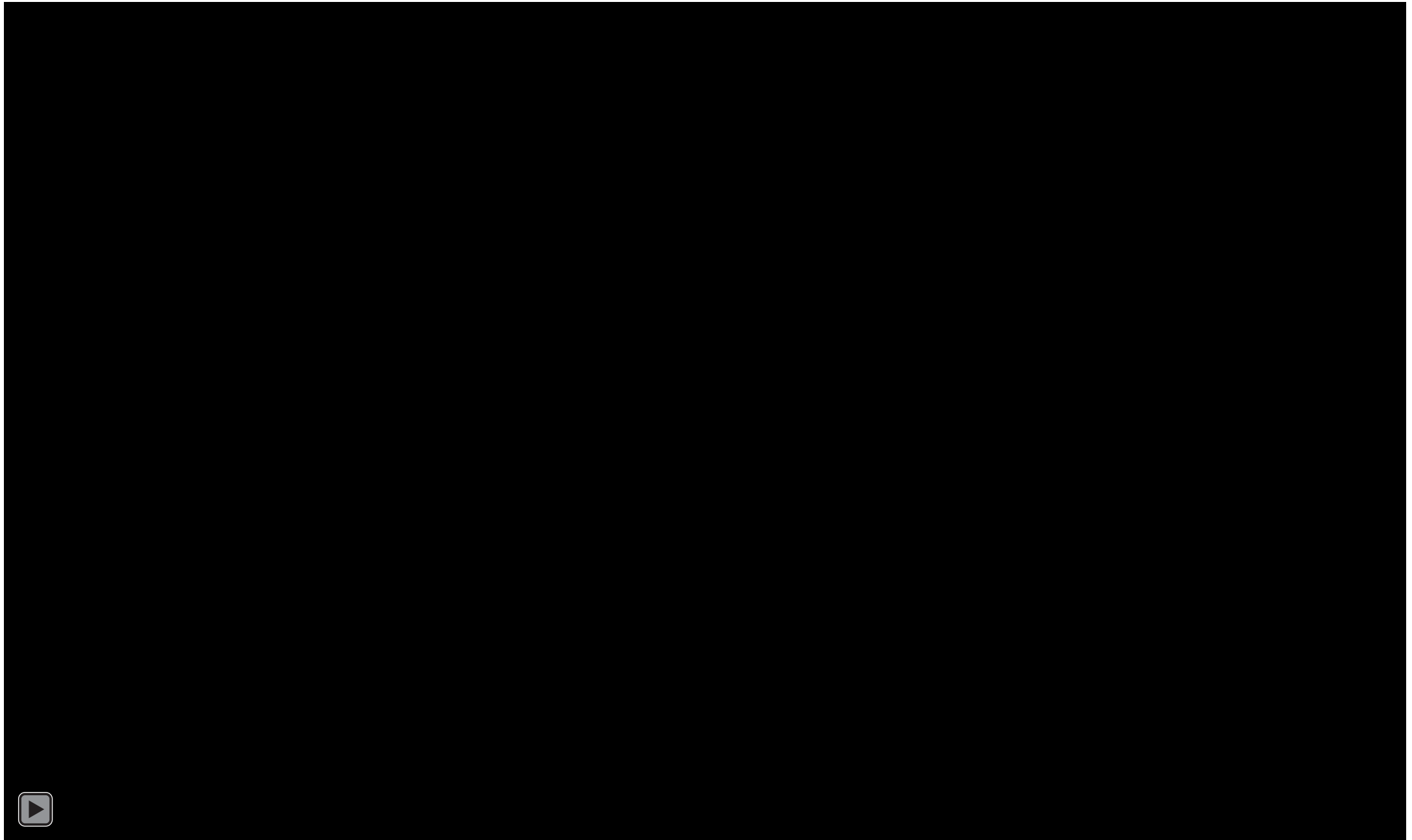
Create regularly sampled property volume

Map made with 'verde' Python package (Uieda, 2018, JOSS) https://github.com/fatiando/verde





Sterling County Spraberry model E-W sections



Gulf Coast valleys

SRTM data by NASA / USGS
visualization with Google Earth Engine

What do we do?
Shallow-subsurface & seafloor

Traditional offshore mapping integrated w/ burgeoning ML/AI techniques

Quantitative Clastics Laboratory

@ClasticsLab
@zzsylvester

Jacob Covault
Zoltán Sylvester

Collaborators
Sean Gulick
John Goff
David Mohrig
Tip Meckel
Sergey Fomel
Dallas Dunlap

TEXAS Geosciences
The University of Texas at Austin
Jackson School of Geosciences

Sediment Budget Analysis and Modeling of the Texas Coast

Richard Lewis

HR Wallingford
Working with water

Sediment Budget Analysis & Modeling of the Texas Coast

Texas GLO Sediment Workshop

November 2021

Richard Lewis

The Need

- Longshore Transport Modeling identified as Tier 1 Project in CRMP.
- Programmatic approach to support planning of beach nourishment and smaller projects under CEPRA and other coastal grant programs.

Study Objectives

- Use existing hydrodynamic, metocean and sediment data to develop a Regional sand transport model of the Texas Coast.
- Identify sand transport pathways and fluxes along the open coast and inlets.
- Compile this information in Sediment Budgets for Regions 1 & 4.

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Data identification & collation

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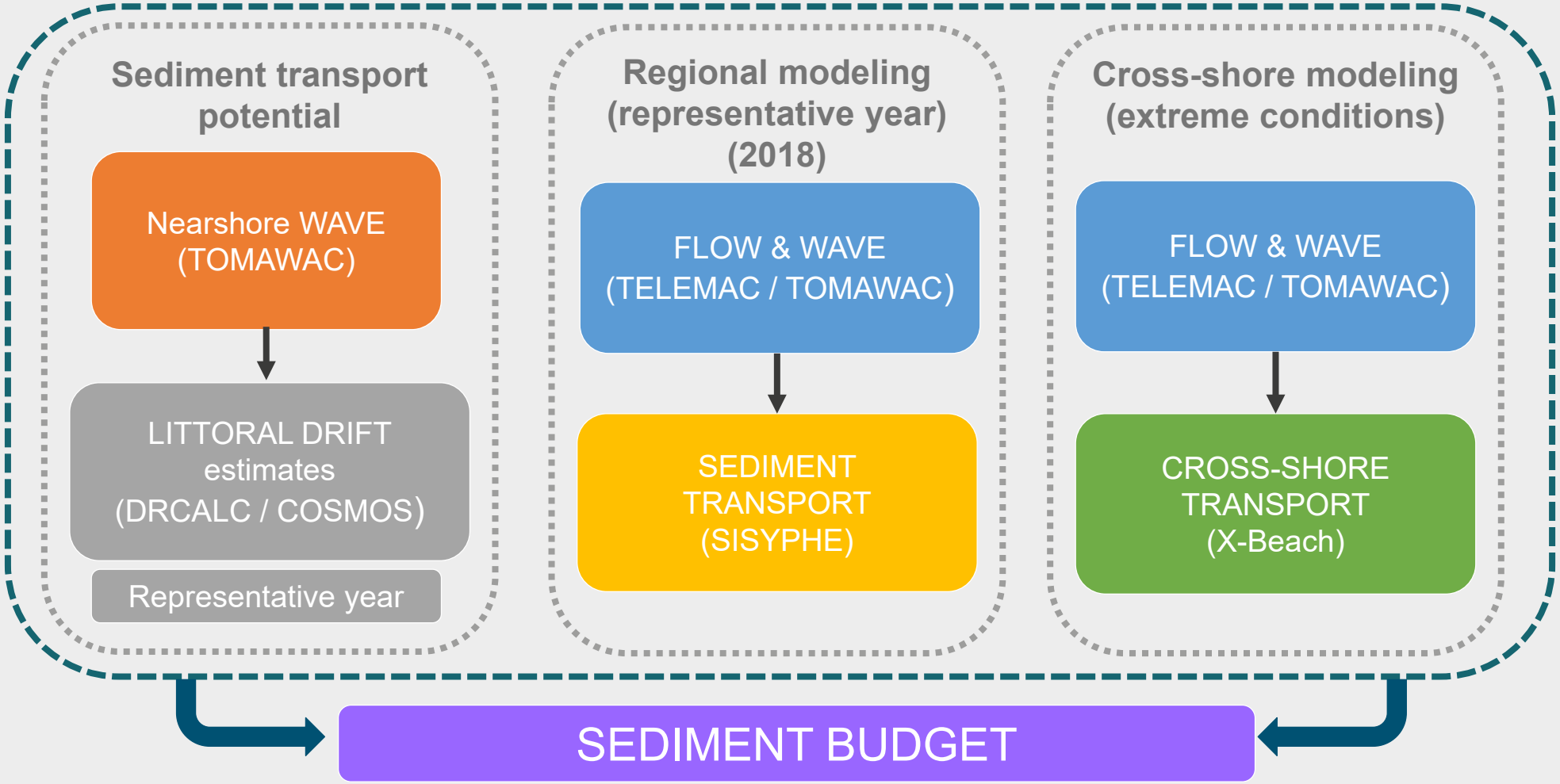
Modeling overview



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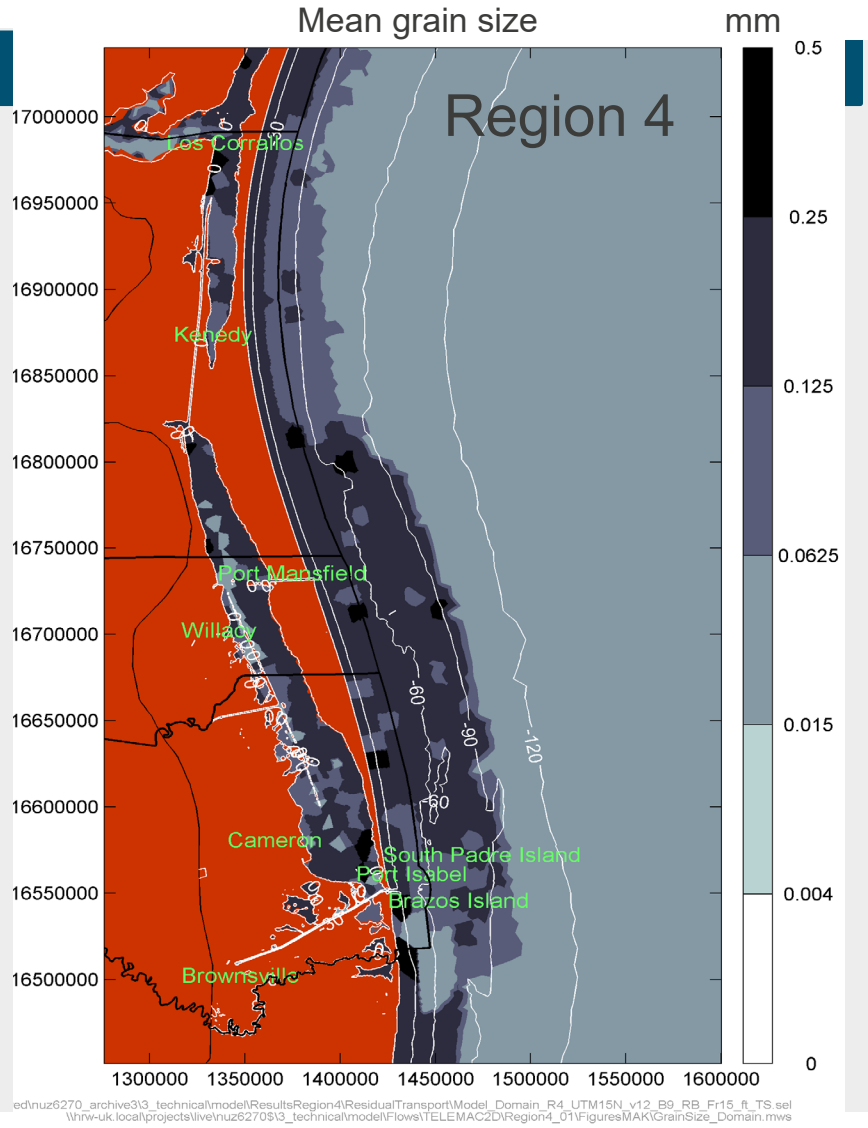
Sediment data

- TxSed (TGLO)
- usSEABED (USGS)
- Marine Mineral Information System (BOEM)
- Shear strength maps (TAMU OTRC)
- Sediment sampling from individual projects

- Non-erodible layers:
  - Clay outcrops
  - Structures (seawall, jetties, groins)



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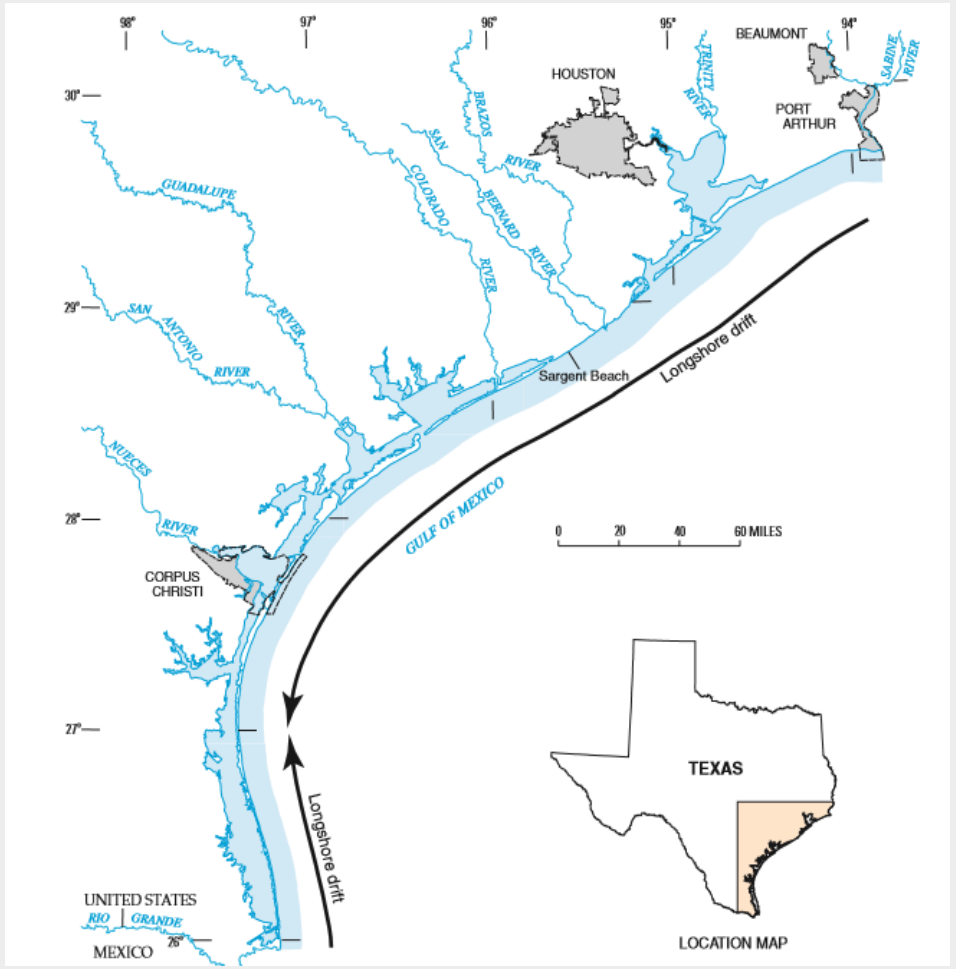
Conventional wisdom…



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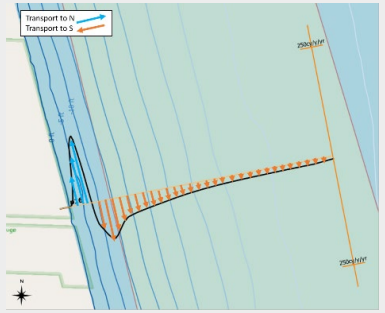
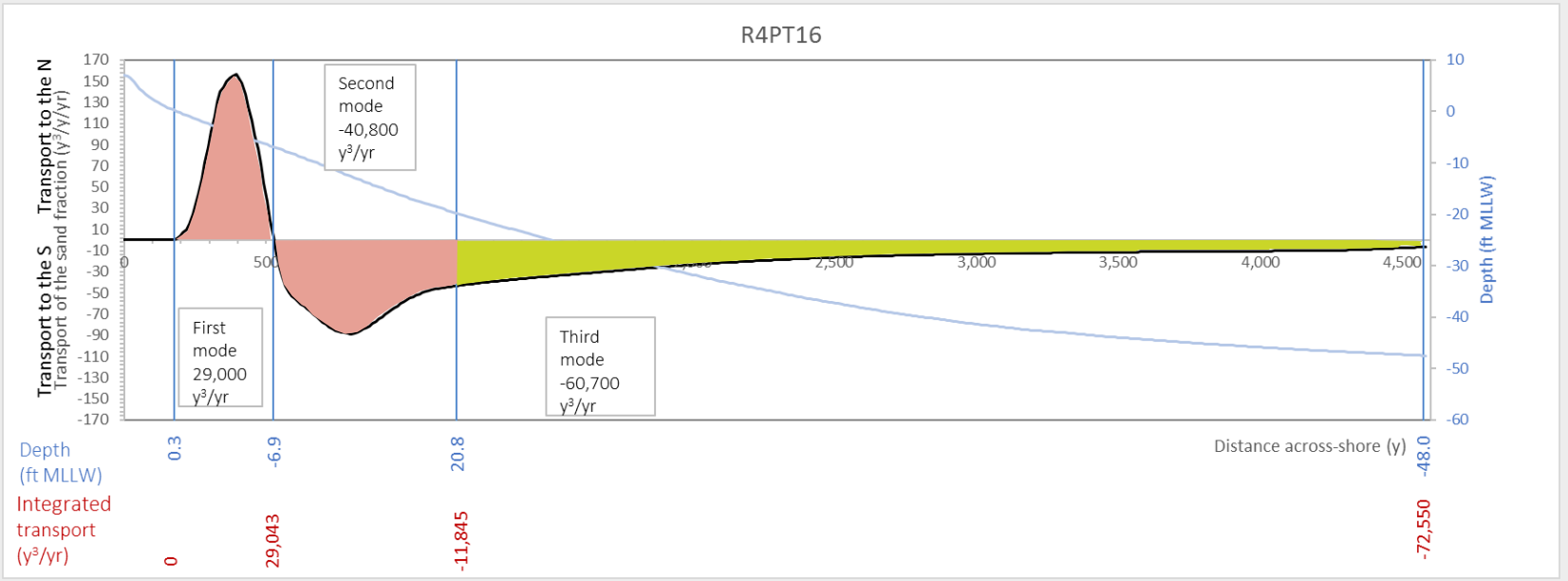
Regional model results



Annual net transport across a transect



Littoral drift | Transport due to currents

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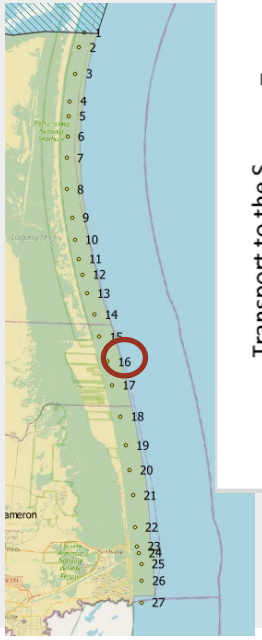
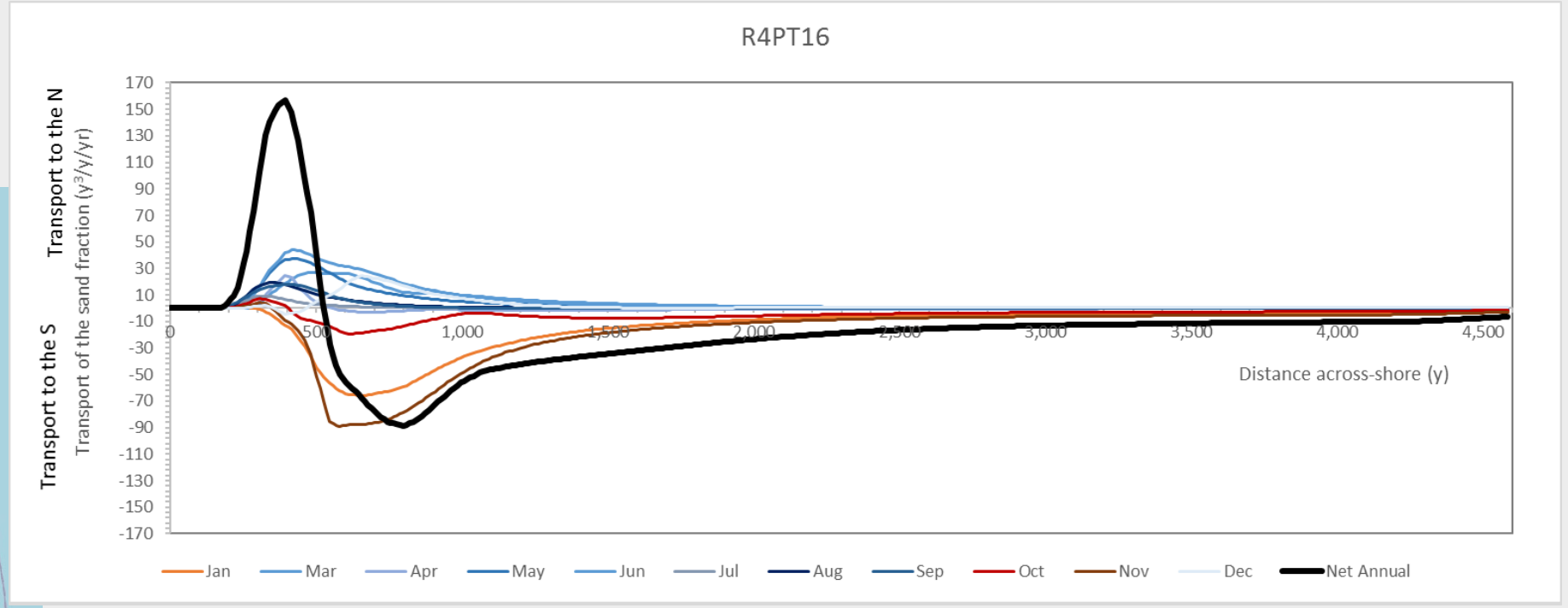
Regional model results

Monthly net transport across a transect





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South Padre Island Tracer Study

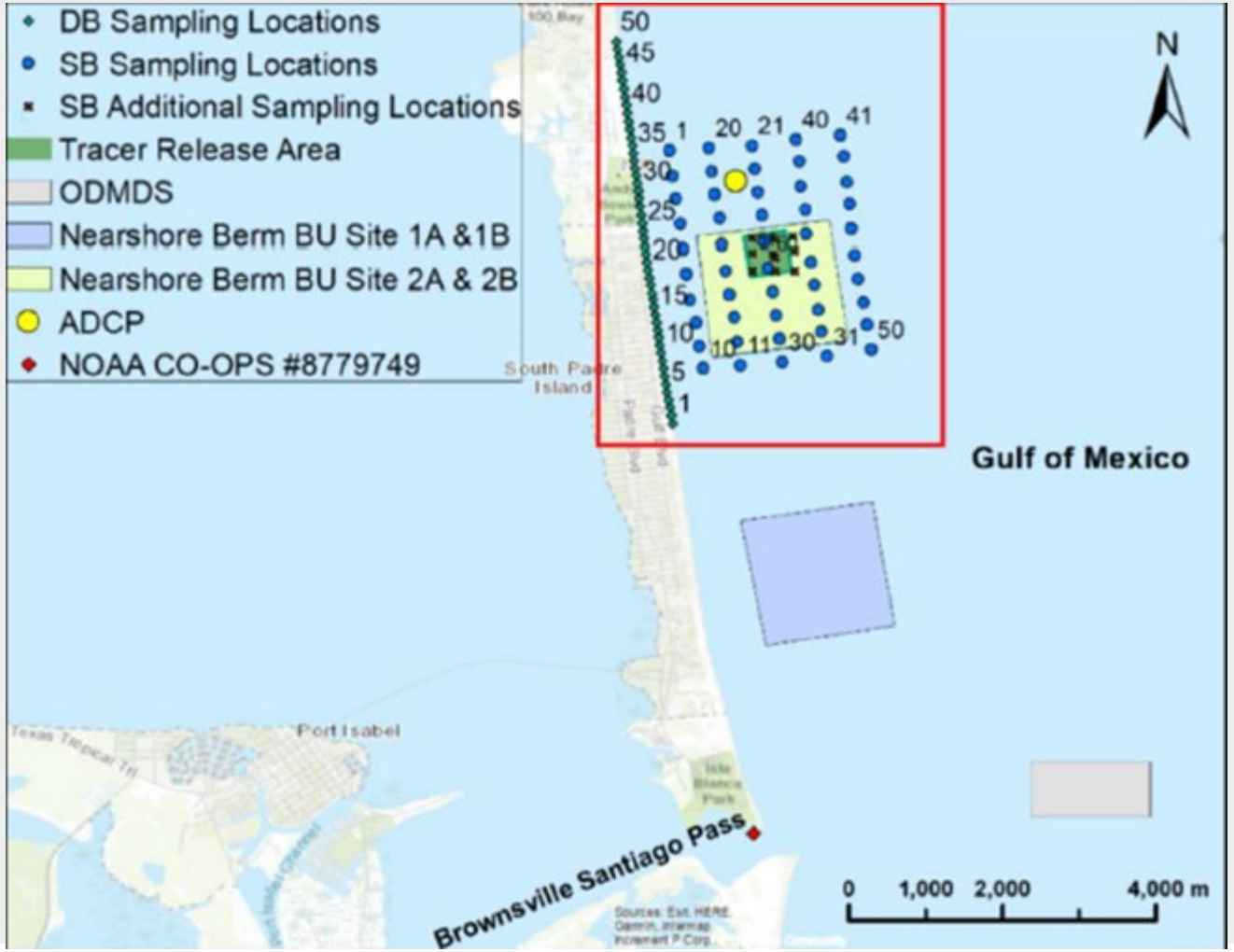
USACE SWG

City of SPI

USGS

Campaign	Time past initial tracer deployment	# of Samples (DB / SB)
0	pre-deployment	10 / 10
1	24 hours	50 / 60
2	3 days	50 / 60
3	1 week	50 / 60
4	2 weeks	50 / 60
5	1 month	50 / 60
6	2.5 months	50 / 60
7	6.5 months	50 / 60
8	10 months	50 / 60
9	15 months	50 / NA
	Total # of Samples:	950

Note: Campaigns 1-8 were conducted by the USGS and Campaign 9 was conducted by Partrac Inc. and SPI.



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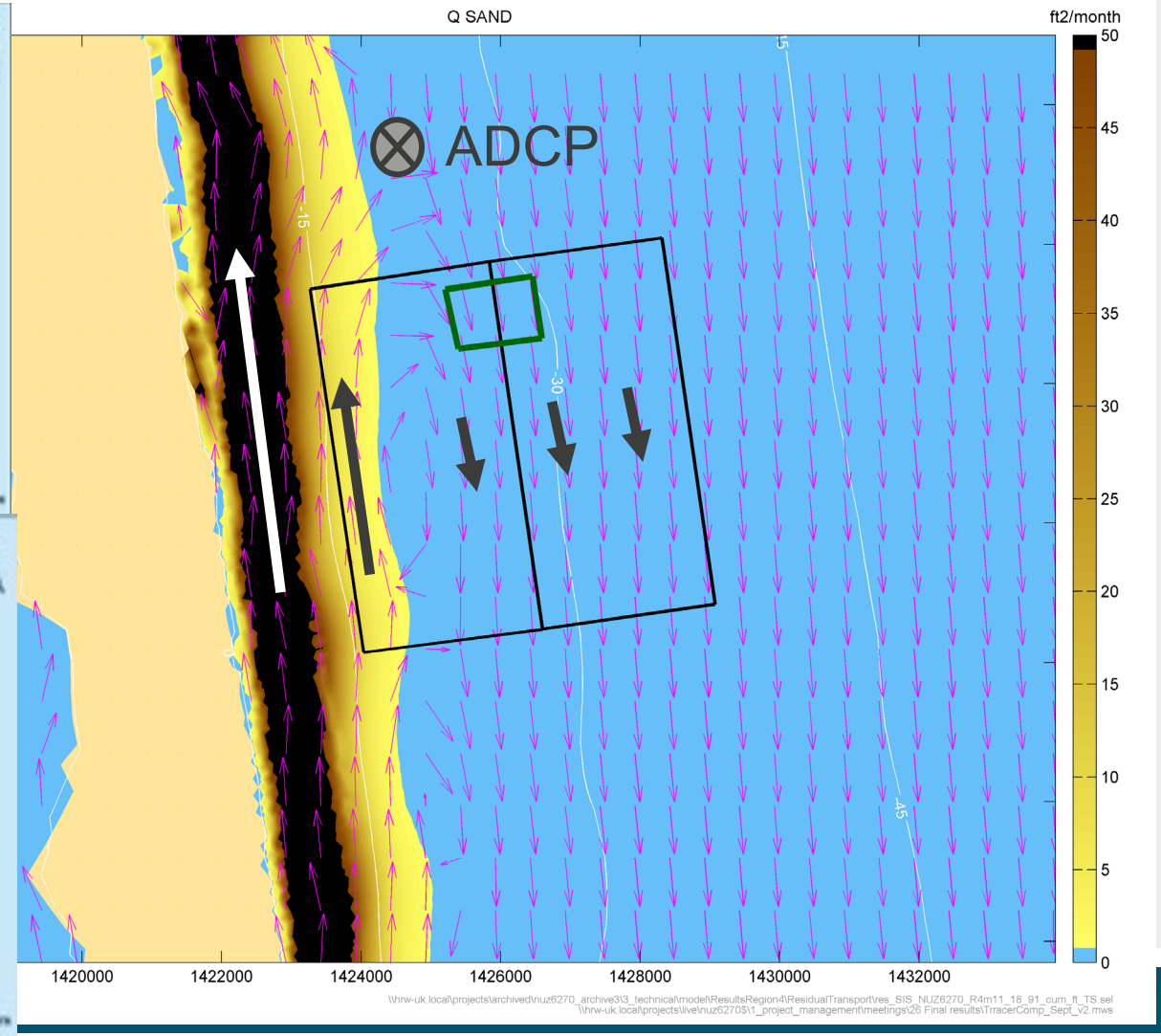
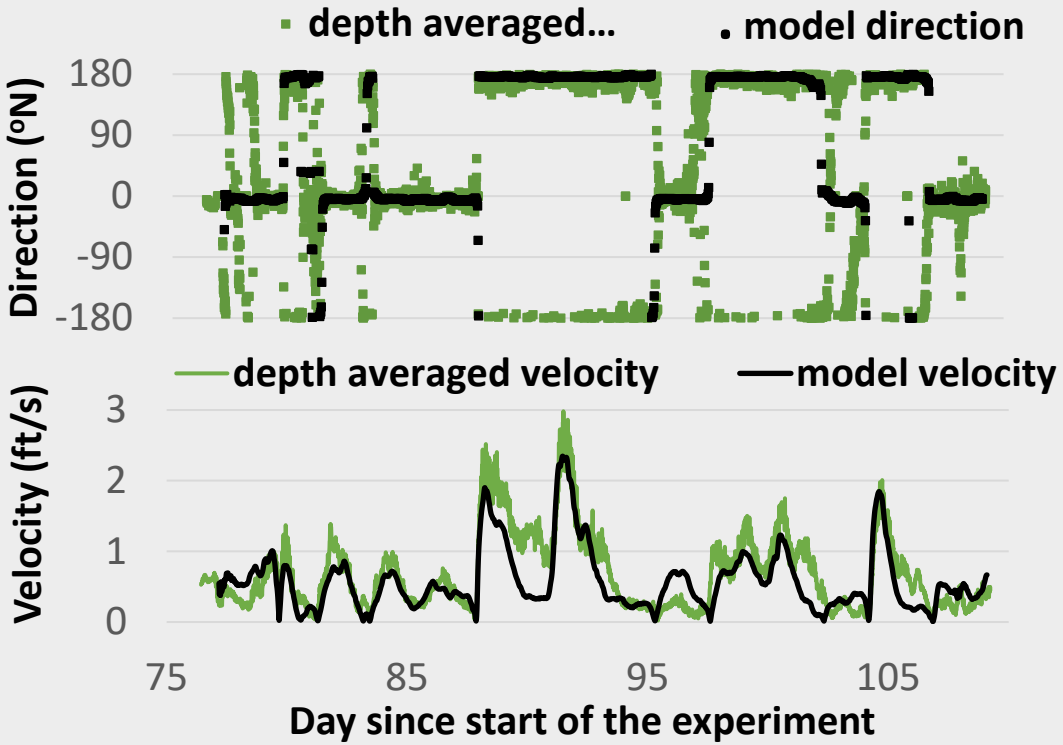
Comparison with SPI Tracer study



Regional sediment transport model



Boundary forcing	Previous modeling studies	HRW TELEMAC 2D model
Winds	✓	✓
Waves	✓	✓
Water levels	✓	✓
Freshwater inputs	✗	✓
Ocean Currents	✗	✓

Inclusion of ocean currents is key to modeling sediment transport in Region 4 (and we suspect the rest of the Texas Coast)

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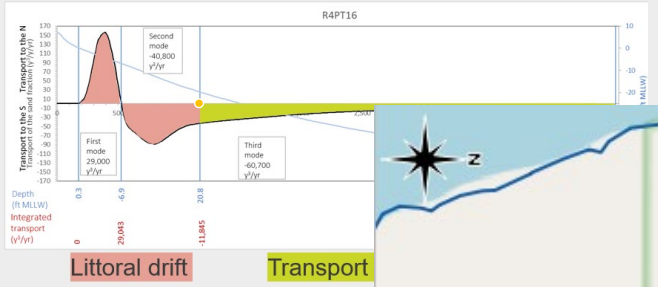
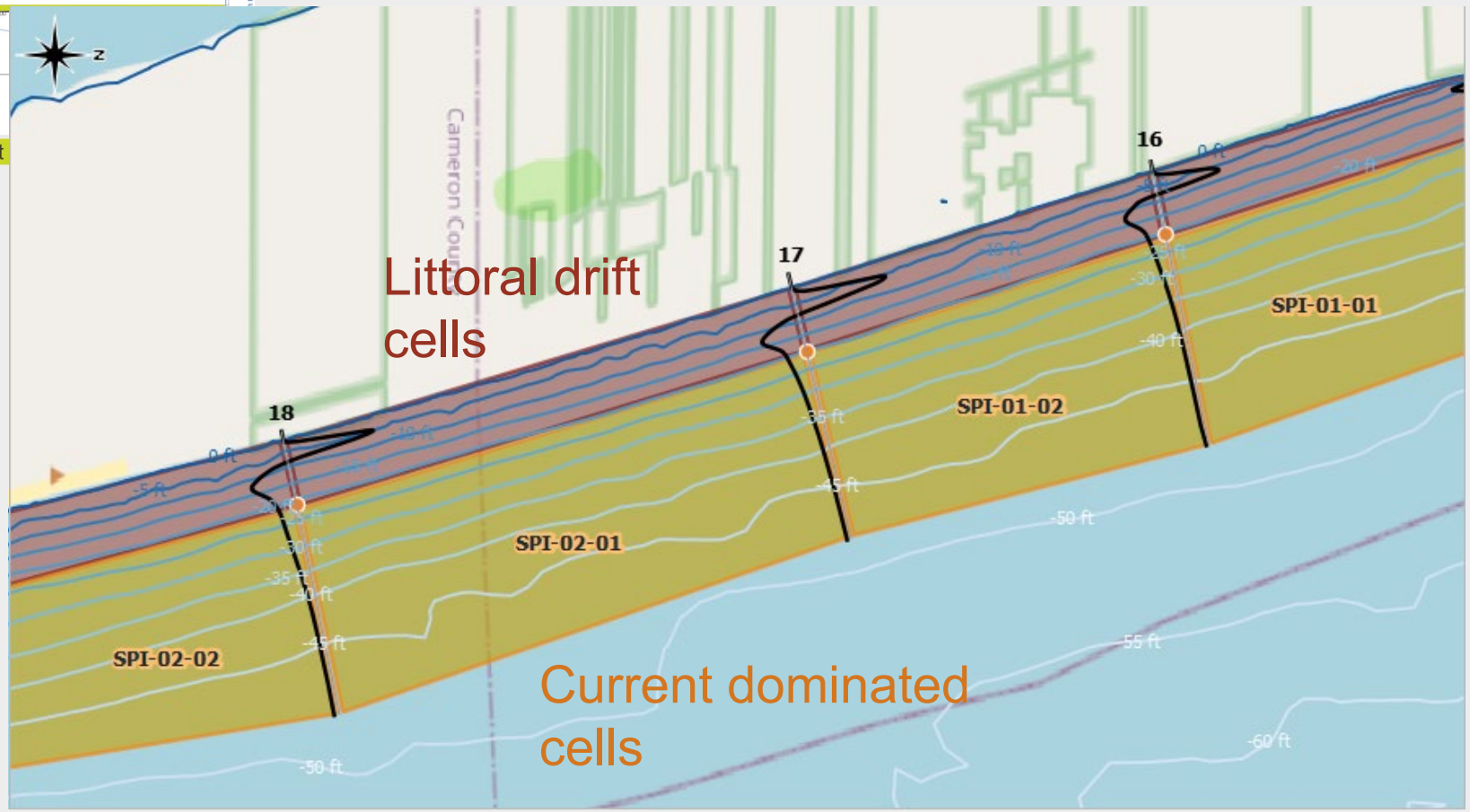
Sediment Budget – Defining the cells





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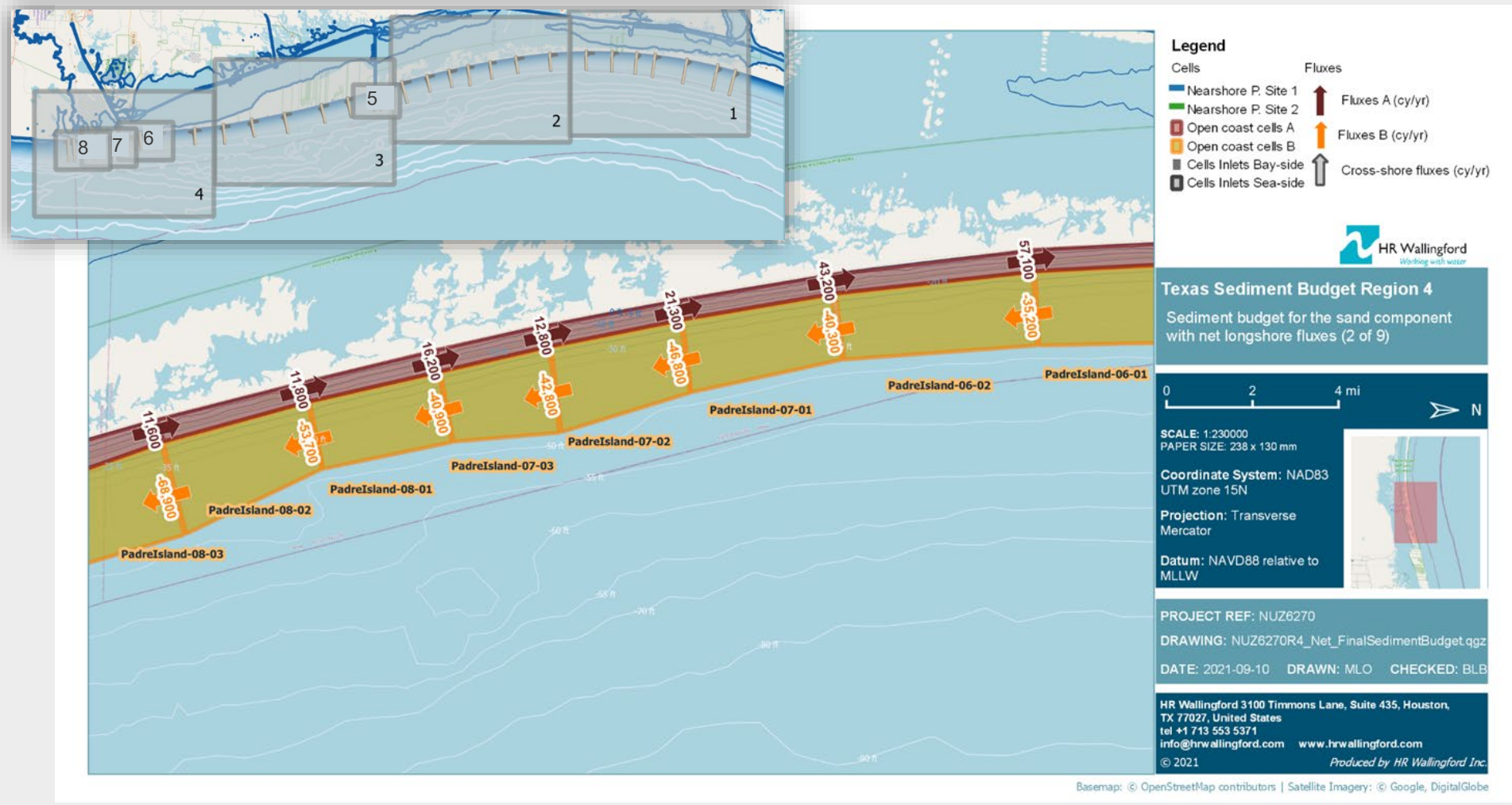
Sediment Budget – Annual net fluxes



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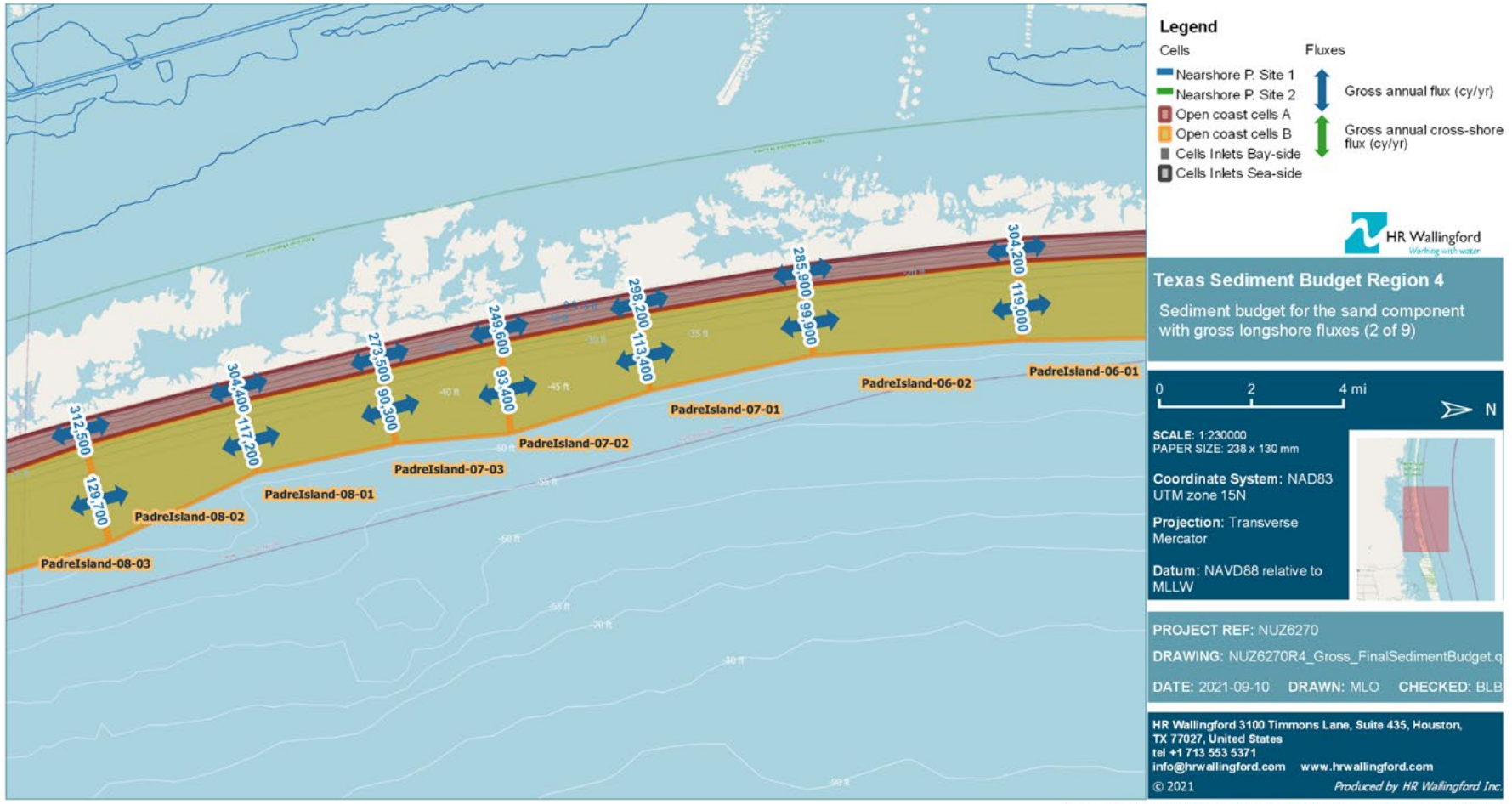
Sediment Budget – Annual gross fluxes



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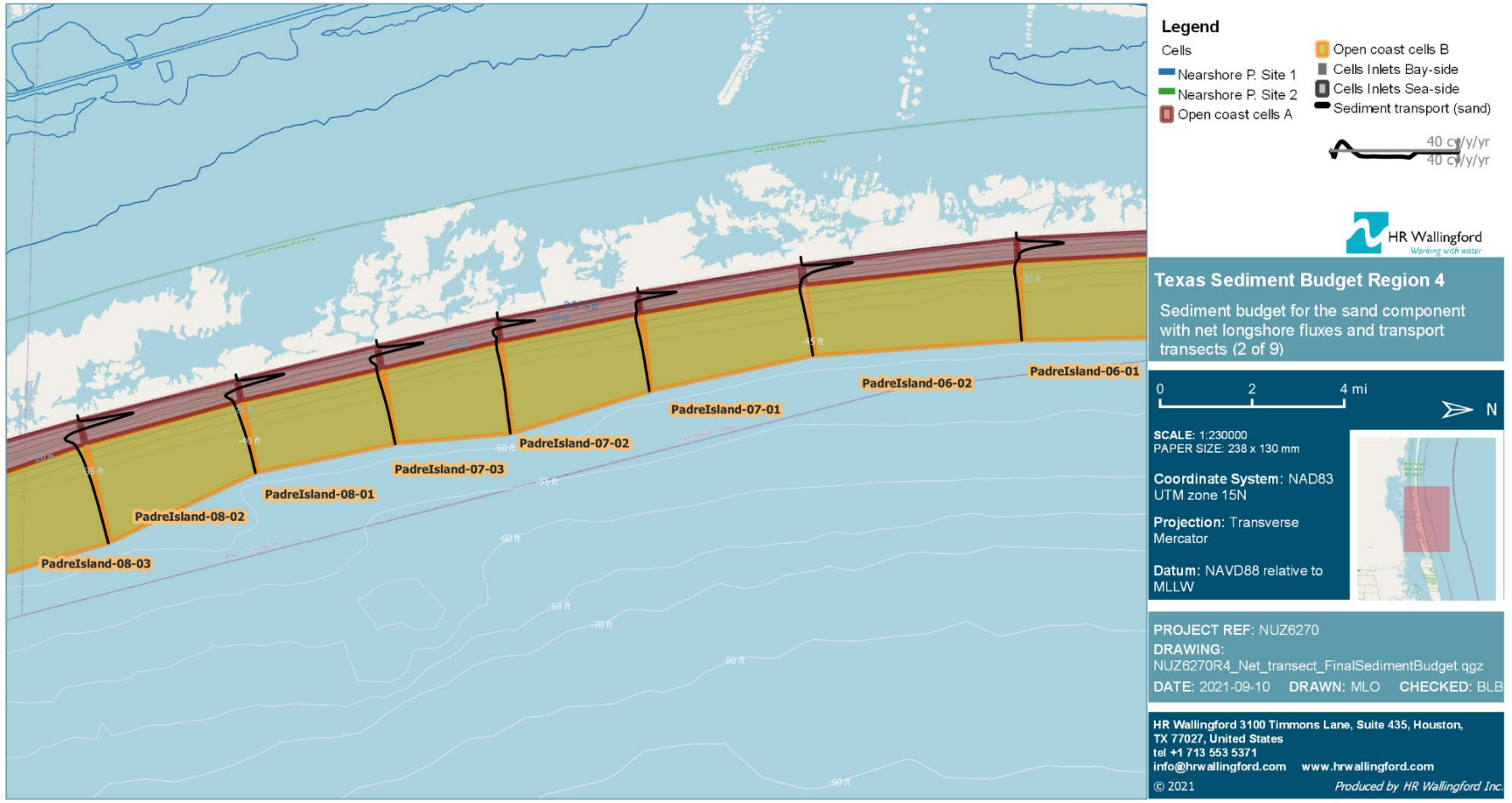
Sediment Budget – Annual cross-shore distribution of longshore transport



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Key takeaways

- Sediment transport pathways in Region 4 are more complex than originally thought and are not always well represented using simple CERC formula predictors of LST.
- This added complexity is attributed to the role that ocean currents play in nearshore sediment transport processes.
- More tracer studies along other parts of the coast may help to further our understanding of offshore countercurrents and their influence on nearshore sediment transport processes.

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BREAK

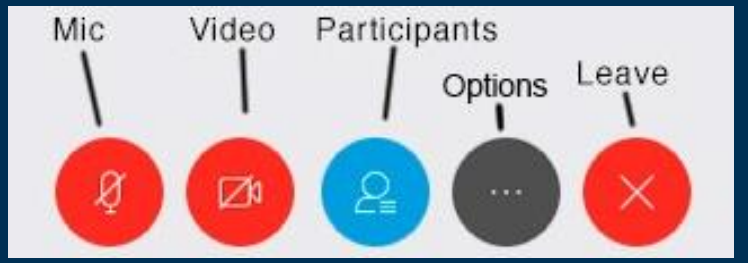
15 Minutes

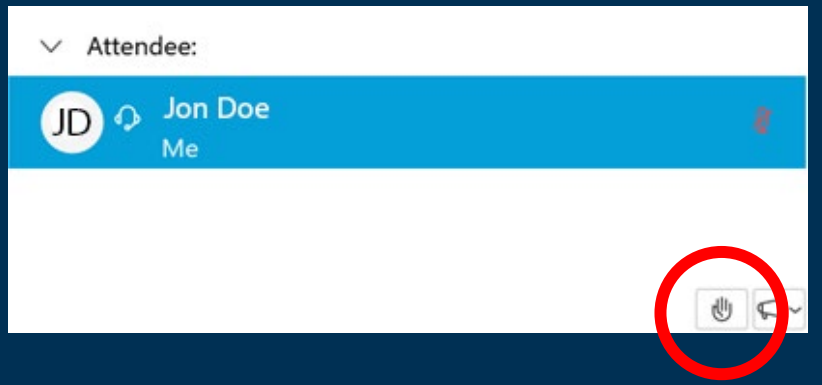
Texas General Land Office Sediment Workshop 2

HOW TO PARTICIPATE

There will be a brief Q&A after each presentation:

- ***Use the "Raise Hand" feature*** *– facilitator will prompt you to ask your question to the presenter/panel*
- ***Use the Chat feature*** *– facilitator will read questions verbally to the presenter/panel your behalf*





Please mute your microphone when not speaking

Beach Dune Rules for Beach-Quality Sand

Michelle Culver

Beach Dune Rules for Beach-Quality Sand

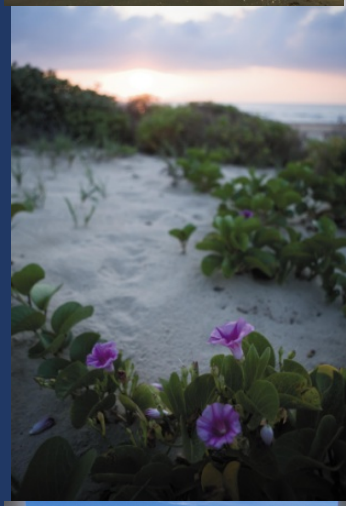
November 10, 2021

GLO's Beach Access & Dune Protection Program

- Open Beaches Act (OBA)
- Dune Protection Act (DPA)
- Beach/Dune Rules (Texas Administrative Code)
- Local Dune Protection and Beach Access Plans, including Erosion Response Plans

Texas General Land Office
George P. Bush, Commissioner

Beachfront Construction Certificates and Dune Protection Permits



- All construction within 1,000 feet of mean high tide or seaward of the first public road, whichever is greater, requires a **Beachfront Construction Certificate**.
- Any construction that will impact critical dunes seaward of the local government's Dune Protection Line requires a **Dune Protection Permit.**
- The statutes require the GLO to review all applications and comment on their consistency with state law, GLO rules and local plans.
- Local governments issue the permits. Most jurisdictions combine the certificates and permits into one application.

Texas General Land Office
George P. Bush, Commissioner

Texas Administrative Code

Beach/Dune Rules are found in Title 31, Chapter 15 of the Texas Administrative Code (TAC). These rules established requirements for local governments to develop their own Beach Access & Dune Protection Plans consistent with the OBA, DPA, and Beach/Dune Rules.

The rules cover a wide variety of topics:

- Construction requirements
- Dune mitigation requirements
- Enforcement procedures
- Beach User Fee Standards
- Local government management of the public beach

Beach Dune Rules for Dune Restoration

- 31 TAC 15.4 & 15.7
- Dunes may not be restored more than 20 feet seaward of the landward boundary of the public beach
- Must not restrict or interfere with public use of the beach at normal high tide
- Allowable materials:
  - Piles of sand having similar grain size and minerology as the surrounding beach
  - Temporary sand fencing conforming to GLO guidelines
  - Organic brushy materials
- Prohibited materials:
  - Fine, clayey, or silty sediments
  - Sediments containing toxic materials
  - Hard or engineered structures
  - Materials such as riprap, concrete, or any non-biodegradable items

Sand for Beachfront Projects

- Sand, soil, sediment, or dredged spoil must be of an acceptable mineralogy and grain size when compared to the sediments found on the site (31 TAC 15.4(c)(3) and 15.7(d)(2) & (e)(6)(A))
- Sand, soil, sediment, or dredged spoil must not contain the hazardous substances listed in Volume 40 of the Code of Federal Regulations, Part 302.4, in concentrations which are harmful to people, flora, and fauna as determined by applicable, relevant, and appropriate requirements for toxicity standards established by the local, state, and federal governments (31 TAC 15.4(c)(2) and 15.7(d)(3) & (e)(5)(D))

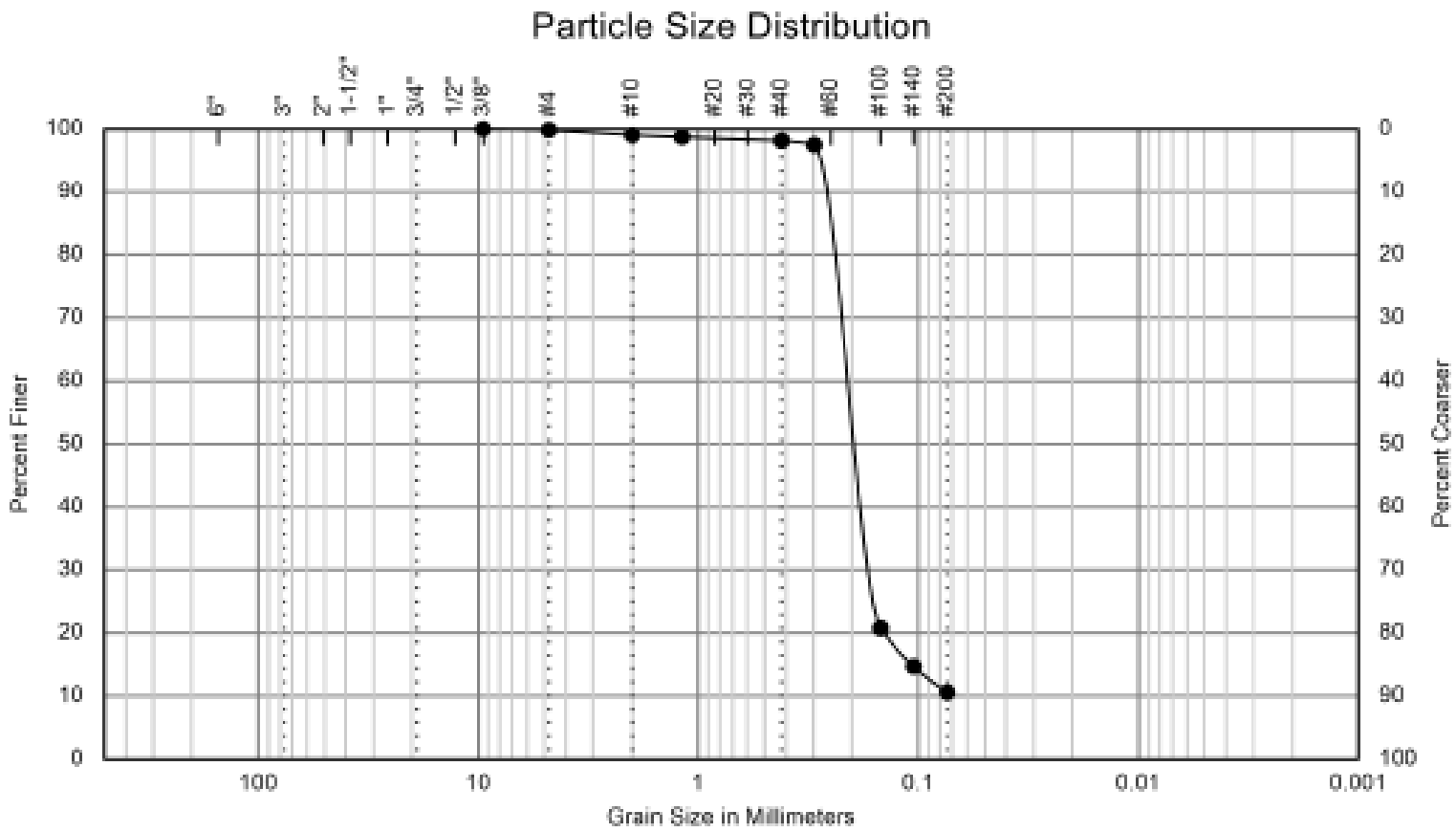
Sediment Analysis

General parameters:

- At least 75% quartz, with the remainder predominantly carbonate, feldspar or lithic fragments
- Median grain size between 0.10 – 0.30 mm, based on the site conditions of placement area
- No more than 10%, by weight, passing the #230 sieve
- No more than 5%, by weight, retained on the #4 sieve
- Not result in cementation of the beach

Sieve Size	Percent Finer	Spec.*	Pass (X=Fail)
3/8"	100.0		
#4	99.8		
#10	99.0		
#16	98.7		
#40	98.1		
#50	97.4		
#100	20.8		
#140	14.7		
#200	10.6		

*



% Cobbles	% Gravel - 0.2		% Sand - 89.2			% Fines
	Coarse	Fine	Coarse	Medium	Fine	
0.0	0.0		0.8	0.9	87.5	10.6

D_{60}=0.21	D_{30}=0.17	D_{10}=0.070 (Est.)	C_c = 2.0	C_u = 3.0	FM =

Comments:

S-
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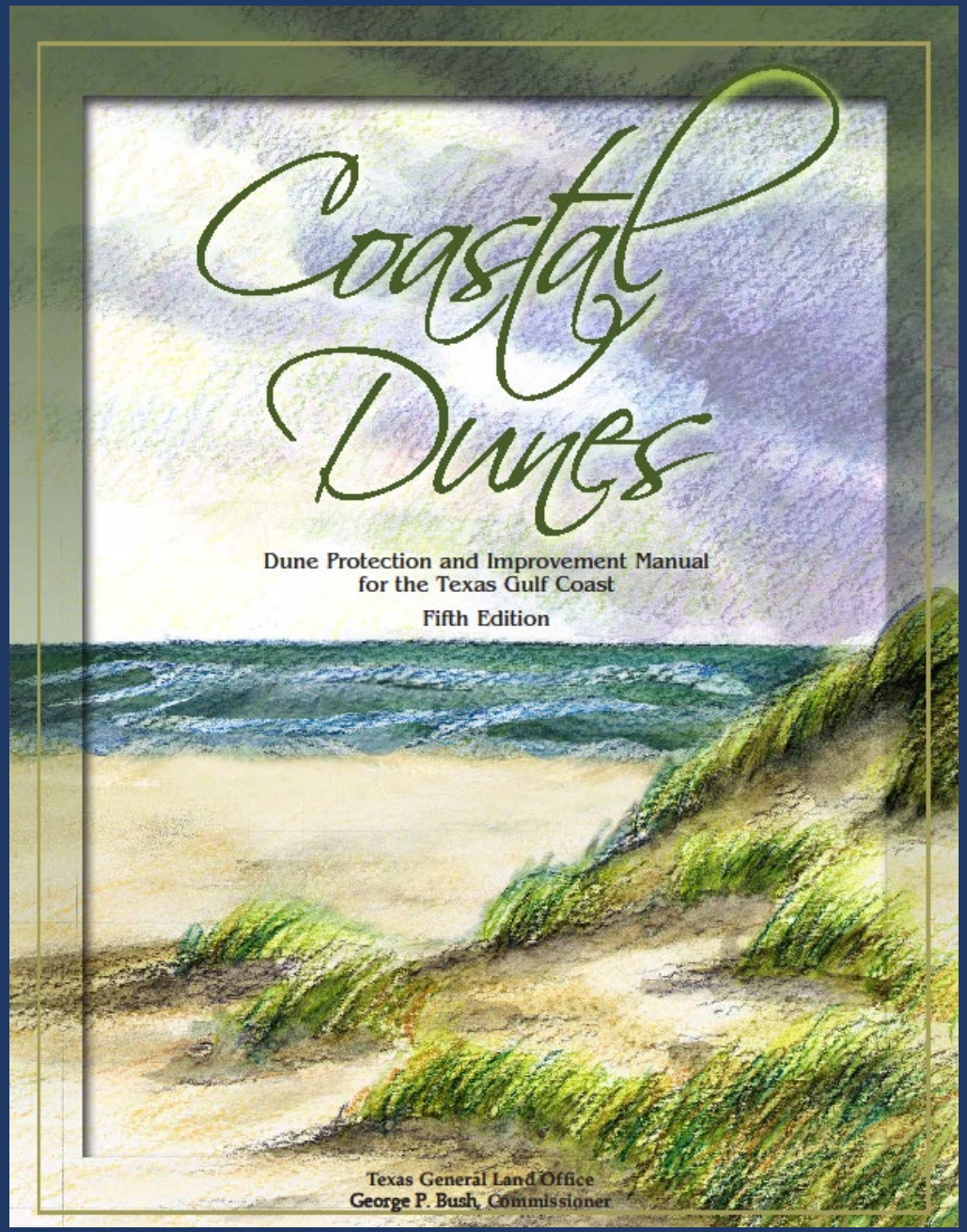

DUNE CONSTRUCTION & RESTORATION

The GLO encourages dune restoration in areas that have recently experienced dune loss or damages due to storm tides. Dune restoration projects may not block or restrict use of the public beach. Plantings of native vegetation should be the primary method for dune construction, improvement, and repair. Only dune vegetation indigenous to the dune system in the area where the vegetation will be planted may be used in dune restoration projects.

VEGETATION

Bitter panicum

Sea oats

Marshhay cordgrass

Three species of grass are recommended for dune restoration anywhere along the Texas coast: bitter panicum (Panicum amarum), sea oats (Uniola paniculata), and marshhay cordgrass (Spartina patens). Transplants of existing dune plants may also be used, but vegetation should only be harvested from dense, healthy stands at intervals of 2 feet. Continual watering of newly planted vegetation, especially during drought conditions, is encouraged to increase the likelihood of survival.

NOTICE

Certain organic brushy materials such as seaweed may be used for dune-building, but should not be placed in large or dense piles. Non-organic materials such as plastics, sandbags, rocks, bulkheads, riprap, asphalt rubble, concrete, or tires may not be used for dune building; these materials are not biodegradable and are safety hazards.

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Questions?

The Marine Minerals Program: A Quick Guide to Policies and Processes

Jessica Mallindine

BOEM

Bureau of Ocean Energy Management

THE MARINE MINERALS PROGRAM: A QUICK GUIDE TO POLICIES AND PROCESSES

November 2021

Jessica Mallindine | jessica.mallindine@boem.gov | 504-736-7516

Noncompetitive OCS Sand

- **Leasing authority - Section 8(k) of the Outer Continental Shelf Lands Act (OCSLA)**

  - "The Secretary may negotiate with any person an agreement for the use of Outer Continental Shelf sand, gravel and shell resources—

  - (i) for use in a program of, or project for, shore protection, beach restoration, or coastal wetlands restoration undertaken by a Federal, State, or local government agency; or

  - (ii) for use in a construction project, that is funded in whole or in part by or authorized by the Federal Government." (Outer Continental Shelf Lands Act)

Functions and Priorities

- **Stewards** of **OCS non-energy marine minerals**
- **Facilitate access** to OCS sediment for Federal, State, and local government agencies (G&G)
- **Identify and evaluate** OCS sediment resources (National Sand Inventory)
- **Manage multiple-use conflicts** (e.g., pipelines, telecom cables, navigation, and commercial fisheries)
- **Conduct research** to inform decisionmaking and manage risk
- **Provide** for **competitive** and **noncompetitive** leasing of OCS “non-energy” marine minerals

BOEM Leasing Process

Lease Agreements

Each project is unique, having different parties involved, different environmental concerns and different leasing concerns, because of this each Agreement is for a one-time use.

Ship Island, USACE

Complete Leasing Process

Assateague Island

Before

After

Problem Identification
- Local community driven
- Congressional involvement

Reconnaissance
- Define Problem & Stakeholders
- Define cost sharing agreement

→
- Identifying information gaps
- Environmental Studies feed into information on potential impacts
- Join the USACE Project Development Team (if warranted)

Feasibility
- Planning, Analysis, Options
- NEPA & Consultations

→
- Participation/Lead on consultations
- BOEM Subject Matter Experts review all NEPA and consultation reports
- Environmental studies provide information for impact analysis
- Develop EA/EIS and execute FONSI/ROD

Engineering & Design
- Congressional Authorization
- Technical Studies

→
- BOEM Subject Matter Expert review of technical studies and design
- Review for consistency and compliance with BOEM standards and known requirements

Real Estate Acquisition
- Responsibility of Local Sponsor

BOEM Agreement
- 2-Party NNA
- 2-Party or 3-Party MOA

→
- BOEM's approving action
- Executed as an agreement with all parties involved

Construction
- Funds are appropriated
- All requirements completed

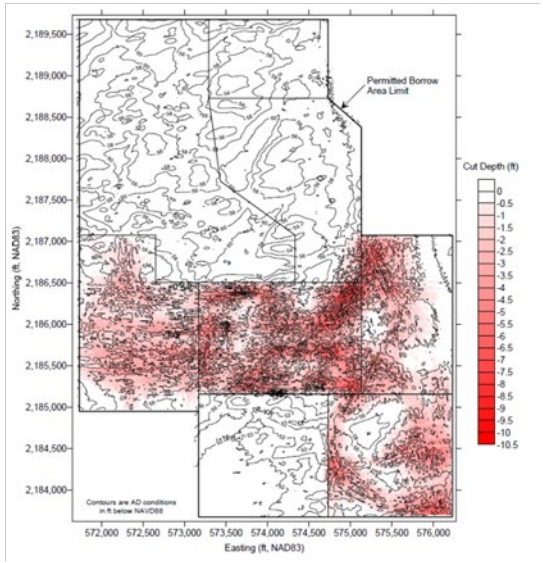
→
- Review all pre-construction requirements for consistency and compliance with BOEM Agreement

Maintenance
- Inspections and Monitoring
- Local sponsor takes ownership

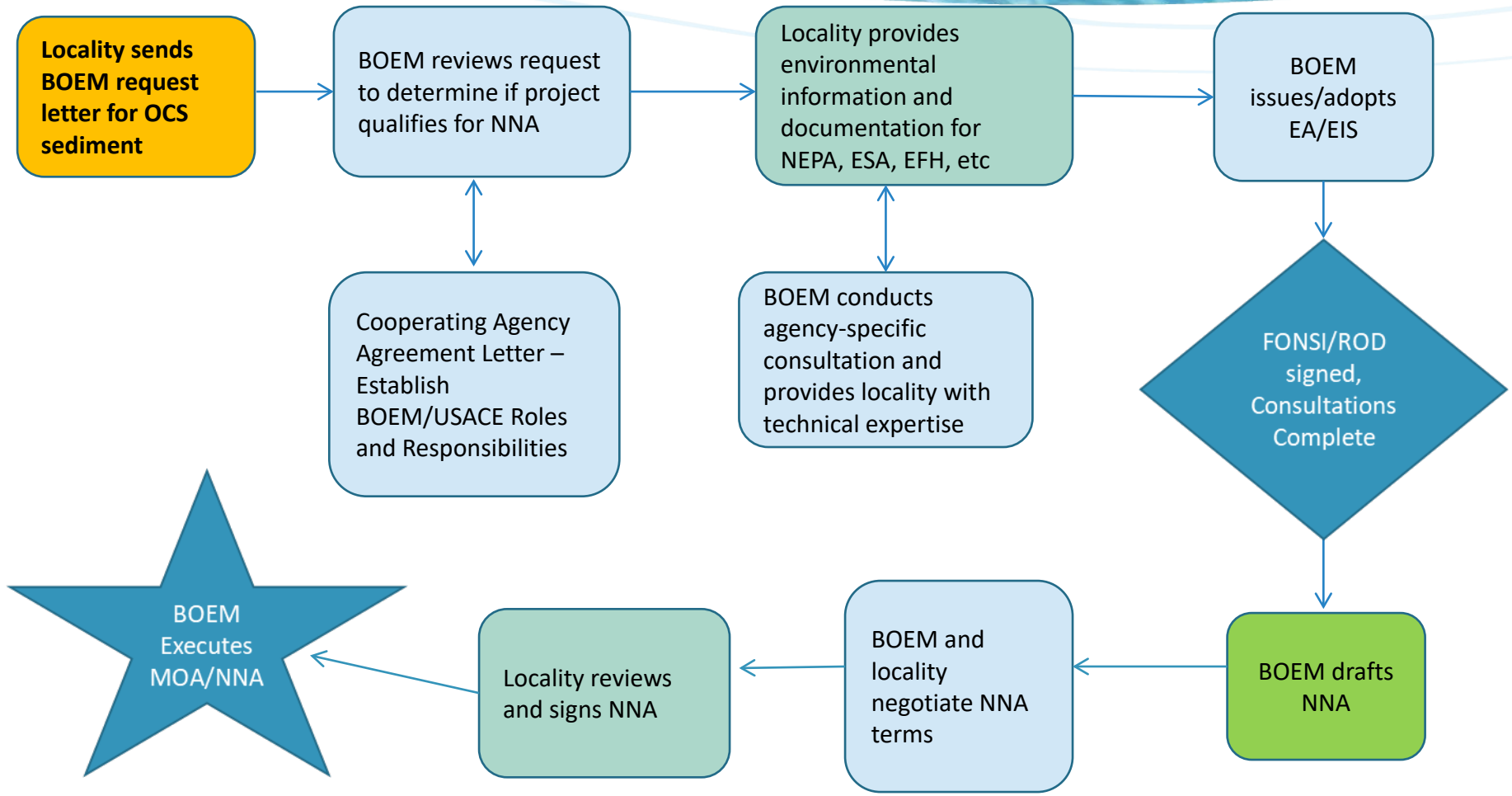
→
- Review all requirements for consistency with BOEM Agreement
- Conveyance of information to BSEE for compliance

Stipulations of Construction

- Notifications
- Dredge Positioning Reporting
- Dredge Operating Requirements
- Production and Volume Information
- Notice to Other Users
- Marine Pollution Control and Contingency Plan
- Discovery of Ordinance Procedures
- Bathymetric Surveys
- Protection of Archaeological Resources
- Project Completion Reporting
- Environmental Compliance Reporting
- Environmental Monitoring



Process for Locality to Obtain a Lease (USACE Regulatory Program)



BOEM G&G Process

Geologic and Geophysical Data Collection on the OCS

There are 7 major types of BOEM approvals or notice requirements associated with G&G.

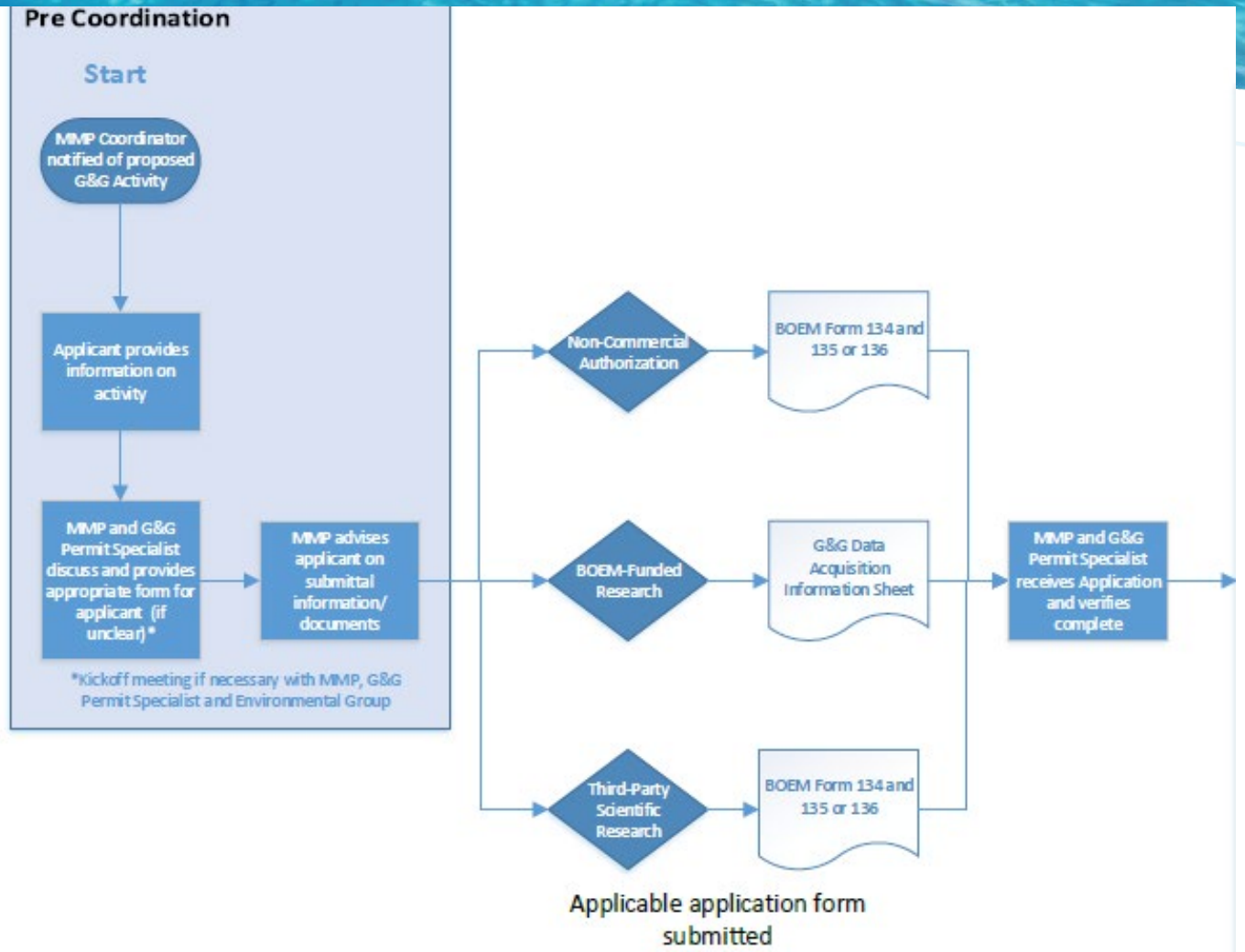
BOEM Authorization Required:

- **Section 11 authorization of persons (i.e., state, state contractor, companies, etc.) undertaking pre-lease mineral G&G exploration (e.g., search for minerals)**
- **Other non-mineral G&G pursuant to 30 CFR 583 (pre-lease)**

BOEM Notice Requested:

- **Scientific Research**
- **Discretionary notice by federal agencies and federal contractors conducting mineral-related G&G**
  - Examples: USGS vibracores, USACE surveying, NOAA, EPA surveying ocean disposal sites
- **Section 8(k) lease authorization – "on lease" G&G**
- **BOEM-sponsored cooperative agreement G&G research**
- **BOEM-funded and contracted G&G**

G&G Authorization/Notice Coordination Process



- Sand Search EA (2019) is a Programmatic Environmental Document that covers most equipment used in sediment investigations.

https://www.boem.gov/Regional-Projects/

- Stipulations incorporated into the EA are recommended in workplan to streamline review of proposed G&G activities.

- Timeline for review: 2-4 weeks

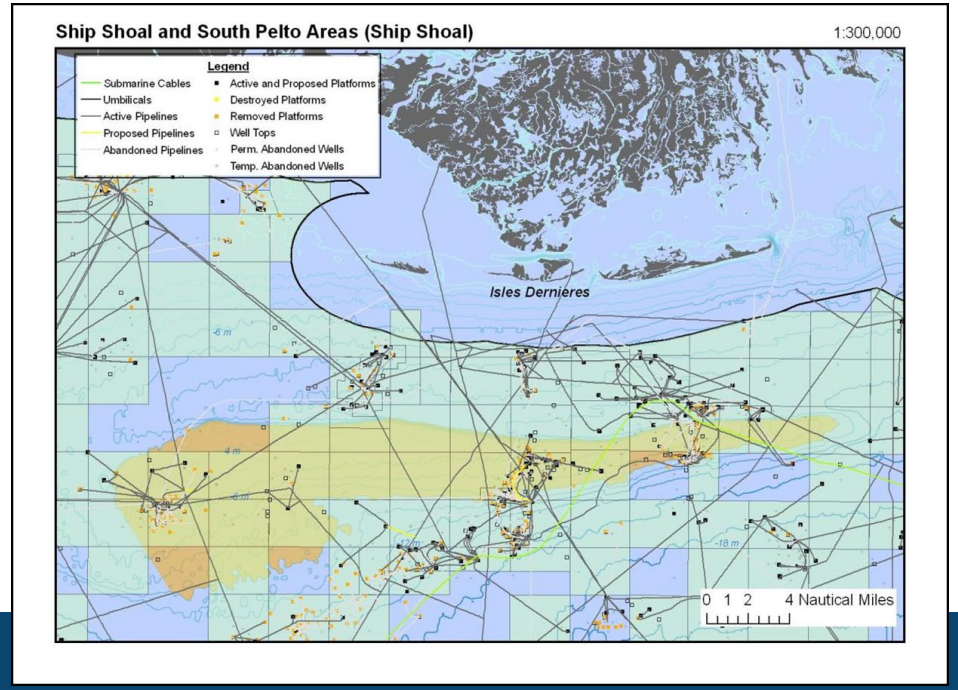
Work Plan Stipulations Examples

- **No Airguns/Sparkers** are proposed for use.
- Chirp or boomer sub-bottom profiler, including hydrophone array (with boomer only), **operated at ≤205 dB rms Sound Pressure Level (SPL) and lower than 180 kHz**
- Magnetometer, Bathymetric multibeam or interferometric transducer, Side-scan sonar or acoustic backscatter from multibeam (towed or mounted) or interferometric swath side-scan sonar, **operated >180 kHz**
- NMFS certified **PSO's Required**
- Historic and pre-contact site **avoidance and reporting** requirements
- Nighttime surveying and **passive acoustic monitoring** protocol

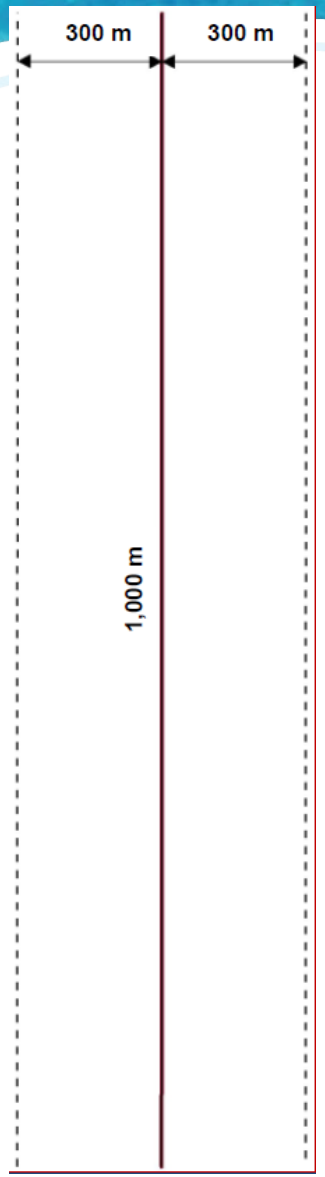
Multiple-Use Conflicts

Gulf of Mexico: Managing Multiple Uses

- Sediment is extremely scarce where needed most in the Gulf of Mexico
- **Every Gulf of Mexico Region OCS-identified borrow area has pipeline conflicts (usually multiple)**
- Oil and gas infrastructure obstructs access = higher costs to projects
- Significant OCS sediment resources policy developed: BOEM must proactively manage resources to ensure availability



Impact of Pipeline Buffers



- Volume and value of sand unavailable based on 1,000-meter pipeline
  - It will occupy 1,000 x 600 sq. meter = 600,000 sq. meter of significant sediment resources area
  - It will prevent access to about 600,000 x 3 meter (thick) = 1,800,000 sq. meter **or** 1.8 MCM/2.4 MCY of sediment
  - Average economic value of sediment – $21 per meter cubed
  - Economic value of 1.8 MCM – ~$37.8 million

Courtesy of Syed Khalil, Louisiana CPRA (2019)

Activities in Significant OCS Sediment Resources

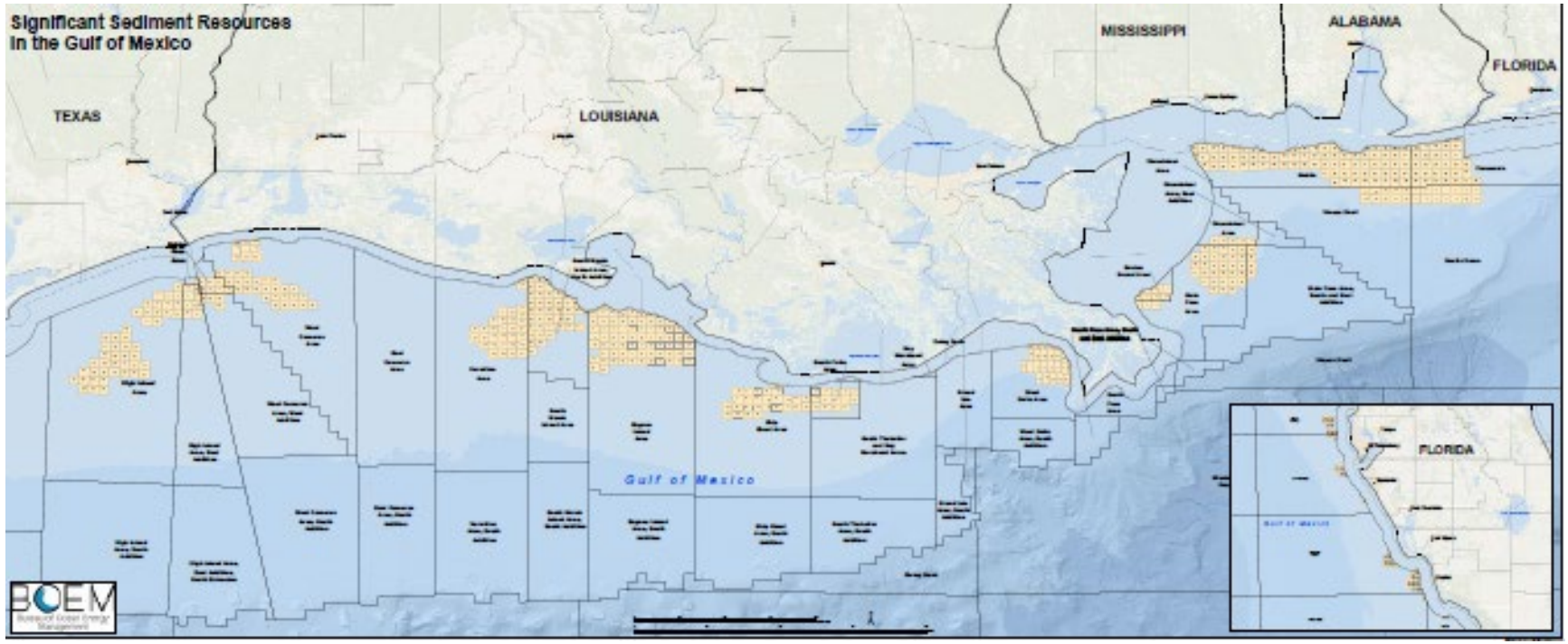
- **Marine Minerals Program review requests for activities (ie..pipeline decommissioning) in areas which may contain significant sediment resources.**
- **Consider existing permanent obstructions (e.g., active or plugged and abandoned wells)**
- **Consider best available geologic/geophysical and sediment dynamics data (centralized database → MMIS)**
- **Coordinate with State geologists to ensure consistent guidance in BOEM vs State CZMA reviews**
  - Texas does not currently have enforceable policies for sand.
- **Provide recommendation to the BSEE**

Designation of Significant Sediment Resource Areas(SSRA)

- Data collected through National Sand Inventory initiative and cooperative agreements with States determine areas of significant reserves of surface and shallow subsurface mineral deposits.
- BOEM designates these areas as Significant OCS Sediment Resource Areas (SSRAs).
- Full list available: https://www.boem.gov/marine-minerals/managing-multiple-uses-gulf-mexico

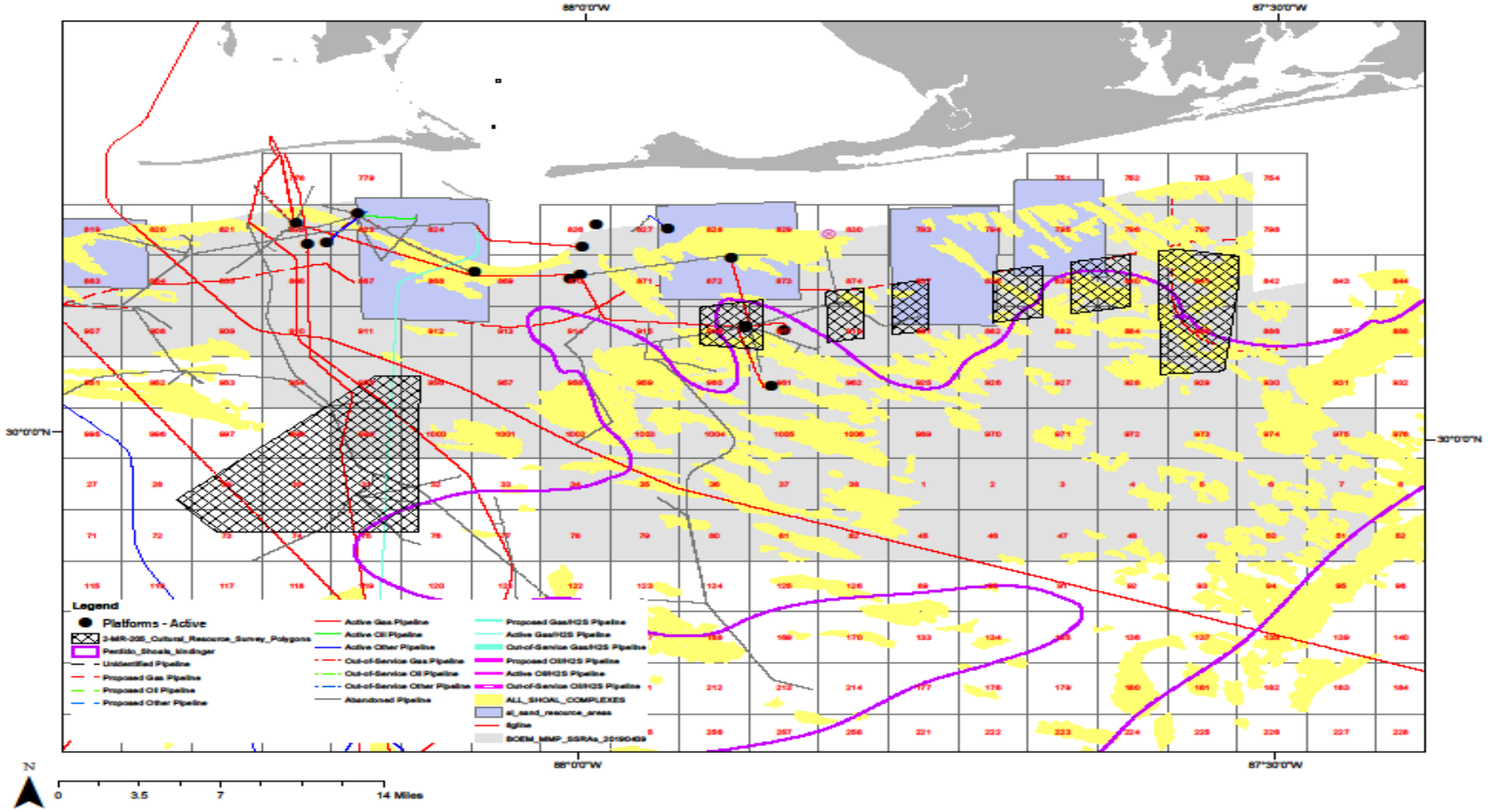
Significant Sediment Resource Area Updates

- 650+ OCS blocks are flagged as SSRAs.
- There have been four SSRA updates since 2014.
- Anticipating a Texas OCS update to incorporate new potential resources.



Other of Conflicts of Use

- **Anchorage Basins, Artificial Reefs, Cables, Aquaculture, Renewables...**



How do you ensure your OCS projects are successful?

- Engage BOEM early, even if the borrow area is not determined.
- Budget time and coordinate with BOEM to ensure an efficient G&G activity review.
- Texas is a priority for BOEM, let us know about needs and data gaps.
- To ensure availability of resources, Texas SSRAs should be updated.
- CZMA enforceable policies updated to include sand resources.

BOEM

Bureau of Ocean Energy Management

BOEM.gov

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Conflict Resolution in Managing Offshore Sediment for Multiple Use

Beth Forrest

Conflict Resolution in Managing Offshore Sediment for Multiple Use

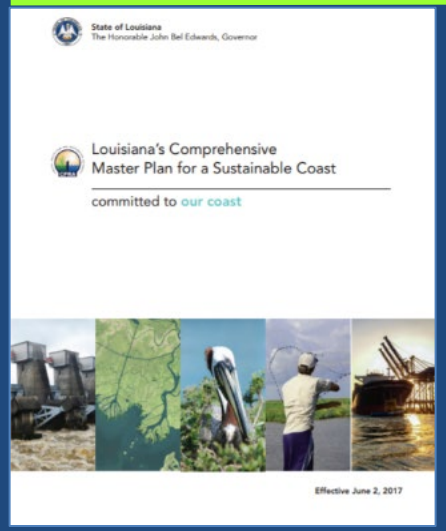
Syed Khalil, Beth Forrest, & Ed Haywood

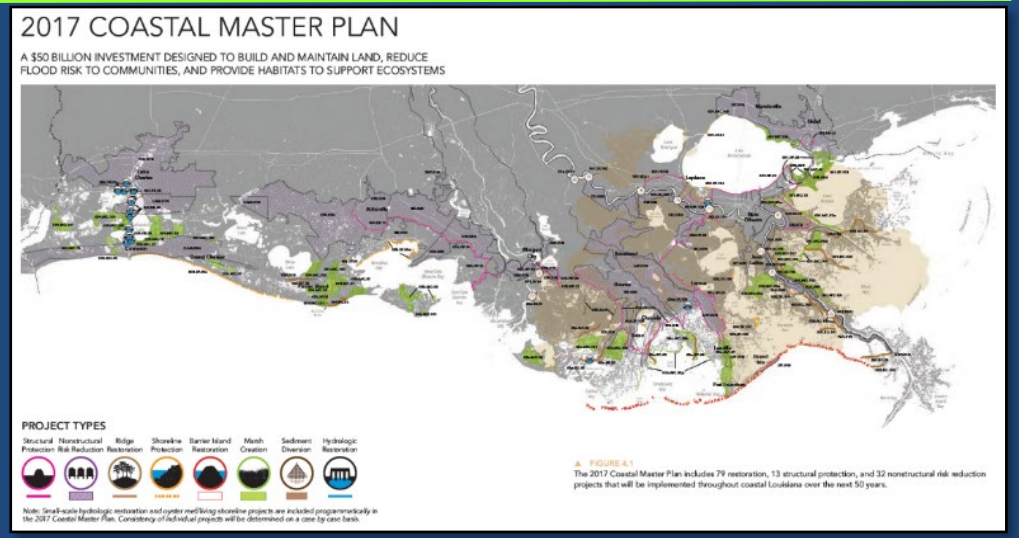
GLO Sediment Workshop

November 10, 2021

Building, maintenance, and dissolution of the coastal landscape is primarily a mass-balance between sediment input and accommodation space created due to various natural and anthropogenic causes (Khalil et al. 2018a)

MITIGATION AND COASTAL MASTER PLAN (CMP 2017)





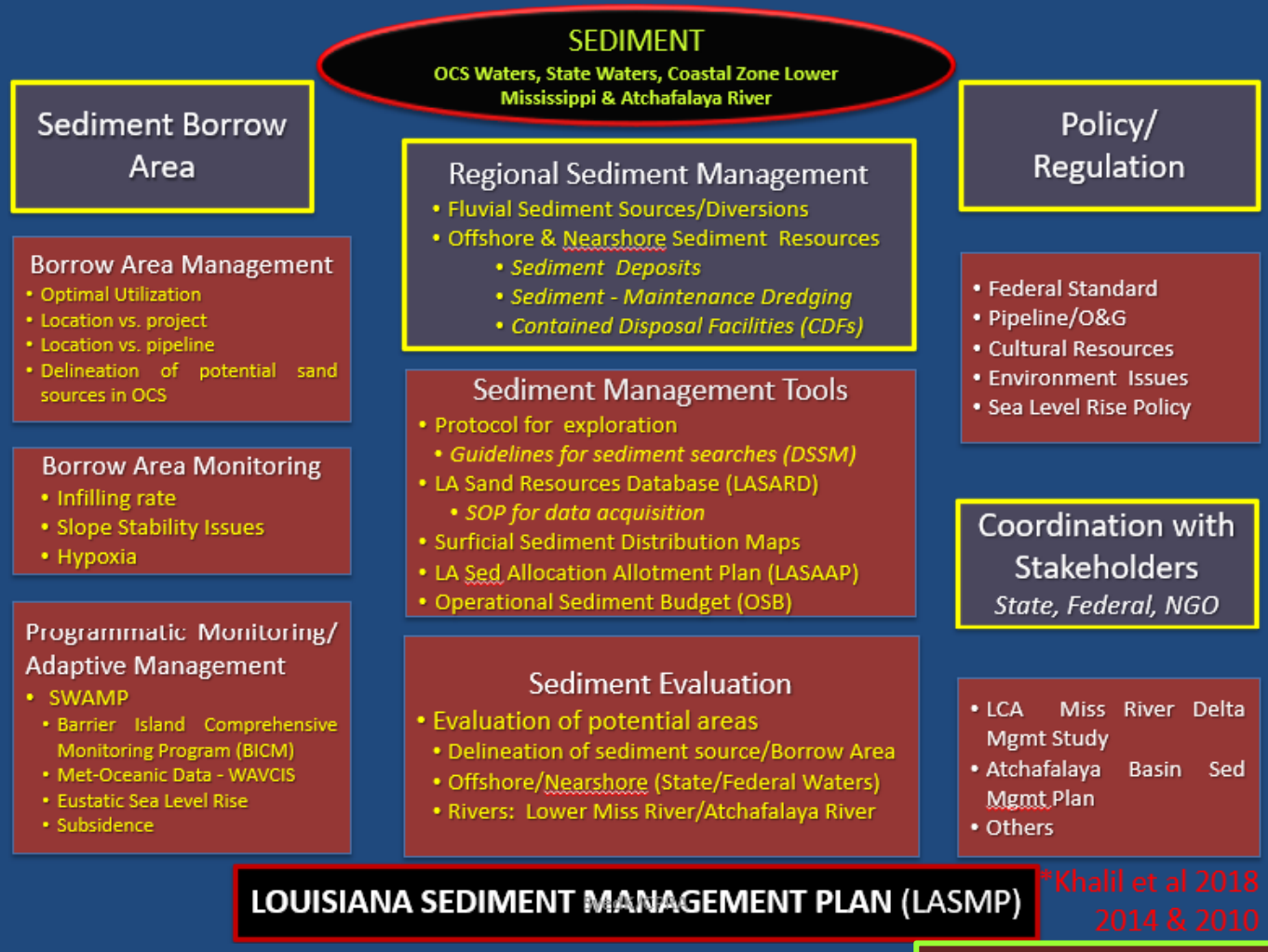
- 124 projects to build/maintain 800 mi^2 of land over next 50 years
- Near Term Sediment Need (next 5 years) = 148 -160 MCY
- Short term sediment need (next 10 -15 years) = 1.5-1.8 BT*
- Long Term Sediment Need (next 50 years) = 16-28 BT *
- Land loss = Sediment Loss
- Common thread = Sediment-Infusion/Emplacement
- Sedimentological Restoration needs Sediment Management

**1st order approximation*

CPRA , 2017;
Killebrew & Khalil 2018

LOUISIANA SEDIMENT MANAGEMENT PLAN (LASMP)

- LASMP is a framework for sediment management in LA which identifies and inventories all proven and potential sediment resources
- The initial frame work was adapted early on for LA need and hasn't changed much
- LASMP helps manage sediment resources efficiently & cost effectively
- The overarching goal is to enhance the ability to make informed management decisions for an *environmentally effective* and *economically feasible* restoration strategy
- Acts as a tool for identifying and minimizing conflict in usage of suitable sediment resources



*Khalil et al 2018 2014 & 2010

Khalil et al, 2020 & 2018; & 2010
Khalil & Freeman 2014

DELTA SAND SEARCH MODEL (DSSM) - *LASMP & ITS TOOL*

GUIDELINES FOR EXPLORATION FOR FLUVIAL AND OFFSHORE SEDIMENT *(UPDATED 2019)*

GENERAL GUIDELINES:
EXPLORATION FOR SEDIMENT RESOURCES FOR COASTAL RESTORATION

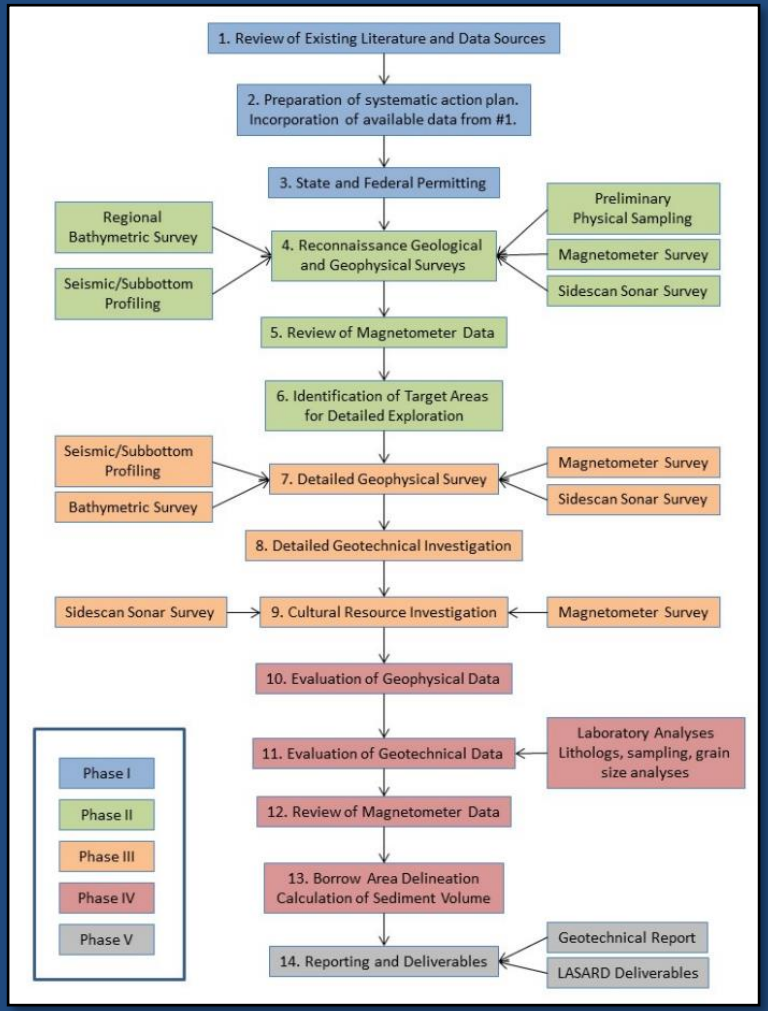
COASTAL PROTECTION AND RESTORATION AUTHORITY
CPRA

Recommended Citation

Khalil, S.M., 2019. *General Guidelines: Exploration for Sediment Resources for Coastal Restoration*. Baton Rouge, LA: Coastal Protection and Restoration Authority. Version_VIII.pdf

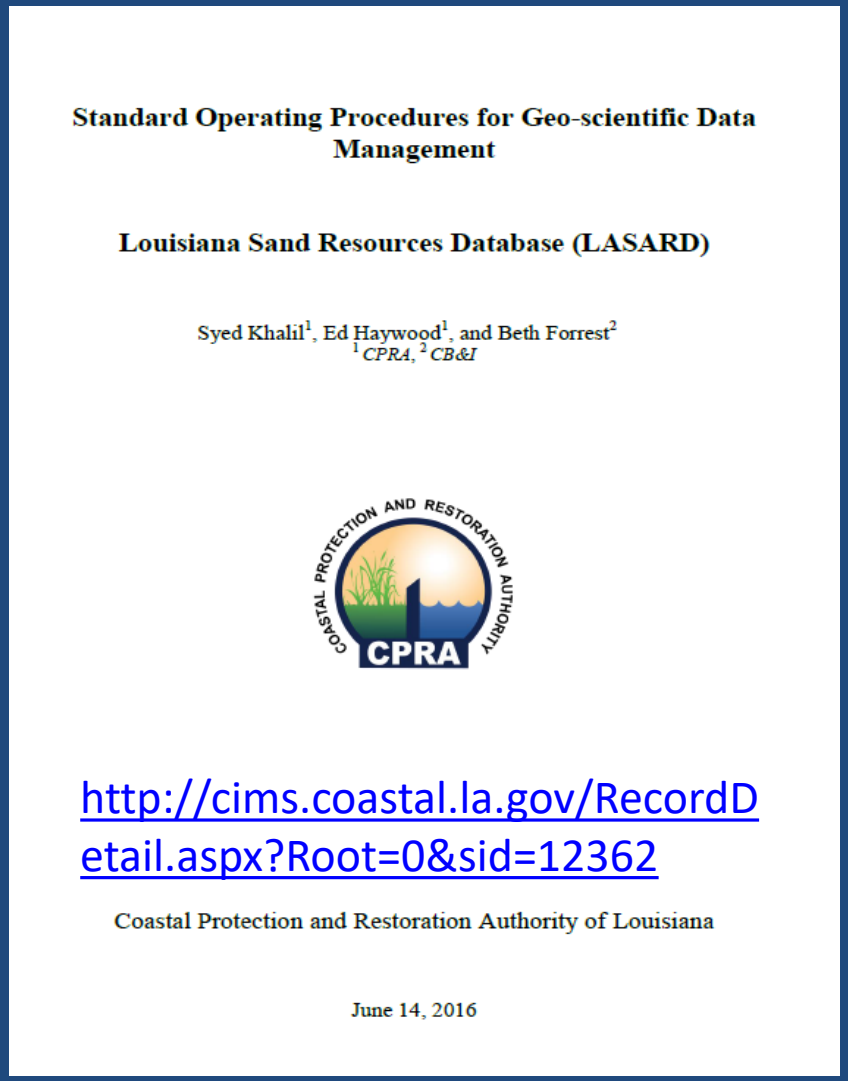
http://cims.coastal.louisiana.gov/RecordDetail.aspx?Root=0&sid=1034

- DSSM/Guideline: first tool developed for implementation of LASMP
- **Adapted** mainly for sediment investigation in sedimentologically complex deltaic environment
- **General guidelines** for sediment searches developed for cost-effective, comprehensive, flexible, systematic sediment investigation
- **Phased Approach** with initial reconnaissance-level geophysical surveys and geotechnical investigations to identify target areas
- Followed by detailed investigation and cultural resource investigations
- **Flexible** - changes made in the field on basis of data as it becomes available



LOUISIANA SAND RESOURCES DATABASE (LASARD) - *LASMP & ITS TOOL*

- **Conceptualized & Initiated** in 2003 and is the most important tool for implementation of LASMP
- **Manages, archives and maintains** geological, geophysical, geotechnical and other related data related to the sediment resources exploration on GIS
- **Centralizes** relevant data from various sources for better project coordination and future planning for delineation and utilization of sediment resources
- **Archives** relevant data including:
  - CPRA historic and current project data
  - Data collected through the state's regional monitoring, programs (SWAMP, BICM, CRMS)
  - Legacy data by other federal, state and local sources



Standard Operating Procedures for Geo-scientific Data Management

Louisiana Sand Resources Database (LASARD)

Syed Khalil[1], Ed Haywood[1], and Beth Forrest[2]
[1] *CPRA*, [2] *CB&I*

http://cims.coastal.la.gov/RecordDetail.aspx?Root=0&sid=12362

Coastal Protection and Restoration Authority of Louisiana

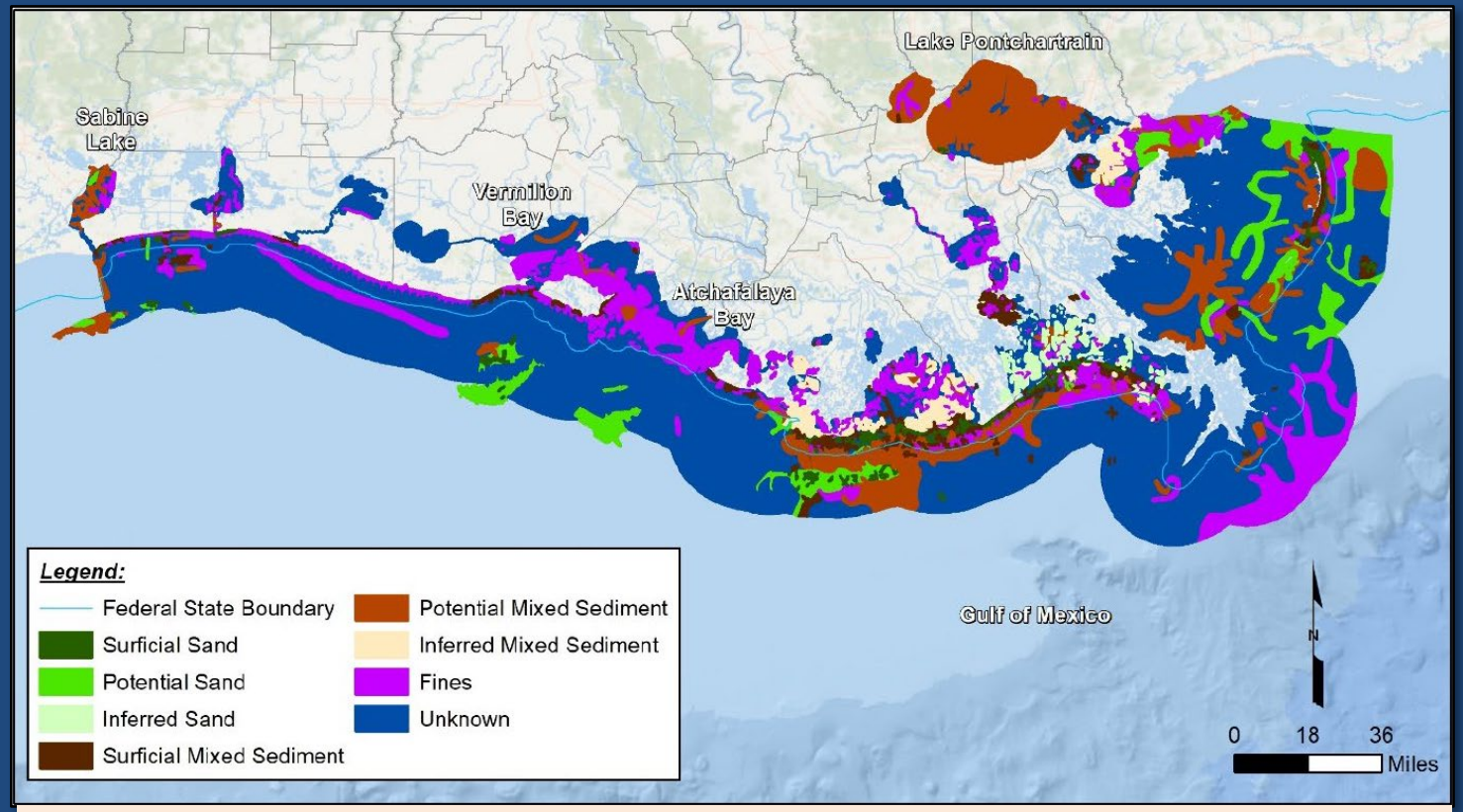
June 14, 2016

3,000+ DATASETS IDENTIFIED, REVIEWED, FORMATTED:

- ADCP
- Bathymetry (single & multi-beam)
- Topography
- Magnetic Anomalies
- Geophysical data/Tracklines
- Sidescan Sonar (mosaics & contacts)
- Sediment Samples (vibracores & grab samples)
- Shipwrecks/Cultural Resources
- Isopach
- Infrastructure (oil/gas)
- Deposits/Borrow Areas
- DETAIL ATTRIBUTE TABLES ARE DEVELOPED FOR FORMATTING THE DATA FOR UPLOAD

SURFICIAL SEDIMENT DISTRIBUTION (SSD) MAP - *LASMP & ITS TOOL*

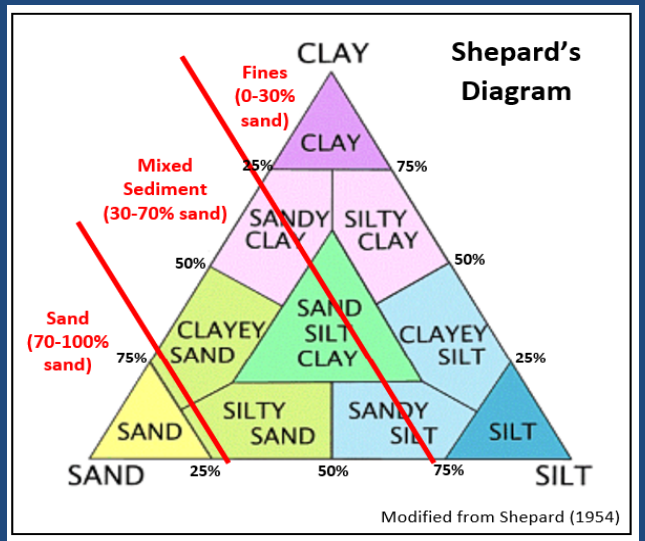
- Developed as planning tool for CMP from sediment/acoustic data in LASARD
- Map showing *Sand, Mixed Sediment, Fines, & Unknown* in offshore/LMR (*nomenclature modified slightly)*
- 1st order volume estimates for sediment
- State & Federal Regulations
  - Enforcement of the CZM Program
  - Basis of delineation of federal regulations
  - Helpful in BOEM's offshore Significant Sediment Resource Areas (SSRAs)
  - Helps in decision for removal/or otherwise of decommissioned P/L
- Tool for data gap analyses
- Tool for habitat mapping
- Living Document – updated annually

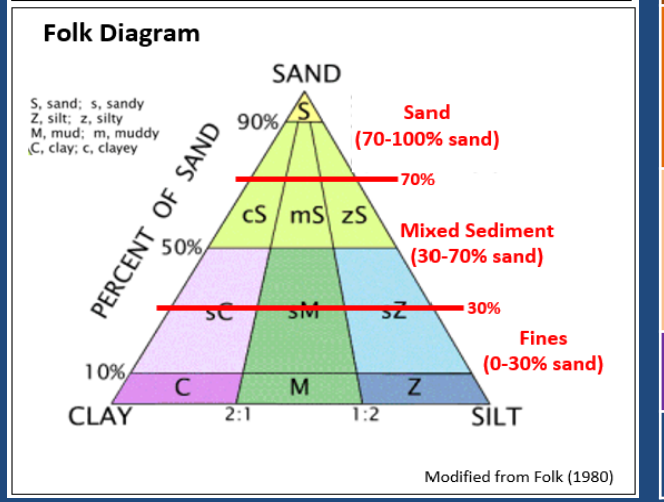


https://cims.coastal.louisiana.gov/RecordDetail.aspx?Root=0&sid=24126

Forrest et al 2019; Khalil et al 2018 a & b,

SEDIMENT TYPES FOR RESTORATION PURPOSES IN LOUISIANA

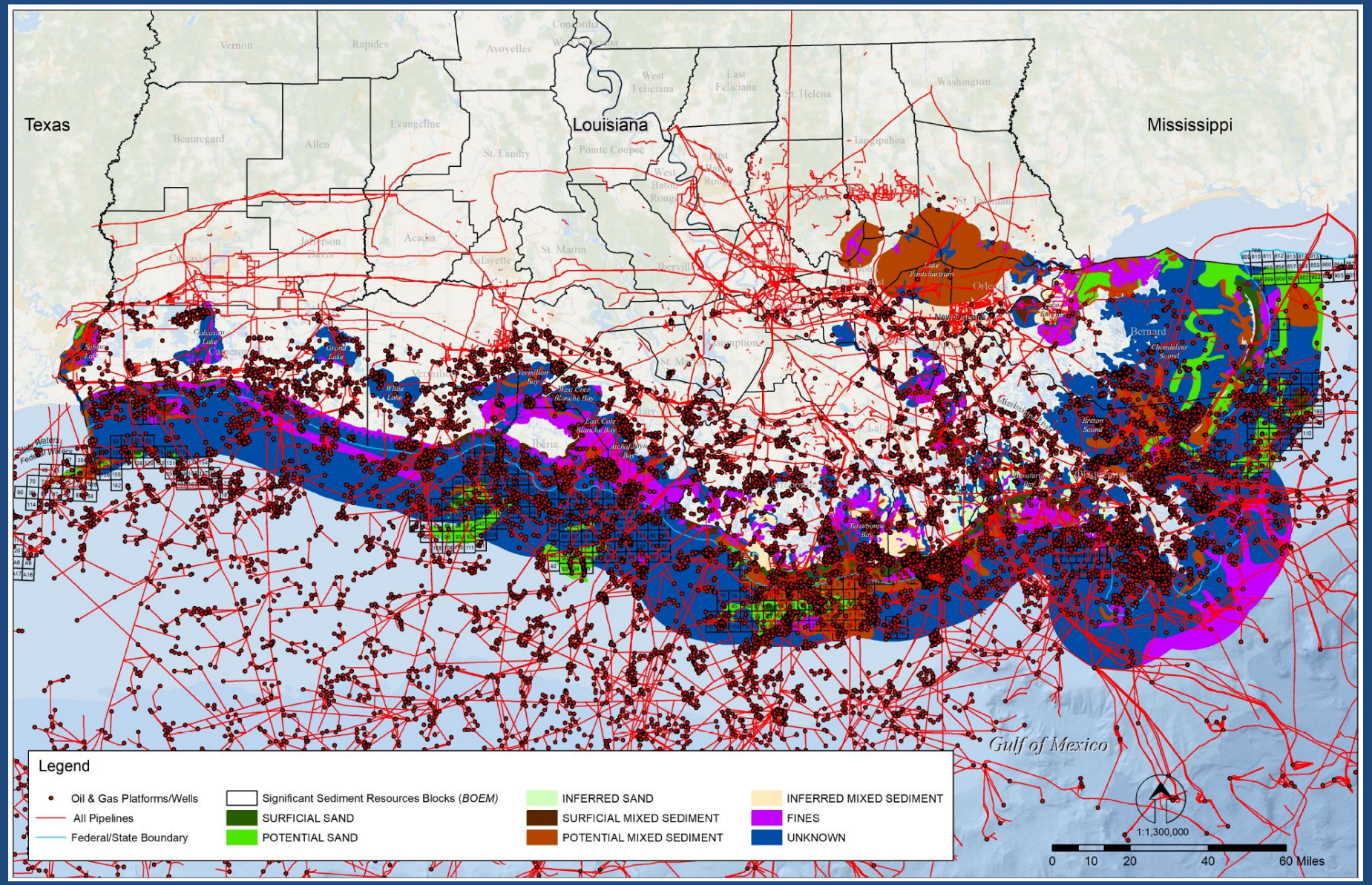




SAND	Sediment comprised predominantly (70-100%) of sand with <30% fines
Surficial Sand	Surficial sand deposit delineated based on data spaced <1 mi apart
Potential Sand	**Sand deposit delineated based on data spaced > 1 mi apart**
Inferred Sand	**Sand deposit delineated on acoustic data NOT ground-truthed**
MIXED SEDIMENT	**Mixture of (30 -70 %) sand with remaining fractions made up of fines (silt/clay)**
Surficial Mixed Sediment	**Mixed sediment deposit delineated based on data spaced < 1 mile apart**
Potential Mixed Sediment	**Mixed sediment deposit delineated based on data spaced > 1 mile apart.**
Inferred Mixed Sediment	**Mixed sediment deposit delineated on acoustic data NOT ground-truthed.**
FINES	**Sediment comprised predominantly (70 – 100 %) of silt/clay with <30% sand**
UNKNOWN	**Very limited or no data to make a meaningful interpretation**

- CMP's objective of building land cannot be accomplished by using sand only which is limited
- Mixed sediment is "low grade sand" preferred for constructability/predictability of marsh platform and should be given same weightage/importance as sand

SSD MAP WITH PIPE LINES: *INACCESSIBLE SEDIMENT RESOURCES*



The requirement of a buffer of 1000 feet on both side of any P/L reduces considerably the sediment-quantities for dredging

Khalil et al 2018a

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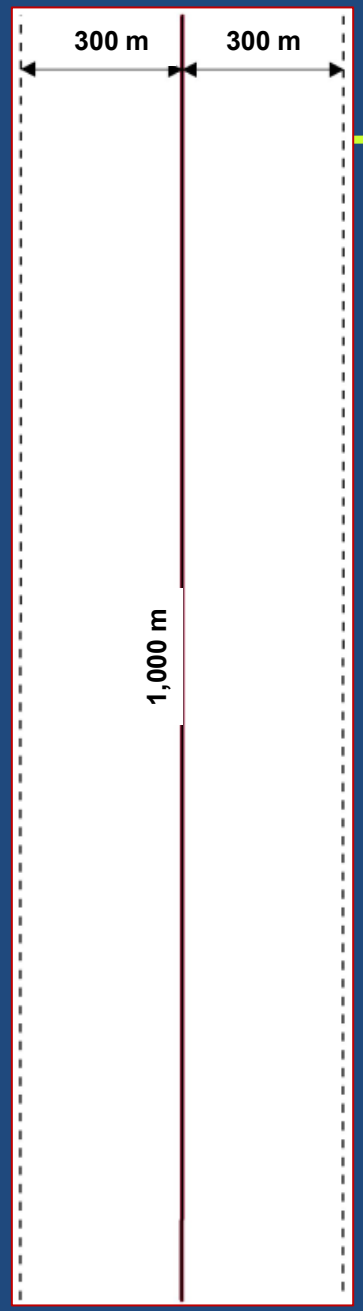

IMPACT OF PIPELINE BUFFERS : *reduction in sediment volume*

- Volume of sediment resources rendered inaccessible by a 1 km (.6 mi) long abandoned pipeline = ~ 1.8 MCM/2.4 MCY
- 2.4 MCY of sand may restore 1.2 – 1.5 miles of barrier island
- 2.4 MCY of mixed sediment may build ~170 acres of 3 feet thick marsh platform
- The requirement of safety buffer of 1000 feet on each side of a pipeline (P/L) reduces the availability of sediment for restoration = ~29%
- By removing decommissioned P/L, ~636 MCY of sand (318 mi of BI can be restored) & ~927 MCY of mixed sediment (103 sq. mi of marsh platform) becomes accessible (2020 data)

Assumptions

- It will occupy 1,000 X 600 m = 600,000 m^2 of significant sediment resources area
- It will prevent access to about 600,000 m^2 x 3 m (thickness) = 1,800,000 m^3 = 1.8 MCM/ 2.4 MCY of sediment
- Average emplacement cost of 1 m^3 of sand = ~$21
- Economic value of 1.8 MCM sand (@1 m^3 = ~$21) = ~$37.8 million
- Economic value of 1.8 MCM/2.4 MCY mixed sediment = ~ $18 million
- 1.6 MCY (300 cy/ft) to 2 MCY (400 cy/ft) sand may restore 1 mile of barrier island
- Average emplacement cost of 1 m^3 of mixed sediment = ~$10

Khalil et al 2018 a & b, 2010

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Agencies and stakeholders have different missions which makes multiple use of resources and stakeholder engagement more challenging/complicated

STAKEHOLDER ENGAGEMENT - MANAGING MULTIPLE USES

- Laying new pipelines - (BSEE, BOEM, LDNR, CPRA, Oil Companies)
- Abandoning wells or drilling new wells - (BSEE, BOEM, LDNR, CPRA, Oil Companies)
- Navigation dredging conflicts in LMR borrow areas - (USACE; USCG; River Pilot; CPRA)
- Windfarms – infrastructures/connecting cables (BOEM, LDNR, CPRA, WF Companies)
- Removal or granting waiver from removal of decommissioned pipeline in offshore Louisiana - (BSEE, BOEM, LDNR, CPRA, Oil Companies)

Stakeholders must work together to resolve conflicts

CPRA & LDNR	BOEM & BSEE	USACE & USCG	Oil &Gas Industry
Restore & Protect Coast; Regulatory	OCS Minerals Oil & Gas Industry	Maintenance Mississippi River	Production (National Security & Royalties)
Limited Sediment	Balance Multiple Use	Navigation & Regulatory Flood Control	Significant Site Investigations

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CONFLICT RESOLUTION: EXAMPLE OF DECOMMISSIONED PIPELINE - REMOVAL OR ABANDONMENT-IN-PLACE

Application for decommissioning

- **Application for decommissioning** *(by removal or abandonment-in-place)* of a pipeline segment by oil & gas company is submitted to BSEE

Compliance Review

- **BSEE engages BOEM** to review for **compliance with NEPA and OSCLA** *(e.g. how the action may impact mineral resources in identified SSRAs which includes analysis of best available geologic and geophysical data, density of infrastructure, and evaluation of other potential uses of the OCS)*

Consistency Determination

- Concurrently, a State "**consistency determination**" and an application is made by the oil company to LDNR *(lead state regulatory agency)*

CPRA review for sediment source protection

- **LDNR engages CPRA** *(lead state agency responsible for restoration)* to review related to **sediment resource protection**

A balancing act – CPRA's approach is always conservative realizing the value of oil and gas industries in nation's economy – *(1) consultation of geological/geophysical reports; (2) SSD maps; (3) restoration plan; (4) density of pipelines; (5) presence of oil and gas infrastructure, wellheads, etc.*

FINAL THOUGHTS…

- Sediment is survival
- "Restoration quality sediment" is limited
- Oil and gas infrastructure obstruct access to sediment resulting in higher costs for coastal restoration projects
- A *decommissioned P/L, abandoned-in-place,* renders the surrounding sediment inaccessible
- Sediment Management in Louisiana has graduated from resource management to resolve conflicts via stakeholder engagements *(with diverging interest and missions)*
- The process developed over the years amongst various stakeholders for resolving conflicts in competitive uses of seafloor resources is a balancing act and has been effective

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CPRA
Coastal Protection and Restoration Authority of Louisiana

THANKS

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An Objectives-Orientated Approach to Regional Sediment Management: the Louisiana Barrier Island System Management (BISM)

Soupy Dalyander

AN OBJECTIVES-ORIENTATED APPROACH TO REGIONAL SEDIMENT MANAGEMENT: THE LOUISIANA BARRIER ISLAND SYSTEM MANAGEMENT (BISM)

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Water Institute Contributors: Alyssa Dausman, Ioannis Georgiou, Lauren Grimley

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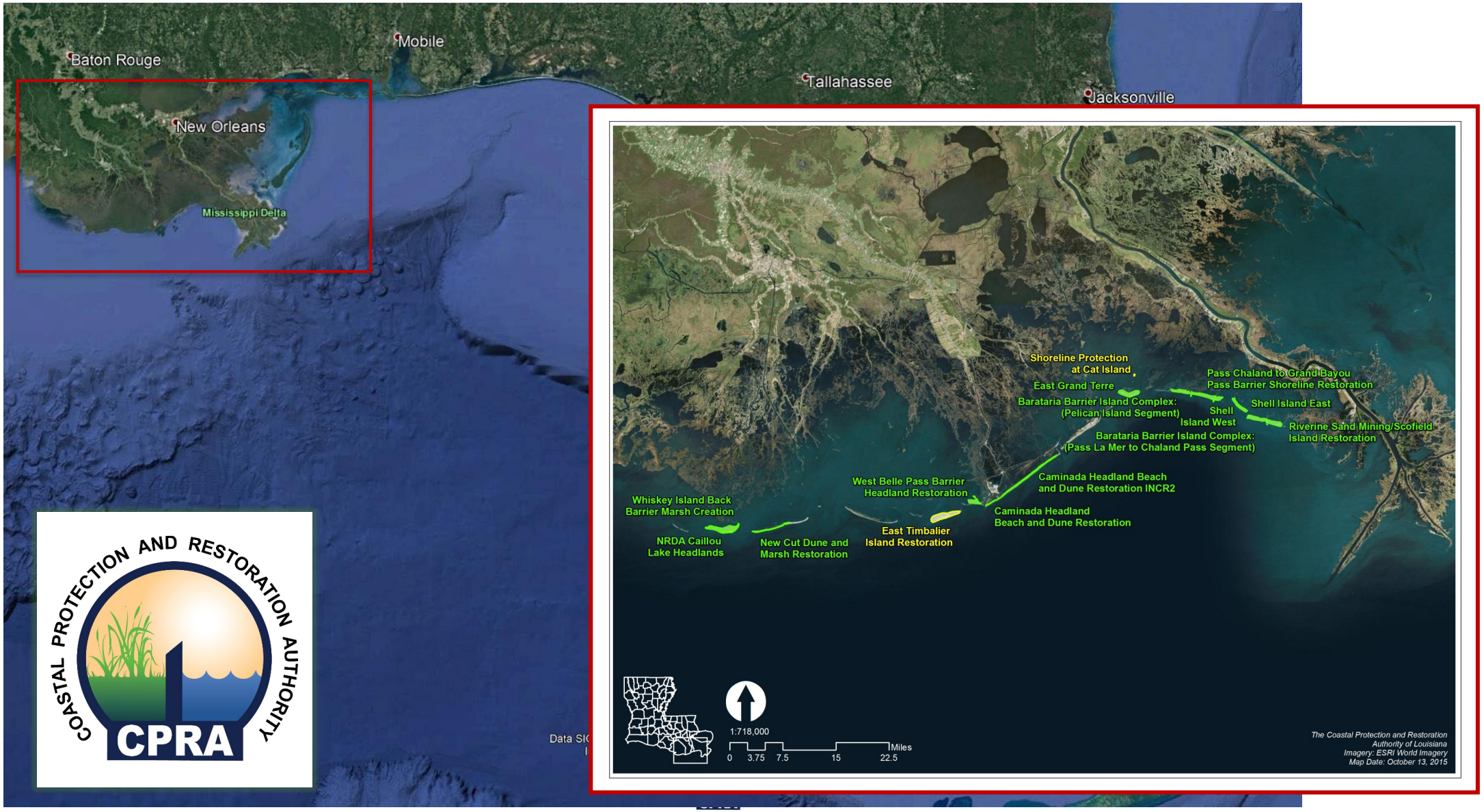
[1]The Water Institute of the Gulf

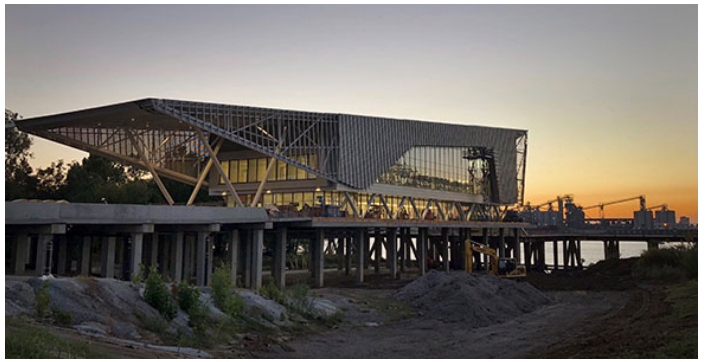
[2] Louisiana Coastal Protection and Restoration Authority

LOUISIANA BARRIER ISLAND RESTORATION



BISM FRAMEWORK DEVELOPMENT

- **Co-production approach:** working group of ~10 people composed of representatives from CPRA and scientists familiar with Louisiana coastal system and barrier island dynamics
- Focus on how to best incorporate science and system understanding into a holistic **adaptive management** approach (project prioritization and **regional sediment management**)
- Input from:
  - Five working group sessions (two in-person, three virtual)
  - One-on-one and small group calls
  - Desktop research into available data/model output and best practice



BISM GOALS AND OBJECTIVES

GOAL

A holistic, system-wide approach to barrier island management that guides *when* and *where* to focus restoration resources (funding and sediment) to **maintain barrier island integrity** as defined in the master plan, while **minimizing overall system maintenance costs** and **reducing project implementation times**.

OBJECTIVES

1. Mechanism to prioritize projects that provide the greatest value on a long-term, system-wide scale.
2. Maximize cost benefits and delineate expected future costs to inform planning and budgeting.
3. Employ and advance Regional Sediment Management (RSM) practices to reduce overall sediment need and delineate expected future need
4. Incorporate adaptive management into barrier island management
5. Reduce implementation time for projects

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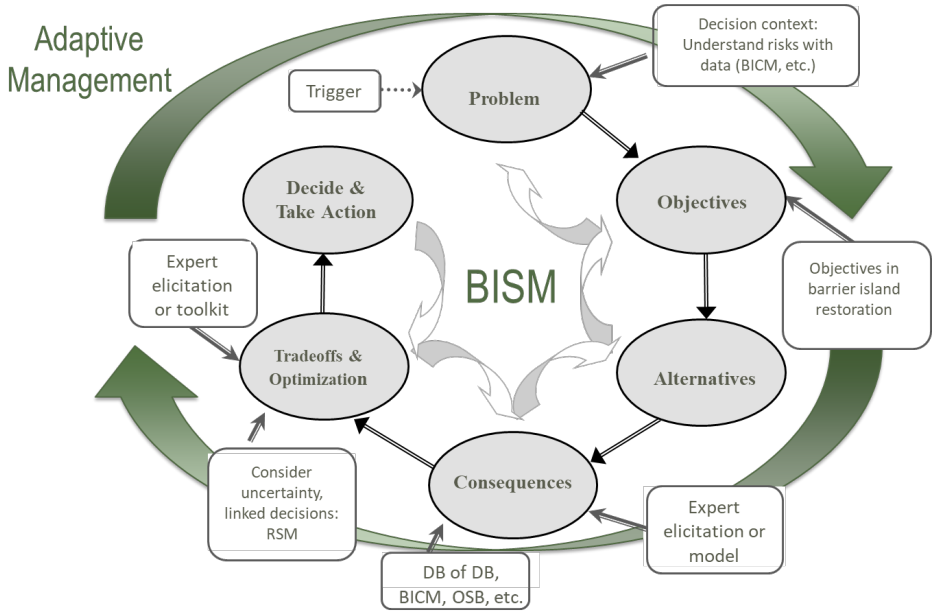
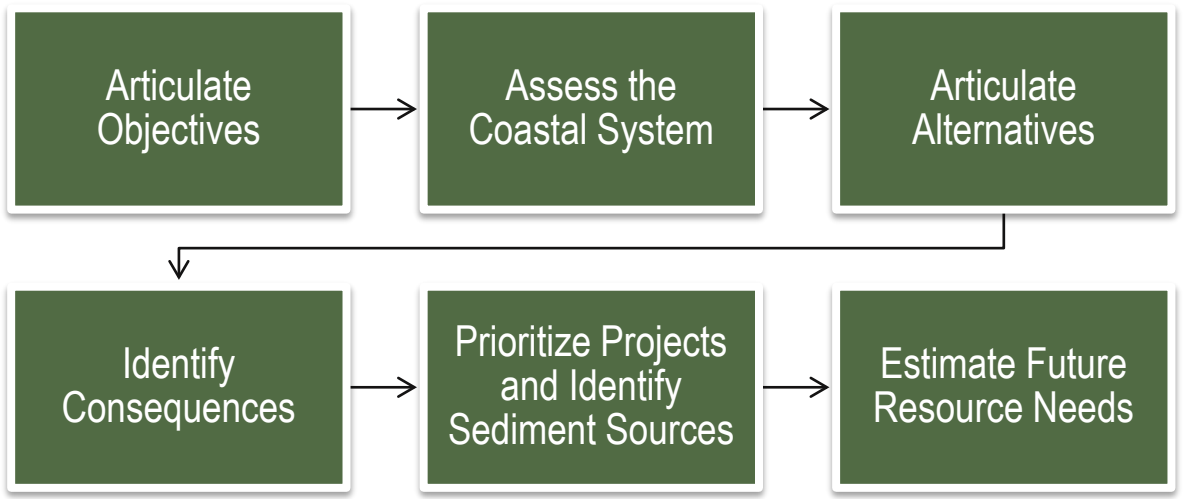
5. Reduce implementation time for projects

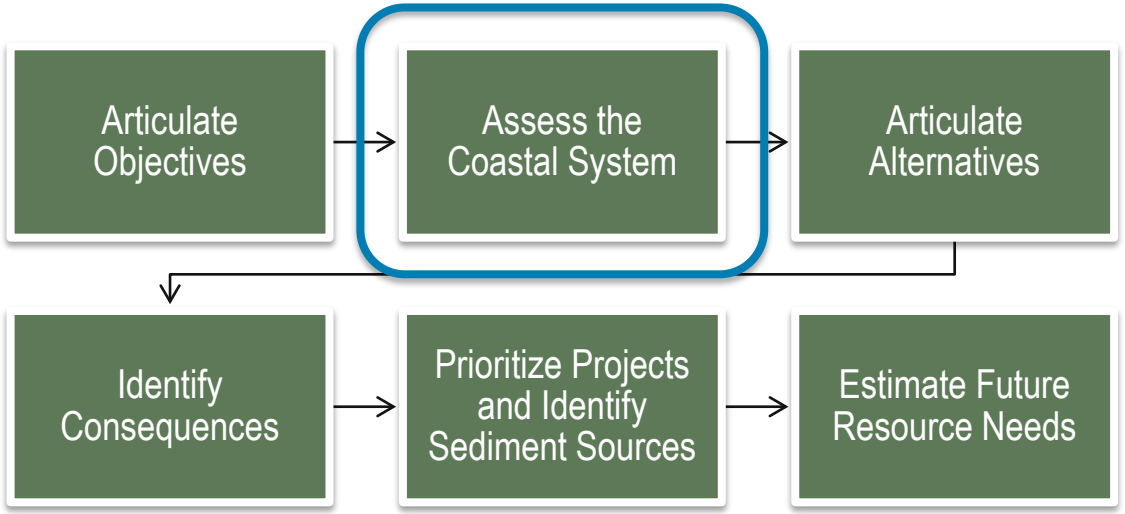
Needs: (1) Objective approach that could be implemented immediately
(2) Quantitative cost/benefit analysis toolkit for the long-term

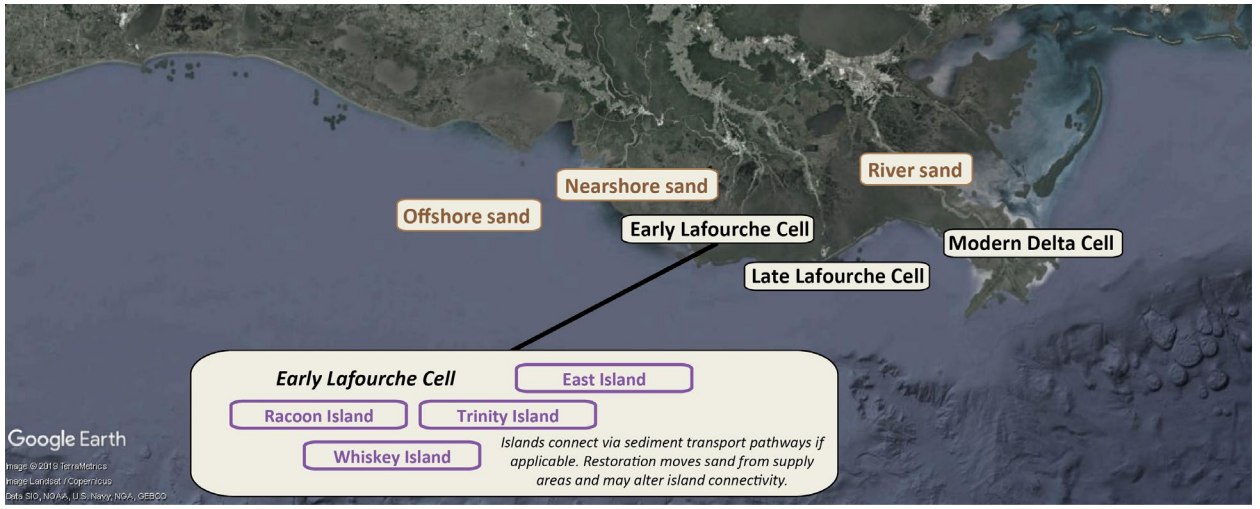
PROJECT PRIORITIZATION WORKFLOW





- Principles/process of Structured Decision Making (SDM)
- Enable future expansion to include quantitative analysis and direct leveraging of data/models in project prioritization and identification of resource needs



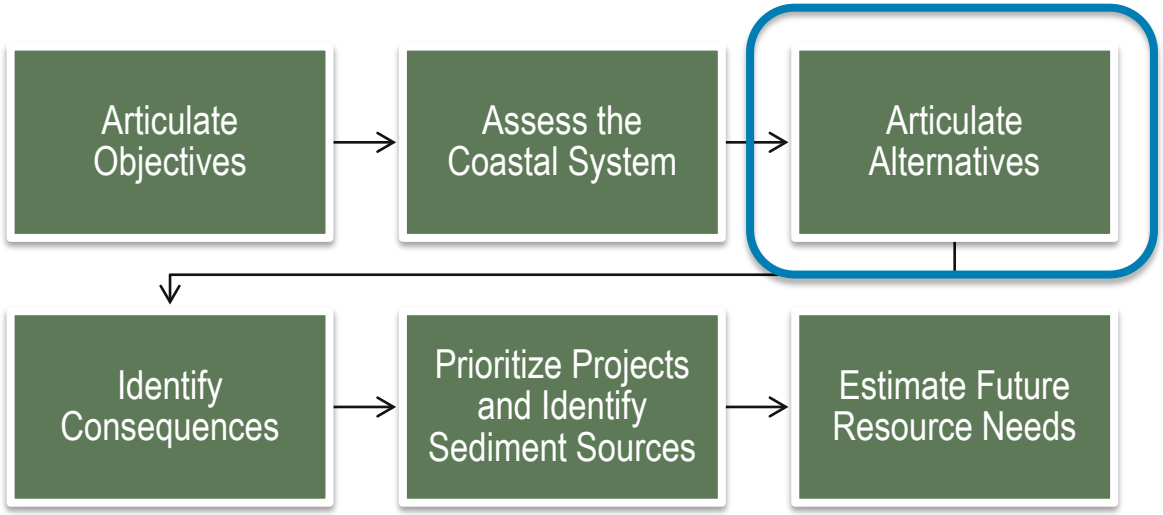


BISM Workflow

- Coast divided into coastal cells characterized through value descriptors
- Barrier islands, headlands also characterized with value descriptors
- Value descriptors are scaled from “1” (providing least value in current state) to “5” (providing most value in current state)

Coastal Cell	Basin Marsh Condition	Basin Estuary Condition	Basin Infrastructure Protection	Basin Land Loss Condition	Basin Land Loss Trajectory
Early Lafourche					
Late Lafourche					
Modern Delta					
St Bernard					

Coastal Cell	Unit	Habitat Condition	Coastal Protection Contribution	Geophysical Integrity	Trajectory	Sediment Connectivity
Early Lafourche	Raccoon Island					
	Whiskey Island					
…						



BISM Workflow

- List/database of potential restoration alternatives
- Systematic evaluation of potential options
- Includes potential sediment sources as part of RSM

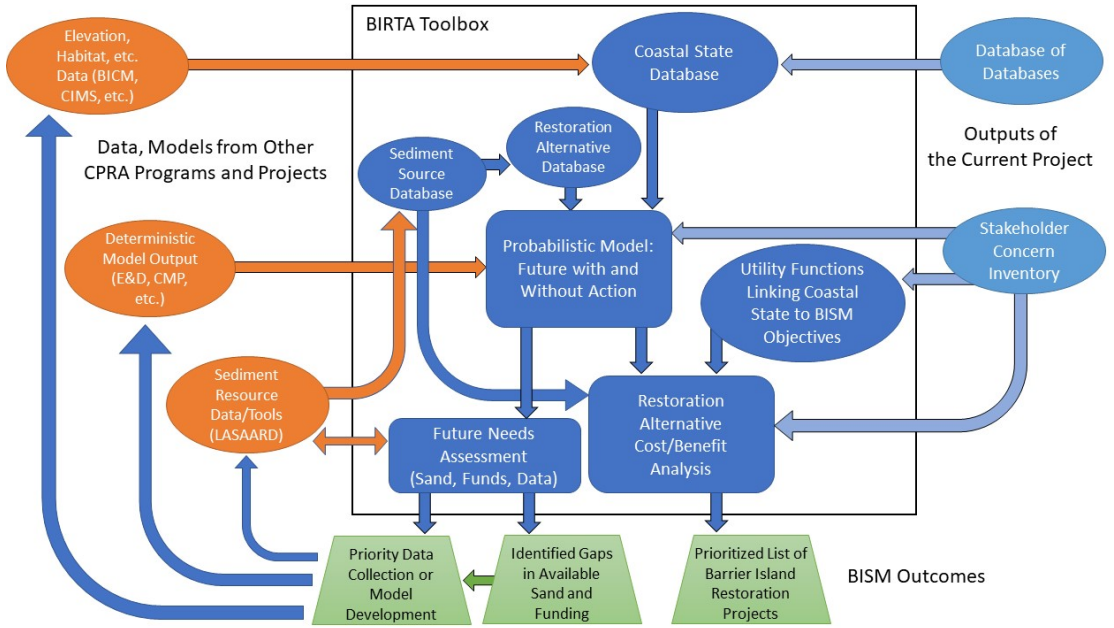
Synergistic Programs and Available Resources

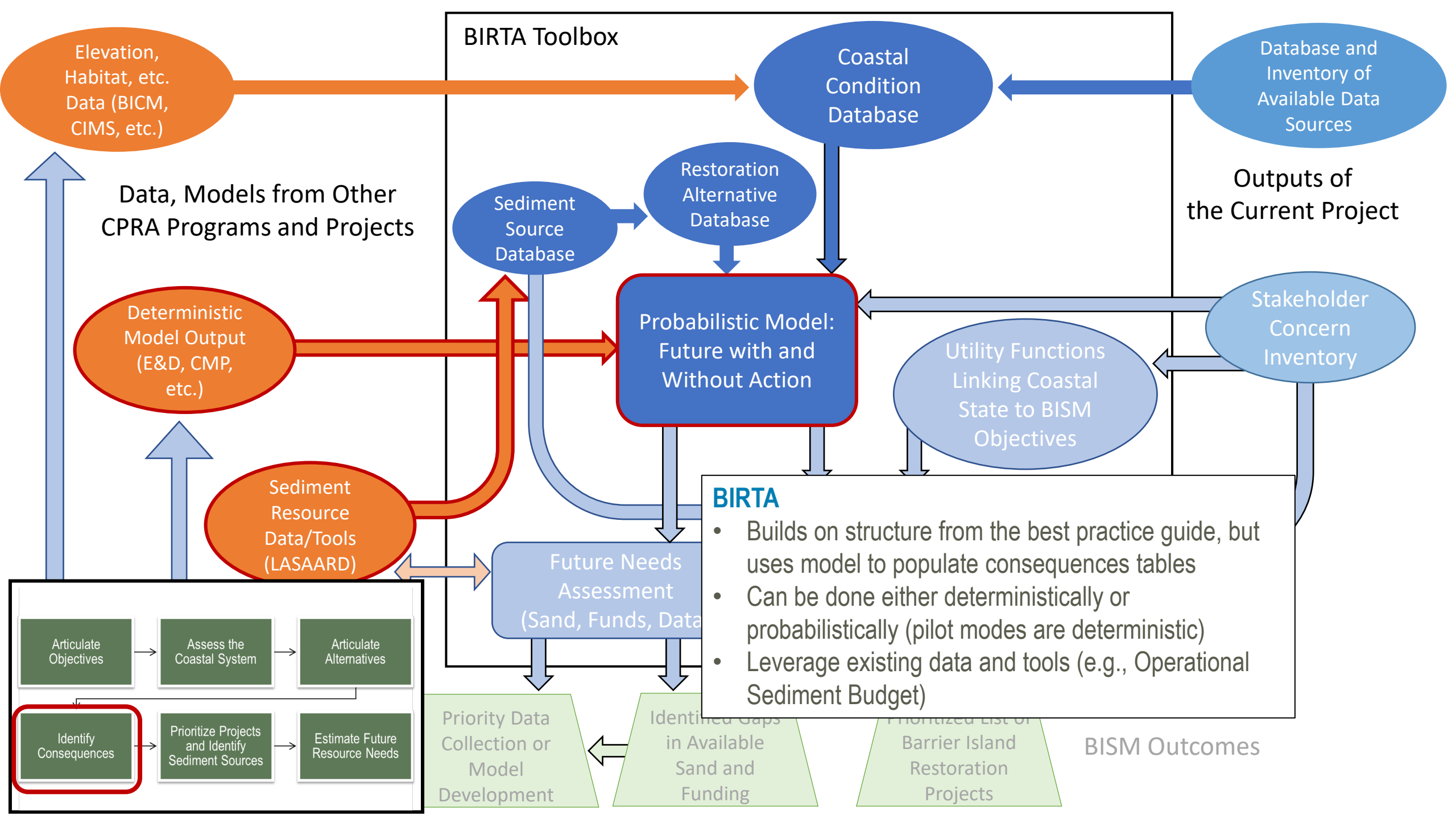
- *BISM Database of Databases,* inventory of prior restoration projects.
- Coastal Wetland Planning, Protection, and Restoration ACT (CWPPRA) Project Viewer: https://lacoast.gov/new/Projects/Default.aspx
- CWPPRA Priority Project Lists, current year and prior
- CIMS Spatial Viewer, which includes identification of projects that may have been conducted outside of CWPPRA
- Louisiana Sand Resources Database (LASARD)
- Surficial Sediment Distribution (SSD) Map (Khalil et al., 2018)
- Louisiana Sediment Availability and Allocation Program (LASAAP) (Aptim Environmental & Infrastructure, Inc. (APTIM), 2020)

Identifier	Coastal Cell	Unit	Cross-Reference to Other Projects	Cost Estimate	Sediment Volume Need Estimate	Sediment Volume Source	Land Owner	Cultural Resources	Other Considerations
WBP1	Late Lafourche	West Belle Pass							
(….)									

PROJECT PRIORITIZATION WORKFLOW

- Workflow is designed so existing data, model output, and resources can inform expert evaluation
- Quick to implement, but CPRA has a wealth of tools that can be more directly leveraged for robust planning and uncertainty analysis
- Conceptual design included for the Barrier Island Restoration Tradeoff Analysis (BIRTA) toolkit




BIRTA Toolbox
Elevation, Habitat, etc. Data (BICM, CIMS, etc.)
Coastal Condition Database
Database and Inventory of Available Data Sources
Data, Models from Other CPRA Programs and Projects
Outputs of the Current Project
Restoration Alternative Database
Sediment Source Database
Deterministic Model Output (E&D, CMP, etc.)
Probabilistic Model: Future with and Without Action
Stakeholder Concern Inventory
Utility Functions Linking Coastal State to BISM Objectives
Sediment Resource Data/Tools (LASAARD)
Future Needs Assessment (Sand, Funds, Data
BIRTA
• Builds on structure from the best practice guide, but uses model to populate consequences tables
• Can be done either deterministically or probabilistically (pilot modes are deterministic)
• Leverage existing data and tools (e.g., Operational Sediment Budget)
Articulate Objectives
Assess the Coastal System
Articulate Alternatives
Identify Consequences
Prioritize Projects and Identify Sediment Sources
Estimate Future Resource Needs
Priority Data Collection or Model Development
in Available Sand and Funding
Barrier Island Restoration Projects
BISM Outcomes

PILOT MODEL EXAMPLE: IDENTIFY CONSEQUENCES

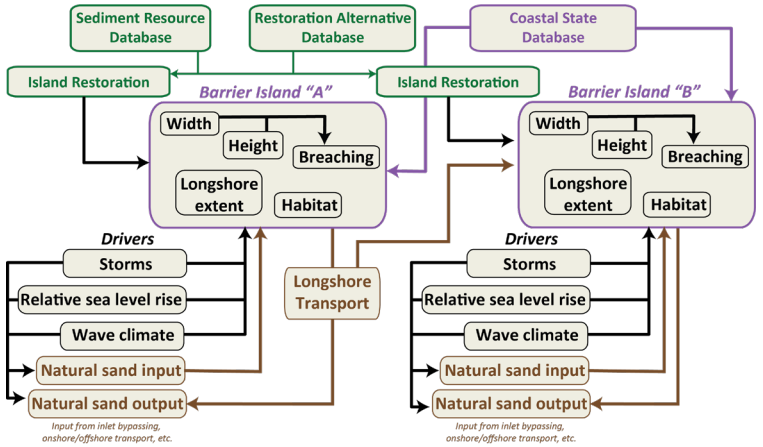
Model Inputs:

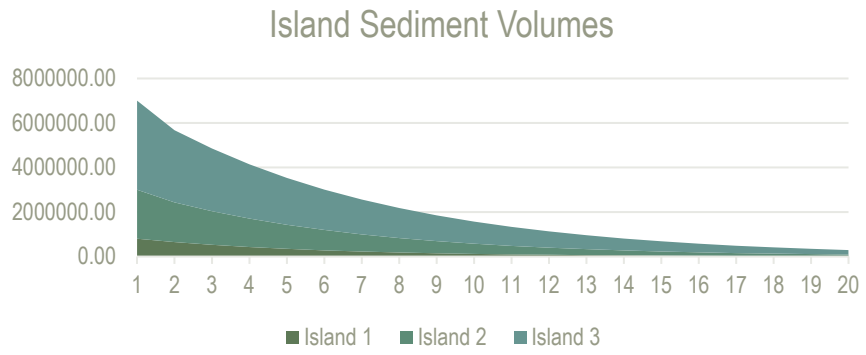
- Initial subaerial sand volume
- Initial island characteristics
- Percentage of sand volume lost from each island each year, including longshore and cross-shore sediment transport
- Fraction of sediment volume lost from an island that is captured by the downstream island
- Functional relationships distributing sediment volume gained or lost into corresponding changes in island width, etc.

Model Output:

- Subaerial sand volume over time
- Island characteristics (average height and width, etc.)

Currently uses simple assumptions, but can be updated to be probabilistic and directly data-driven





Island Subaerial Sand Volume (m^3)

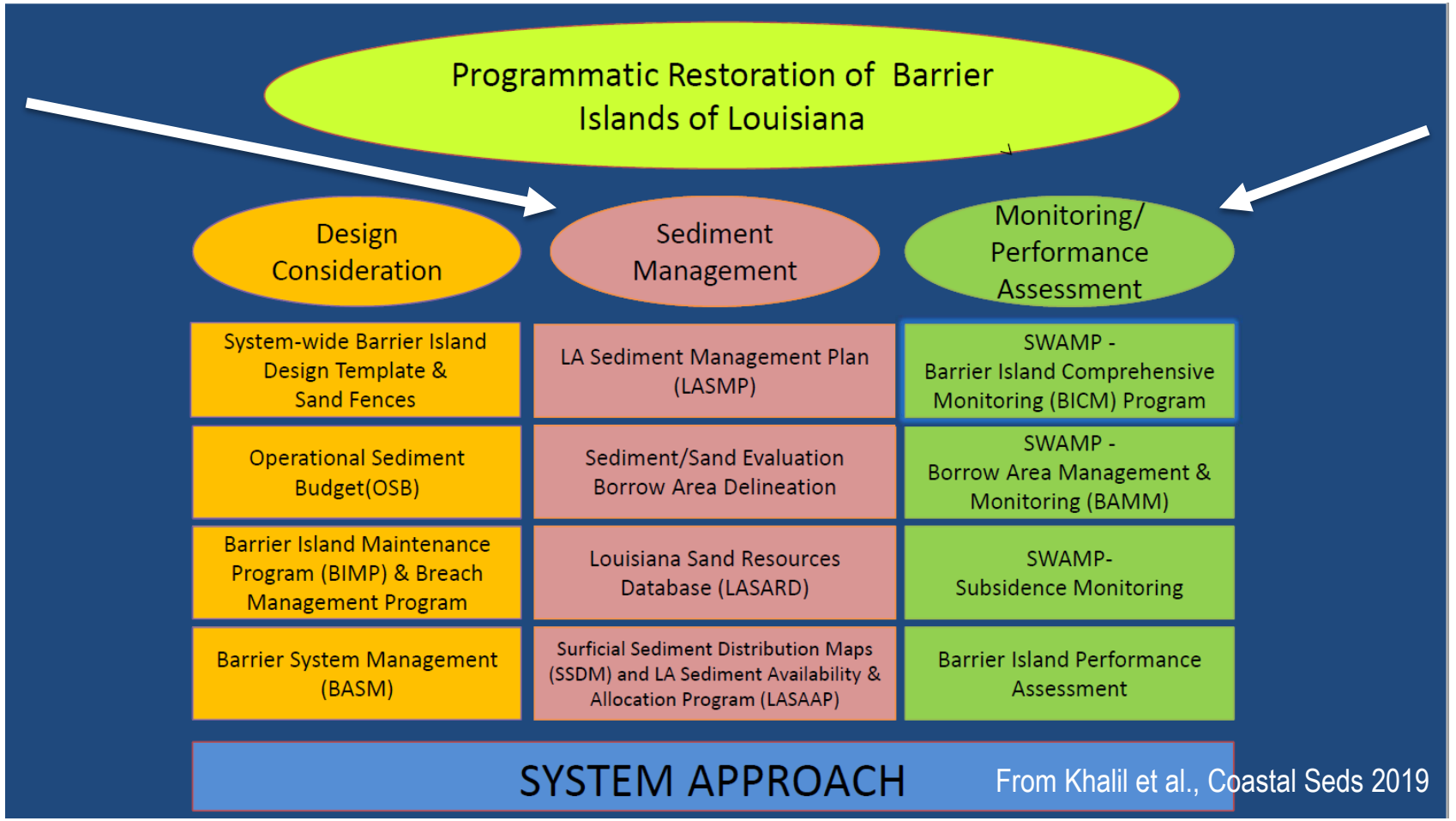
Year	Island 1	Island 2	Island 3
1	800000.00	2200000.00	4000000.00
2	648000.00	1782000.00	3240000.00
3	525480.00	1512540.29	2815495.95
4	425939.03	1281121.25	2435191.92
5	345010.61	1083073.26	2103738.79
6	279458.60	914047.83	1815161.16
7	226361.46	770143.08	1564213.63
8	183352.79	647917.44	1346269.46
9	148515.76	544329.67	1157241.68
10	120297.76	456711.12	993520.50
11	97441.19	382734.03	851917.41
12	78927.36	320378.48	729617.53
13	63931.16	267899.45	624138.31
14	51784.24	223795.34	533293.16
15	41945.24	186778.51	455159.16
16	33975.64	155748.22	388048.20
17	27520.27	129766.09	330480.94
18	22291.42	108034.16	281163.46
19	18056.05	89875.42	238966.17
20	14625.40	74716.68	202904.75

Additional pilot models developed for system assessment, etc.

BISM CONNECTIVITY TO EXISTING CPRA PROGRAMS

Regional Sediment Management Tools

Monitoring and Adaptive Management



BISM leverages data, models, and lessons learned, while providing information and a decision-support framework that can inform multiple needs

CONCLUSIONS

- Structured Decision-Making provides a framework for regional sand management and adaptive management
  - Transparent and objective: systematic process for prioritizing projects and selecting resources that supports stakeholder engagement
  - Modular: components of the framework can be developed sequentially and “right-sized”/prioritized based on need
  - Adaptable: immediate implementation using existing tools and expert elicitation, while readily expandible to be data- and quantitative model-based
  - Flexible: underlying methods and tools designed for BISM are broadly applicable in the Gulf of Mexico and beyond

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Texas General Land Office Region 1 Reconnaissance Geophysical Sand Search, Project Summary and Results

Beau Suthard

TEXAS GENERAL LAND OFFICE REGION 1 RECONNAISSANCE GEOPHYSICAL SAND SEARCH, PROJECT SUMMARY AND RESULTS

Beau Suthard, PG, APTIM
Patrick Bryce, PG, APTIM
Kelly Brooks, Texas General Land Office
Michael Miner, PhD, PG, The Water Institute of the Gulf
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Alexandra Valente, APTIM
Jeffrey Andrews, PSM, CH, APTIM

TXGLO

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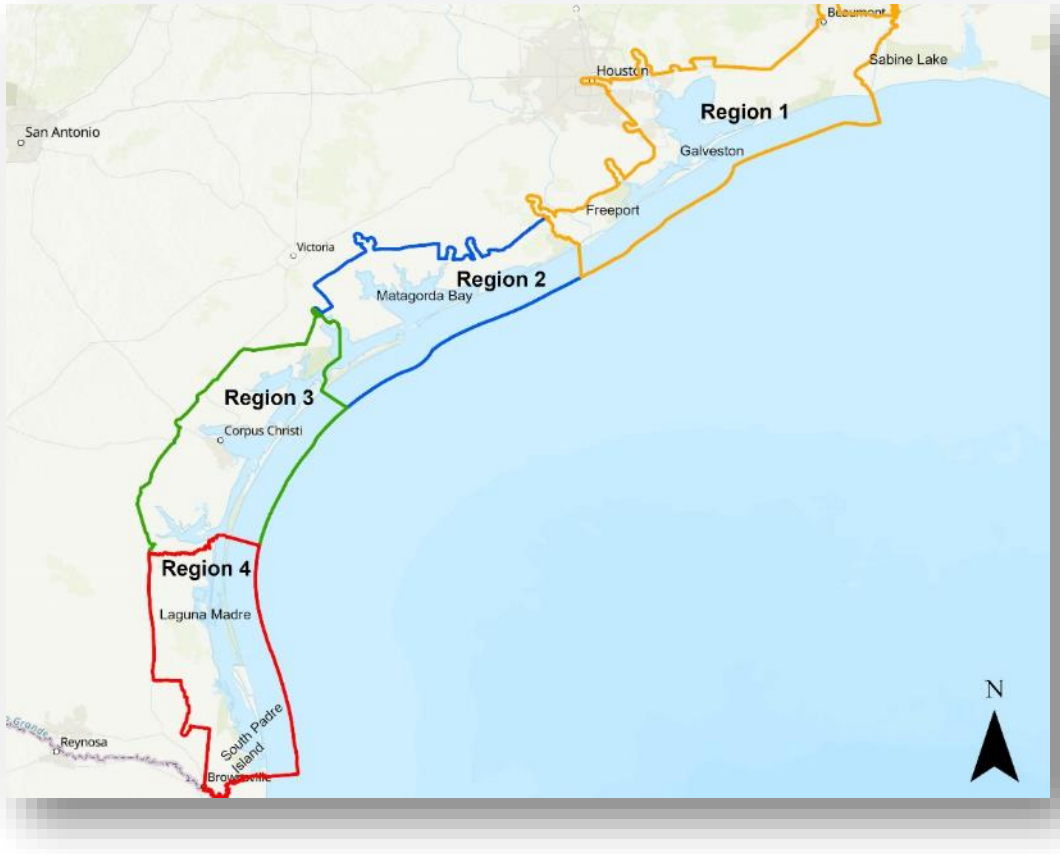
PROJECT OVERVIEW

- Texas Coastal Resiliency Master Plan
  - > Develop a Sediment Management Plan
  - > Inventory of coastal data
  - > Collaboration between Coastal Protection Programs
  - > Coordination of sediment resources
  - > More coordination/effective use of Port/Navigation Sediment
- Reconnaissance Geophysical Survey Region 1
  - 2020/2021
  - Data collection
  - Data processing
  - Geologic model
  - Geotechnical planning



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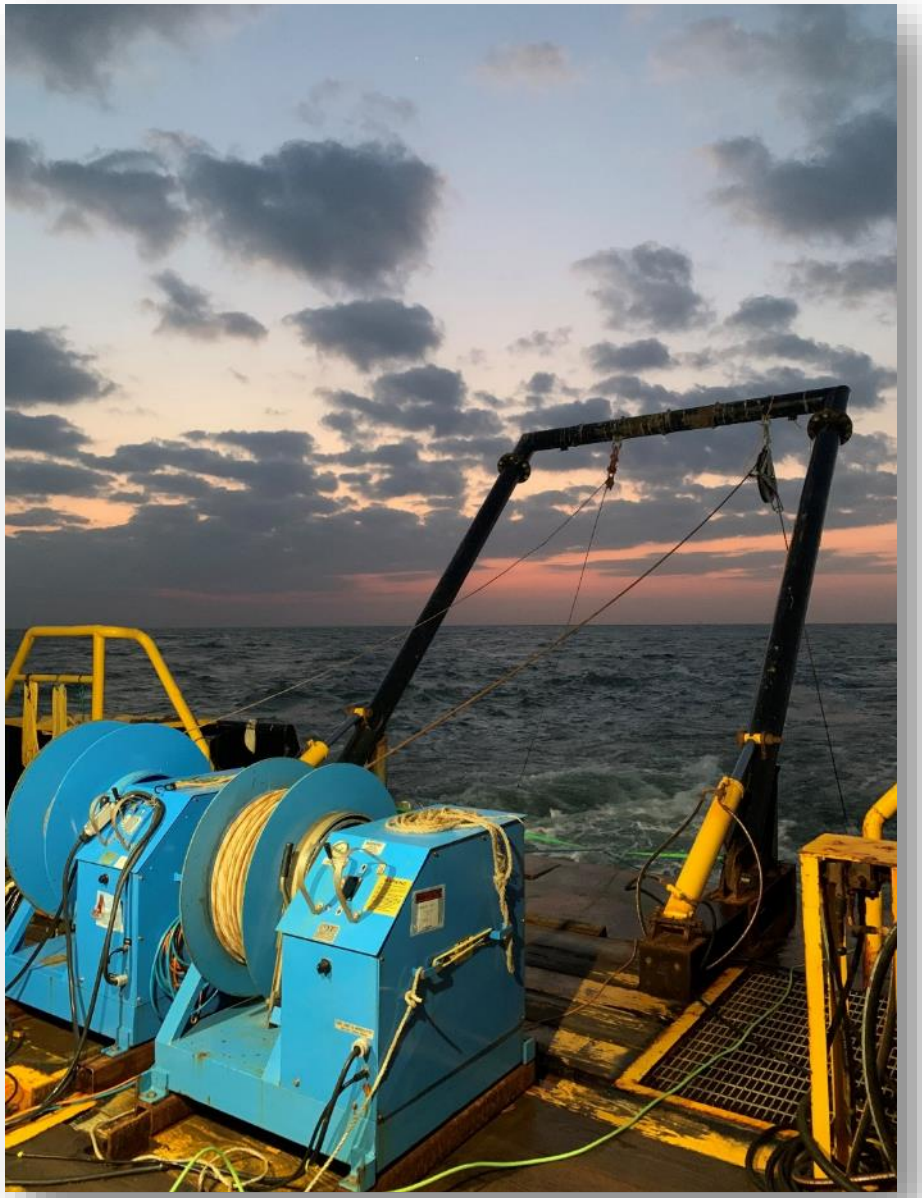
PROJECT APPROACH

- Phase 1: Desktop study
  - > Comprehensive understanding of existing data coverage
  - > Develop 1-mile square grid
- Phase 2: Reconnaissance-level geophysical data collection
  - > 2,254nm of data collection
    - – Full coverage of Region 1
    - – 15% Add on secondary lines
  - > Identify potential sand resources
  - > Propose vibracore sites



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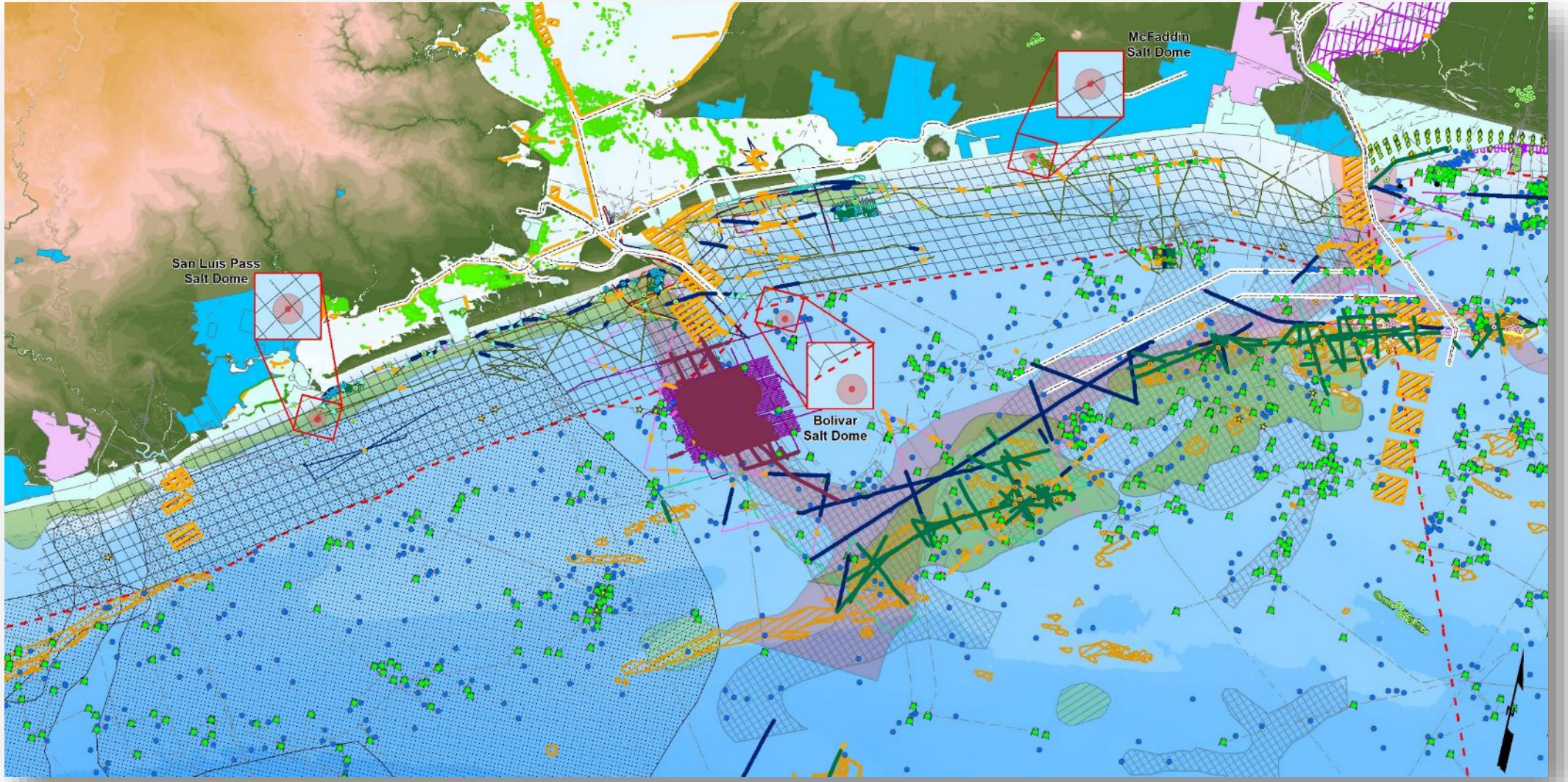
DESKTOP STUDY



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GEOPHYSICAL DATA COLLECTION

- Geophysical systems
  - > Sub-bottom profiler: Edgetech 3200 512i
  - > Sidescan sonar: EdgeTech 4200 300/600kHz
  - > Magnetometer: Geometrics G-882 Digital Cesium Marine Magnetometer
  - > Bathymetry: Odom Hydrographic Systems, Inc. “Teledyne E20” portable Hydrographic Echosounder
- 24-hour operations between August 19 and October 16, 2020
- In field determination of add-on areas/coverage
  - > Sabine Channels
  - > Bolivar Channel
  - > San Luis Pass Salt Dome
  - > Galveston Channel

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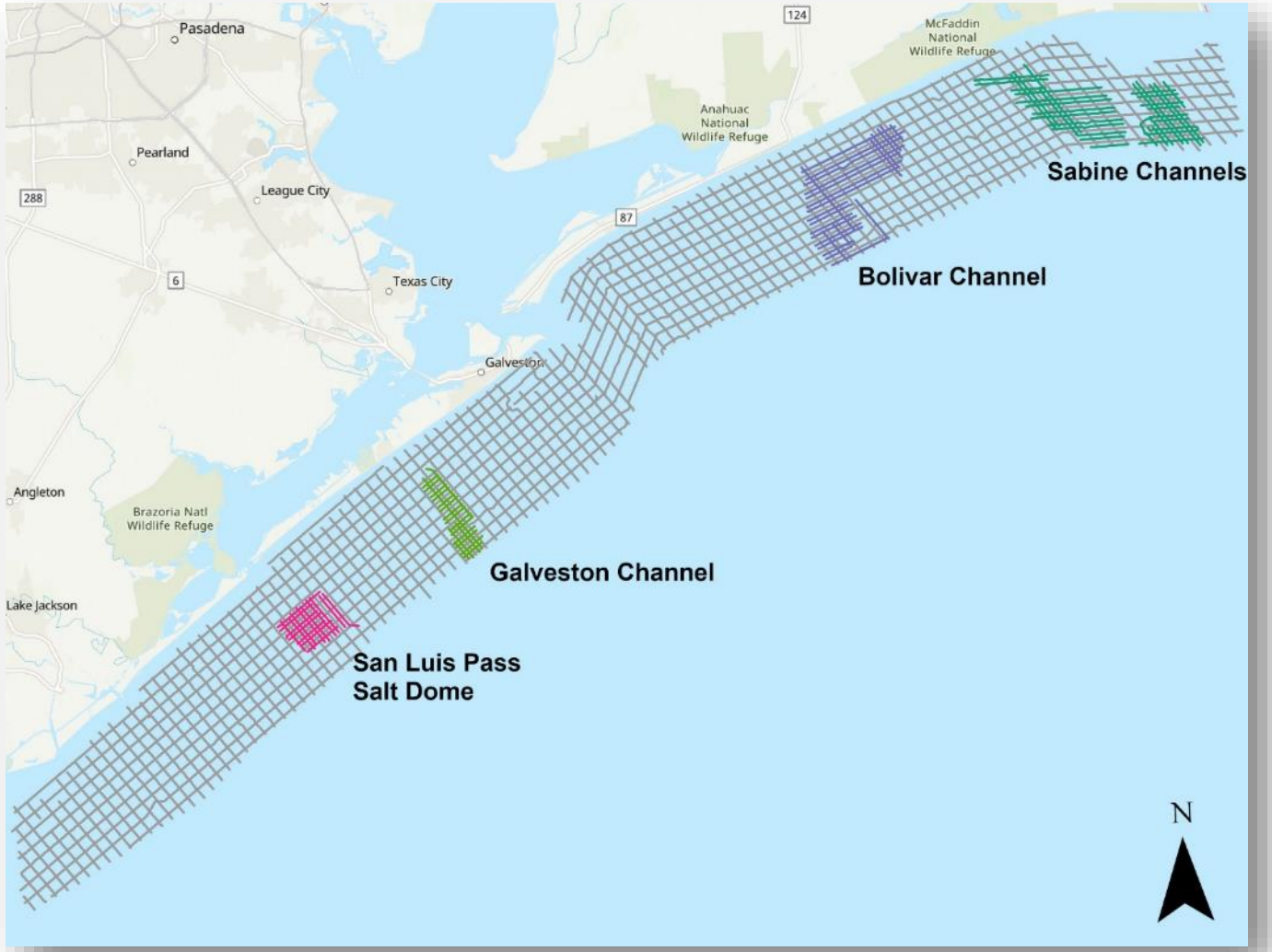
GEOPHYSICAL DATA COLLECTION

		Collected (nm)
Region 1 Geophysical data, primary lines (bathymetric, magnetometer, seismic and sidescan sonar)		1,913
Region 1 Geophysical data, add on secondary lines (bathymetric, magnetometer, seismic and sidescan sonar)	Sabine Channel A	59
	Sabine Channel B	82
	Bolivar Channel	106
	San Luis Pass Salt Dome	47
	Galveston Channel	41
Total		**2,248**



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DATA PROCESSING AND INTERPRETATION

- Magnetometer data
  - > Identify potential hazards
- Sidescan Sonar
  - > Data mosaic
  - > Individual contacts
  - > Seafloor features
- Correlate magnetometer and sidescan data to desktop study hazards
  - > Classification/correlations

- Seismic data
  - > Identify seismic reflection horizons, including most recent transgressive ravinement surface
  - > Boundaries for different seismic facies packages
  - > Erosional unconformities/potential sand bearing features
  - > Develop regional geologic conceptual models
  - > Identify zones for potential sand deposition
  - > Identify deposits for groundtruthing

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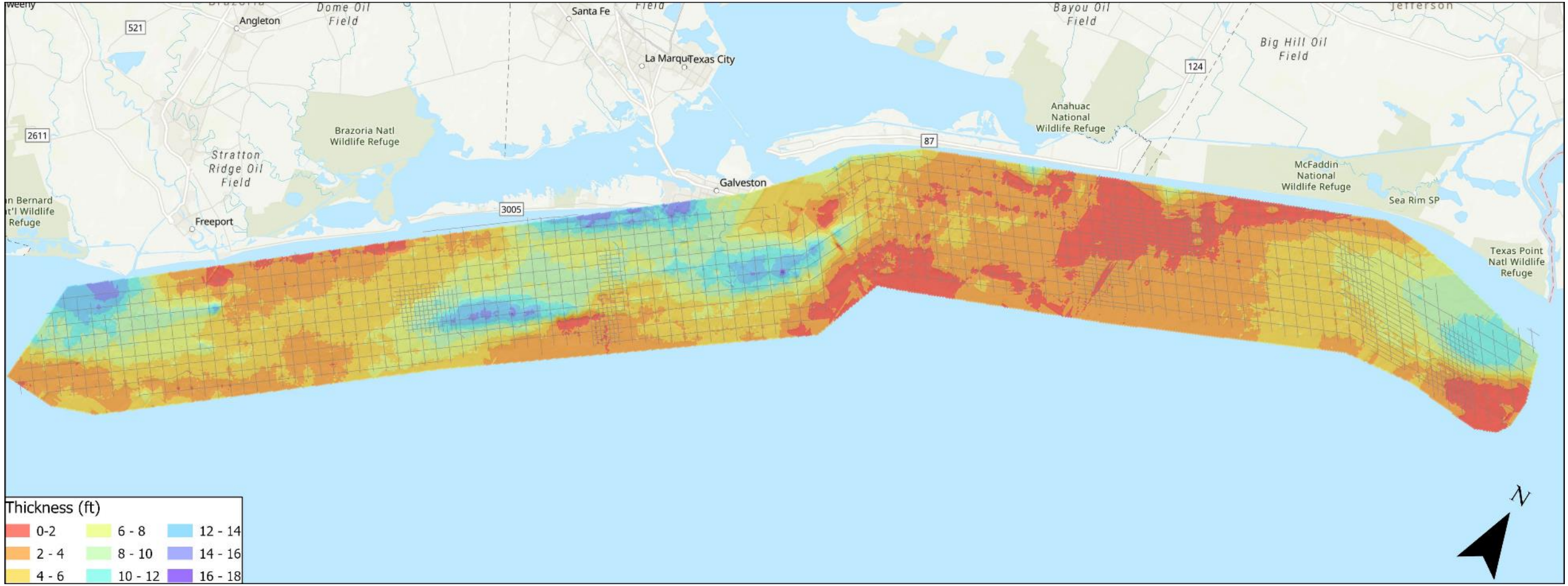
MOST RECENT TRANSGRESSIVE RAVINEMENT



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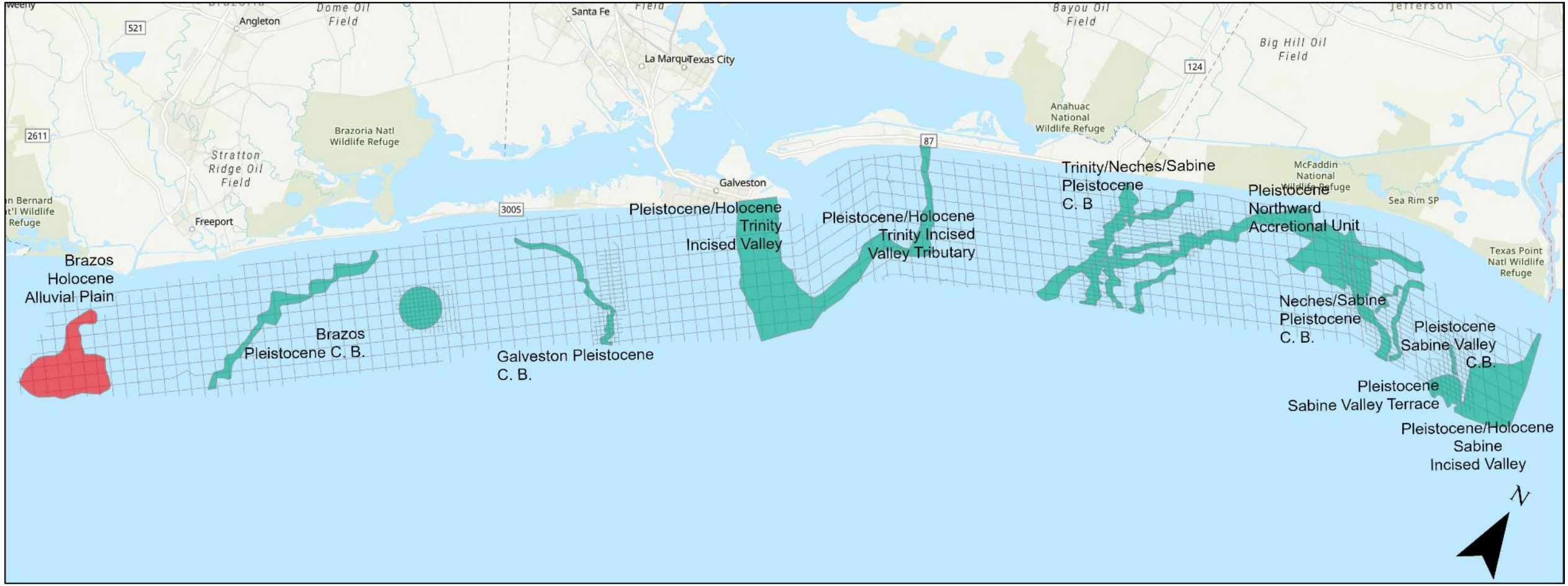
REGION 1 POTENTIAL SAND BEARING FEATURES



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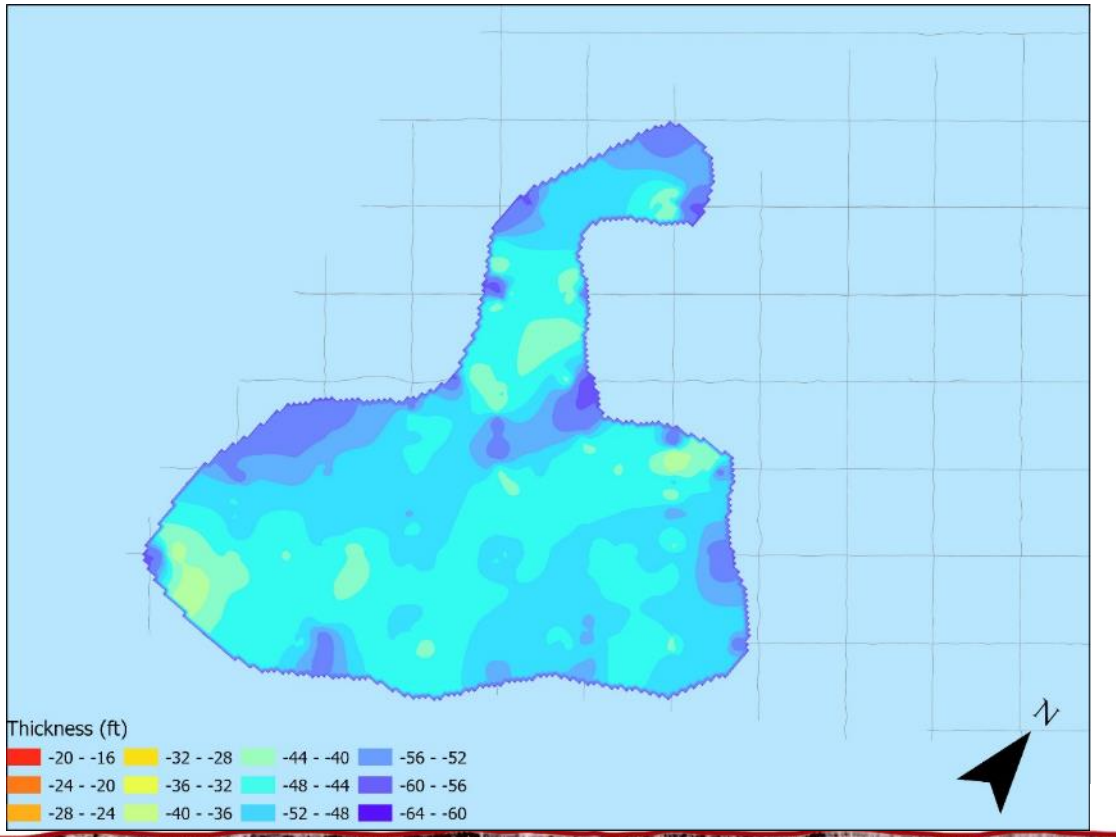
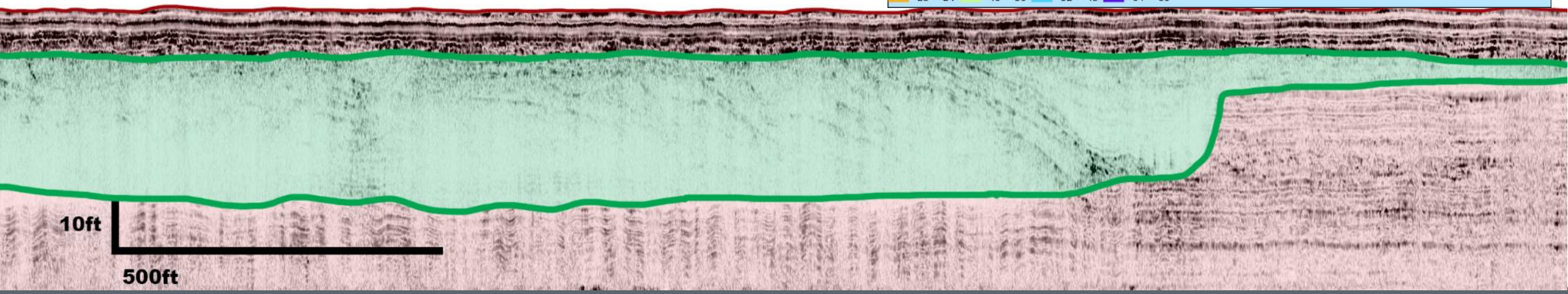
BRAZOS HOLOCENE ALLUVIAL PLAIN

- Dipping clinoforms packages
- Variable thickness between 20-30 ft
- 3-10 ft of overburden
- Gross volume: 250 mcy





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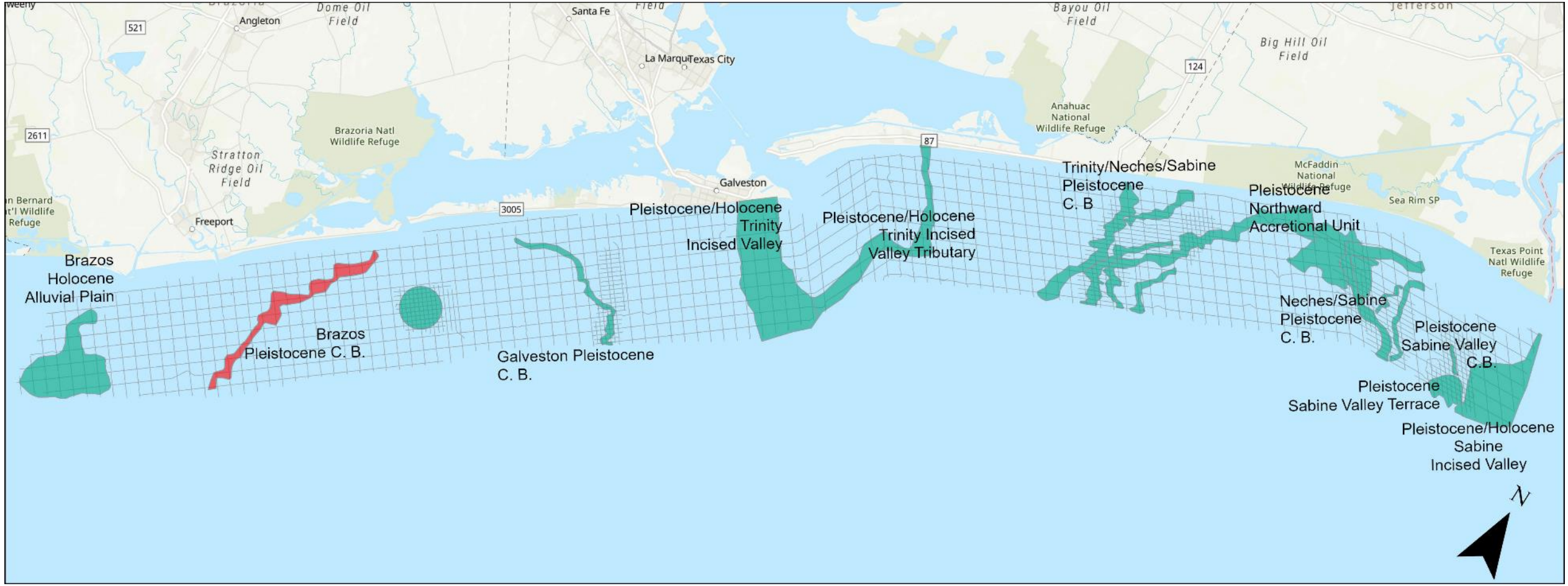
REGION 1 POTENTIAL SAND BEARING FEATURES



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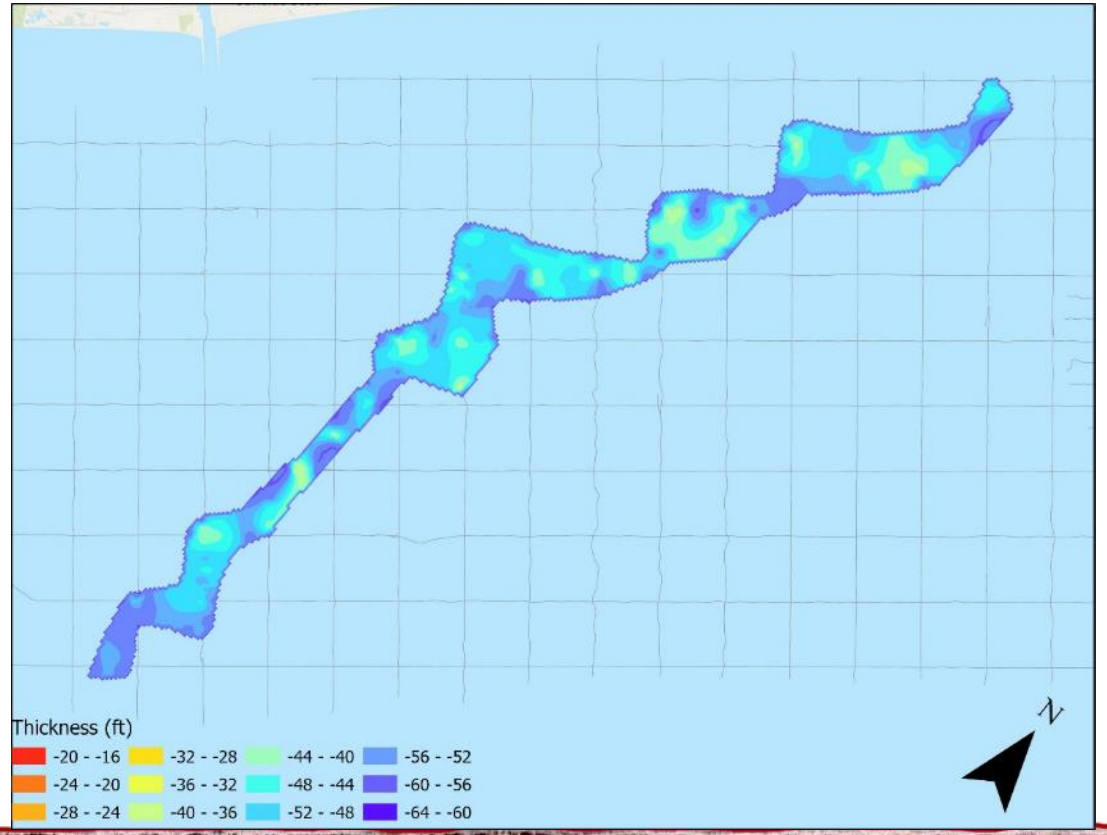
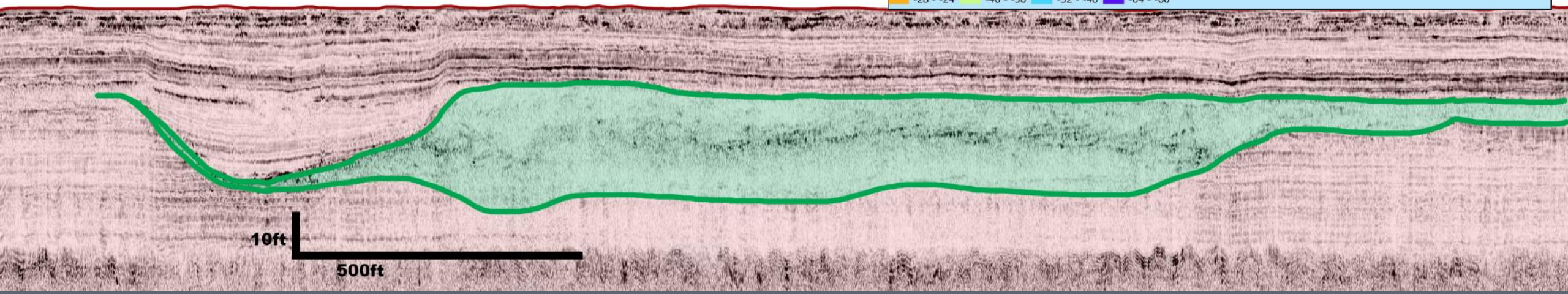
BRAZOS PLEISTOCENE CHANNEL BELT

- Steeply dipping clinoforms with variable acoustic amplitude
- Variable thickness between 20-30 ft
- 15-20 ft of overburden
- Gross volume: 450 mcy





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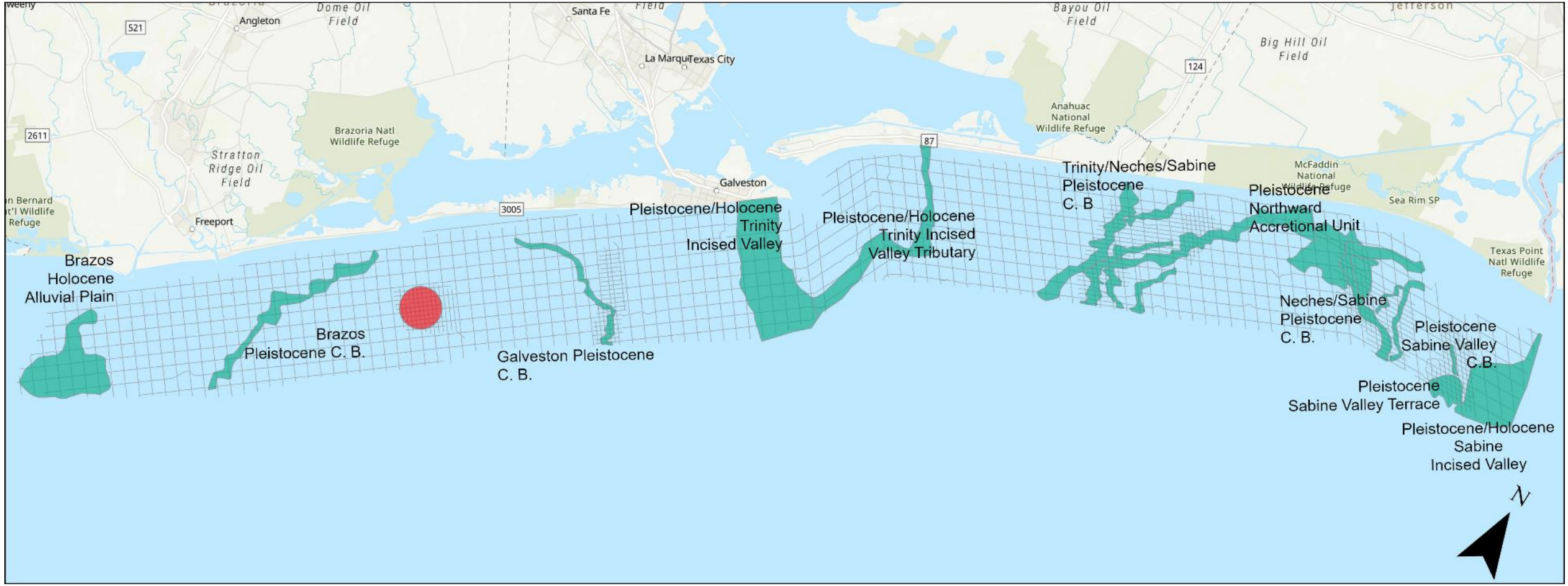
REGION 1 POTENTIAL SAND BEARING FEATURES



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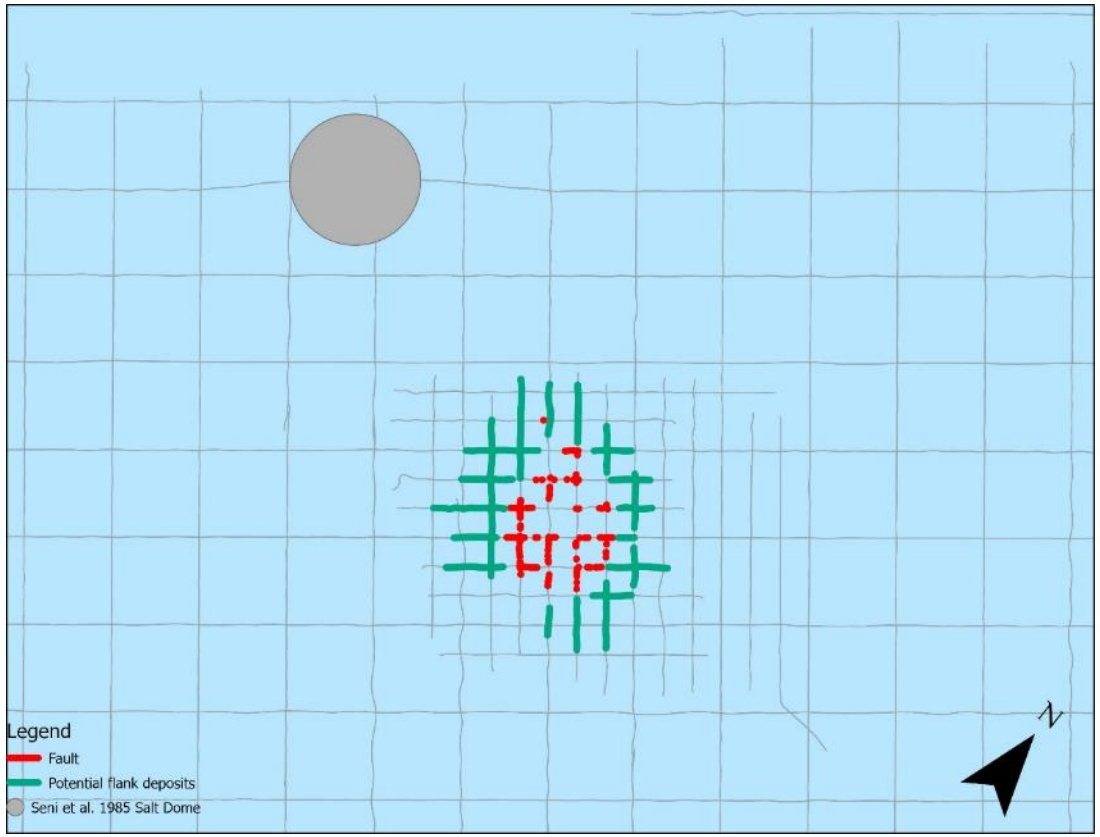
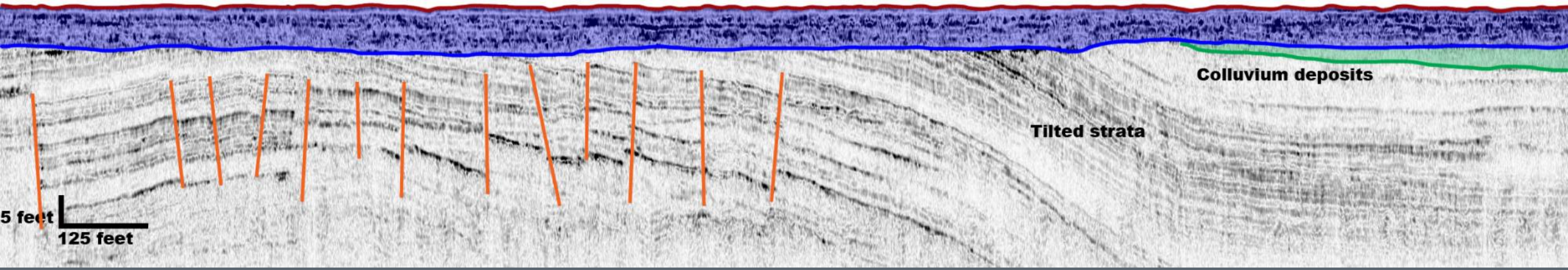
SAN LUIS PASS SALT DOME

- Pleistocene aged salt-induced tectonism
- Near-surface salt diapirs
- 1.37 square miles
- Evidence of gullies
- Highly variable deposition on flanks





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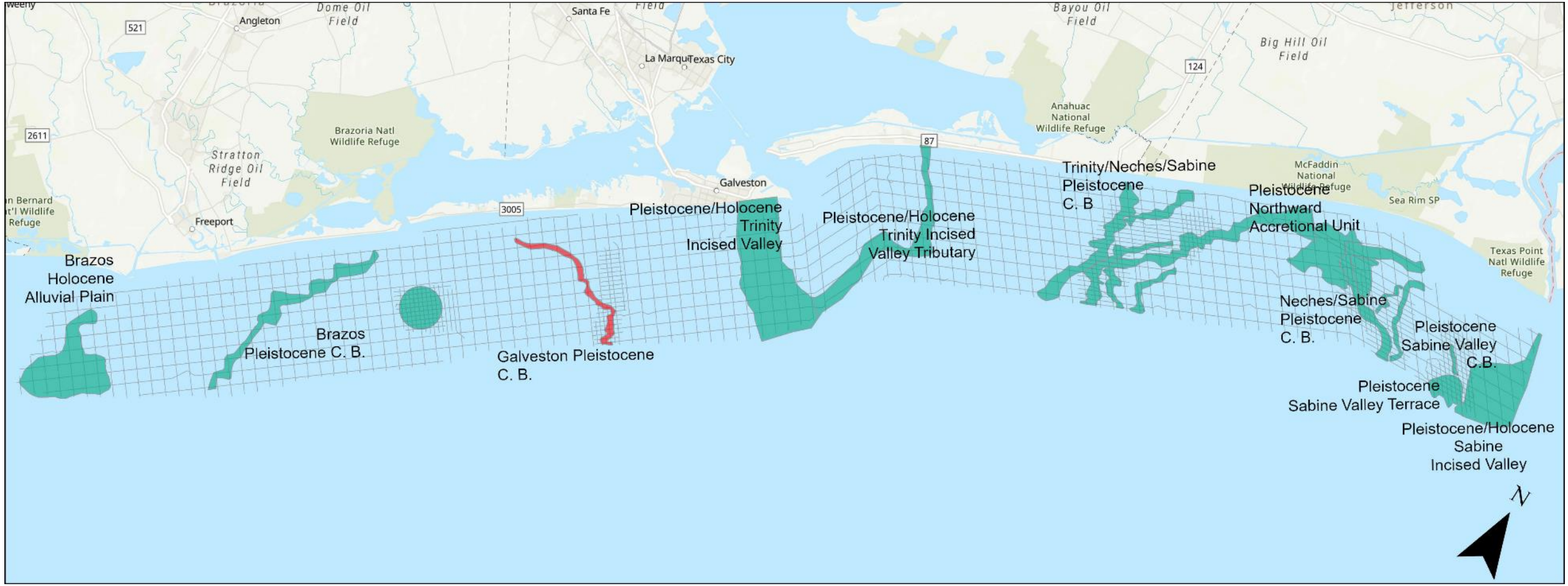
REGION 1 POTENTIAL SAND BEARING FEATURES



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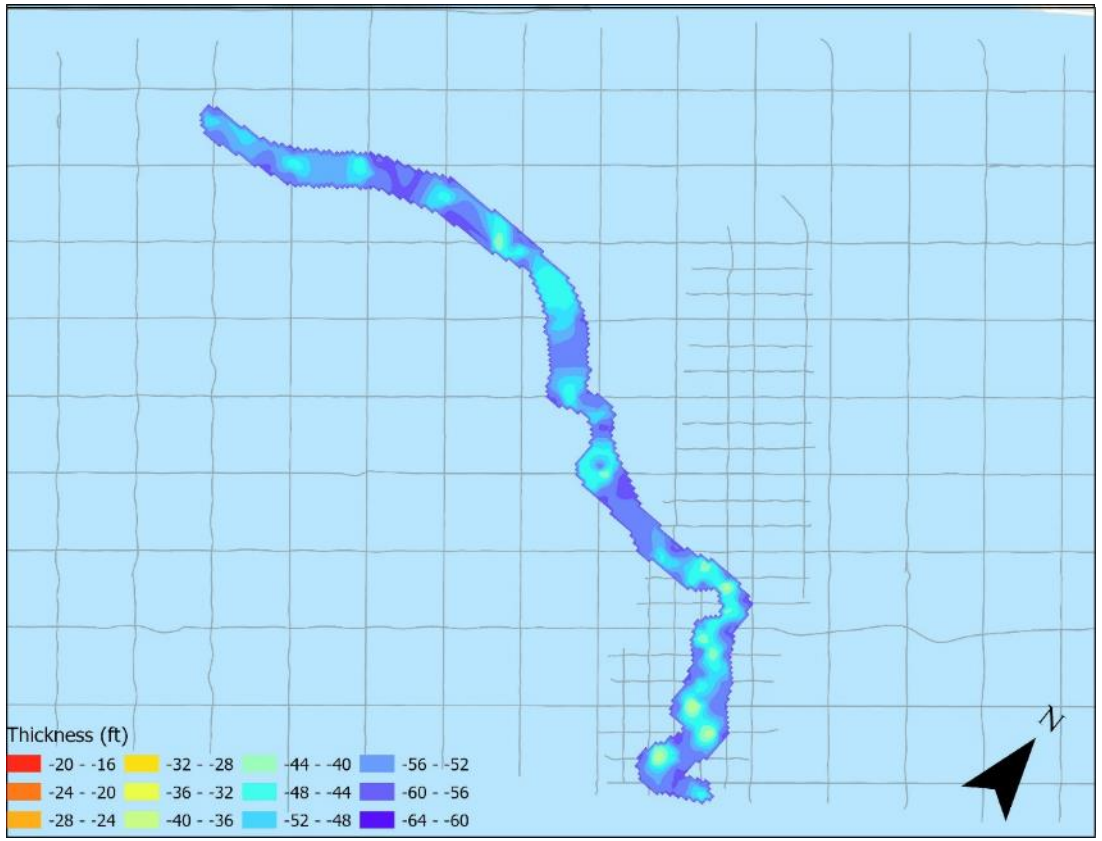
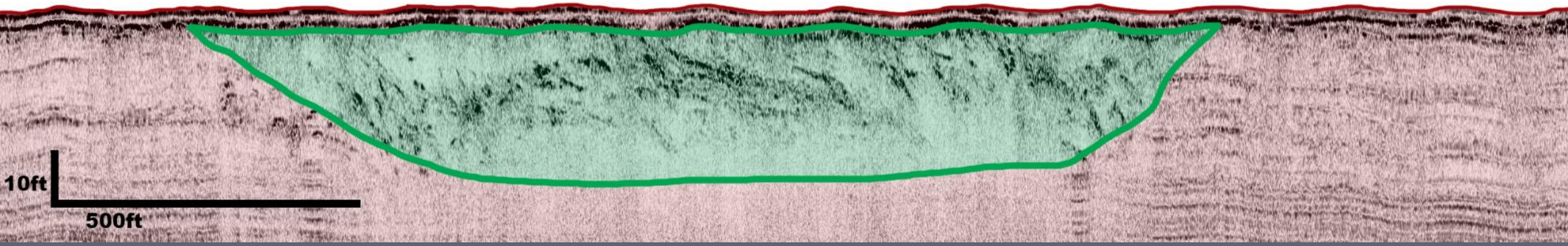
GALVESTON PLEISTOCENE CHANNEL BELT

- Width ~0.5–0.75 miles and a length of 12 miles.
- Dipping clinoforms of variable acoustic amplitude
- Regions of chaotic and transparent seismic facies
- Gross volume: 280 mcy





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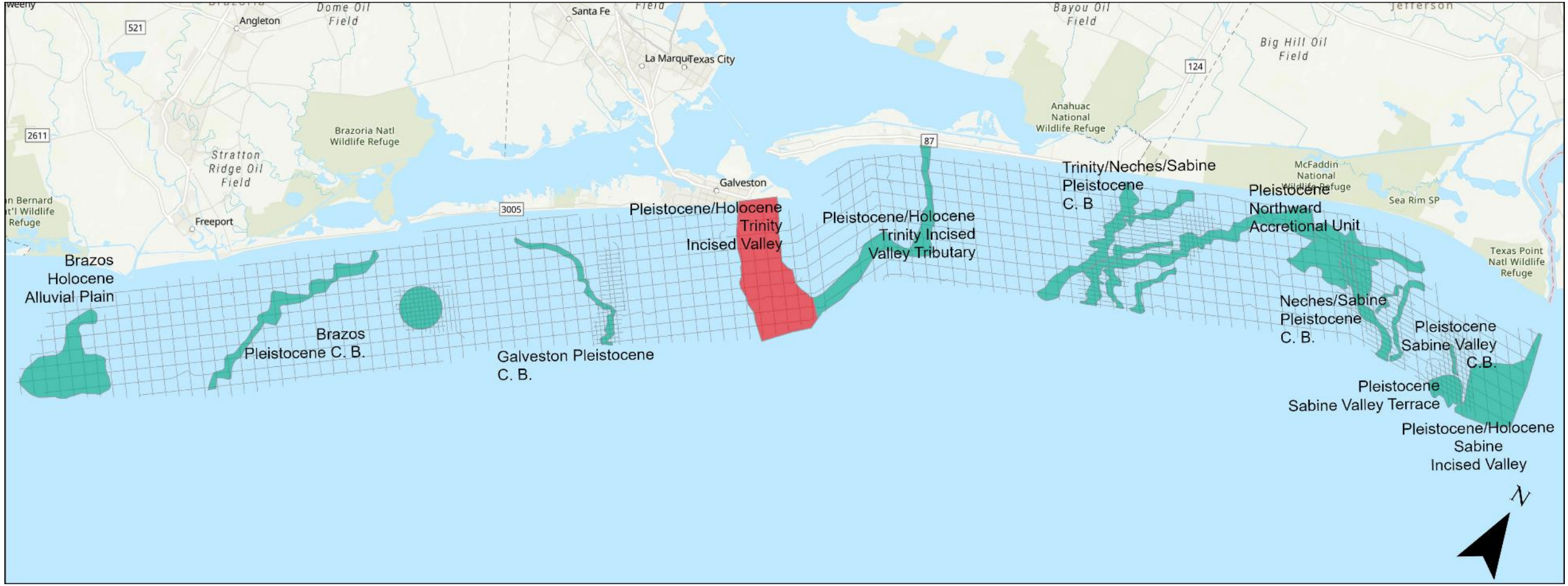
REGION 1 POTENTIAL SAND BEARING FEATURES



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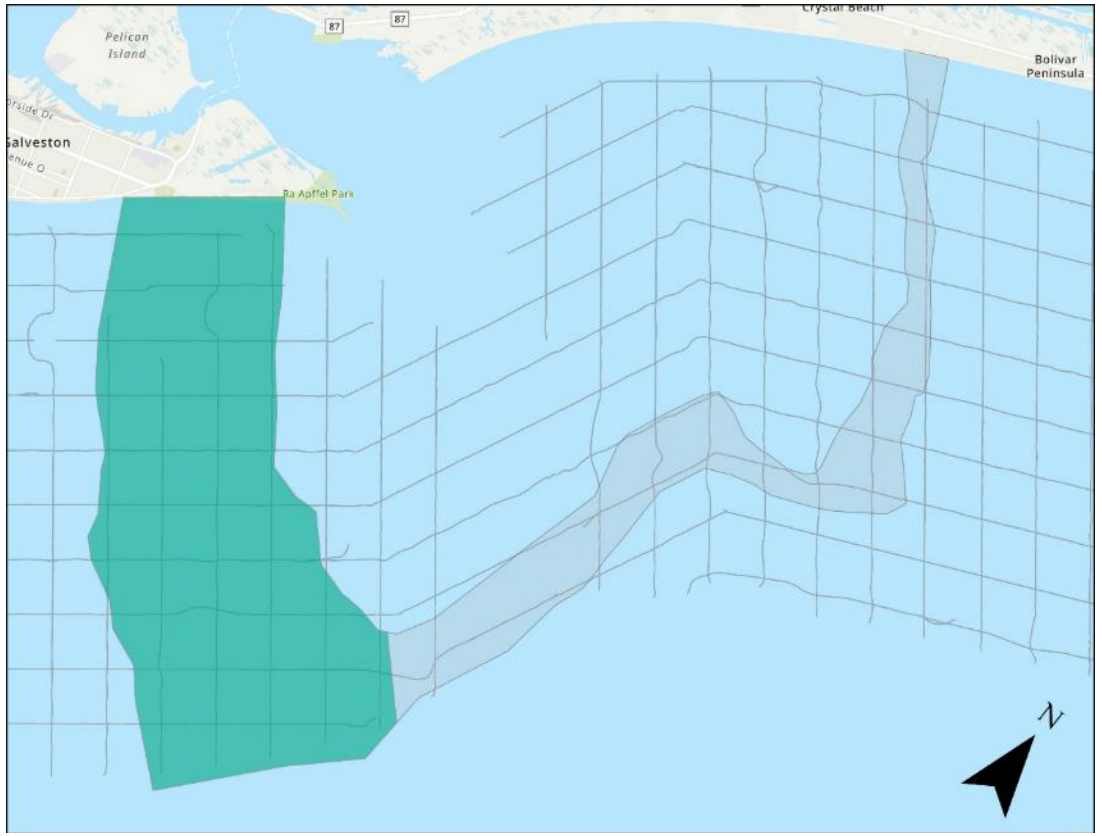
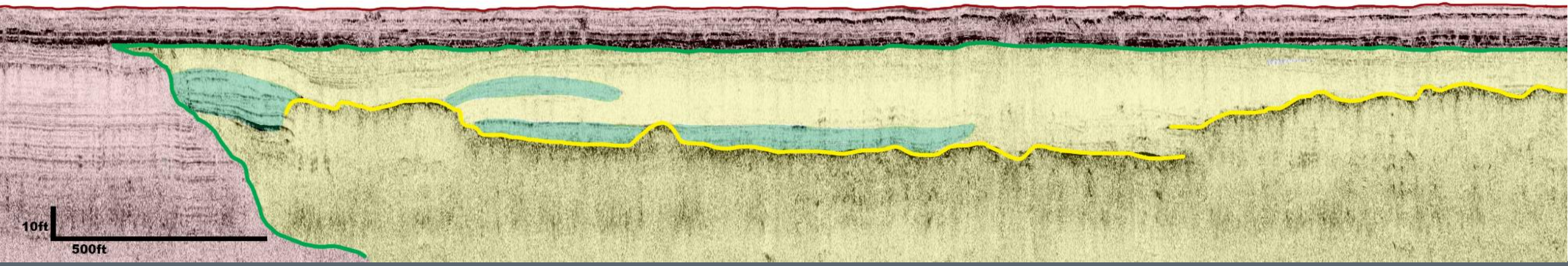
PLEISTOCENE/HOLOCENE TRINITY INCISED VALLEY

- Highly mapped
- Potential sand buried by muddy overburden
  - > 15–25 ft of overburden
- 5–15 ft thick and 500–1,000 ft wide,





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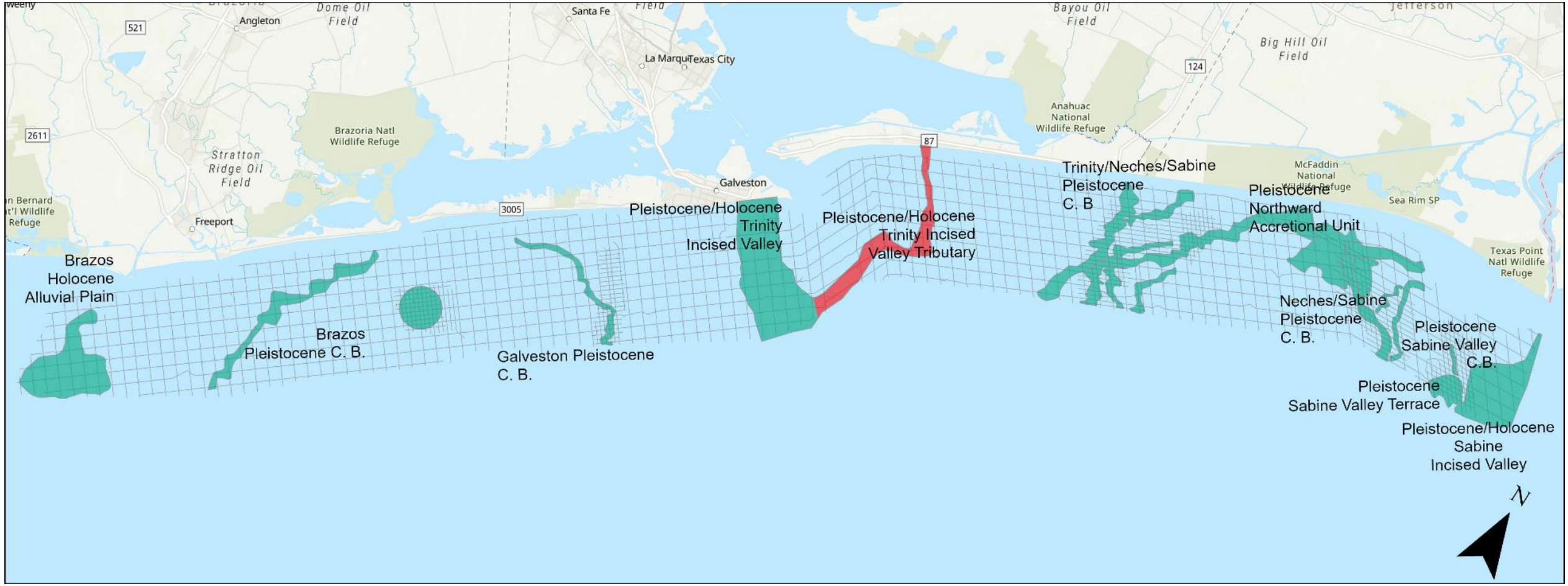
REGION 1 POTENTIAL SAND BEARING FEATURES



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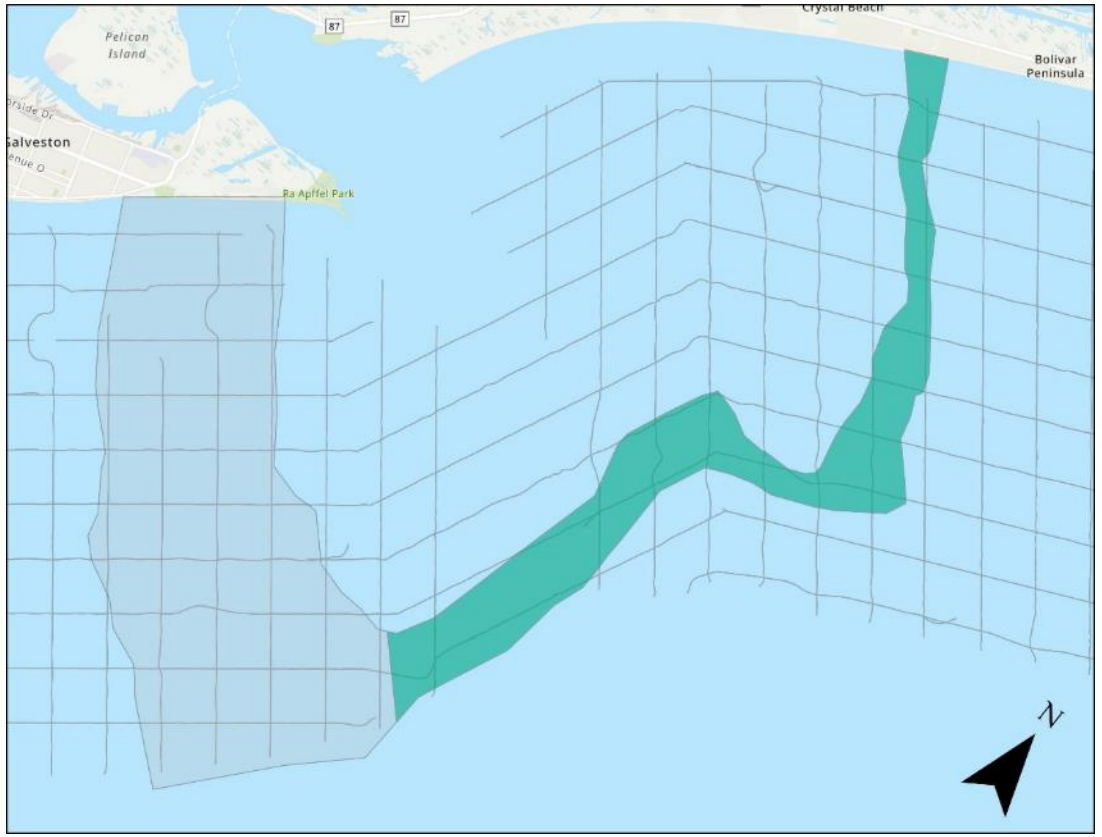
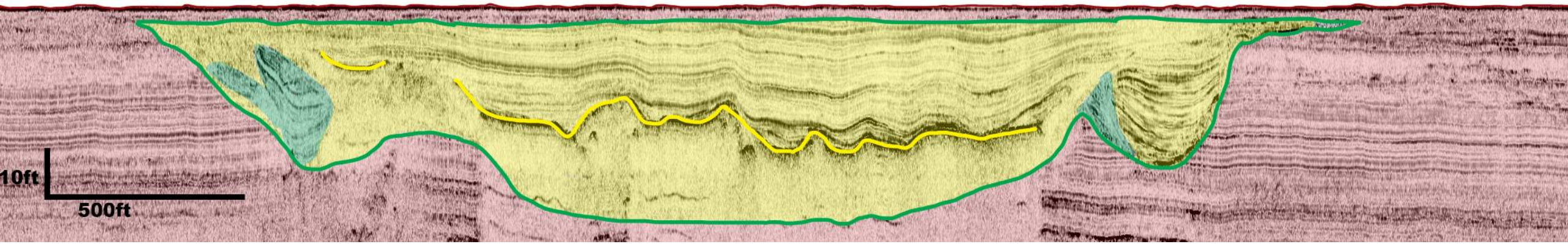
PLEISTOCENE/HOLOCENE TRINITY INCISED VALLEY TRIBUTARY

- Unrecognized incisional drainage
- 1–1.5 miles wide
- Incises 15–50 ft into Beaumont
- 25-40 ft overburden





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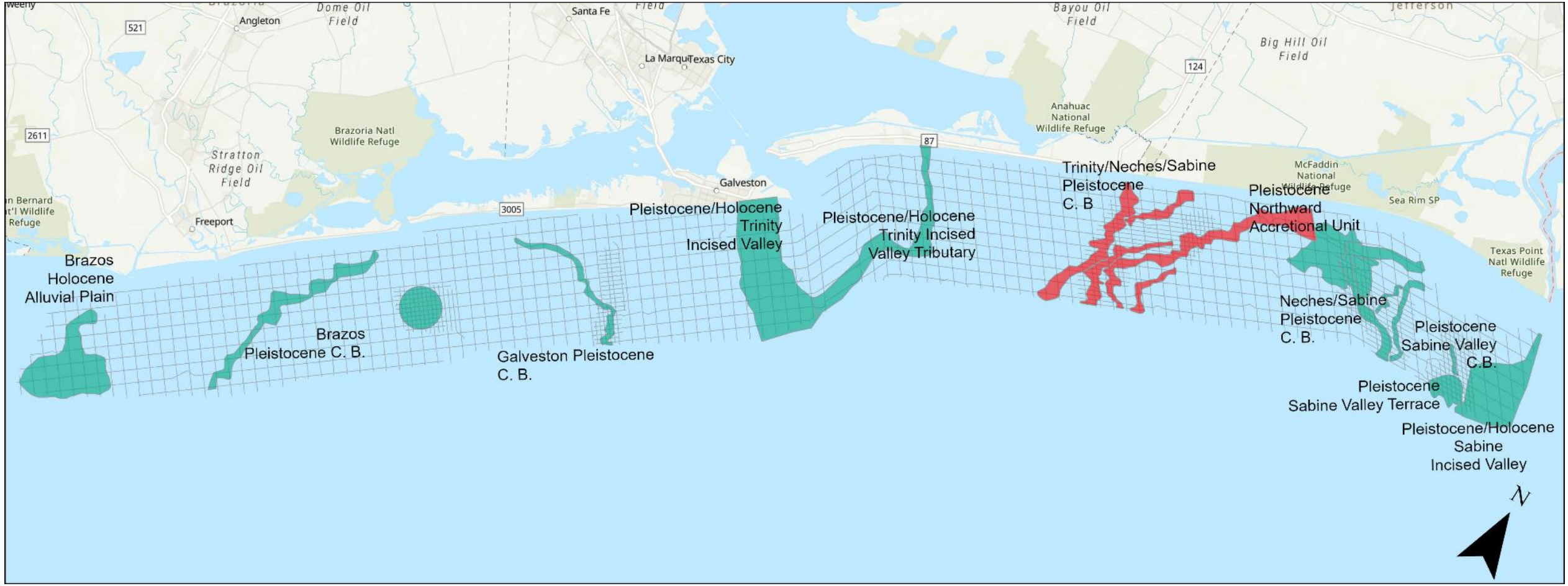
REGION 1 POTENTIAL SAND BEARING FEATURES



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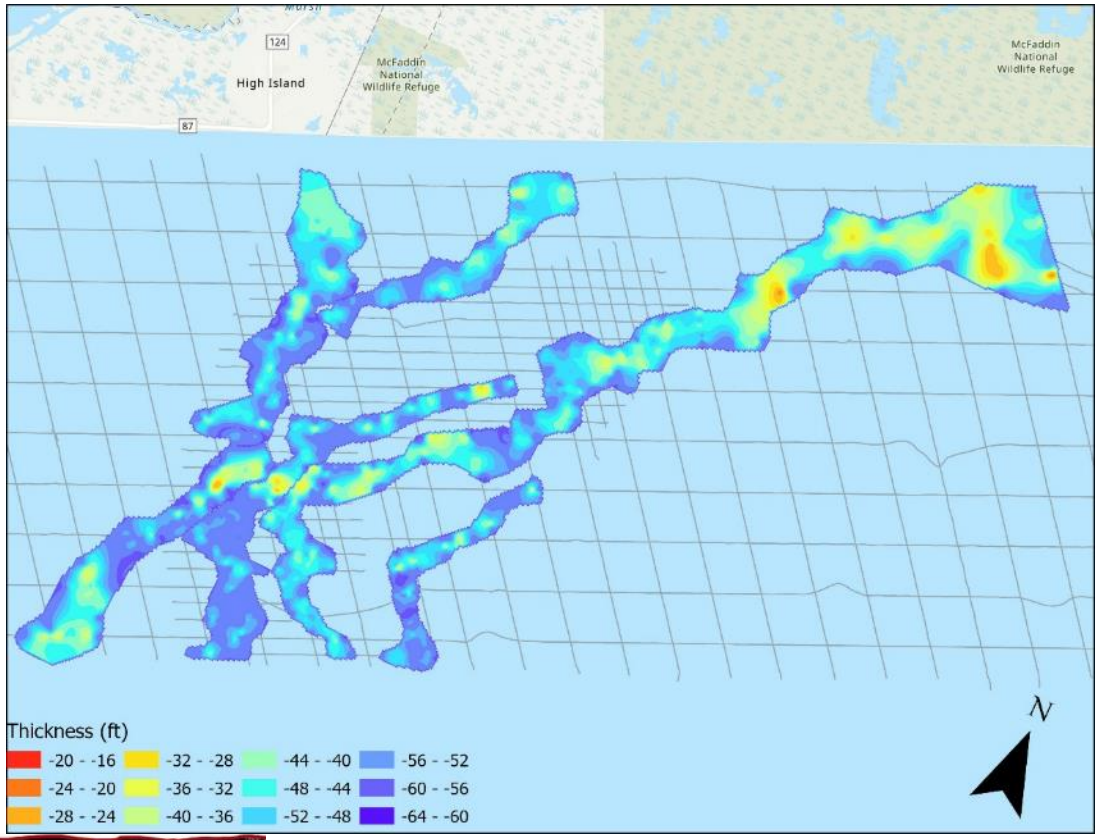
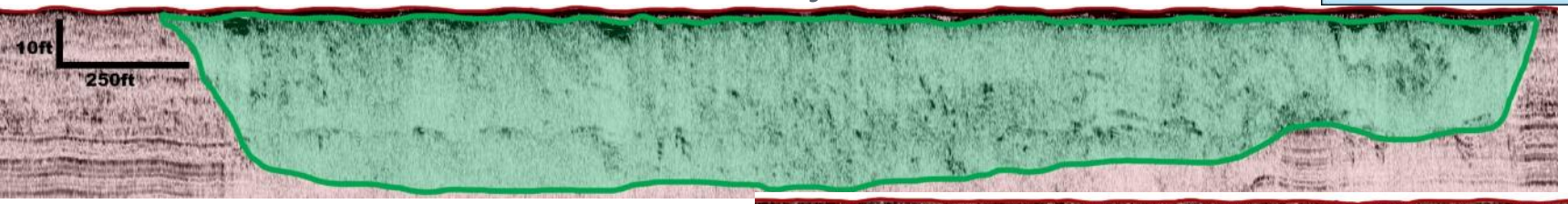
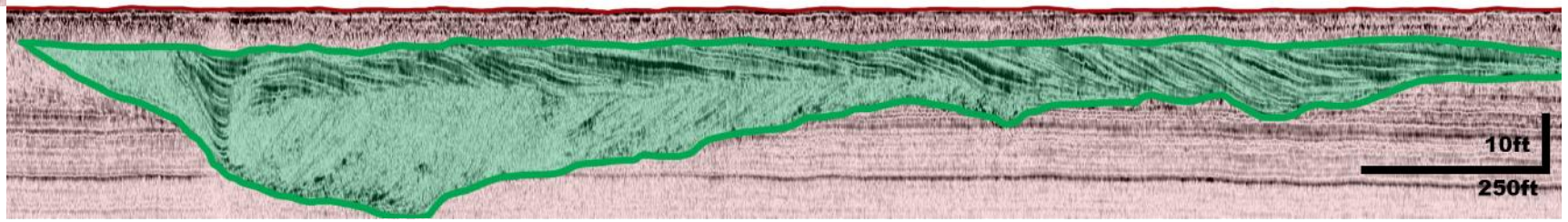
TRINITY/NECHES/SABINE PLEISTOCENE CHANNEL BELT

- Complex cross-cutting and variable geometry
- Width 0.5–2 miles, Length 5 -30 miles
- 20-40ft thick channel, 0-25ft overburden
- Gross volume: 1,091 mcy







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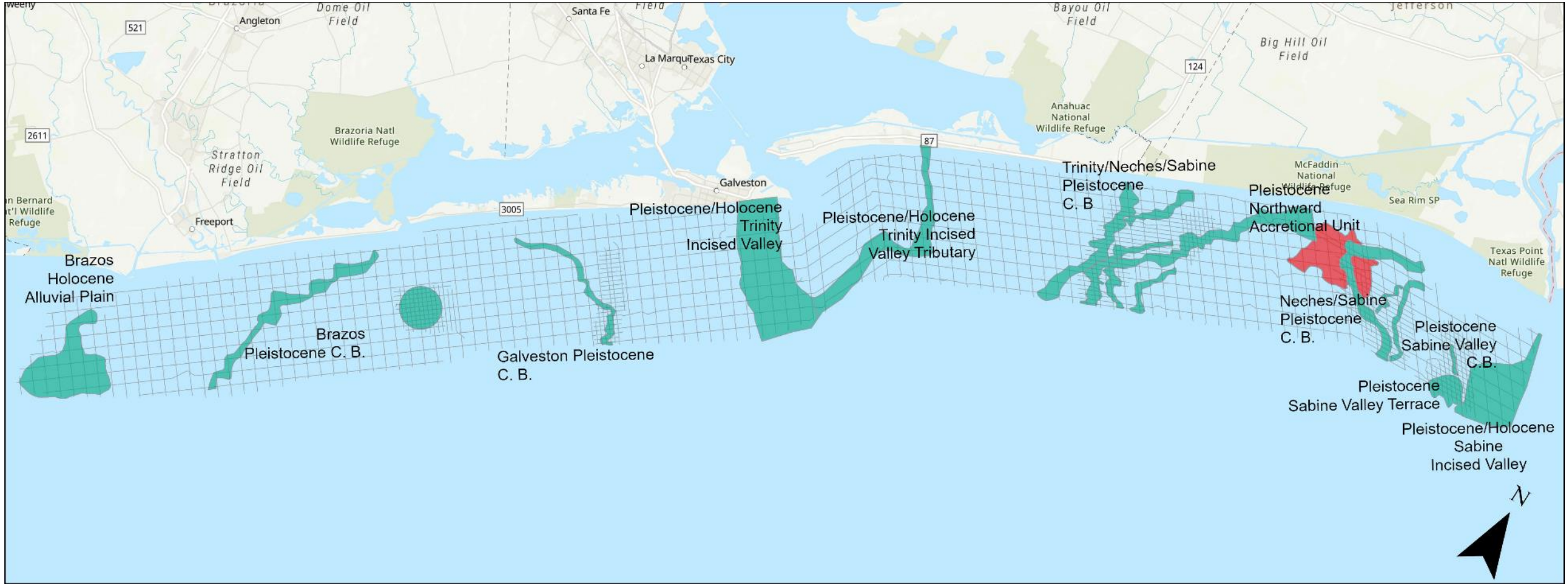
REGION 1 POTENTIAL SAND BEARING FEATURES



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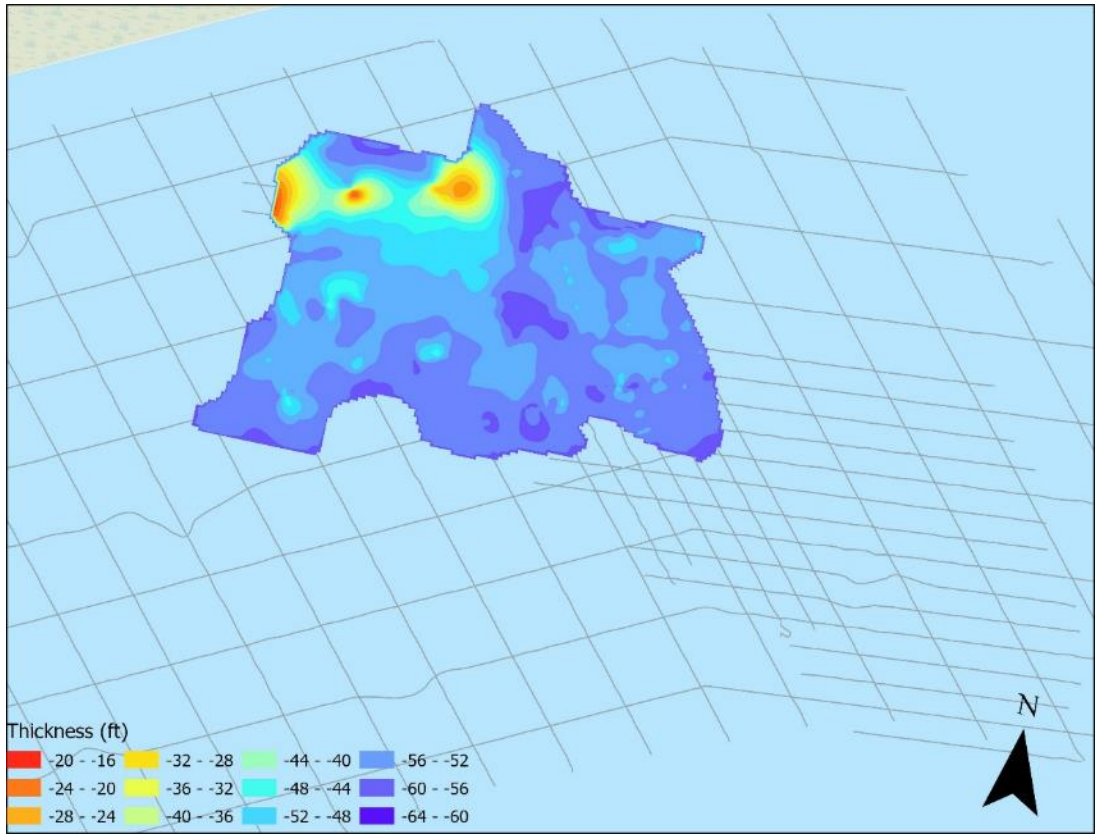
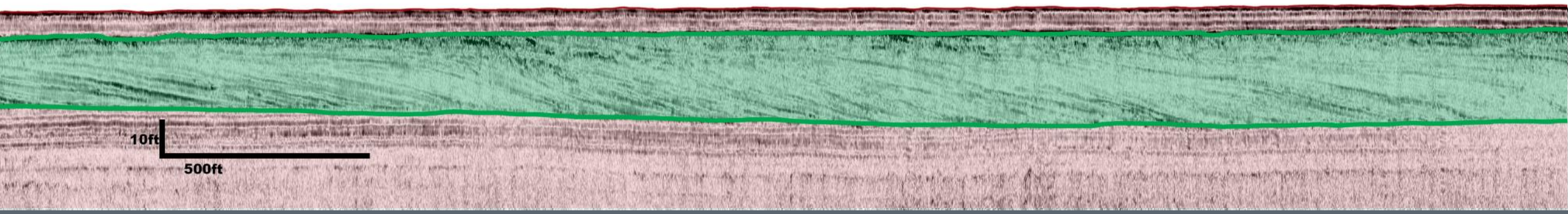
PLEISTOCENE NORTHWARD ACCRETIONAL UNIT

- Uniformly landward dipping clinoforms
- Thickness of 10–30 ft, 2–5 ft of overburden
- Gross volume: 361 mcy





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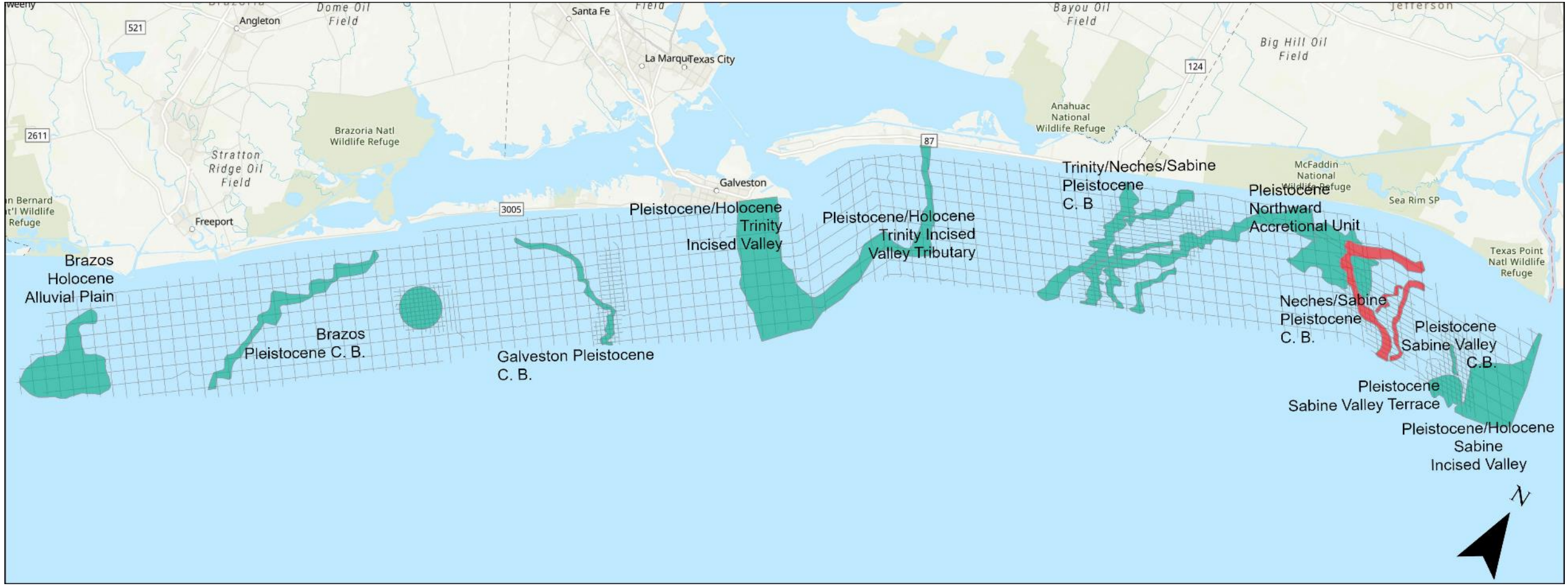
REGION 1 POTENTIAL SAND BEARING FEATURES



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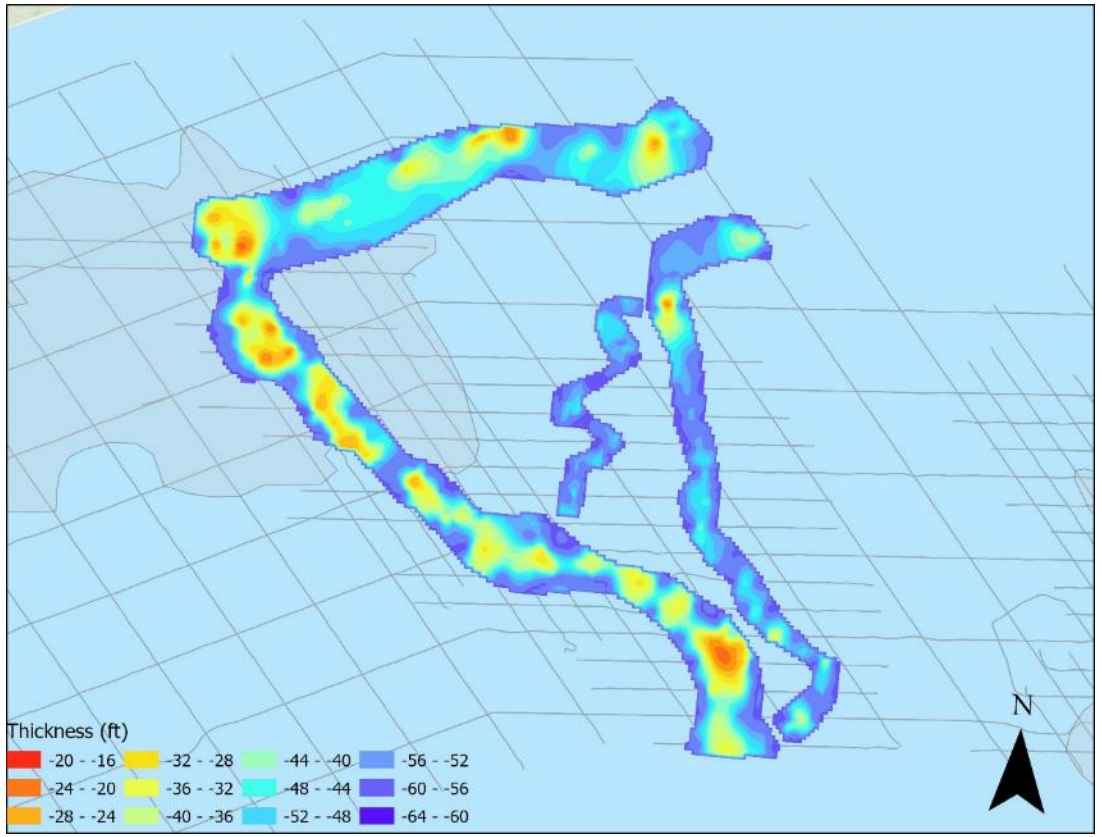
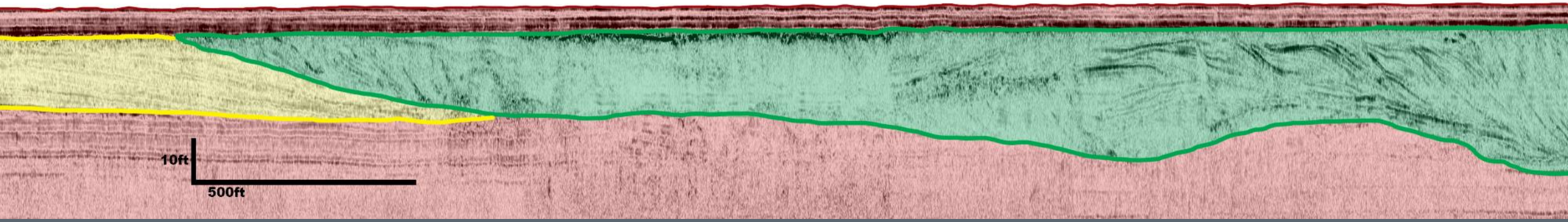
NECHES/SABINE FLUVIAL CHANNEL BELT

- Steeply dipping clinoforms, some acoustic transparency
- Thickness of 15-50 ft, 5-25ft of overburden
- Incised into Beaumont
- Gross volume: 561 mcy





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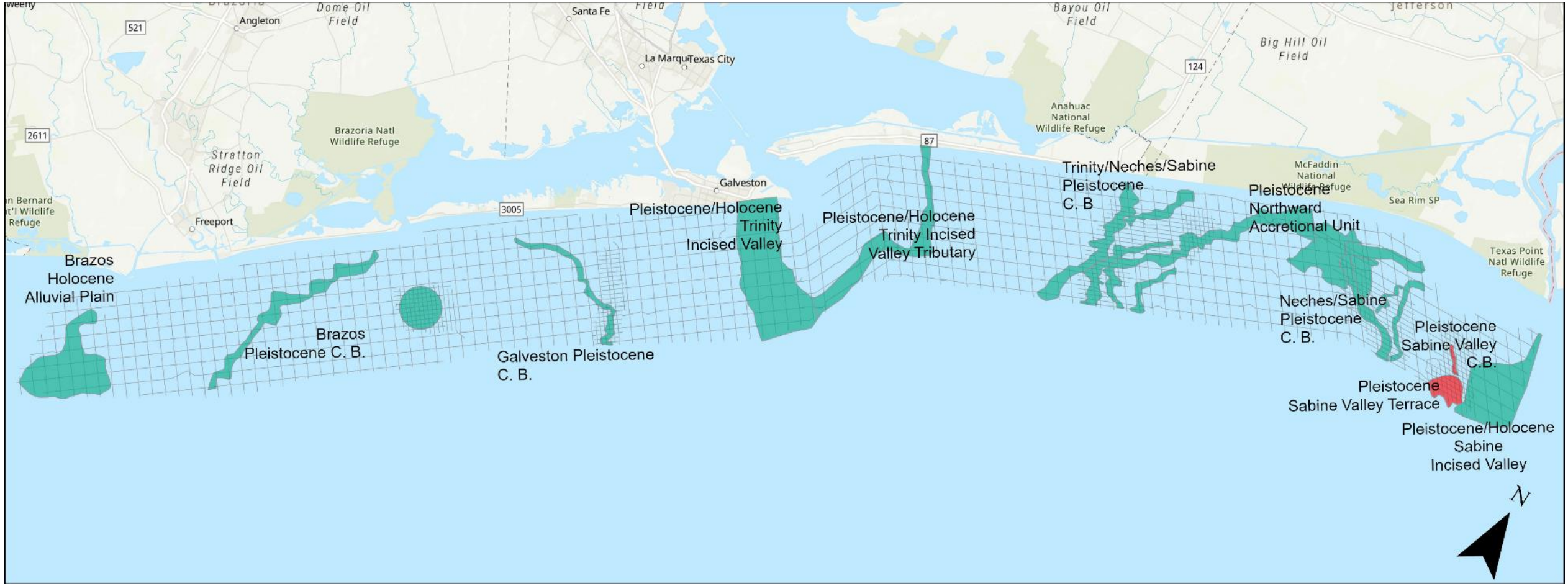
REGION 1 POTENTIAL SAND BEARING FEATURES



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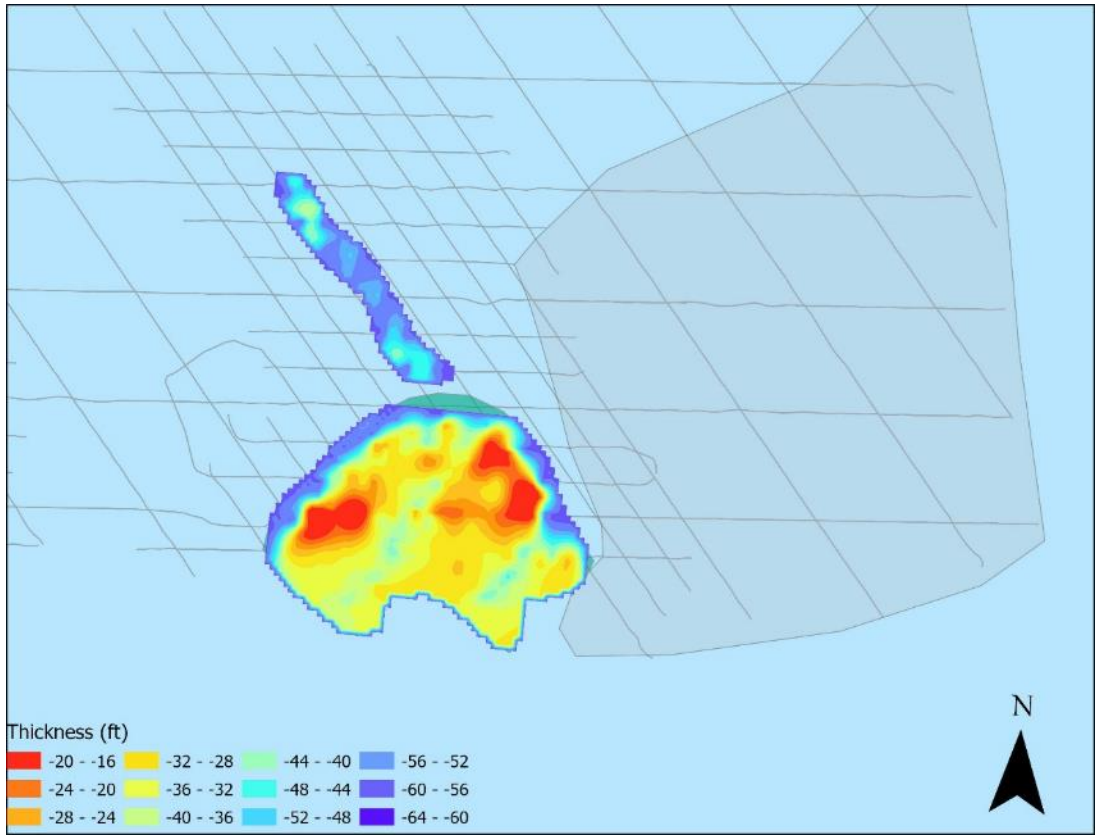
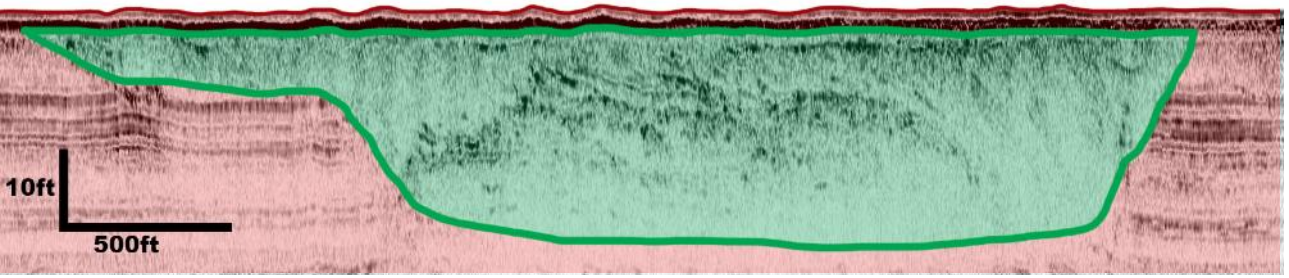
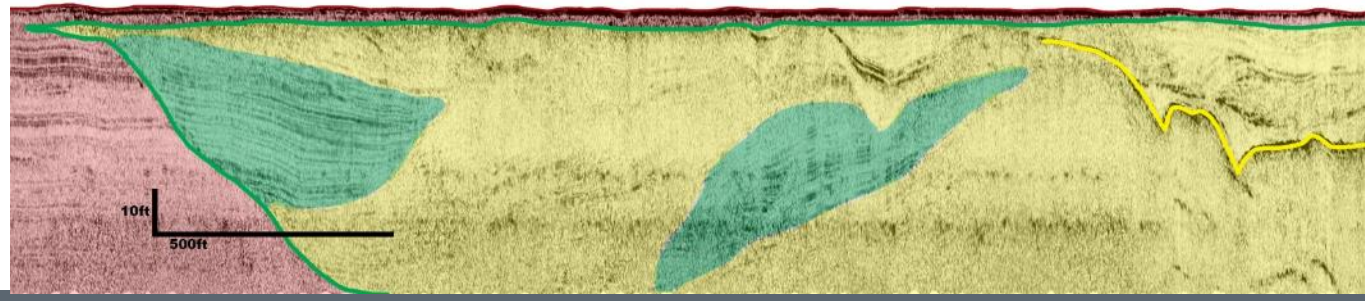
PLEISTOCENE SABINE VALLEY TERRACE

- Steeply dipping clinoforms, some acoustic transparency
- Thickness over 75ft, 5-10ft overburden
- Gross volume: 277 mcy







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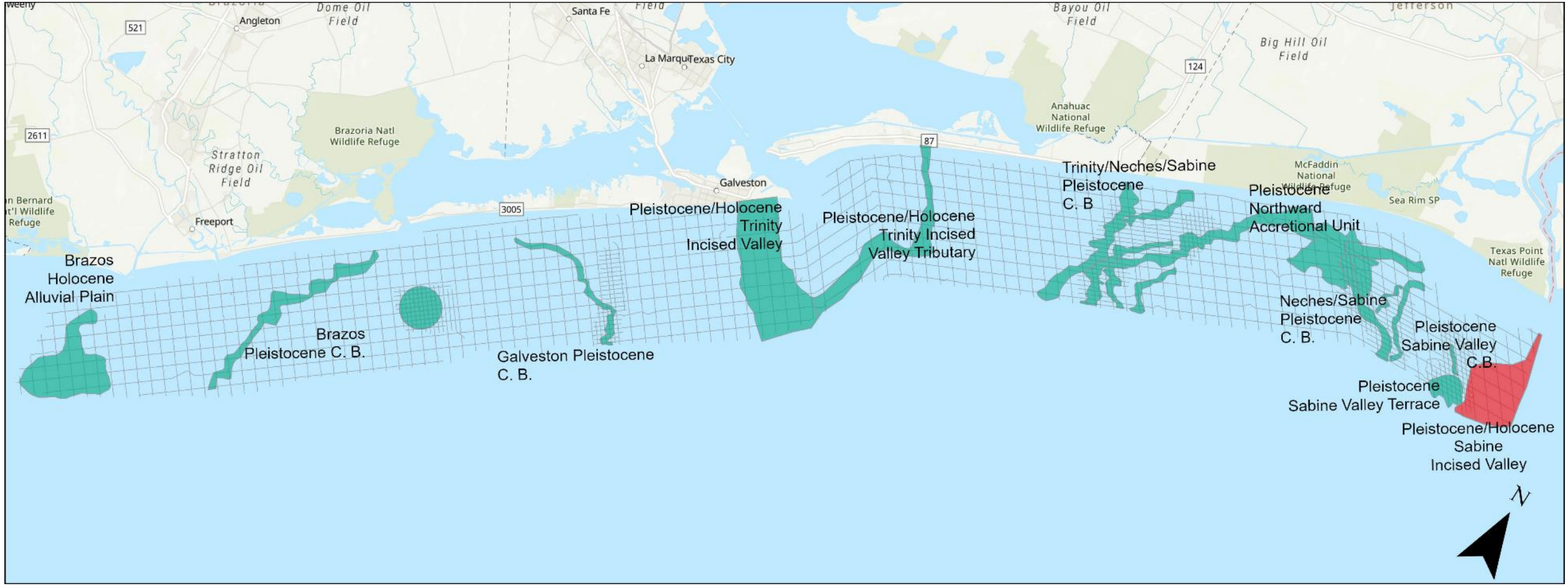
REGION 1 POTENTIAL SAND BEARING FEATURES



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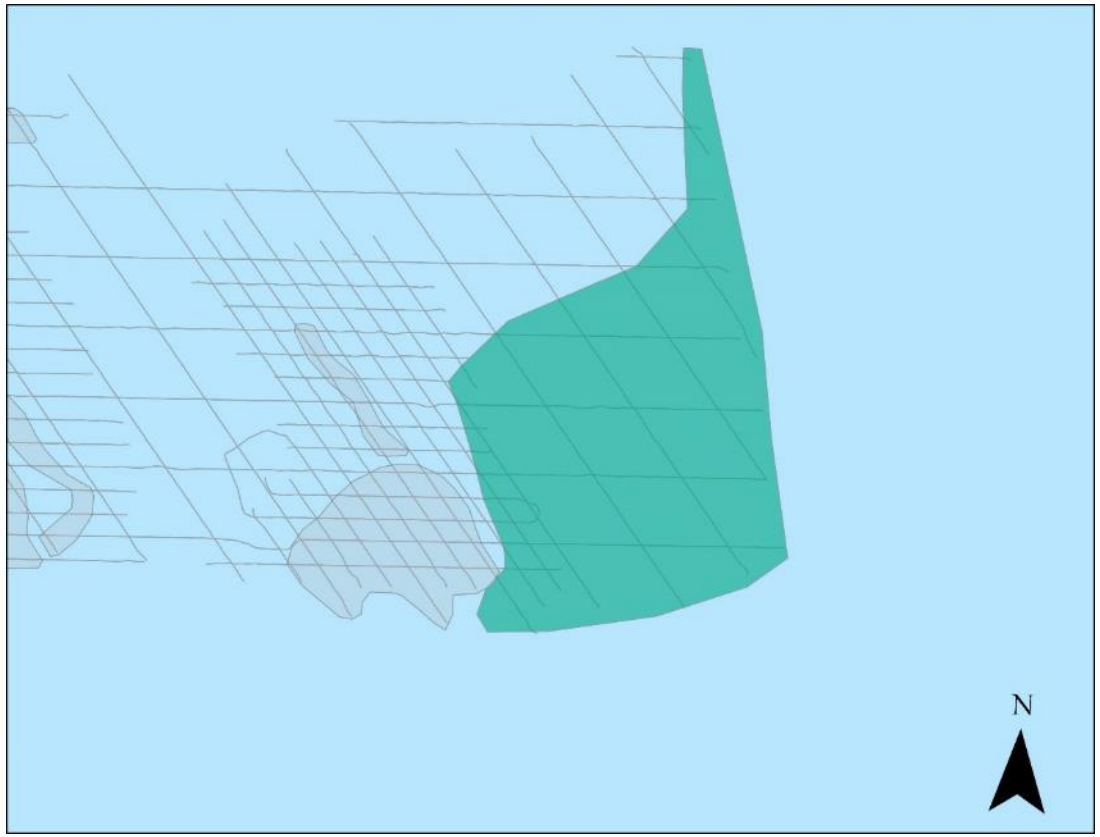
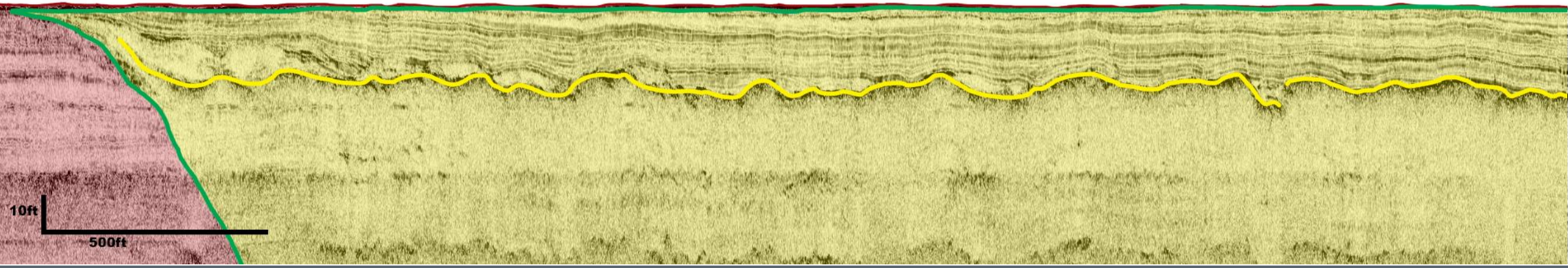
PLEISTOCENE/HOLOCENE SABINE INCISED VALLEY

- Base of valley is not observed
- Few potential tidal features





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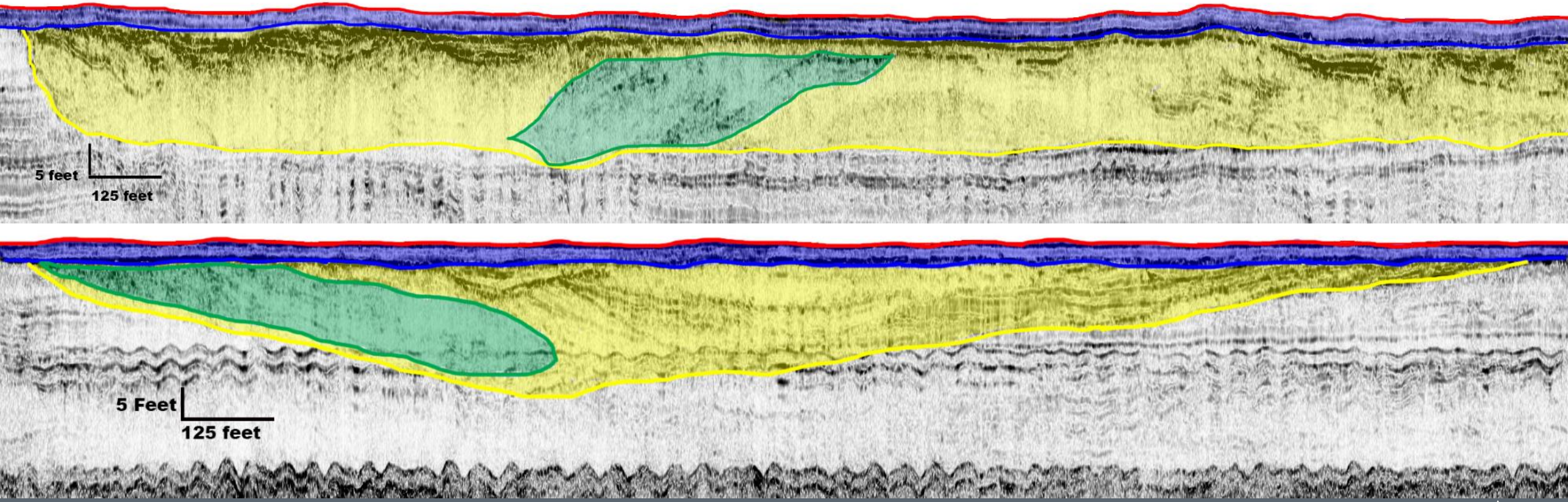
LOCALIZED FEATURES

- Isolated channels or sediment pockets
- Unable to be correlated on 1x1mile grid



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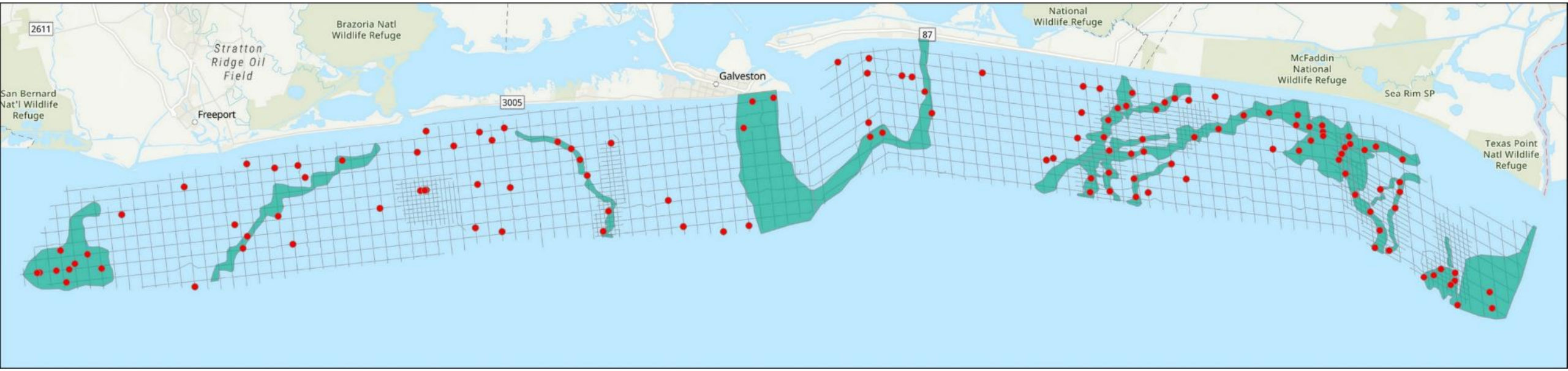
VIBRACORE SELECTION

- Selected 130 potential vibracore sites
  - > Targeted different deposits/components of deposits
- Provide a better understanding of sand resources and geologic framework



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PROJECT CONCLUSIONS

- 2,248 nm of new geophysical data collected and interpreted
- Identified previously uninterpreted Holocene and Pleistocene channel belt systems
- Regional geologic models
- Potential gross mixed sediment volume: ~3.5 billion cubic yards
  - > Sample with 89 vibracores for further sediment characterization
- 41 cores placed on smaller localized features

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QUESTIONS

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Expect the Extraordinary.

The Role of Ancient Rivers in Building the Texas Shelf and Their Importance to Future Sediment Resource Needs

John Swartz

THE ROLE OF ANCIENT RIVERS IN BUILDING THE TEXAS SHELF AND THEIR IMPORTANCE TO FUTURE SEDIMENT RESOURCE NEEDS

John Swartz PhD and Mike Miner PhD PG, The Water Institute of the Gulf

Kelly Brooks, Texas General Land Office

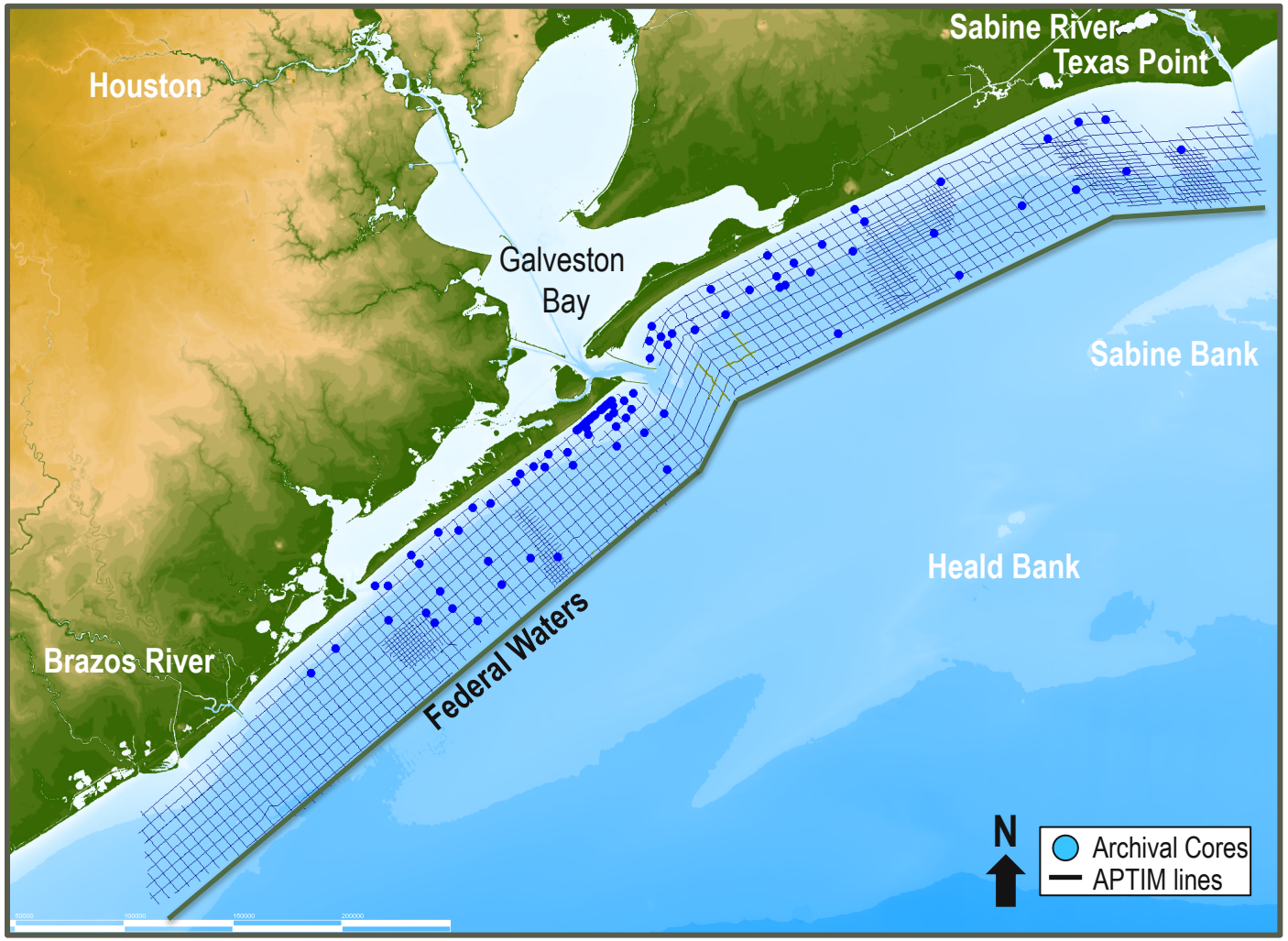
Beau Suthard PG, Patrick Bryce PG, Alexandra Valente, Jeffrey Andrews PSM CH, APTIM

OBJECTIVES AND APPROACH

- Identify promising geologic deposits that may contain sand in the continental shelf offshore Texas
- Develop regional geologic models that can aid in prediction of resource occurrence and character
- Create inventory of accessible and compatible sand resources that can be used in current and future coastal resiliency efforts

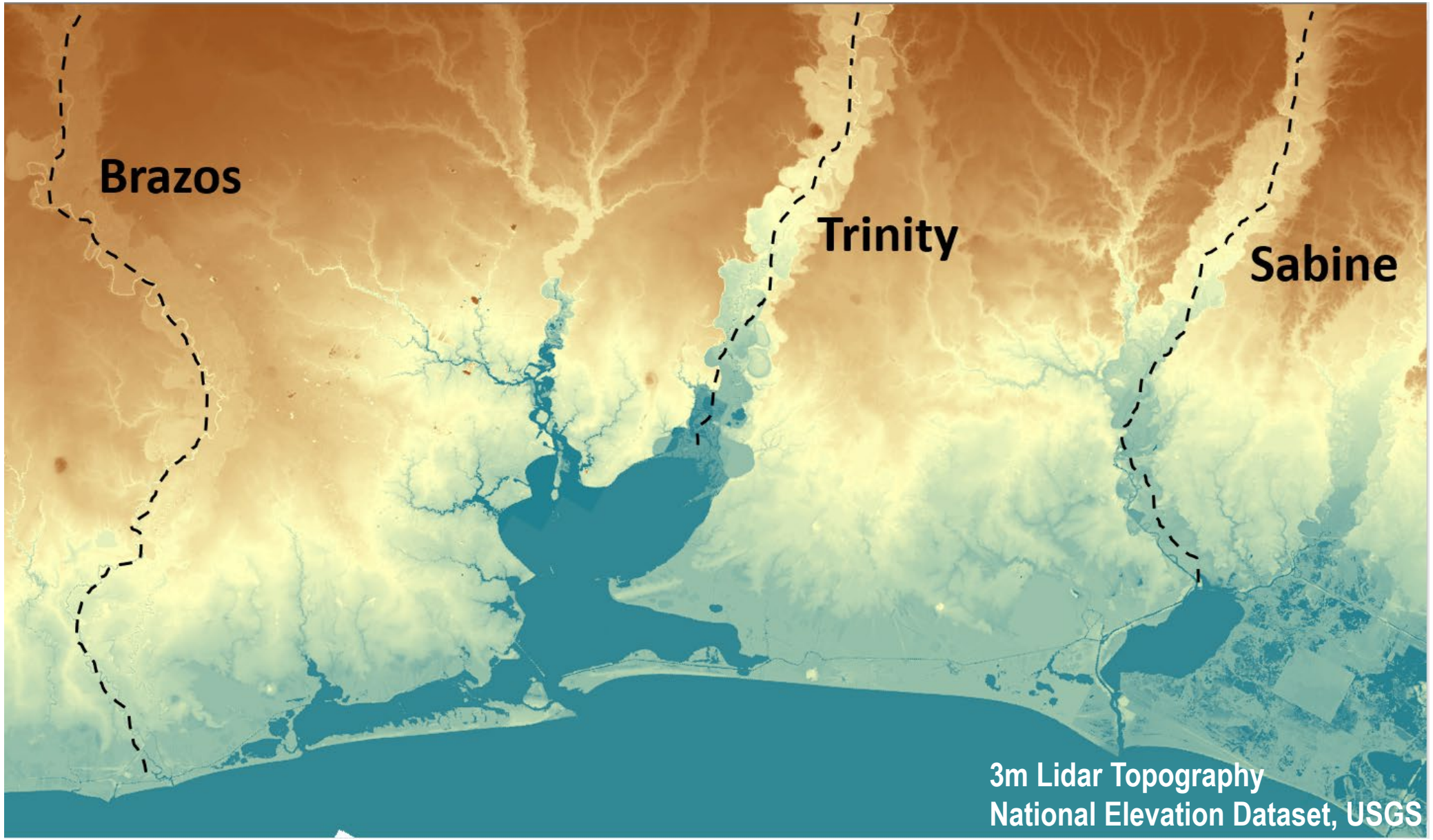
Where are useful sediments located, how much are there, and why are they there?

REGION 1 GEOPHYSICAL DATA



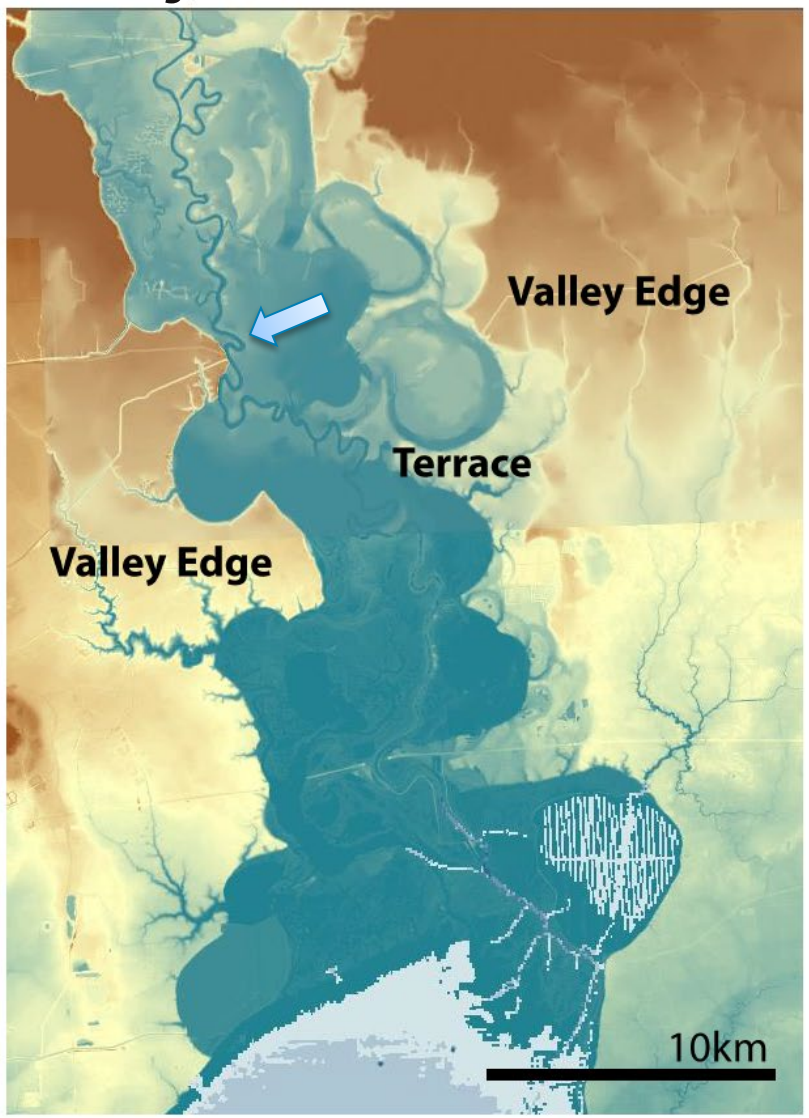
- GLO project to inform the Sediment Management Program in Region 1
  - Sabine to Brazos rivers
- Data collected by Aptim in 2020
  - 2,200nm, 1x1 grid
- TWI provided geologic interpretation and systems approach to sand resource prospecting

REGION 1 MAJOR RIVERS

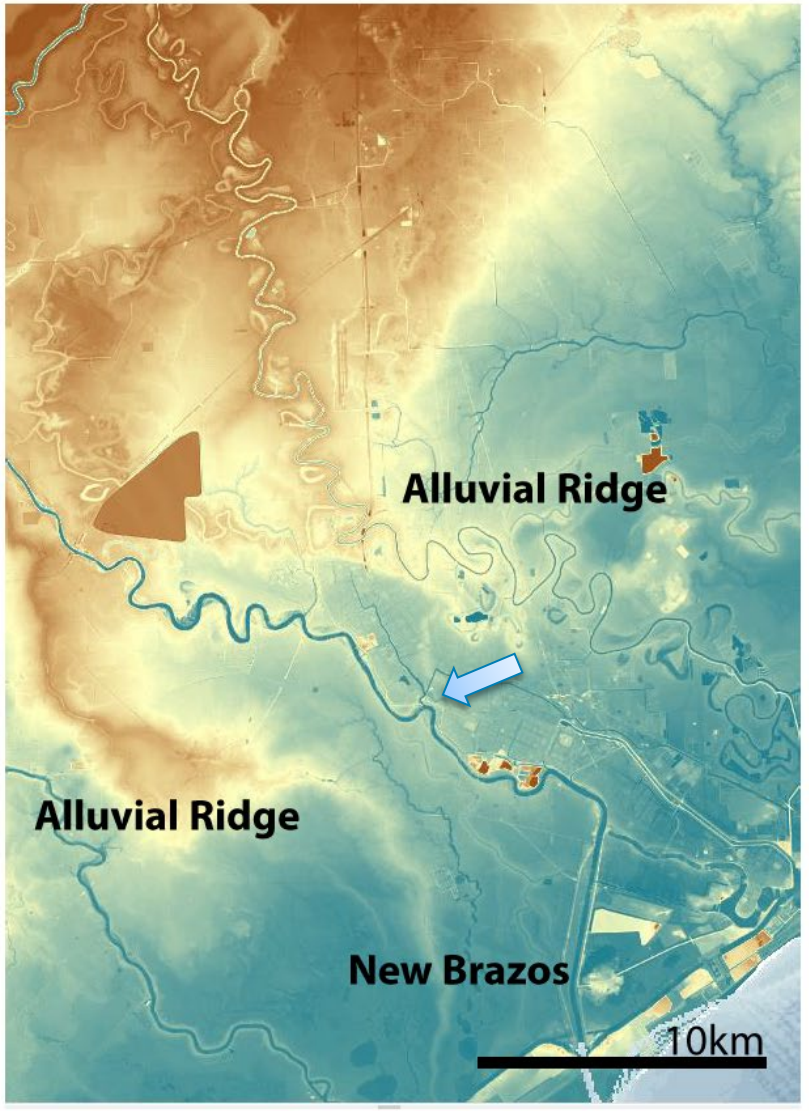


VALLEY CONFINED VS. ALLUVIAL PLAIN SYSTEMS

Trinity River



Brazos River



MEANDERING RIVERS CONCENTRATE SANDY DEPOSITS

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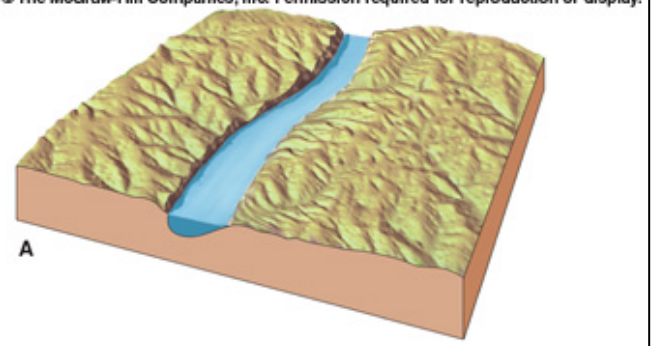
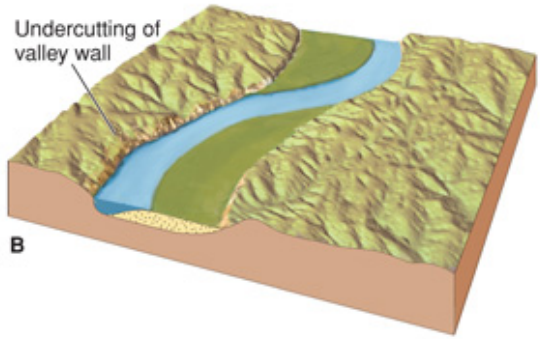
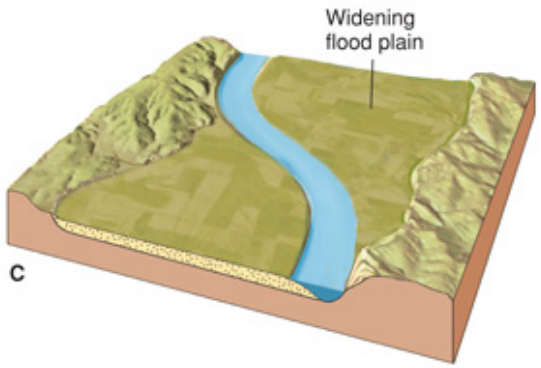
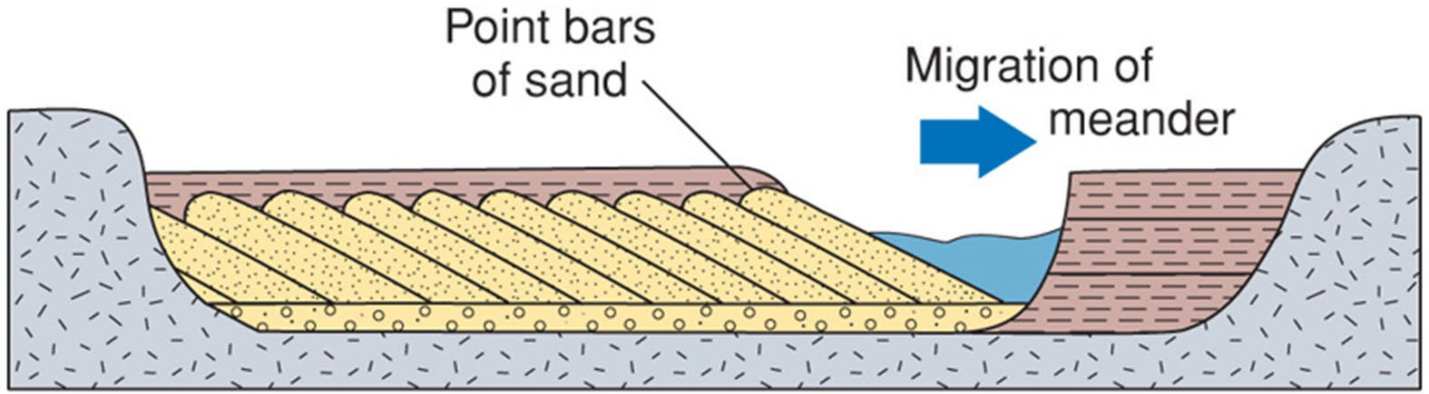
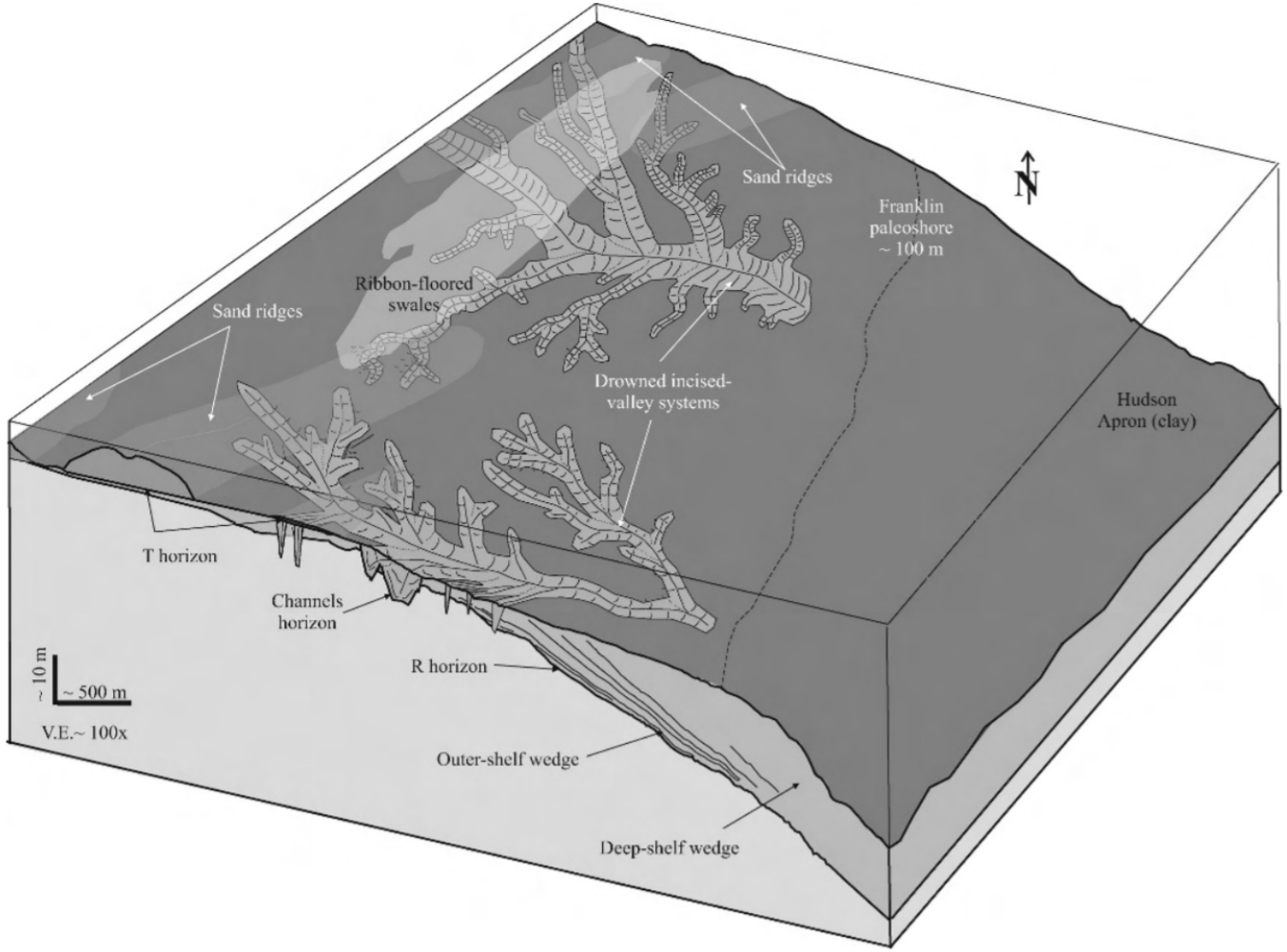


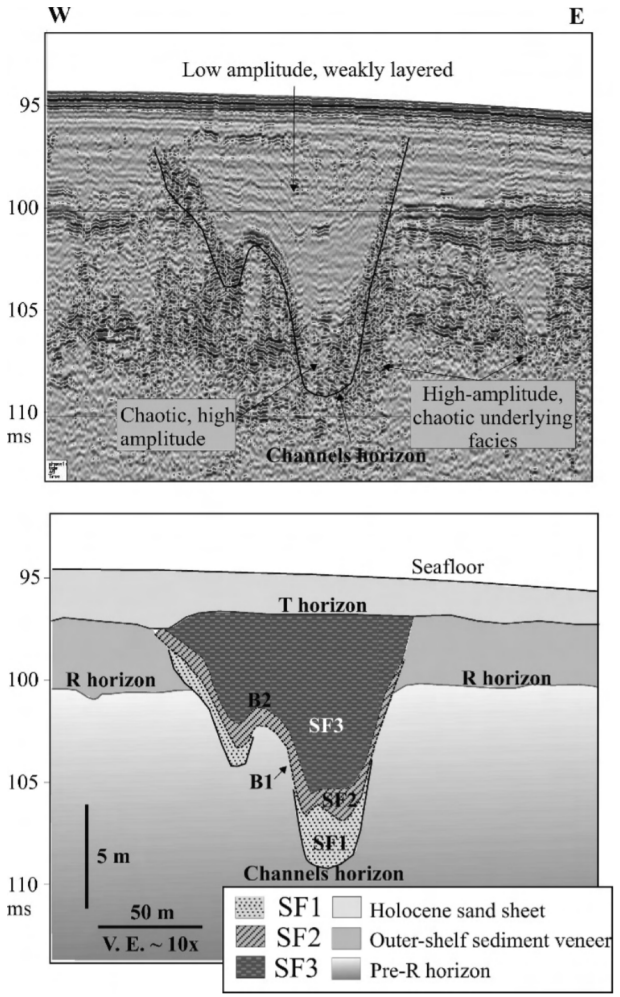




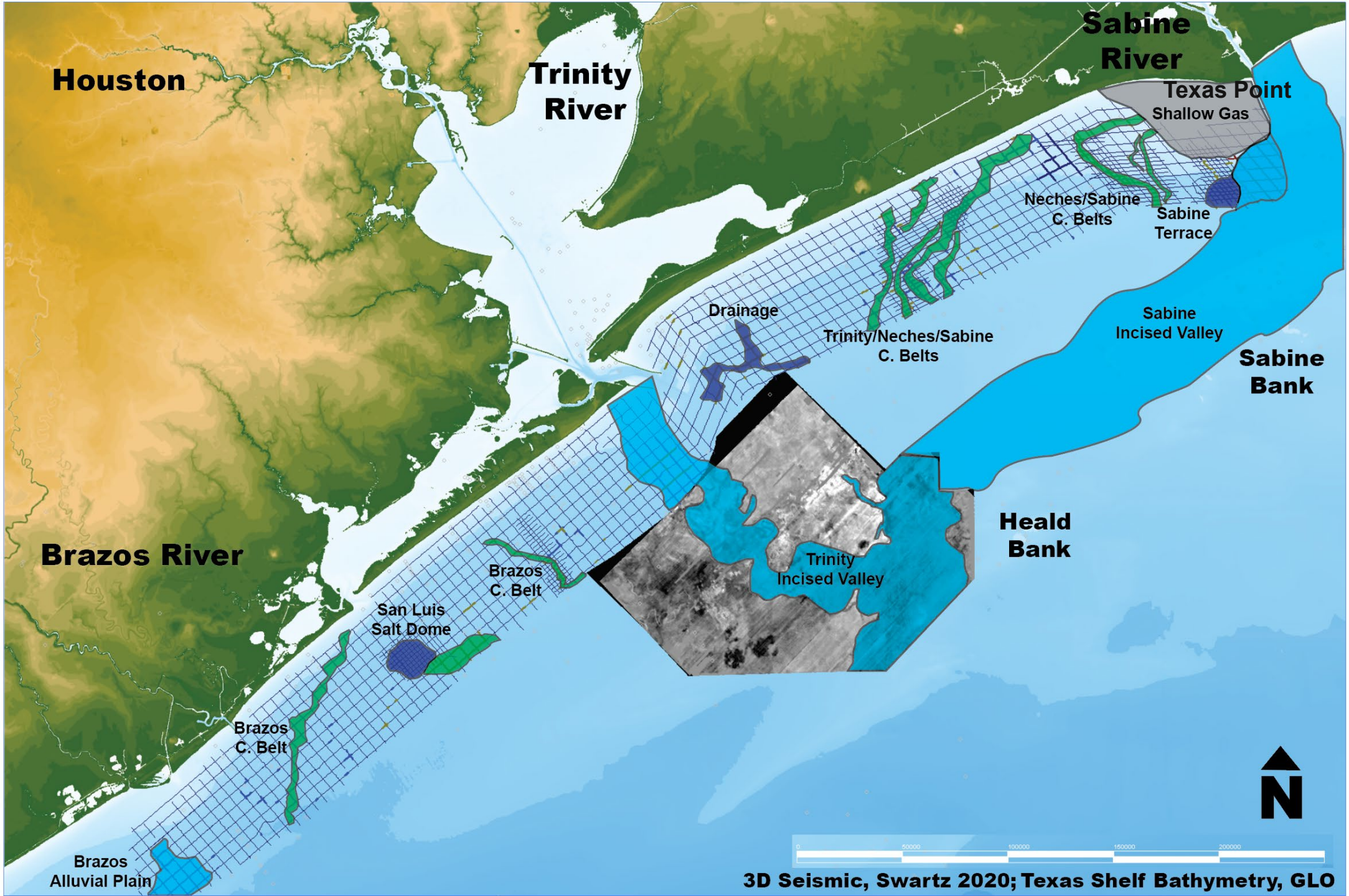


GULLIES AND DRAINAGES INCISE THE SHELF

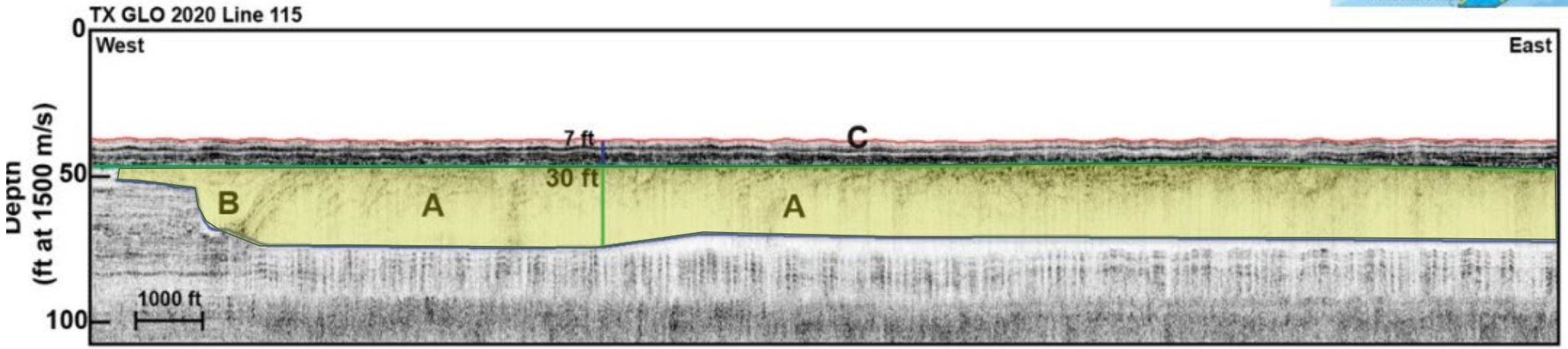


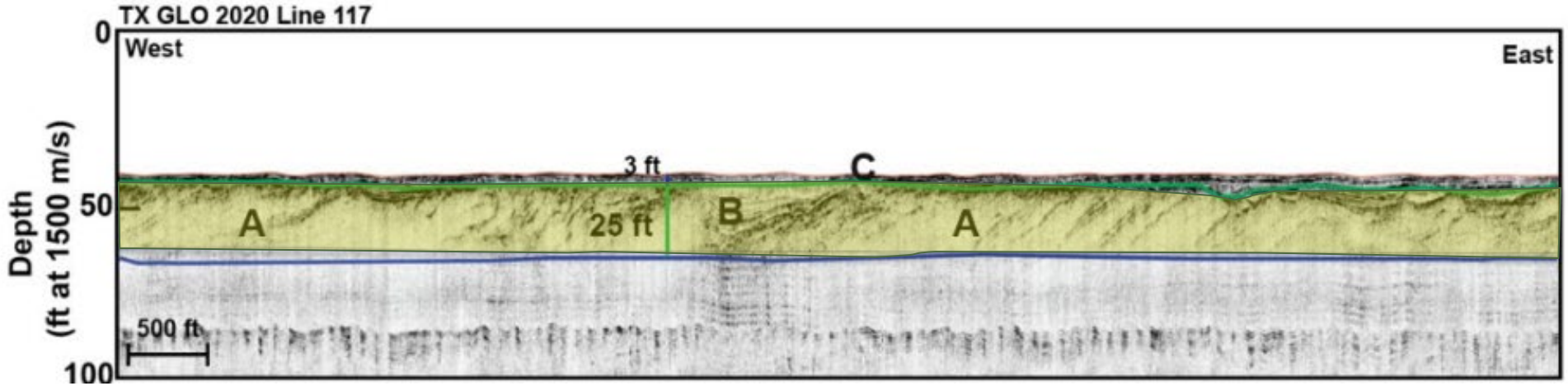


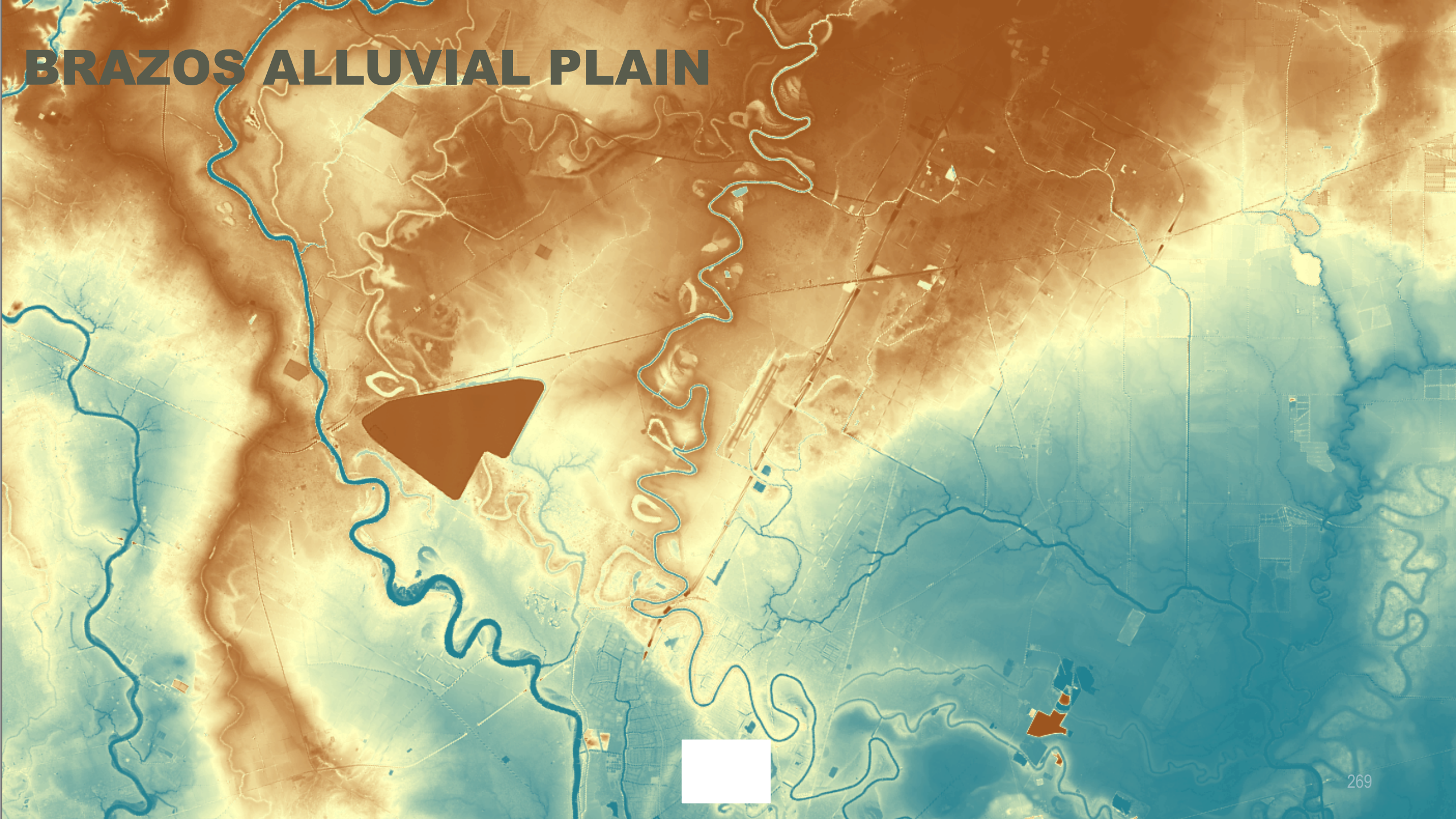
Nordfjord et al., 2006


Houston
Trinity River
Sabine River
Texas Point
Shallow Gas
Neches/Sabine C. Belts
Sabine Terrace
Drainage
Trinity/Neches/Sabine C. Belts
Sabine Incised Valley
Sabine Bank
Heald Bank
Trinity Incised Valley
Brazos River
Brazos C. Belt
San Luis Salt Dome
Brazos C. Belt
Brazos Alluvial Plain
N
0
50000
100000
150000
200000
3D Seismic, Swartz 2020; Texas Shelf Bathymetry, GLO

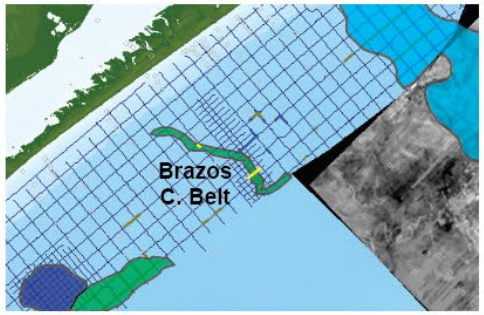
OFFSHORE BRAZOS COMPOSED OF BROAD ALLUVIAL PLAIN, MEANDER DEPOSITS

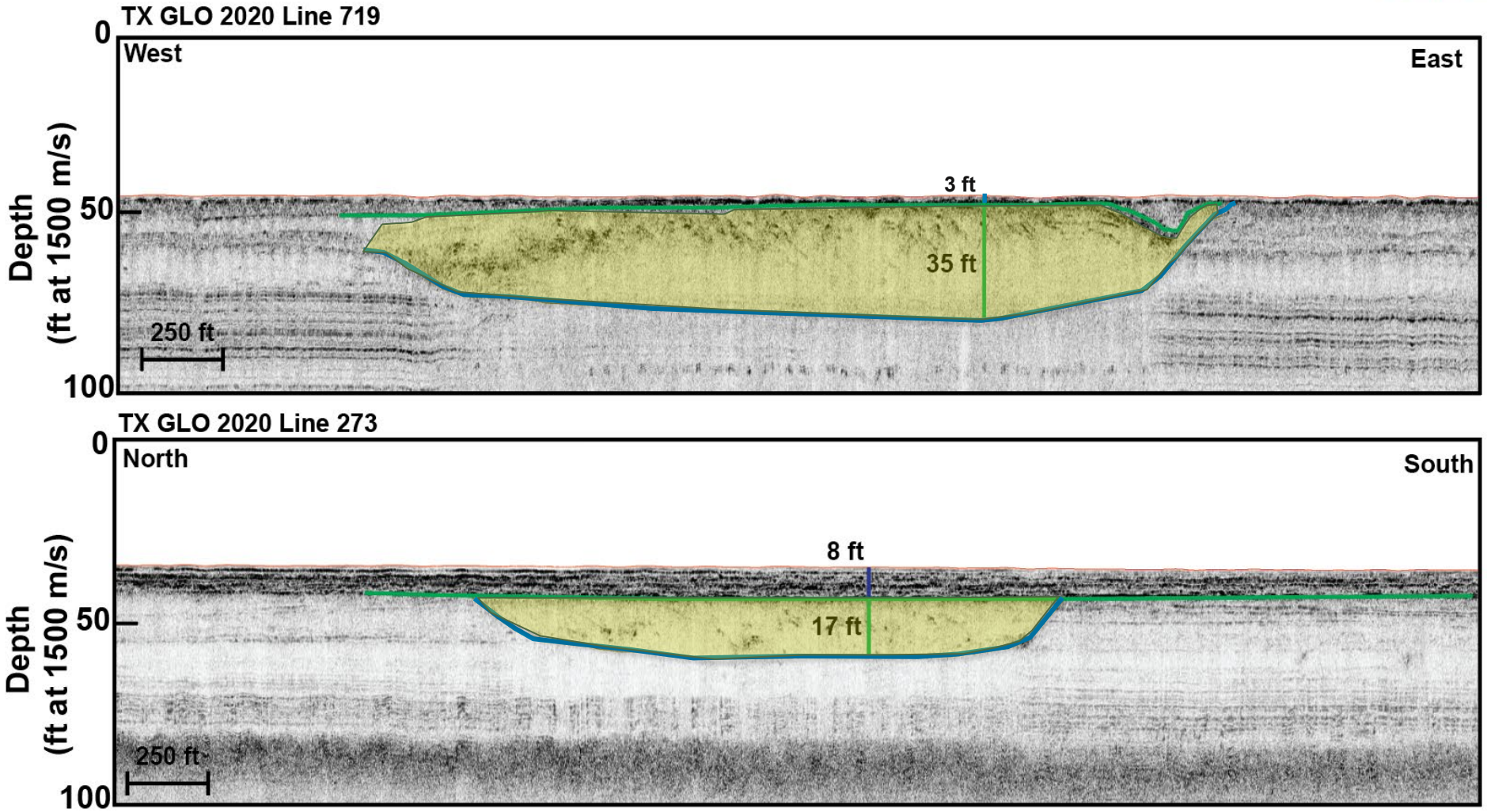




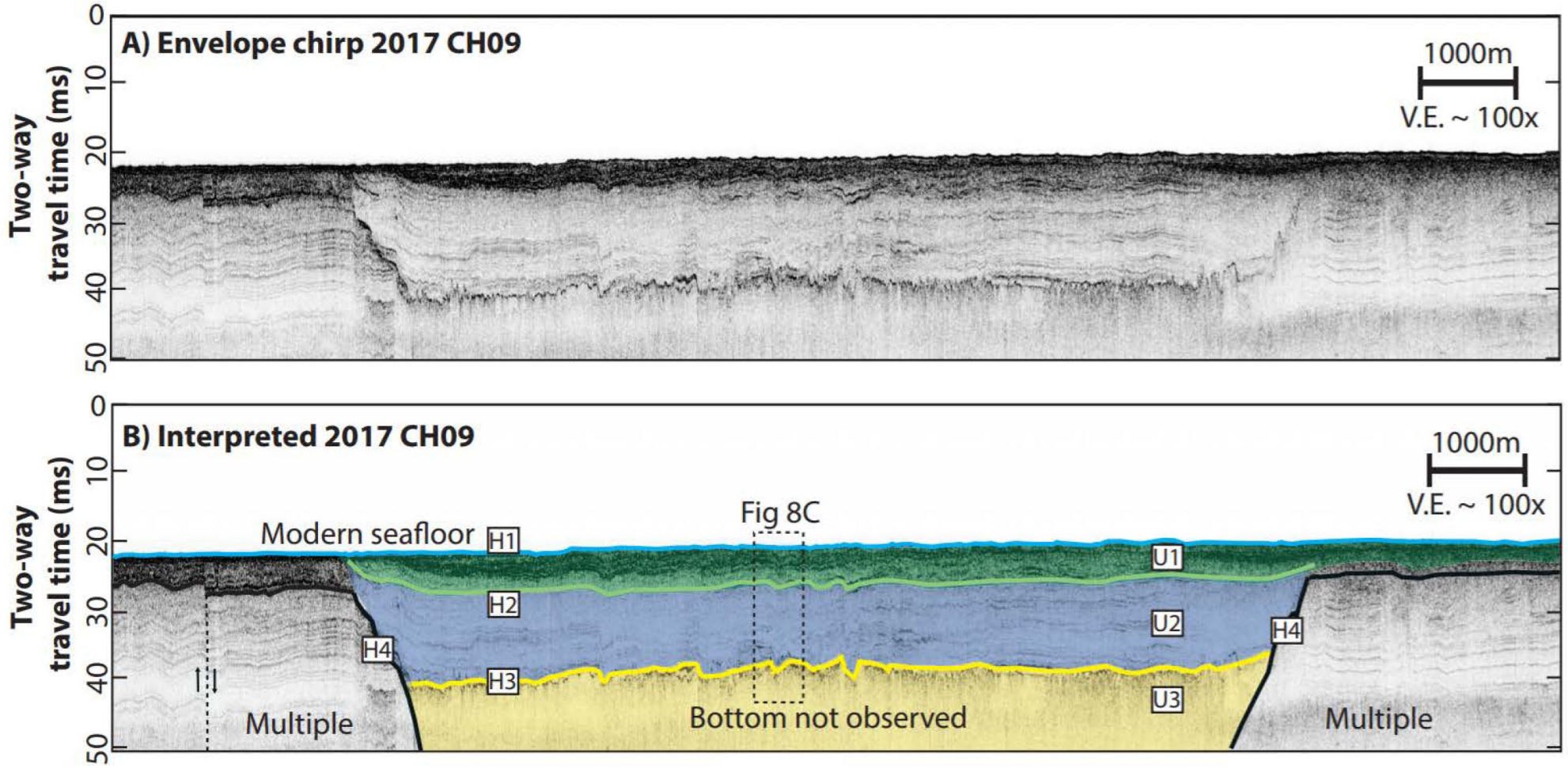

BRAZOS ALLUVIAL PLAIN

OFFSHORE GALVESTON PLEISTOCENE CHANNEL BELT

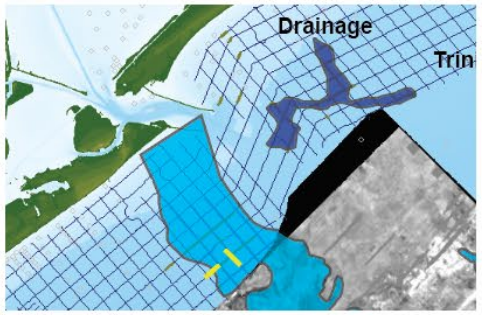




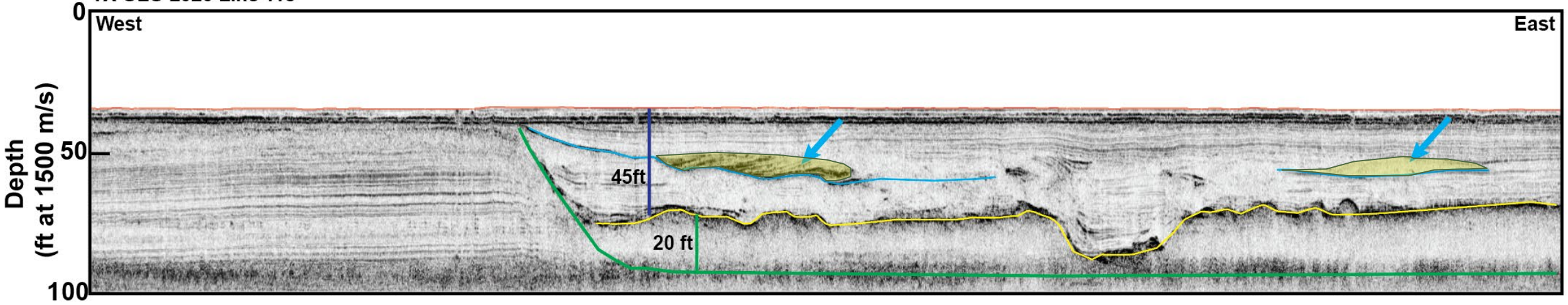
TRINITY INCISED VALLEY: DEEPLY BURIED FLUVIAL SEDIMENT UNDER ESTUARY AND BAY



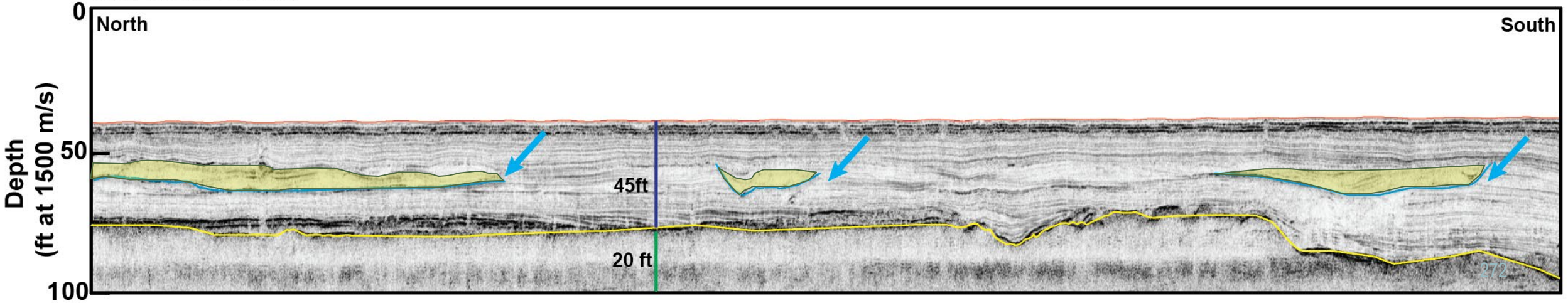
TRINITY INCISED VALLEY TIDAL INLETS AND DELTAS



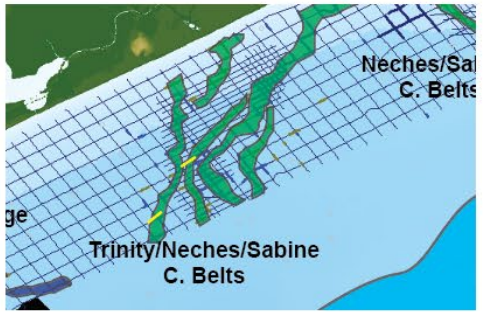
TX GLO 2020 Line 118

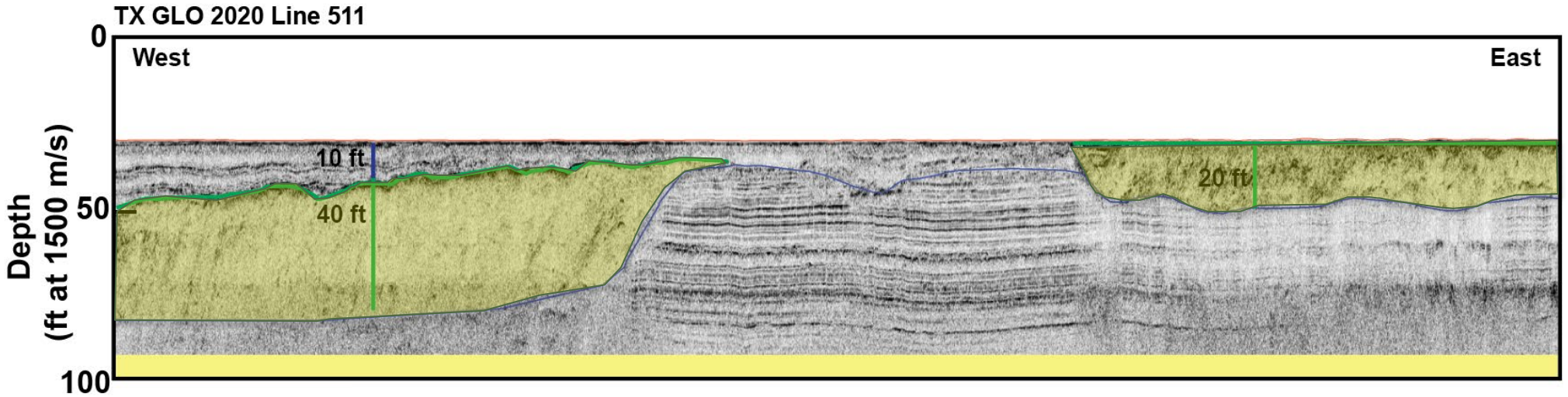


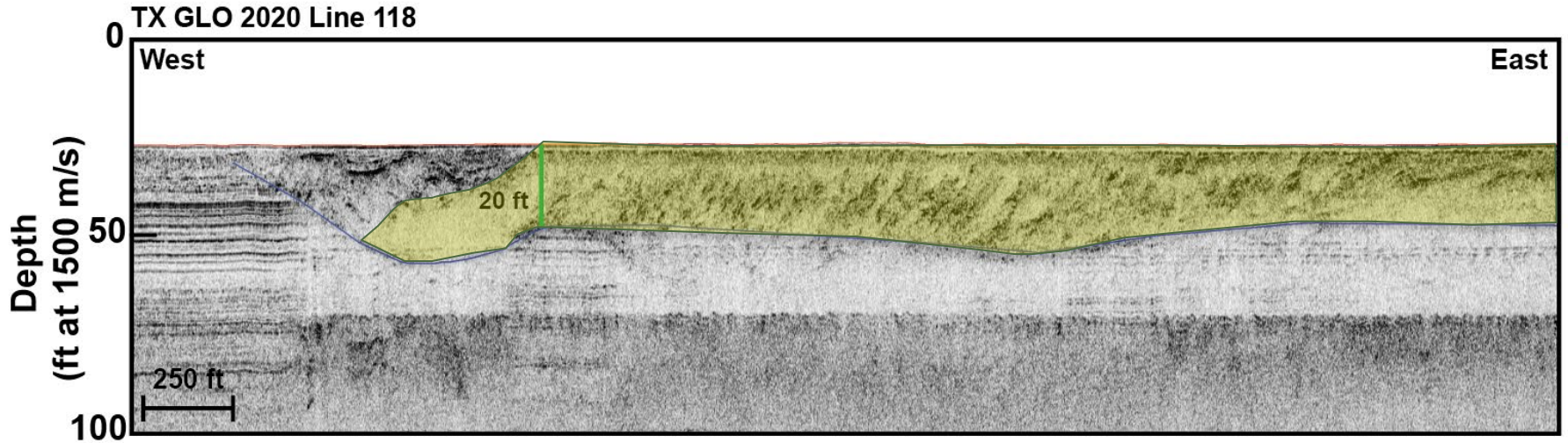
TX GLO 2020 Line 260



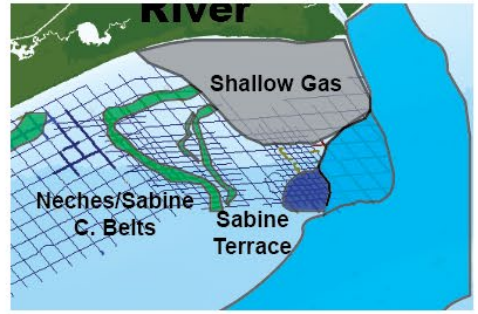
EAST TEXAS PLEISTOCENE CHANNEL BELTS: MASSIVE RIVER DEPOSITS

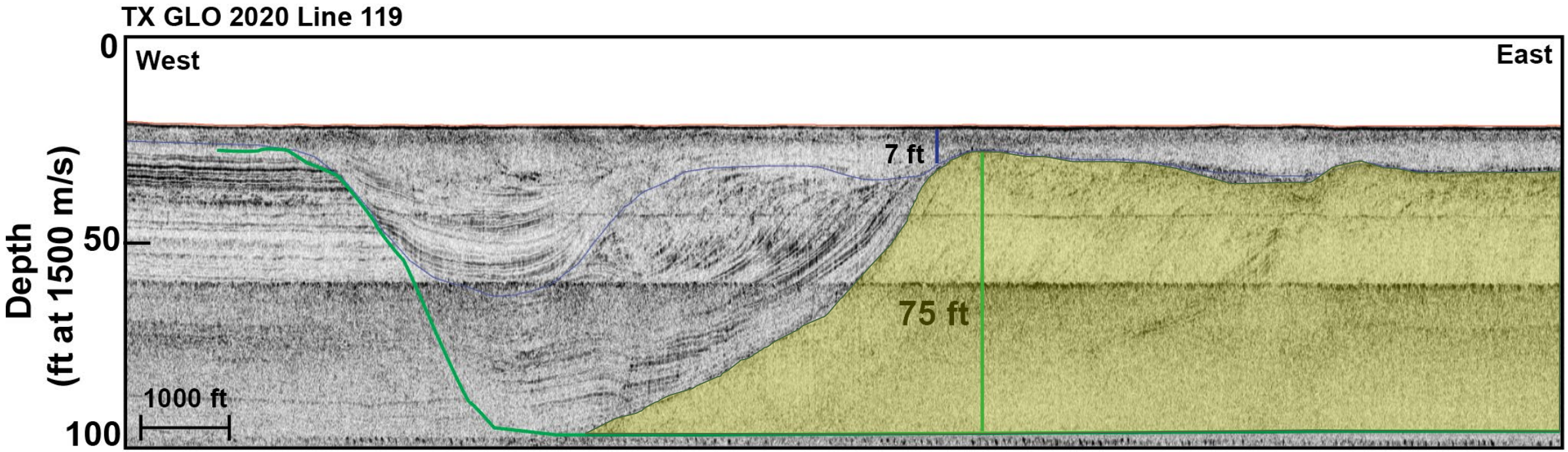




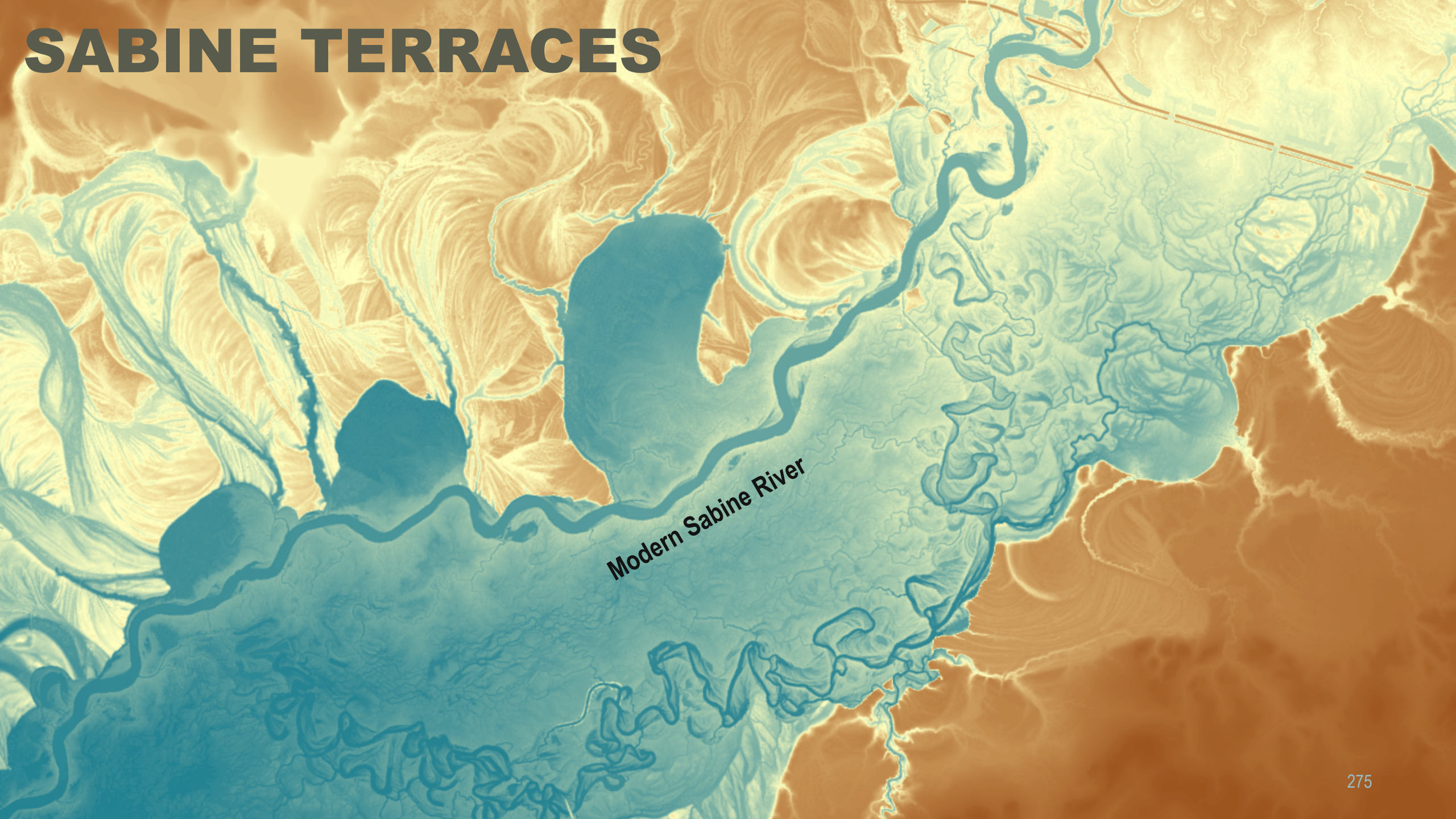


SABINE TERRACE DEPOSITS: MASSIVE POINT BARS CLOSE TO THE SEAFLOOR

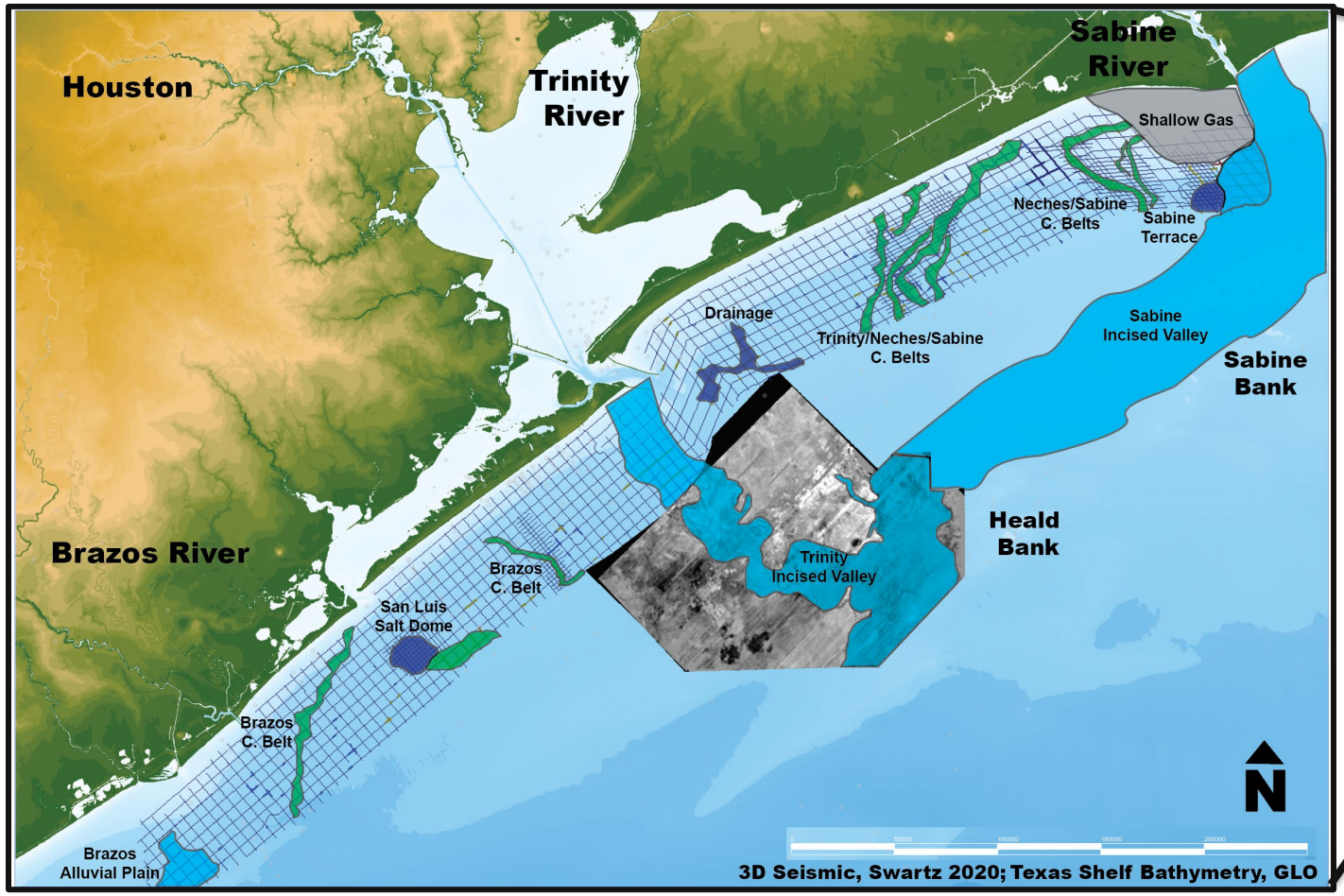


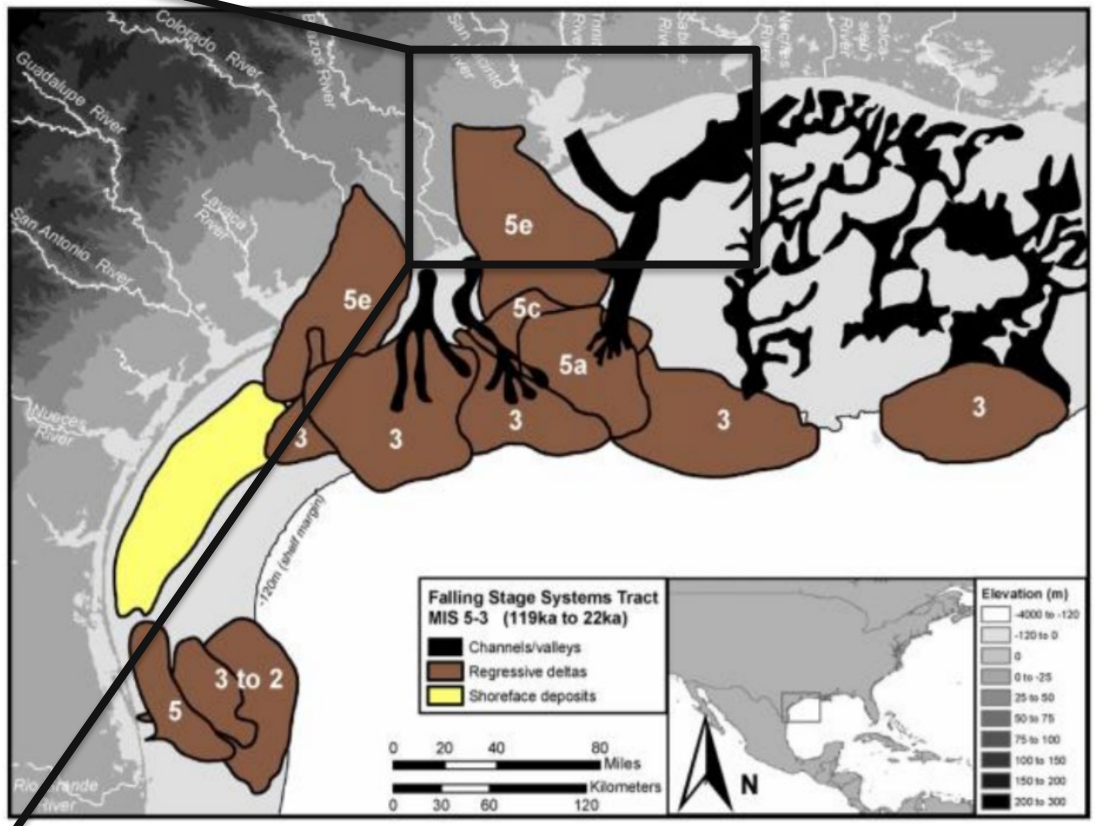


SABINE TERRACES



PLEISTOCENE FLUVIAL COURSES MORE WIDESPREAD THAN PREVIOUSLY IDENTIFIED

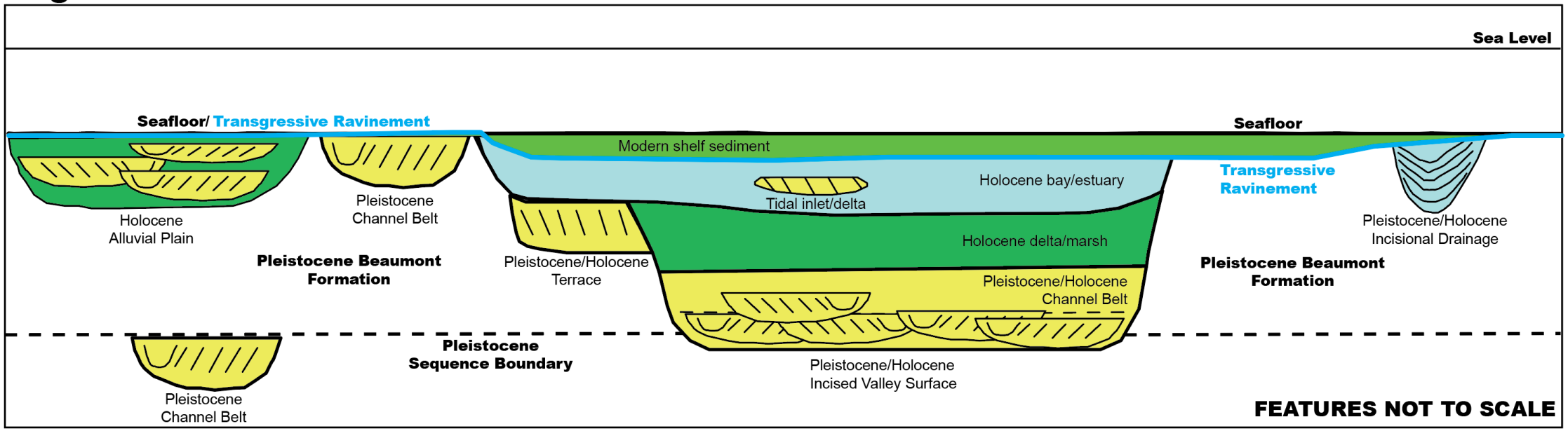




Modified from Anderson et al., 2015

SIGNIFICANT PORTION OF INNER SHELF STRATIGRAPHY COMPOSED OF PLEISTOCENE FLUVIAL AND FLOODPLAIN DEPOSITS

Region 1 Generalized Cross Section



CONCLUSIONS

- Pleistocene fluvial systems (Trinity, Sabine, Brazos) formed large channel belts across the continental shelf that are well preserved with minimal overburden
  - Can be linked to up-dip analogs and equivalents to improve resource characterization
- Pleistocene deposits are shallower than Holocene incised valley fluvial deposits, often outcrop at seafloor
- Inner shelf has often thin or non-existent modern marine layer, minimal shelf sediment deposition as previously interpreted
- Fluvial channel belts and terraces represent high potential for sand and/or mixed sediment resources

Significant volumes of previously unidentified high-potential sand resources offshore Region 1

Use of higher-level processed chirp subbottom data for identifying potential offshore sand resources: a geologic systems approach

John A. Goff

GLO Sediment Workshop
10 November 2021

Use of higher-level processed chirp subbottom data for identifying potential offshore sand resources: a geologic systems approach

John A. Goff, Sean Gulick

UTIG Team: Chris Lowery, Gail Christeson, Steffen Saustrup, Dan Duncan, Marcy Davis

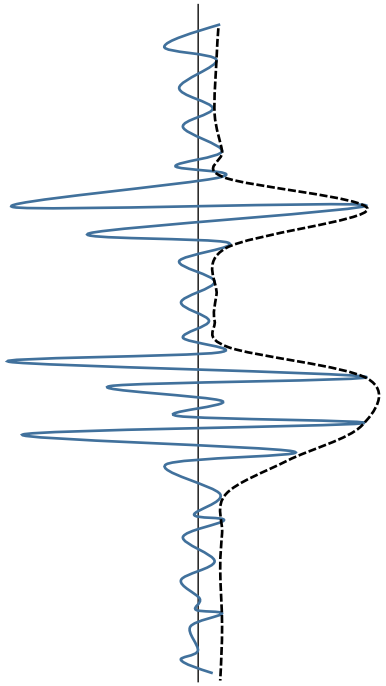
Student Contributors: John Swartz, Jake Burstein, Patty Standring, Carson Miller, Solveig Schilling

Outline

1. Chirp Processing and Methods
- Premier tool for discovering and delineating near-surface sedimentary resources
- How can we maximize the information content of chirp data?

2. Chirp investigations of the barrier/estuary system of the Trinity River Paleovalley
- Identification of different elements of the preserved barrier/estuary system and the types of sediments they contain
- Use of seismic and sedimentary facies to delineate these elements in the stratigraphic section

Envelope vs. Full Waveform

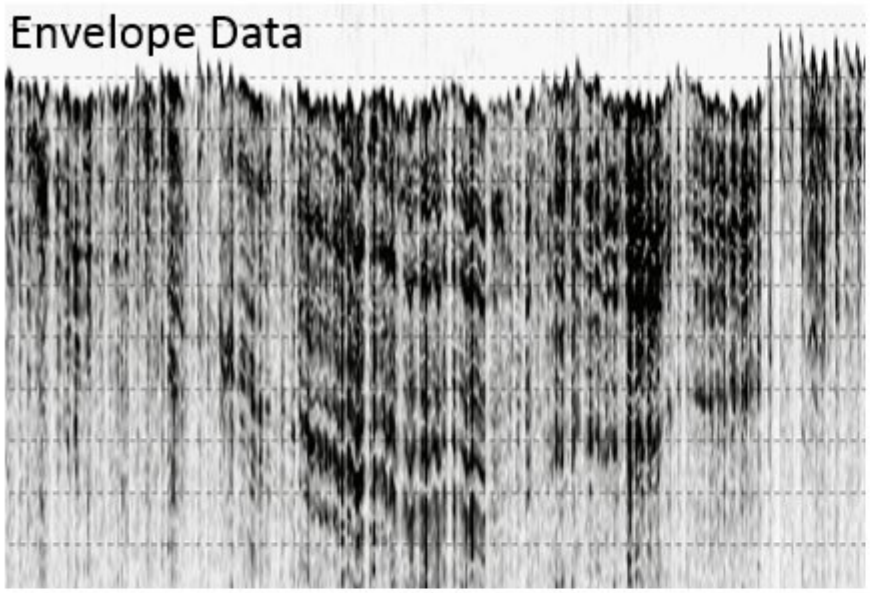


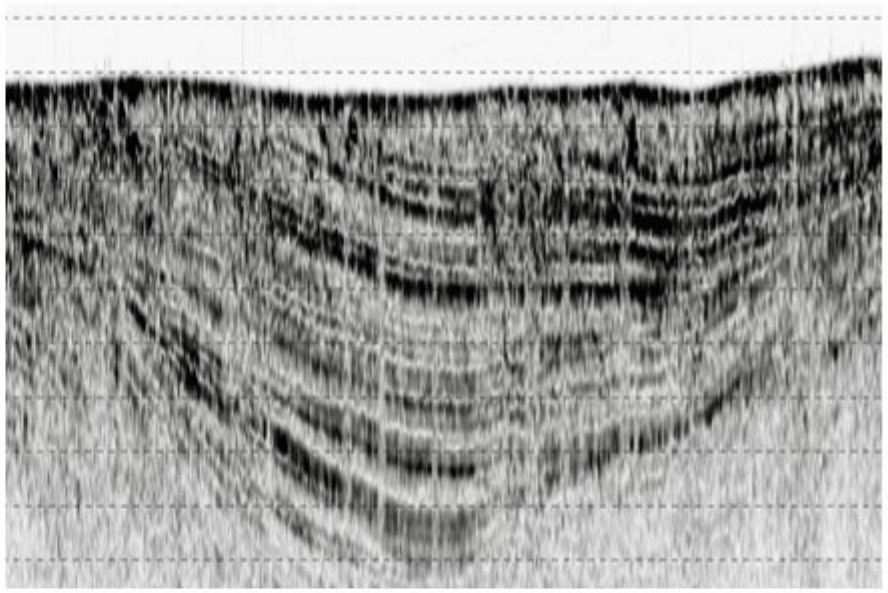
-Envelope records are useful for “big picture”
-Full waveform records are useful for finer detail

Before

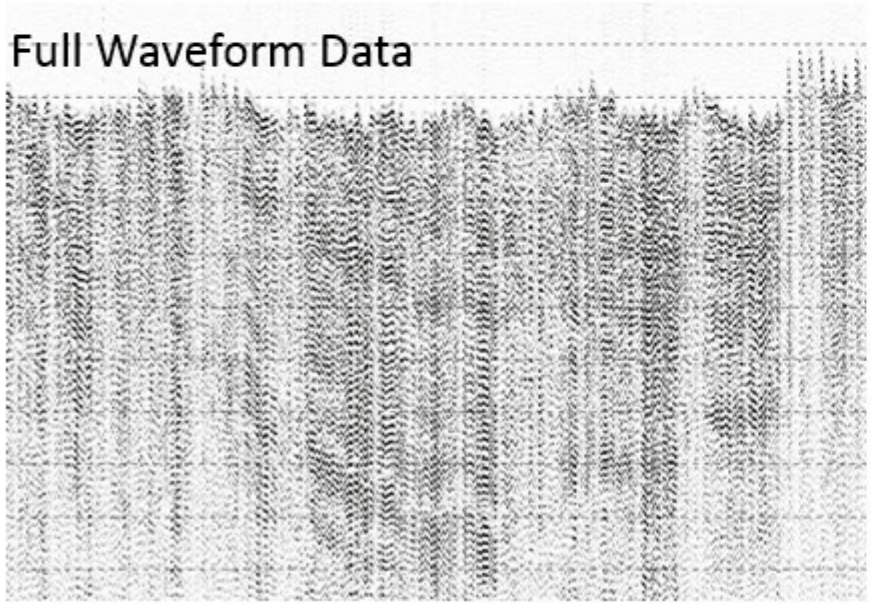
After

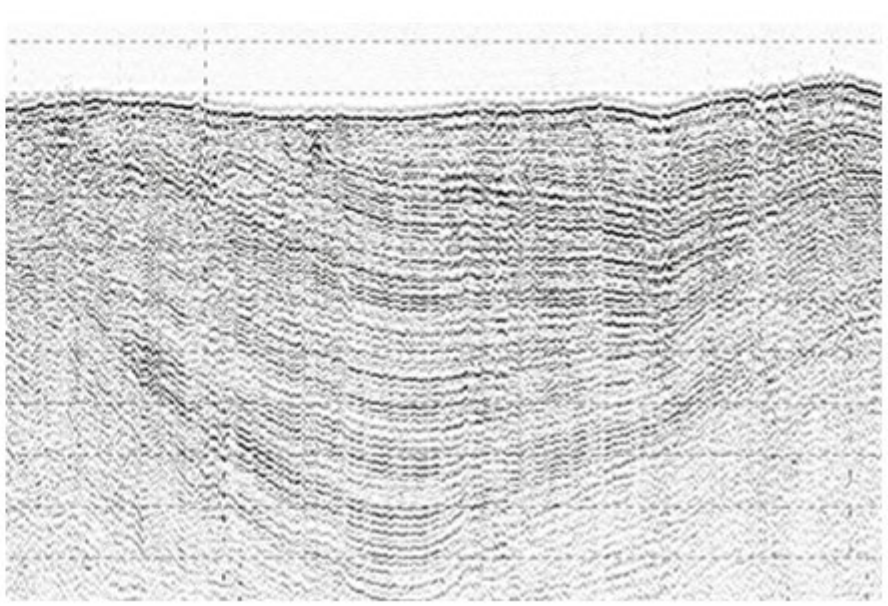
Envelope Data





Full Waveform Data

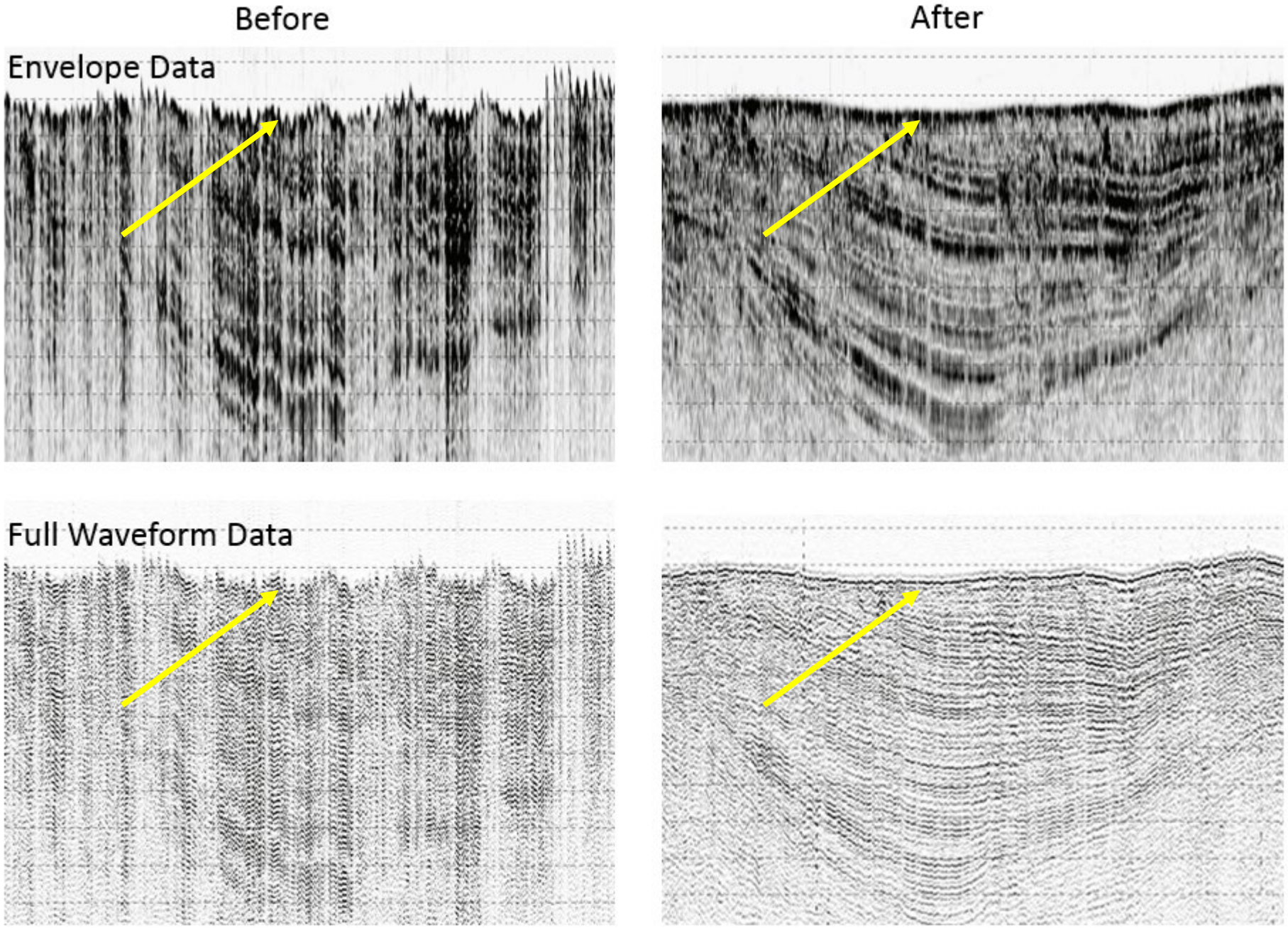




Heave Filtering

After bottom picking, data records can be shifted up or down (statics) to smooth out the seafloor.

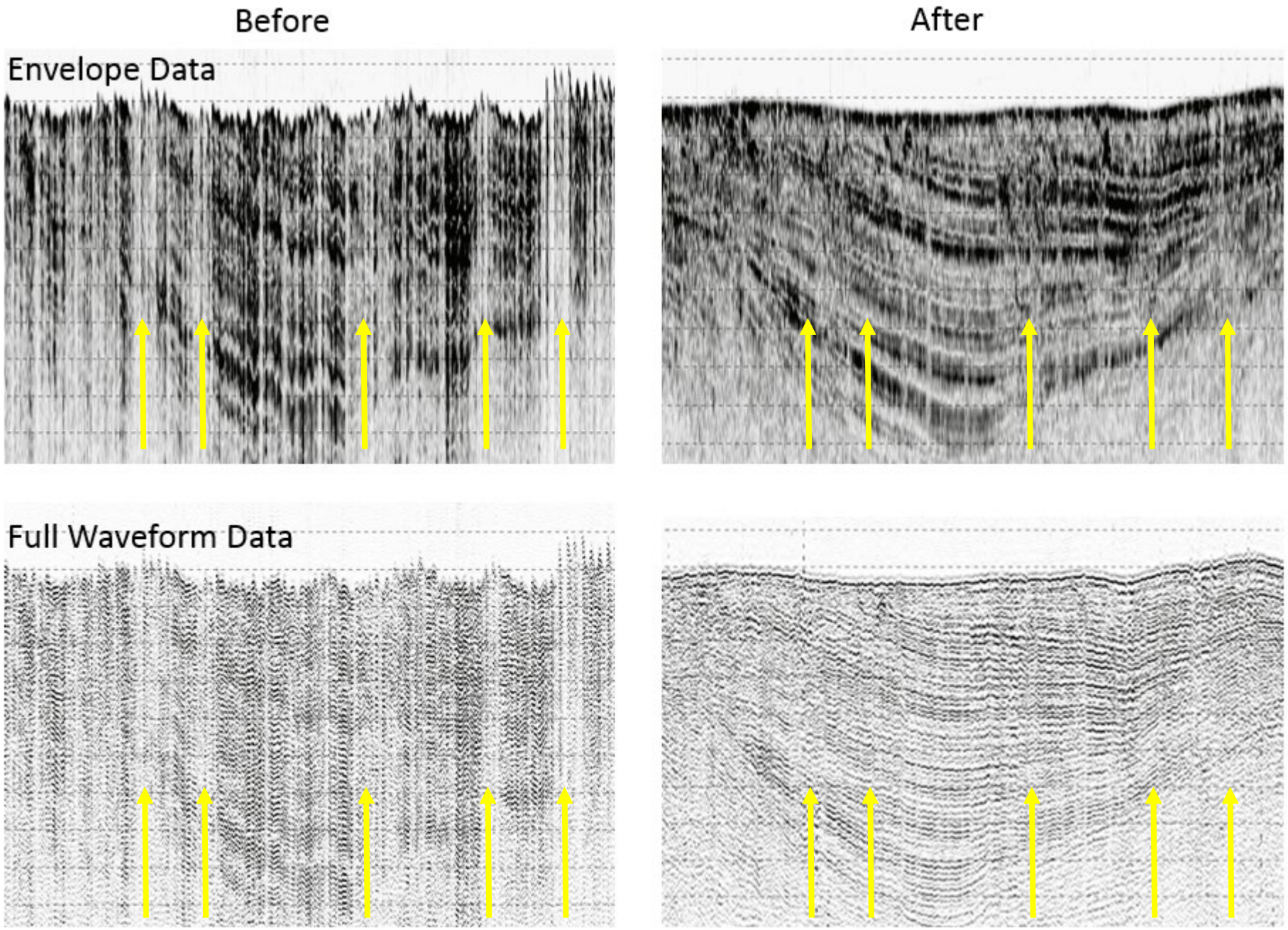
One input parameter: number of pings in low-pass filter of seafloor arrival



Gain Correction

Heave on the towfish will also change the angle of the towfish transducers away from vertical, which can create strong variations in the strength of the returned signal.

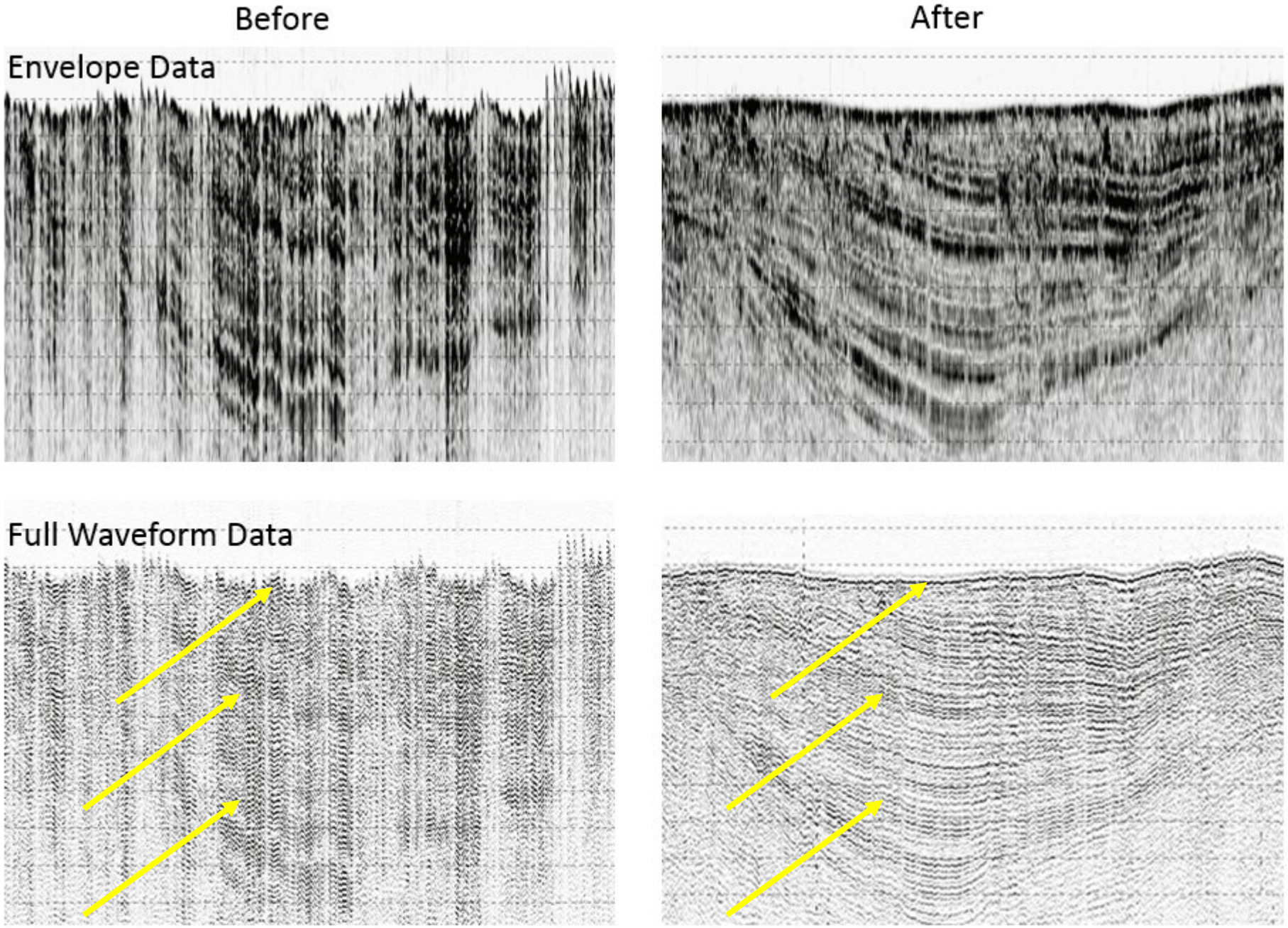
Image quality is greatly enhanced by a simple balancing of amplitudes



Secondary deconvolution

The chirp match-filter deconvolution is compromised to some extent by imperfect (i.e., uncalibrated) rendering of the outgoing pulse.

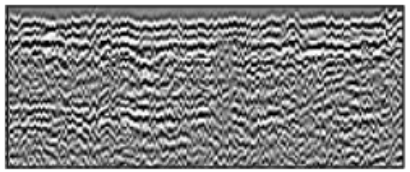
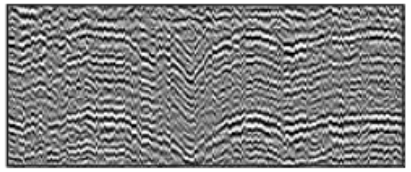
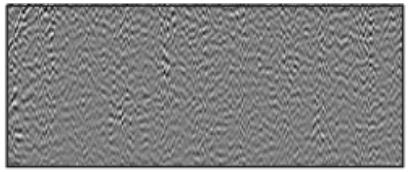
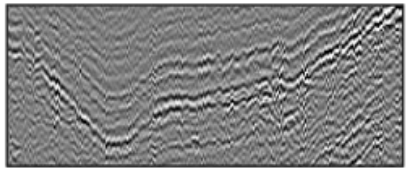
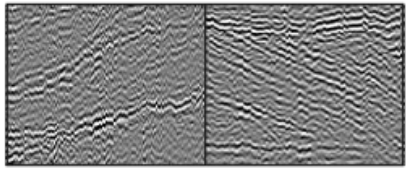
Full-waveform records can be improved by using the seafloor reflection as a pseudo-outgoing pulse and using it to re-deconvolve.

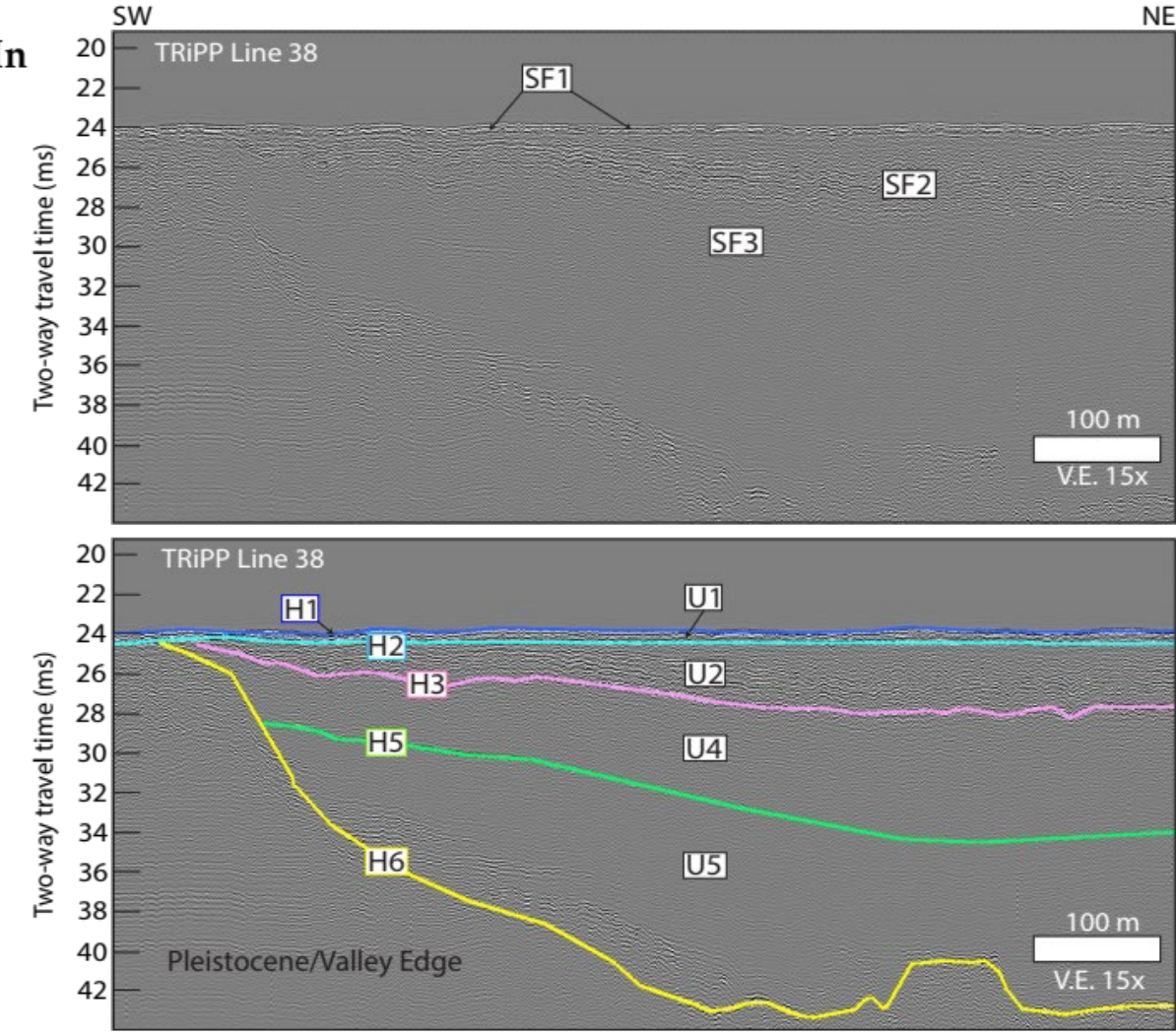


Other Processing Steps

1. Water column muting
2. Tide correction (and/or cross-tie adjustments)
3. Towfish depth correction
4. Recording delay correction
5. Layback correction

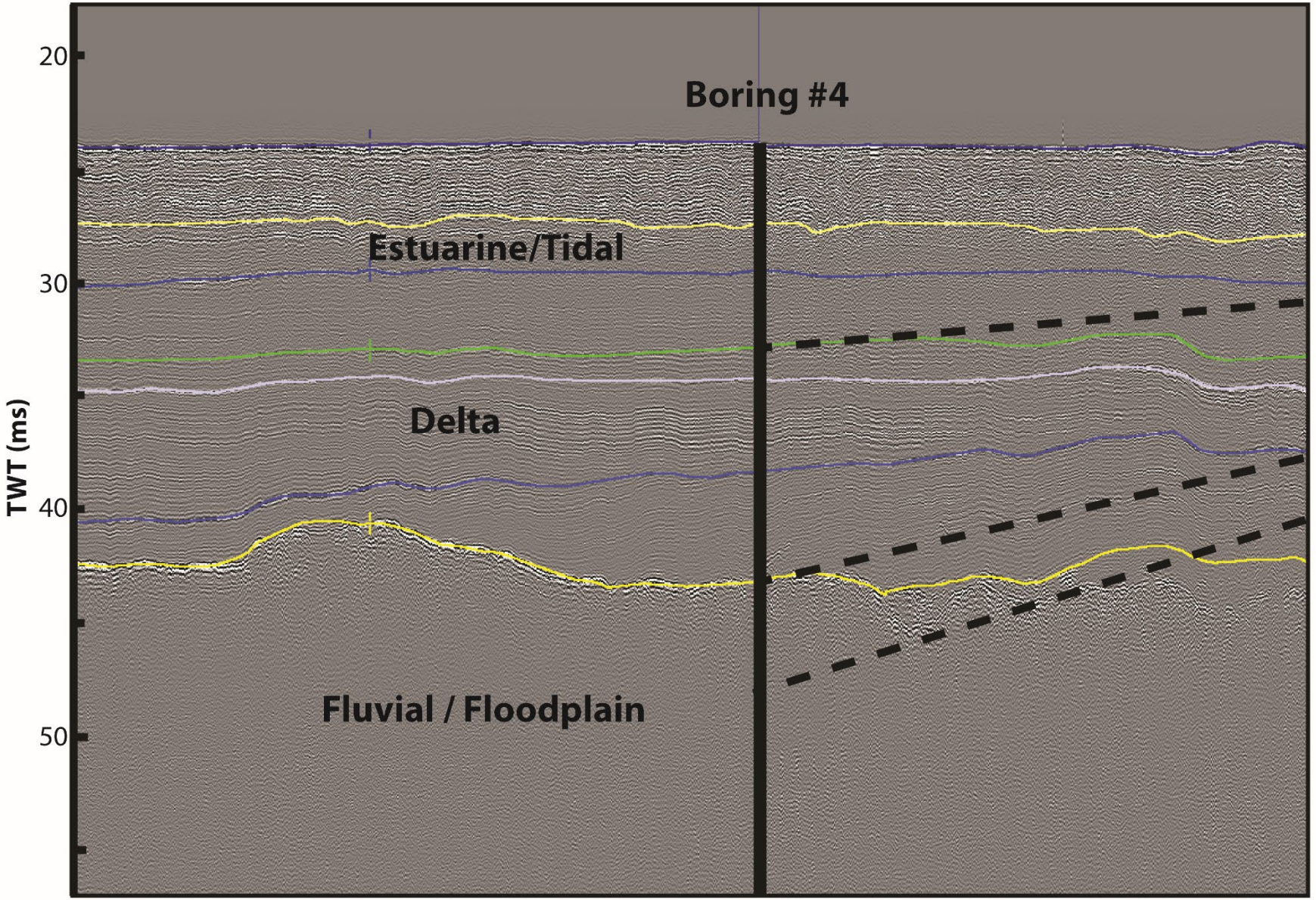
Methods 1: Seismic data are analyzed according to seismic facies which is purely observational can exist in multiple seismic units that are bounded by mappable horizons

Facies	Example	Description	Units Found In
SF1		Medium-to-high-amplitude, chaotic to discontinuous internal parallel reflections, with some truncations within the facies.	U1, U3, U3b
SF2		Medium-to-high amplitude, U-shaped-to-wavy, parallel, aggrading reflections, with some internal truncations.	U2, U3, U3b
SF3		Low-amplitude, sub-parallel, laminated-to-transparent reflections.	U3, U3a, U4, U5
SF4		Medium-to-low amplitude, draping reflections with internal truncations that depict a cut-and-fill evolution.	U3, U3a
SF5		High-amplitude, unidirectional dipping reflectors that display progradation.	U3, U3b

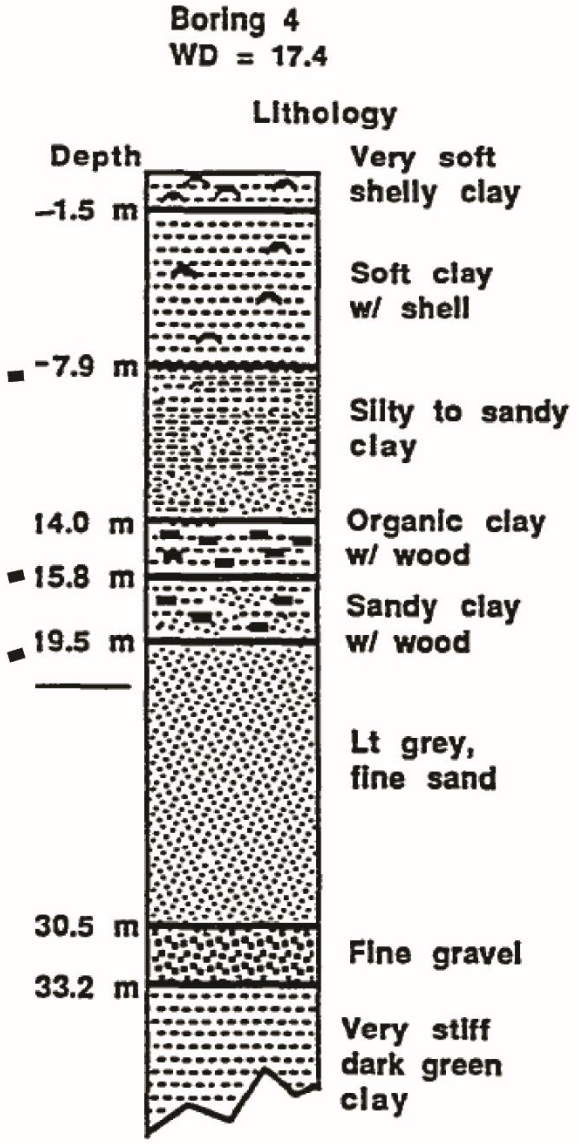


Burstein et al., 2021

Methods 2: Core samples enable us to link sedimentary facies with seismic facies

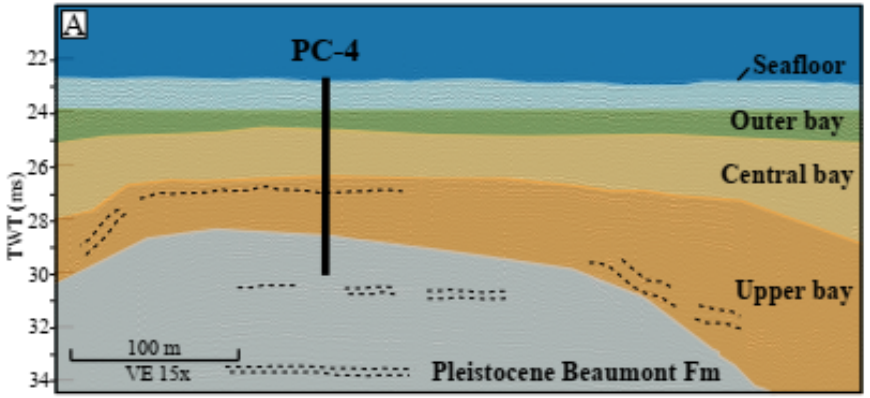


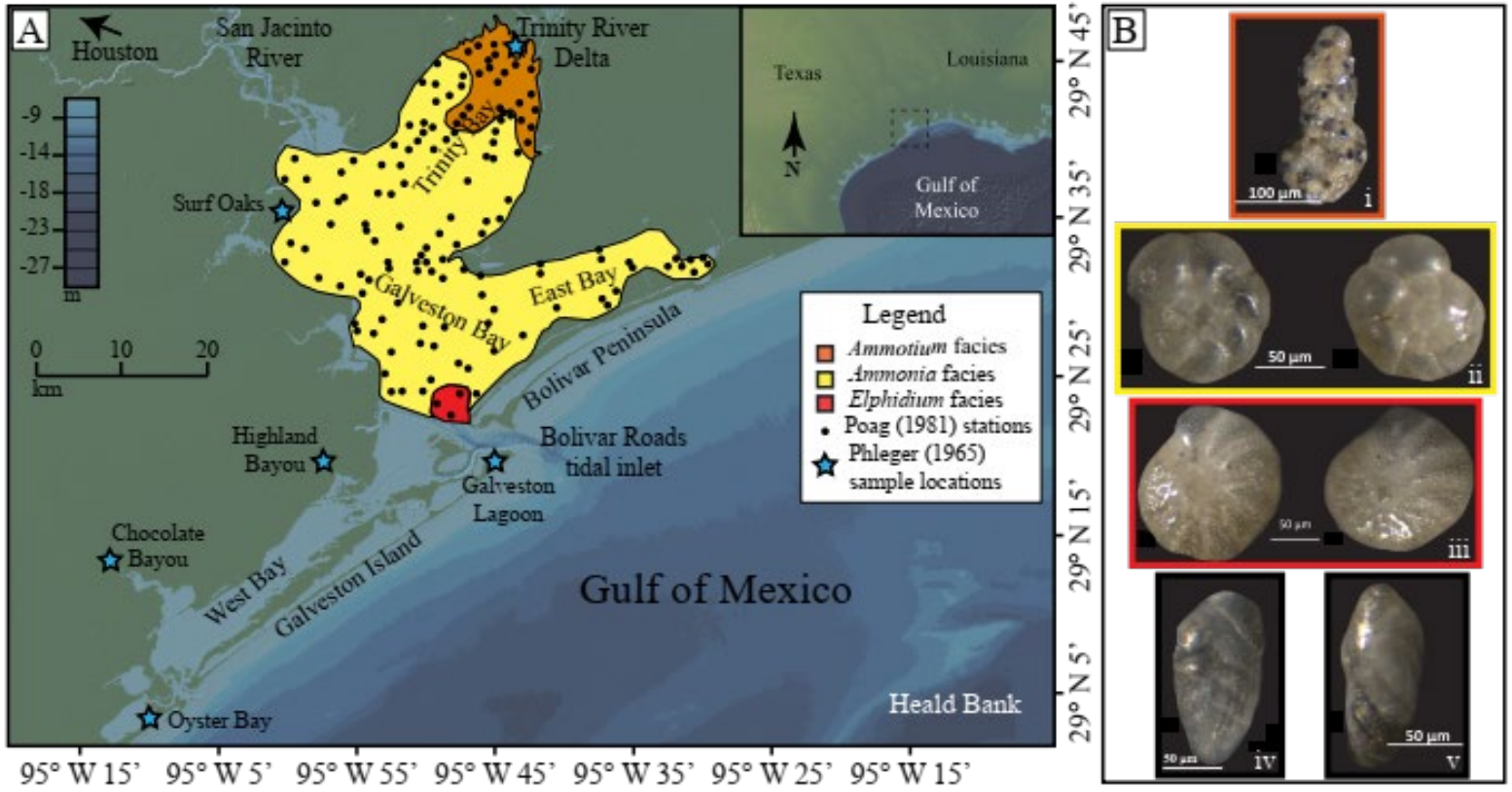
Swartz et al., 2021

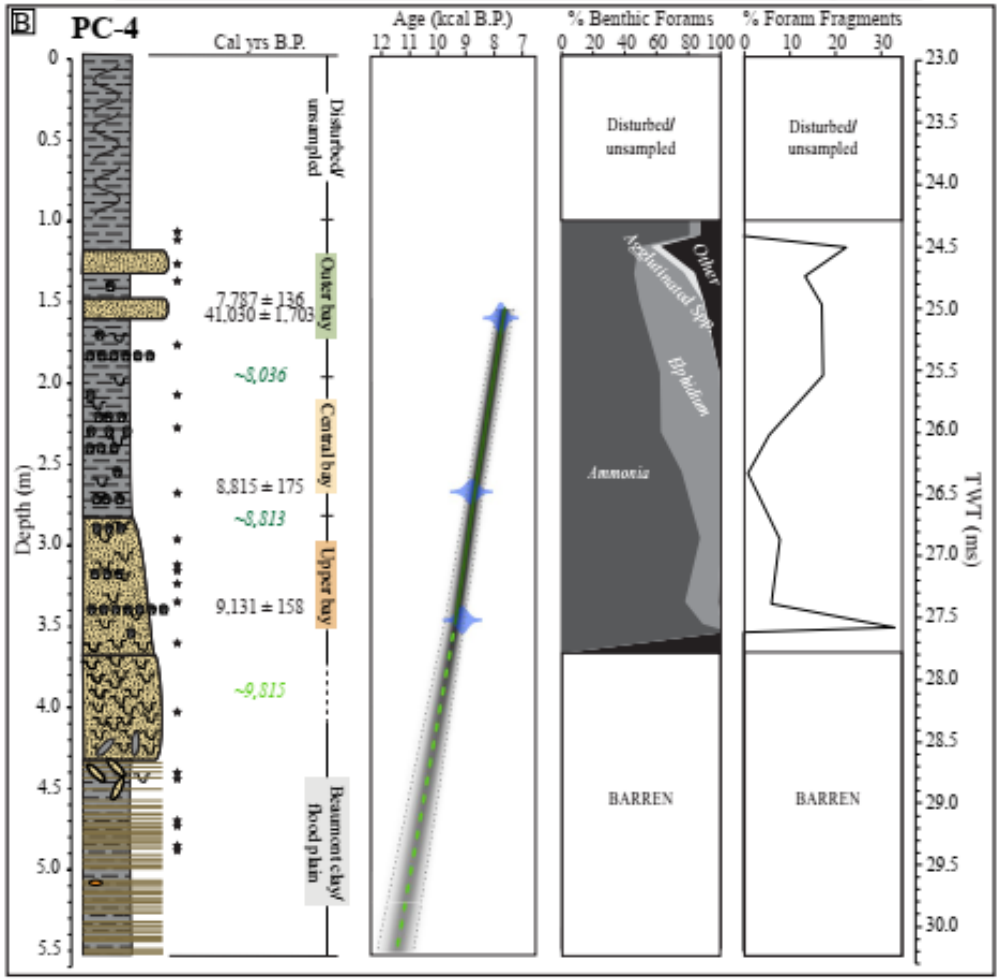


Thomas, 1991

Methods 2: Biostratigraphy enable us to determine paleoenvironment and build an age model through C14 dating.



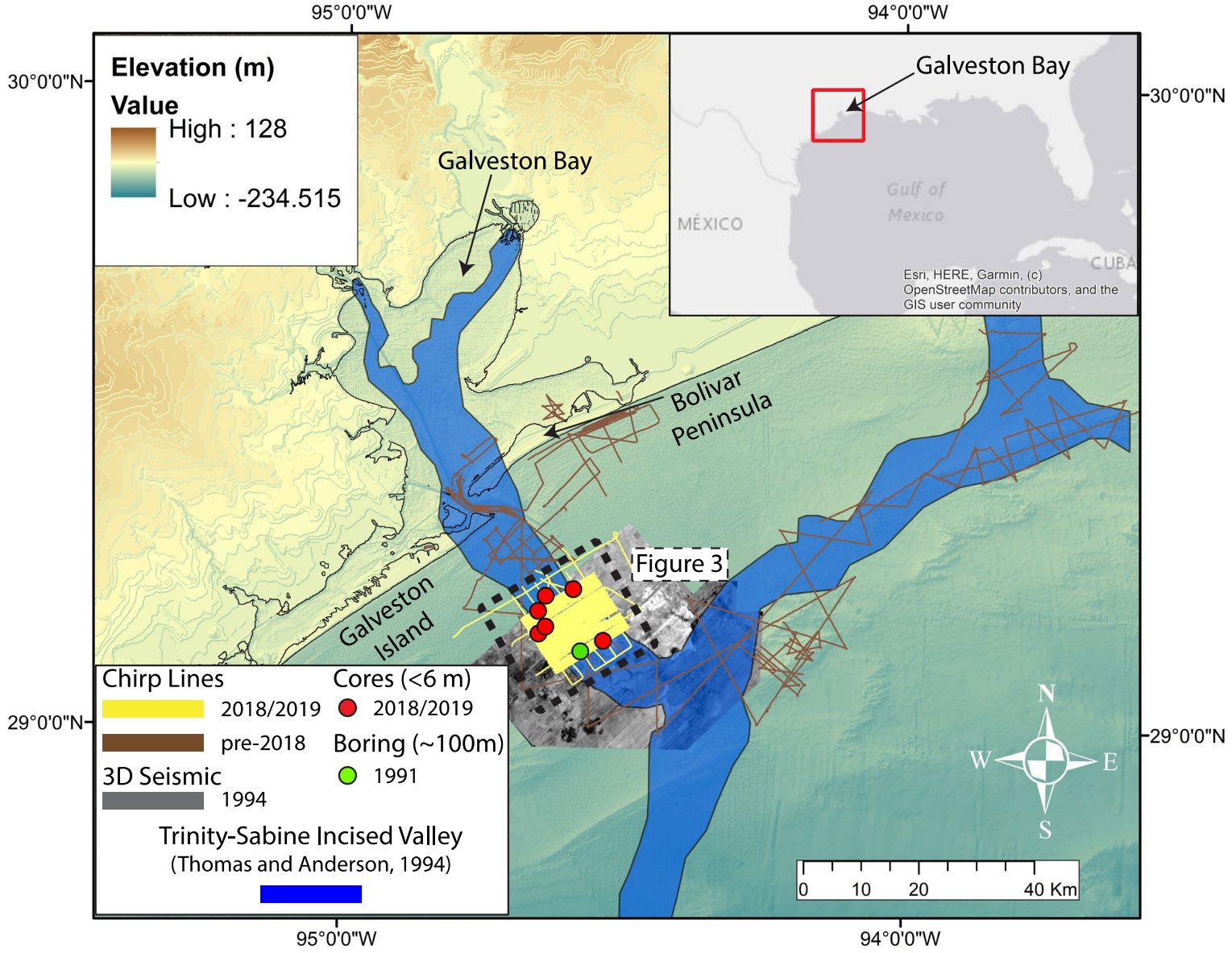




Standring et al., 2021

Study Area

- 20 km offshore Galveston Bay, Texas
- 1,000 km of high-resolution 2D chirp (0.7-12 kHz, decimeter resolution)
  - 700 km of full waveform and envelope chirp (UTIG)
  - 300 km of envelope chirp (USGS, TAMUG)
- 1270 km^2 of industry 3D seismic (25 Hz)
- 6 cores, 1 platform boring

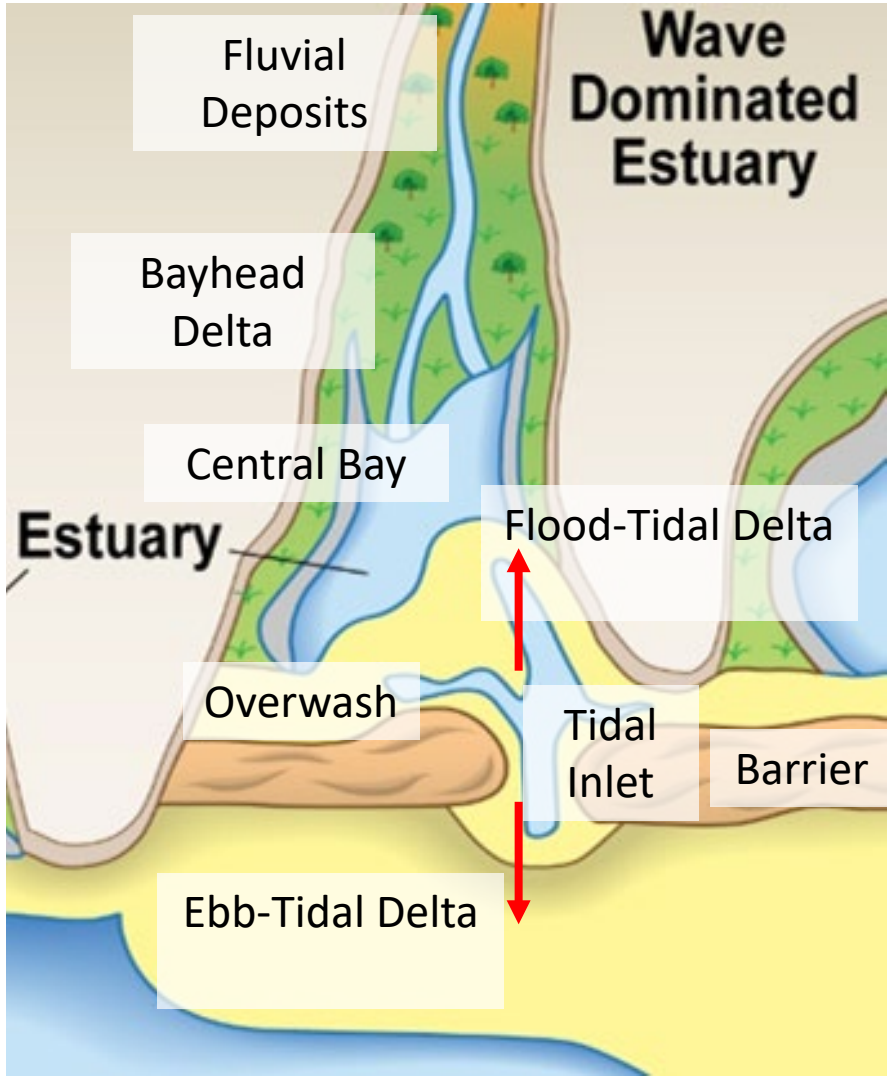


Burstein et al., 2021

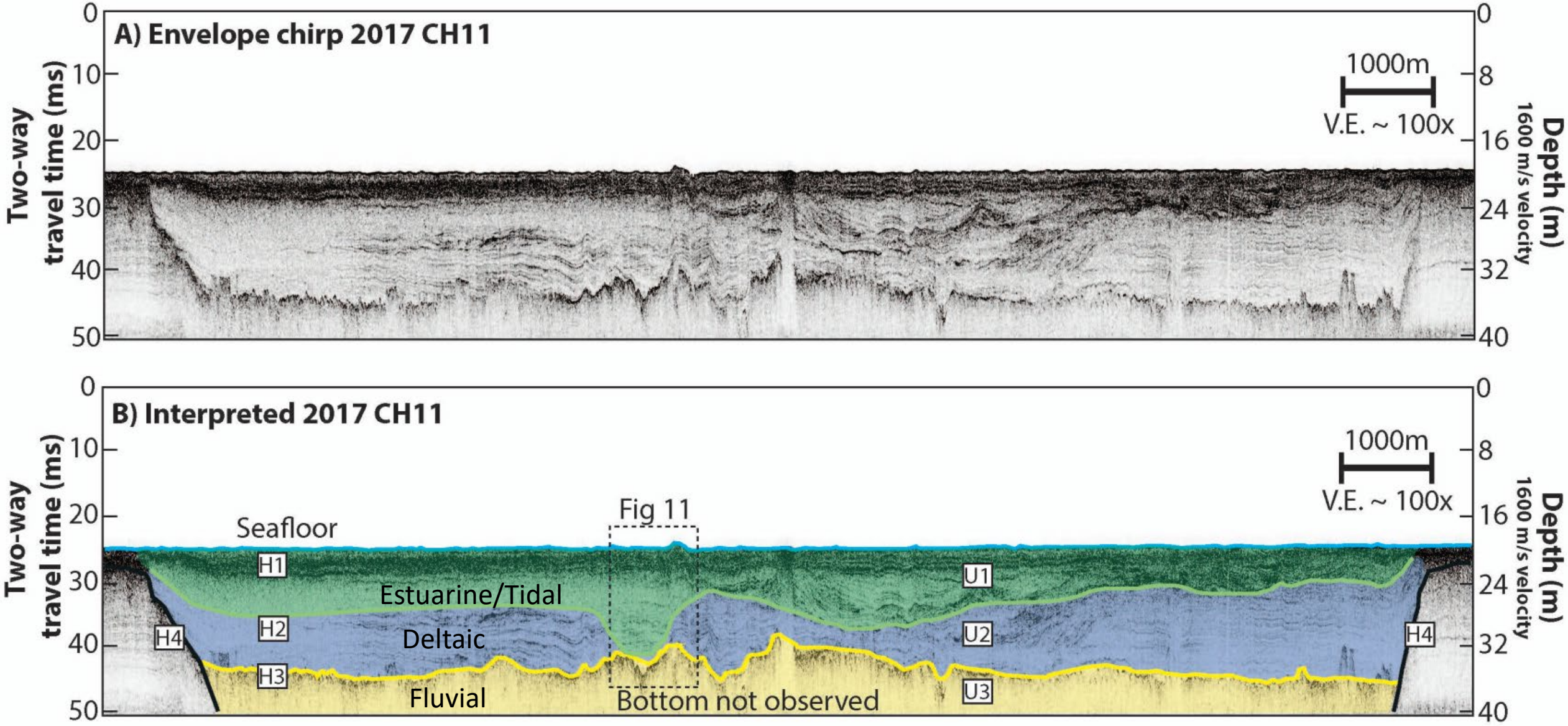
What is a barrier island system?

- Dynamic, direct exchange between marine and terrestrial environments vulnerable to changing conditions

- Classified as “wave-dominated estuary”:
  - **Barrier(s)** protects bay from marine incursion. Built by waves and **overwash** processes
  - **Tidal inlet(s)** transports sediment both in and out of estuary. Built by tidal currents
  - **Tidal deltas** transport material either seaward (ebb-tidal delta) or landward (flood-tidal delta) through tidal currents
  - **Central bay** sediments passively deposit on estuary floor in quiescent, low-energy environment
  - **Bayhead delta** sediments deposit at estuary head in fluvial-dominated environment
  - **Fluvial Deposits** sediments deposited by river processes – point bar deposits

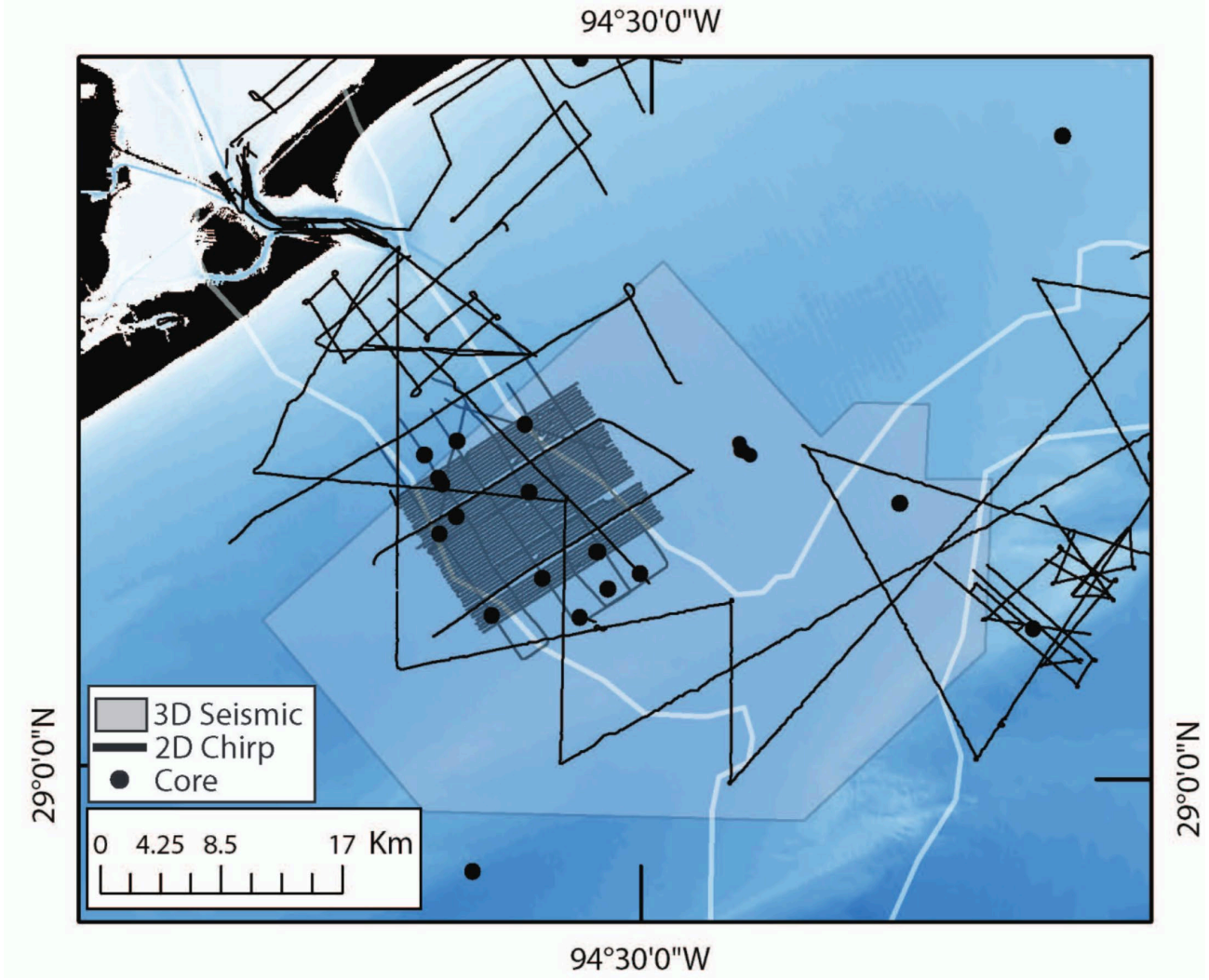


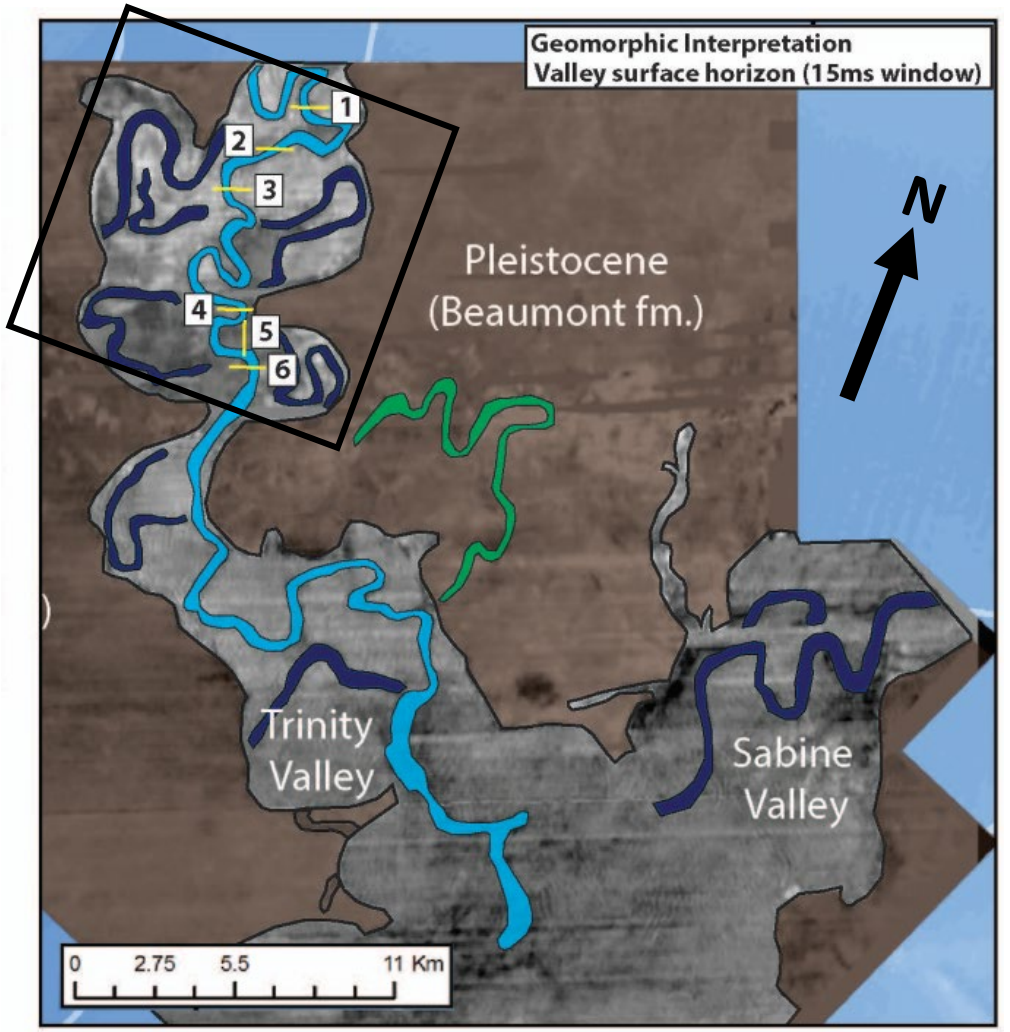
Modified from Steel and Milliken 2013



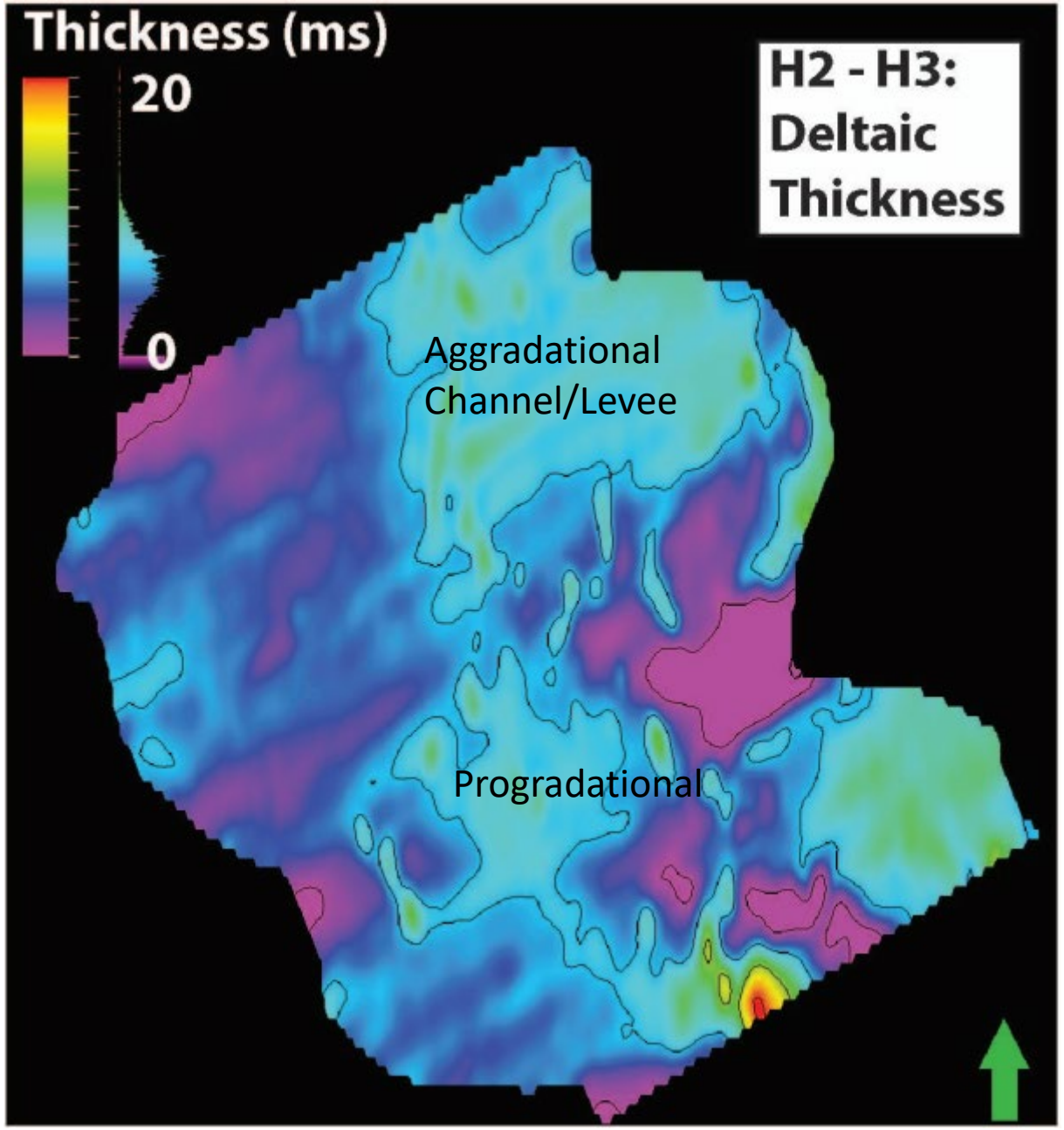
Swartz et al., 2021

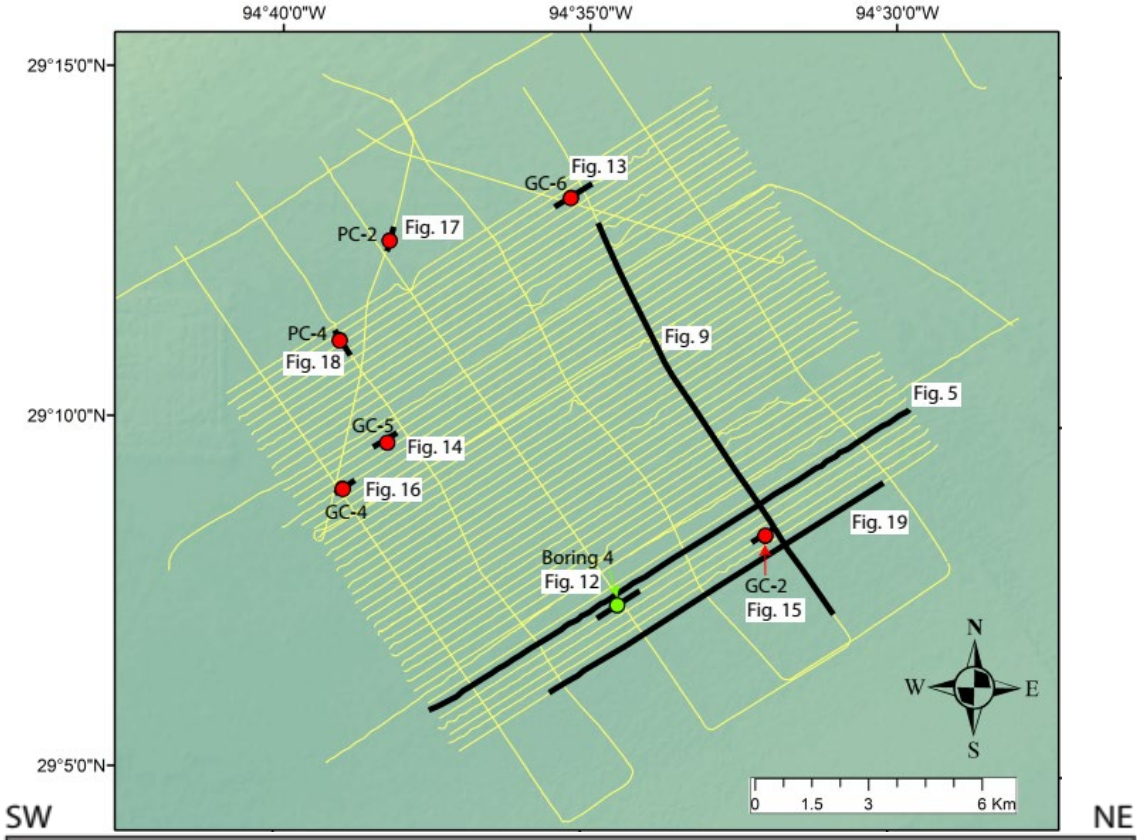
Bayhead delta deposits are more extensive and complex than typically envisioned, with an extensive submarine distribution that transitioned from a channel/levee complex maintaining fluvial channel geometry to progradational lobes.

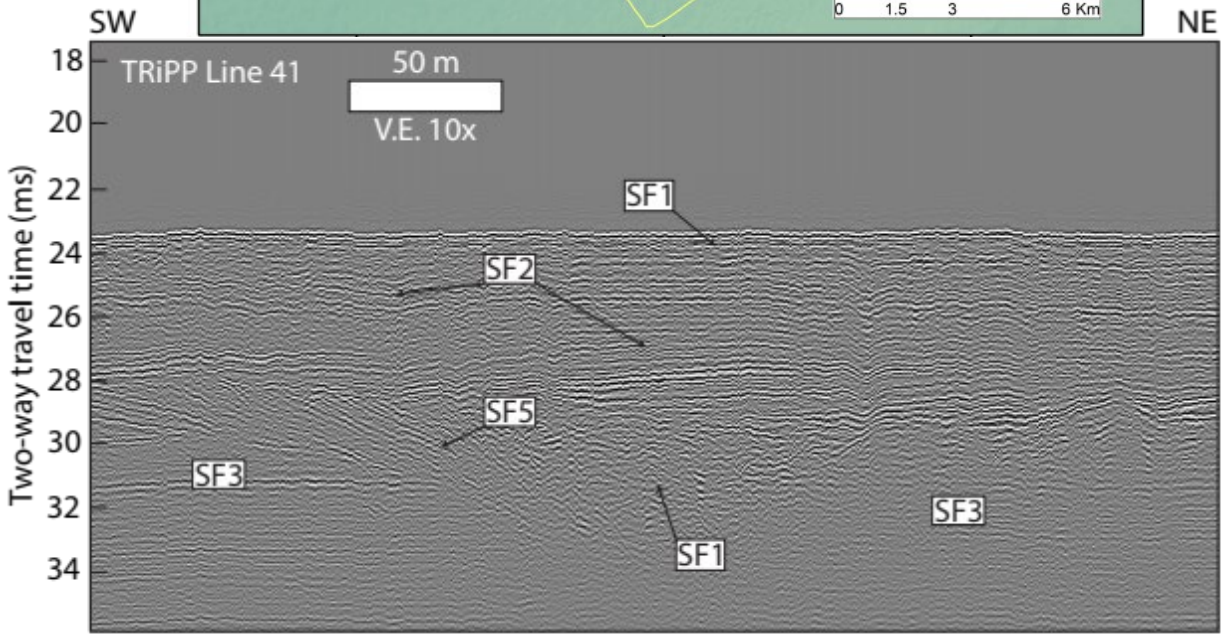




Swartz et al., 2021

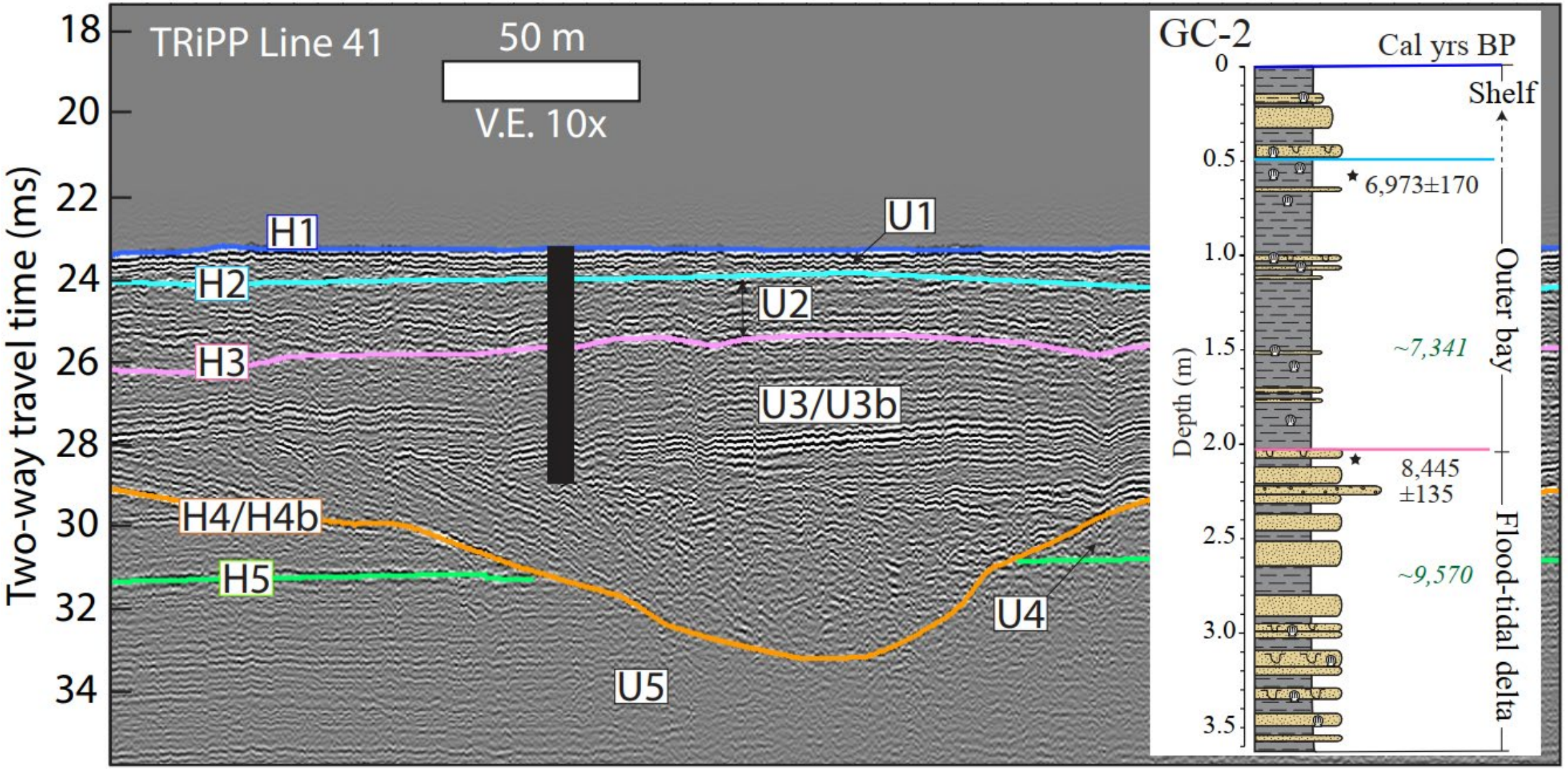






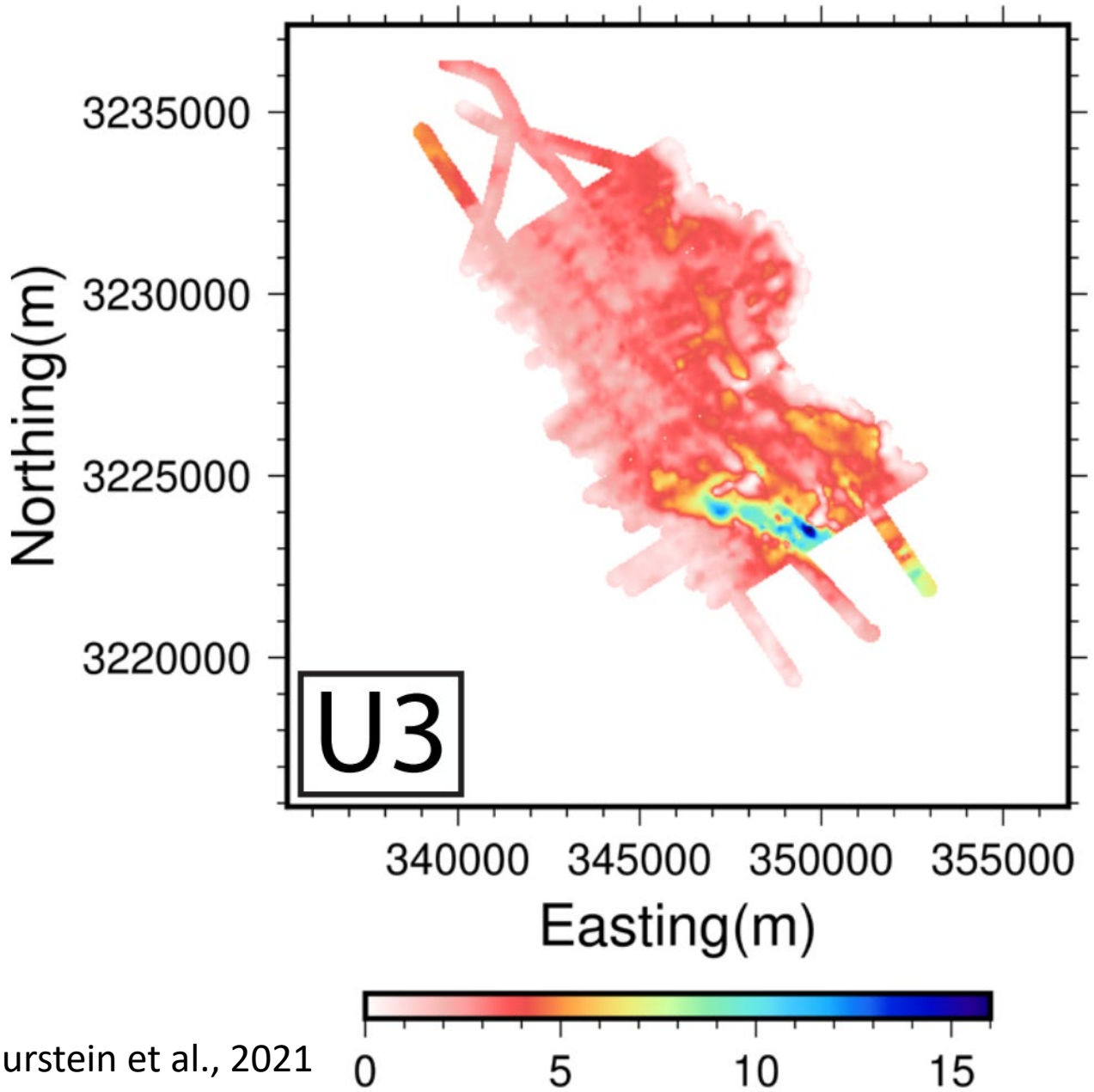
Swartz et al., 2021

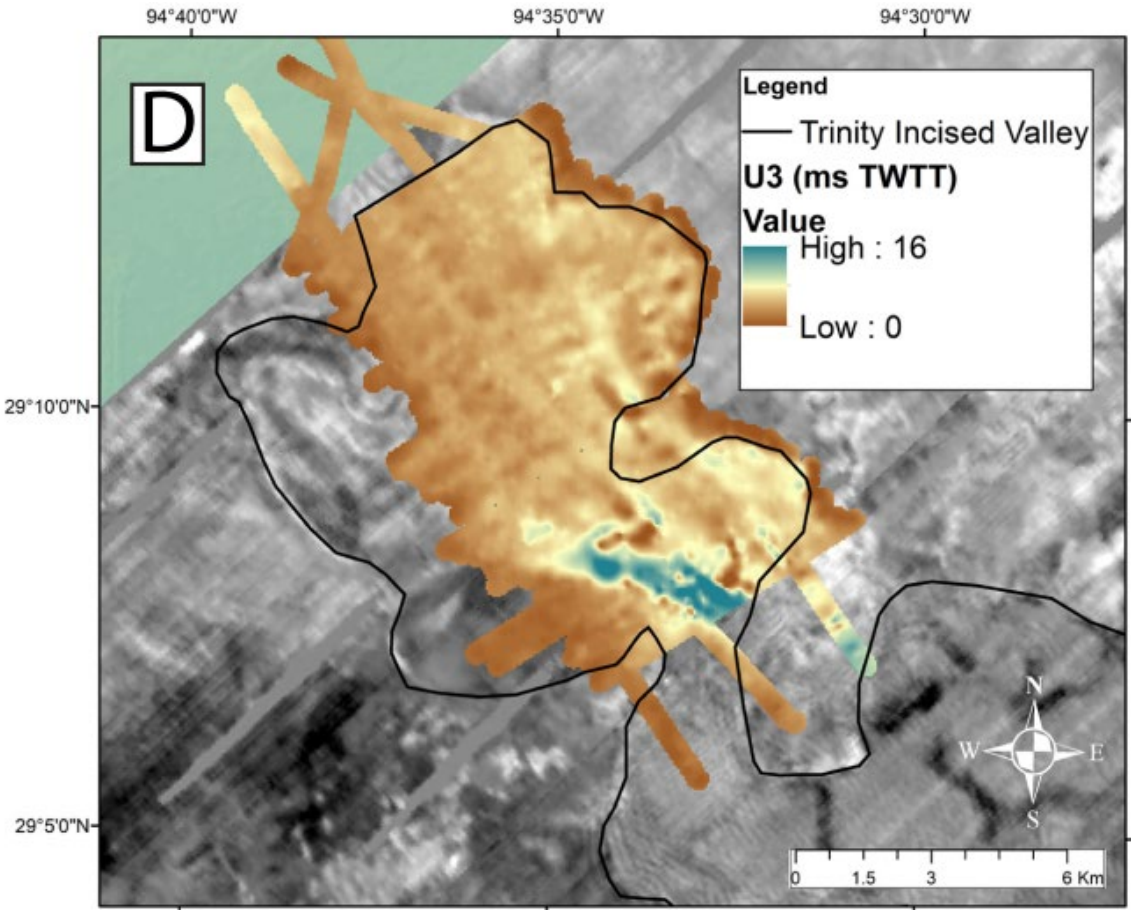
An extensive tidal channel system was mapped on the seaward sector of our survey area, filled with high amplitude, often dipping reflectors that are sand rich where sampled. Closer to the seafloor, we observe more flat-lying high-amplitude reflectors with sandy layers that have outer-bay affinities – interpreted as overwash deposits.



Burstein et al., 2021

Flood-tide delta isopach

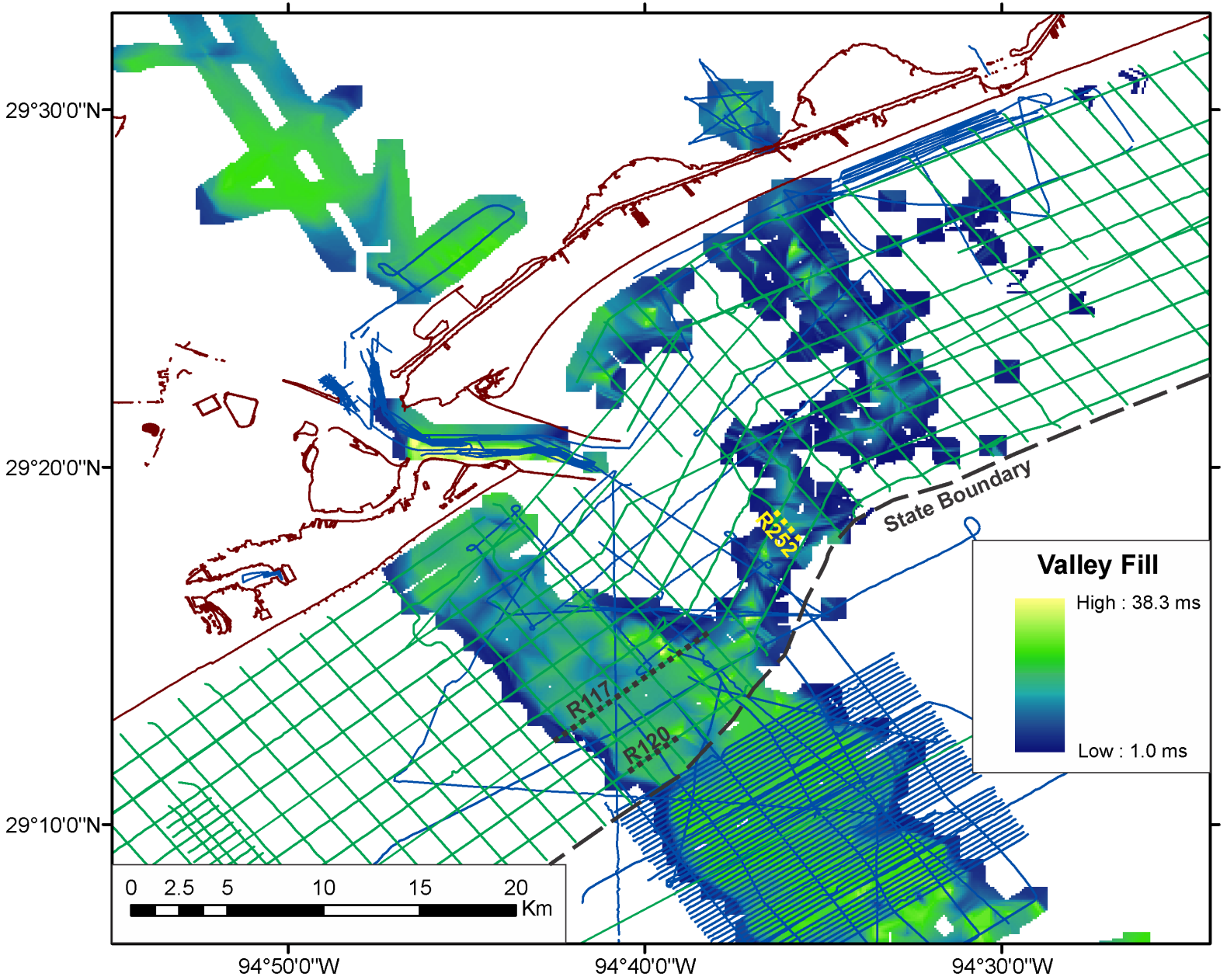




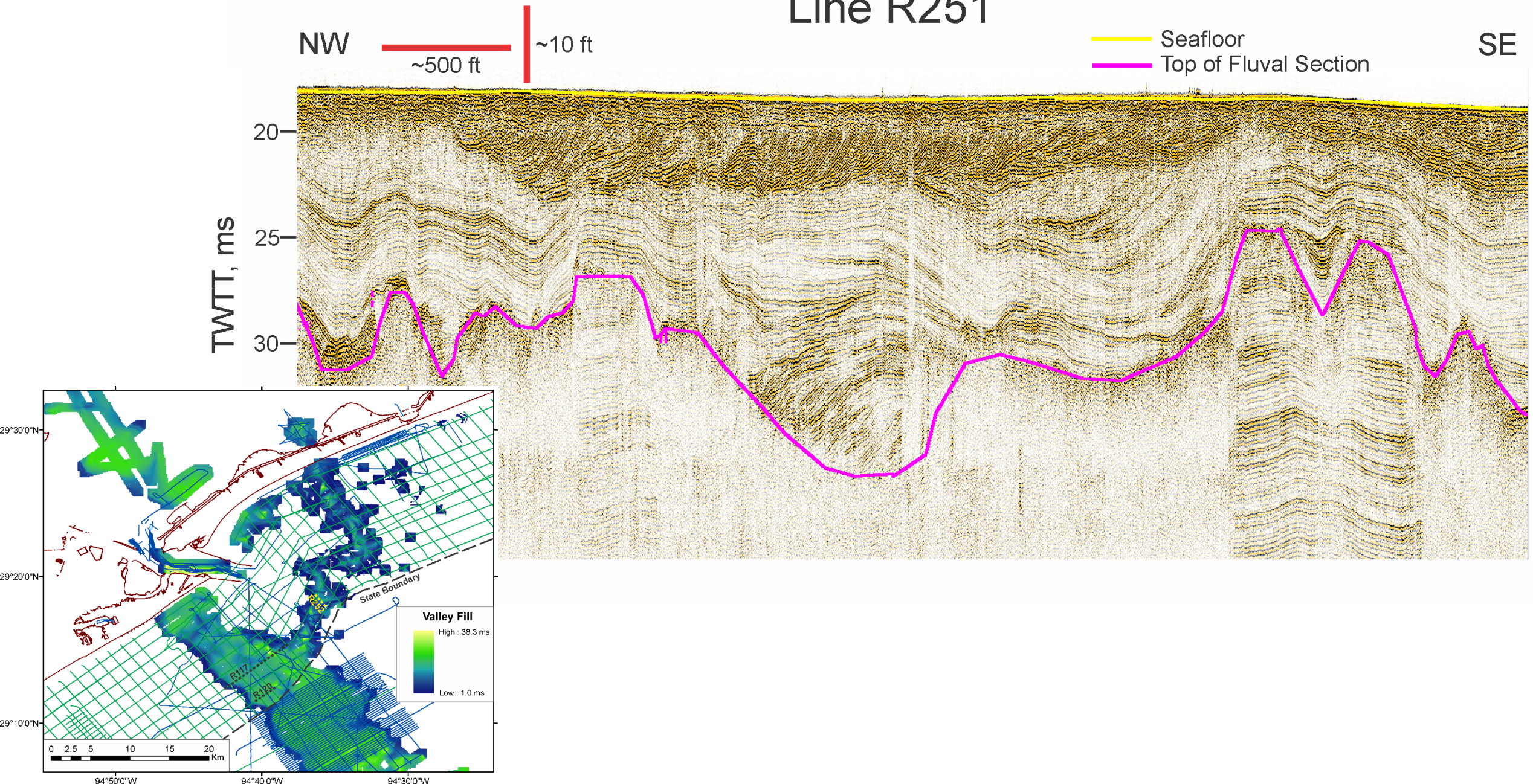
Burstein et al., 2021

MOVING TO STATE WATERS USING KNOWLEDGE OF SEISMIC FACIES TO SEDIMENTOLOGY AND ENVIRONMENT

New data collected by APTIM in State waters, along with legacy data, have been used to trace a large tributary to the Trinity Paleovalley that merges on the NE flank. The tributary can be mapped across Bolivar Peninsula into East Bay.



Line R251


NW
~500 ft
~10 ft
Seafloor
Top of Fluval Section
SE
TWTT, ms
20
25
30
29°30'0"N
29°20'0"N
29°10'0"N
94°50'0"W
94°40'0"W
94°30'0"W
State Boundary
R251
R117
R129
Valley Fill
High : 38.3 ms
Low : 1.0 ms
0 2.5 5 10 15 20
Km

Some suggested paths forward

- Methodology of high res imaging with up to date processing and ground truth with cores for lithology and paleoenvironment works
- Systems approach to understanding the deposition of sand-rich units is critical and the dynamics changes along different areas of the Texas coast resulting in different highest priority targets
- In particular limitations on depth for resource utilization means targeting terraces, tributaries and flood/ebb tide deltas in incised systems (e.g. Trinity, Sabine(?)) and potentially fluvial/interfluvial drainages in evulsing/deltaic systems (e.g., Brazos)

Texas General Land Office Sediment Workshop 2

LUNCH BREAK

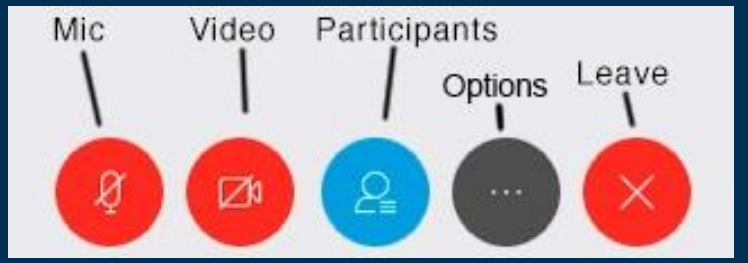
12:00 – 1:00 PM

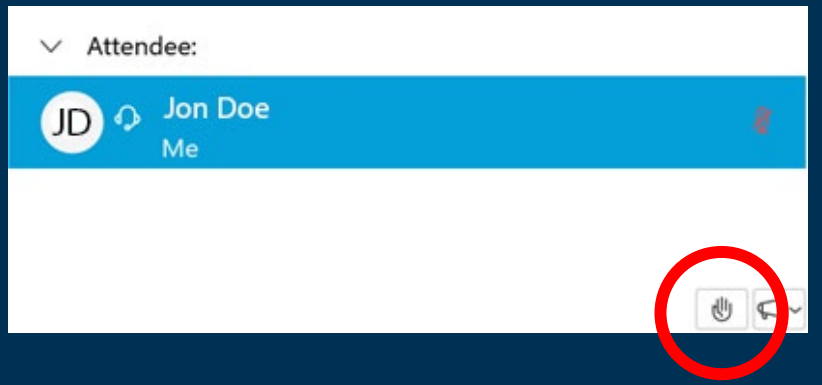
Texas General Land Office Sediment Workshop 2

HOW TO PARTICIPATE

There will be a brief Q&A after each presentation:

- ***Use the "Raise Hand" feature*** *– facilitator will prompt you to ask your question to the presenter/panel*
- ***Use the Chat feature*** *– facilitator will read questions verbally to the presenter/panel your behalf*





Please mute your microphone when not speaking

Texas General Land Office Sediment Workshop 2

Panel Discussion: Offshore Dredging Technology

Maxie J. McGuire Jr
President
Sullivan/Callan Marine

Dave Johanson
Senior Vice President – Project & Area Operations Gulf of Mexico
Great Lakes Dredge & Dock Company, LLC

Henry Schorr, JR., P.E.
Vice President
Manson Construction Co.

Jessica Walden
Estimating Administrative Coordinator
Weeks Marine

Michael Poff, P.E.
President
Coastal Engineering Consultants, Inc.

OFFSHORE DREDGING TECHNOLOGY PANEL

Sediment Resources & Transport Systems for Barrier Island Restoration

Presentation for

Texas General Land Office 2nd Sediment Workshop

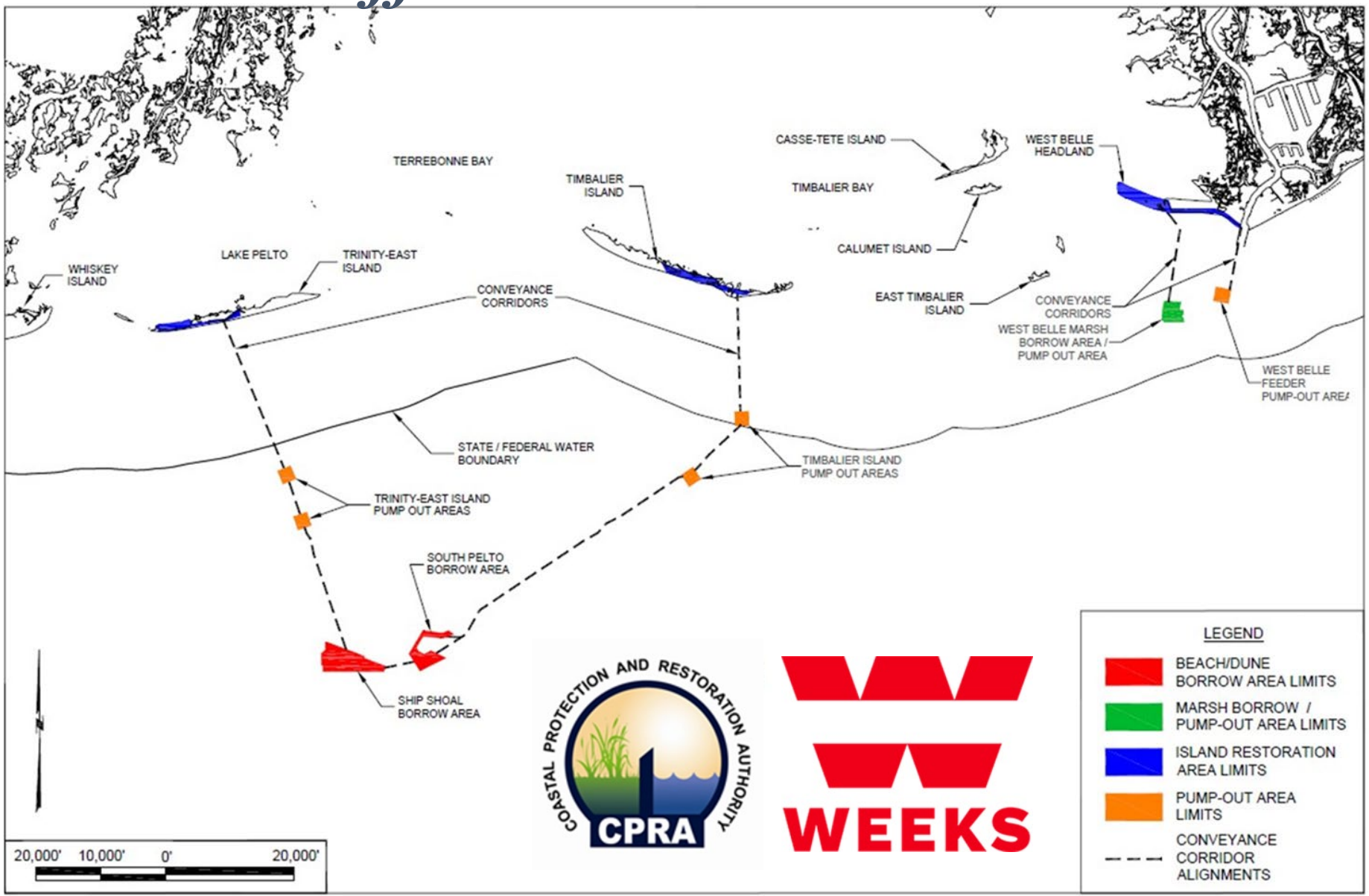
November 10, 2021

Presented by

Michael Poff, P.E., President

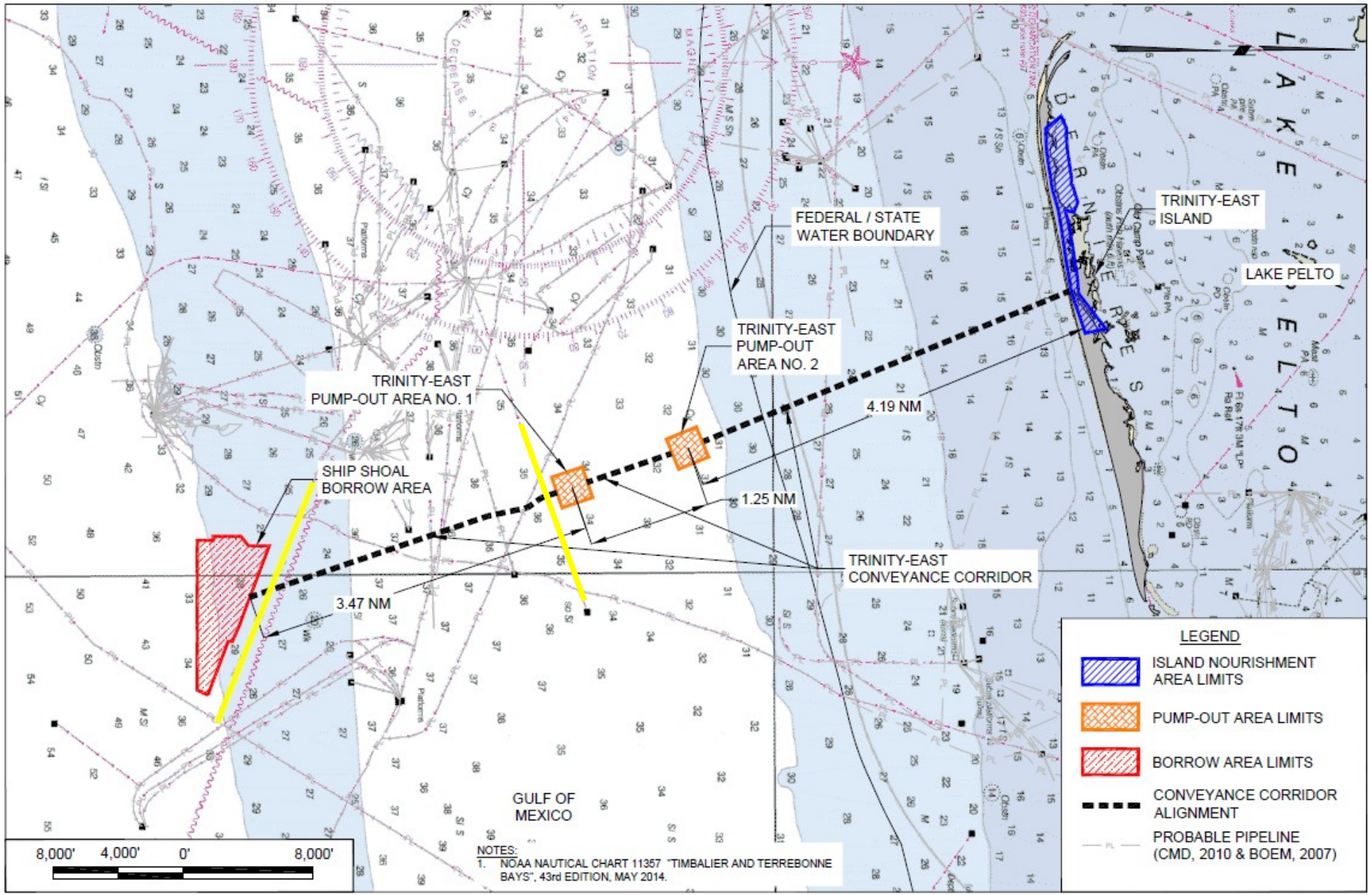
COASTAL ENGINEERING CONSULTANTS INC.

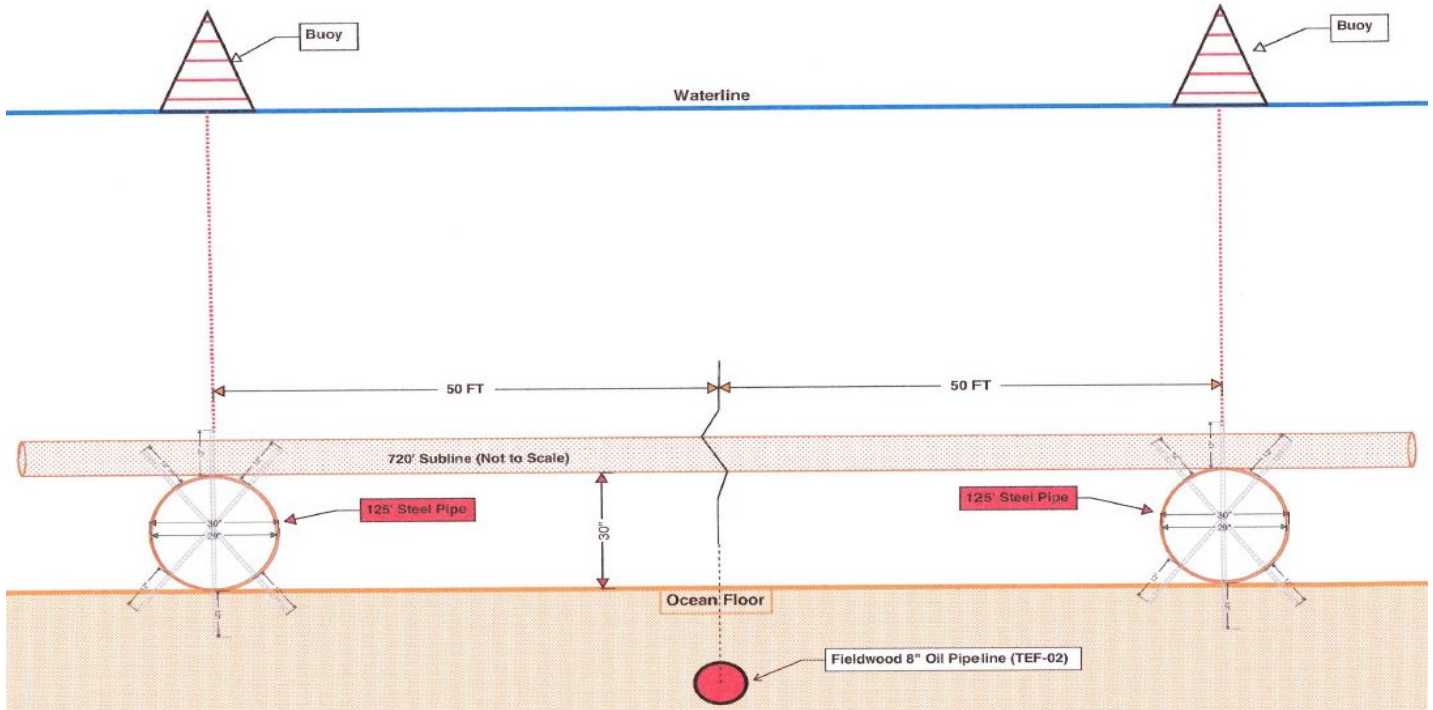
Multi-Island ~ Multi-Delivery Systems
Offshore Sand Sources

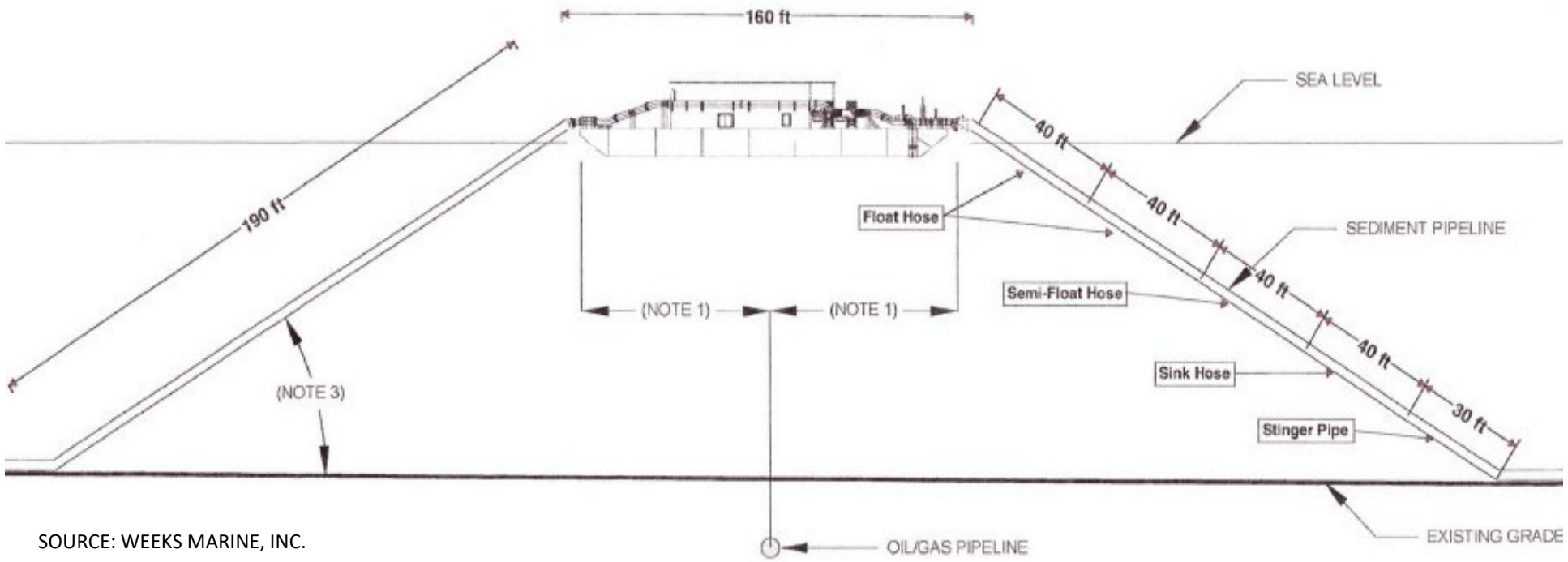


Cutterhead Dredge-Scow Barge-Nearshore Pumpout

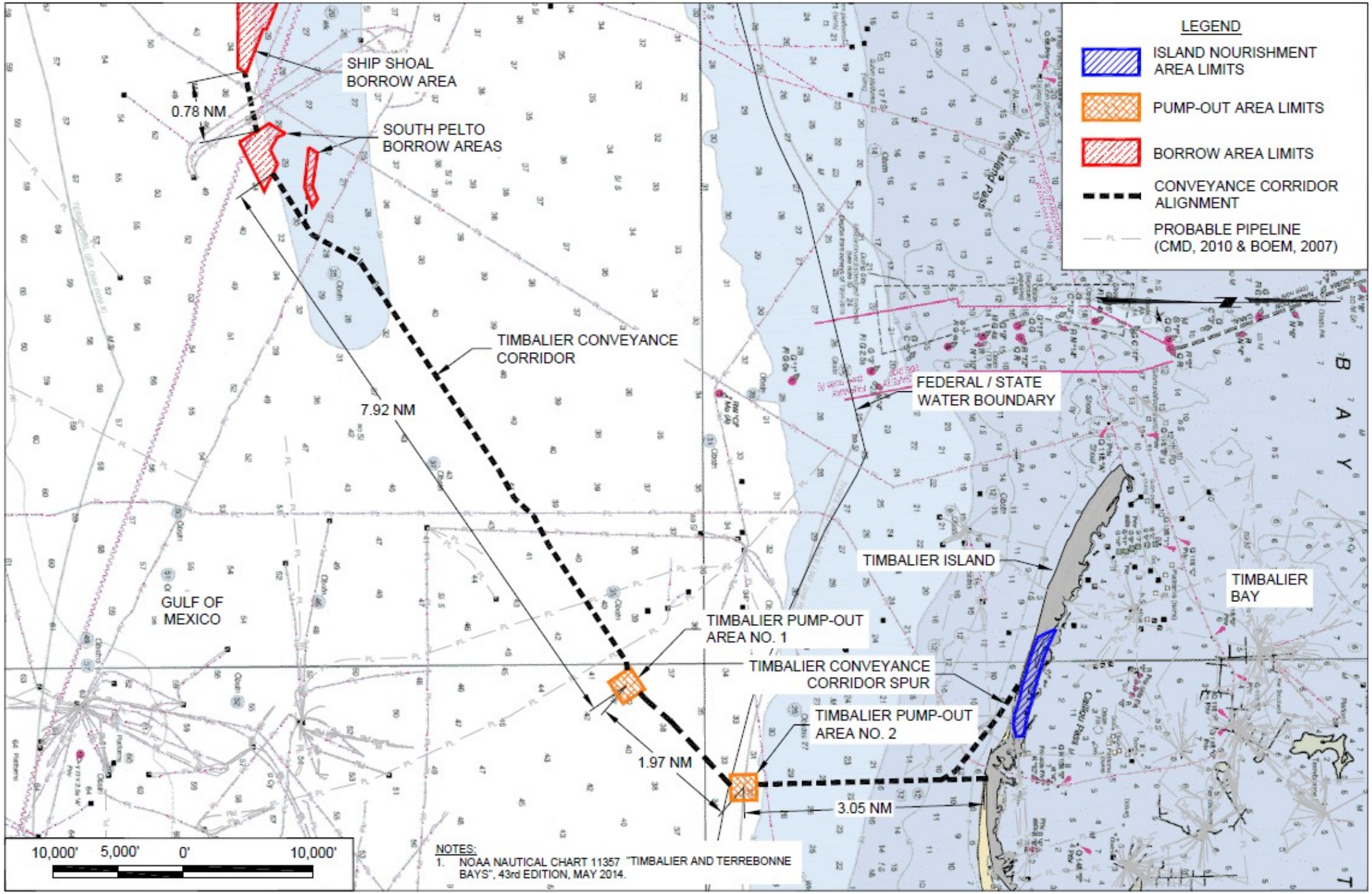
Cutterhead Dredge-Direct







SOURCE: WEEKS MARINE, INC.


LEGEND
ISLAND NOURISHMENT AREA LIMITS
PUMP-OUT AREA LIMITS
BORROW AREA LIMITS
CONVEYANCE CORRIDOR ALIGNMENT
PROBABLE PIPELINE (CMD, 2010 & BOEM, 2007)
SHIP SHOAL BORROW AREA
SOUTH PELTO BORROW AREAS
0.78 NM
TIMBALIER CONVEYANCE CORRIDOR
7.92 NM
FEDERAL / STATE WATER BOUNDARY
TIMBALIER ISLAND
TIMBALIER BAY
GULF OF MEXICO
TIMBALIER PUMP-OUT AREA NO. 1
TIMBALIER CONVEYANCE CORRIDOR SPUR
TIMBALIER PUMP-OUT AREA NO. 2
1.97 NM
3.05 NM
10,000' 5,000' 0' 10,000'
NOTES:
1. NOAA NAUTICAL CHART 11357 "TIMBALIER AND TERREBONNE BAYS", 43rd EDITION, MAY 2014.

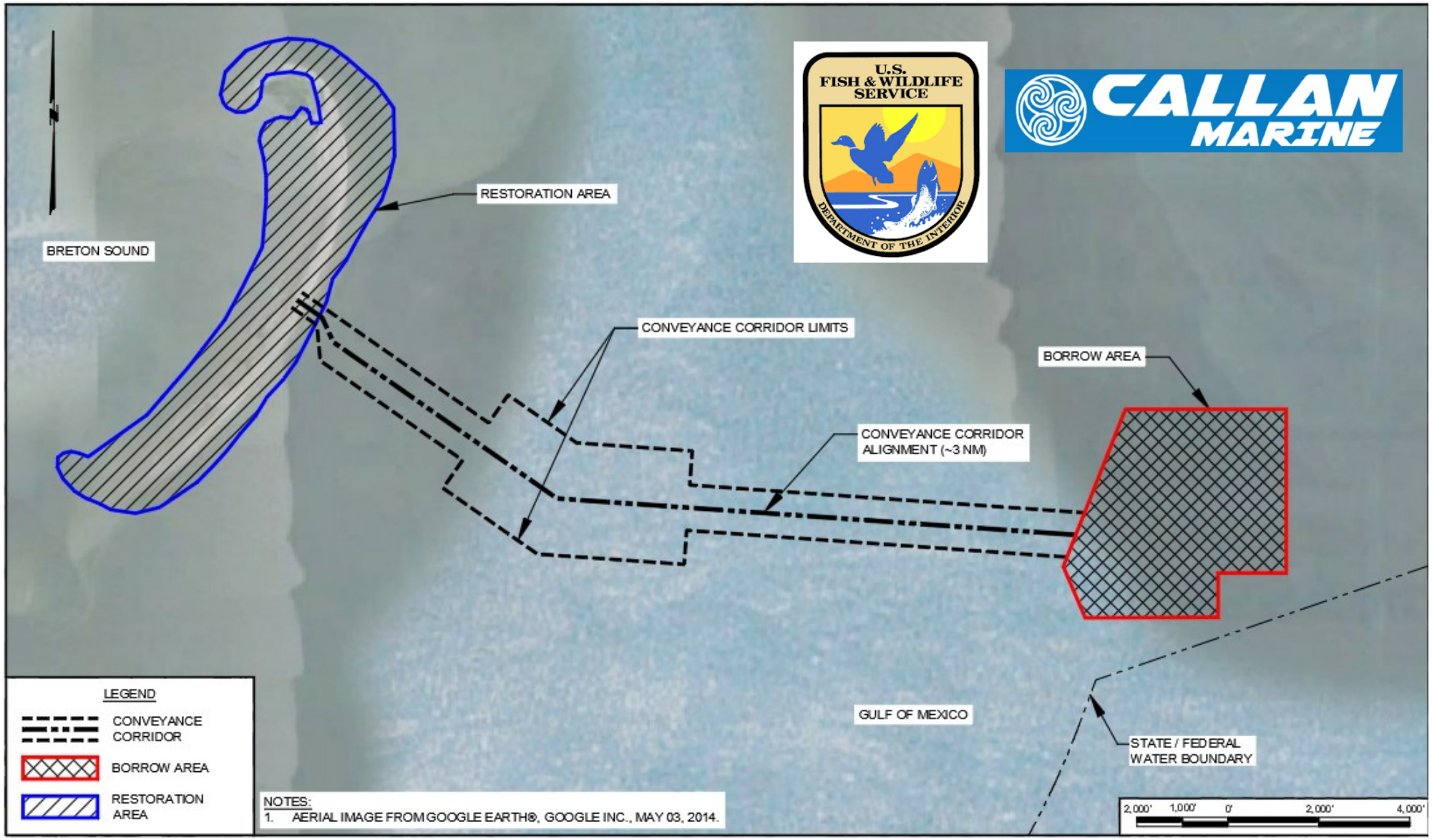
Hopper Dredge Mining OCS Sand Body

SOURCE: WEEKS MARINE, INC.

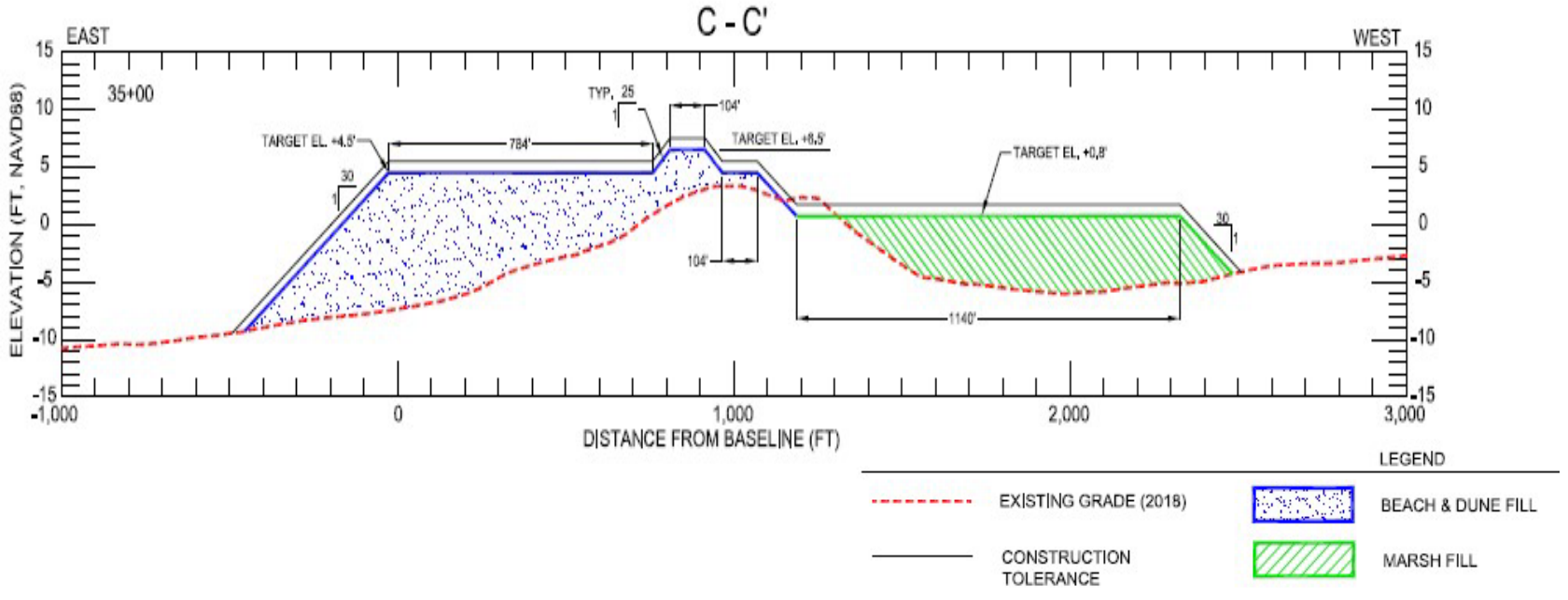
Hopper Dredge-Nearshore Pumpout

SOURCE: CEC, INC.

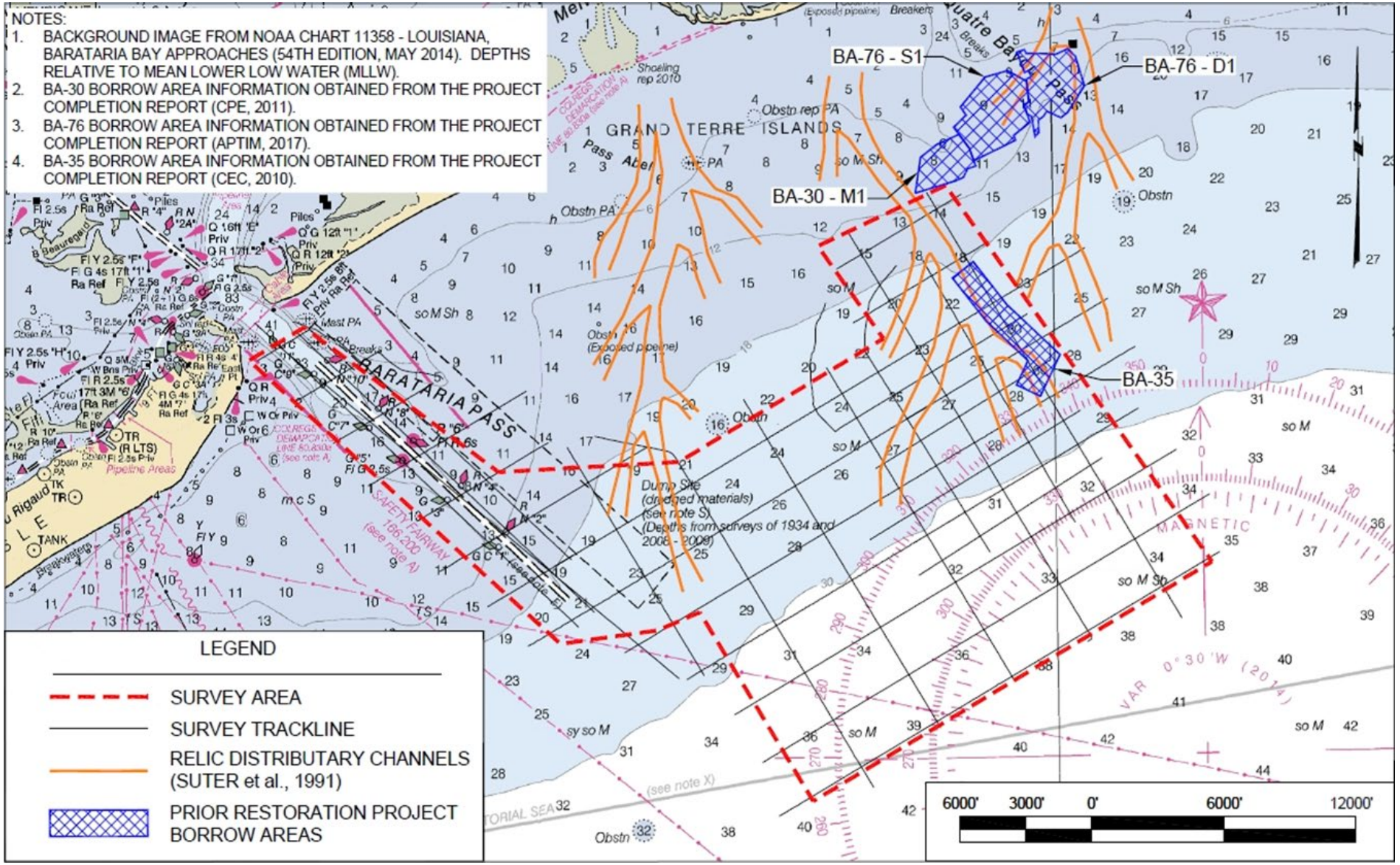
Offshore Sand Source-Cutterhead Direct



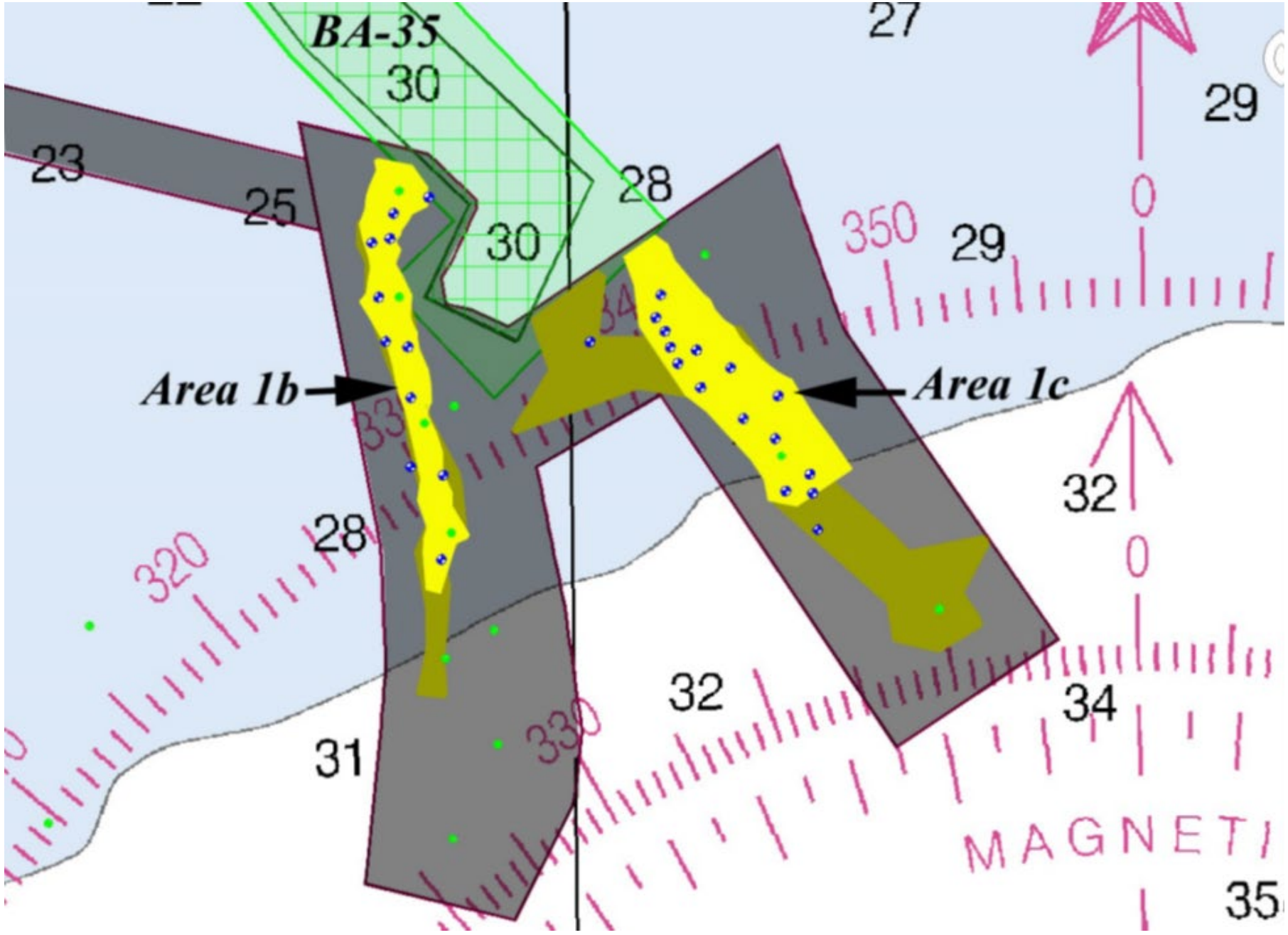
Breton Island – Under Construction



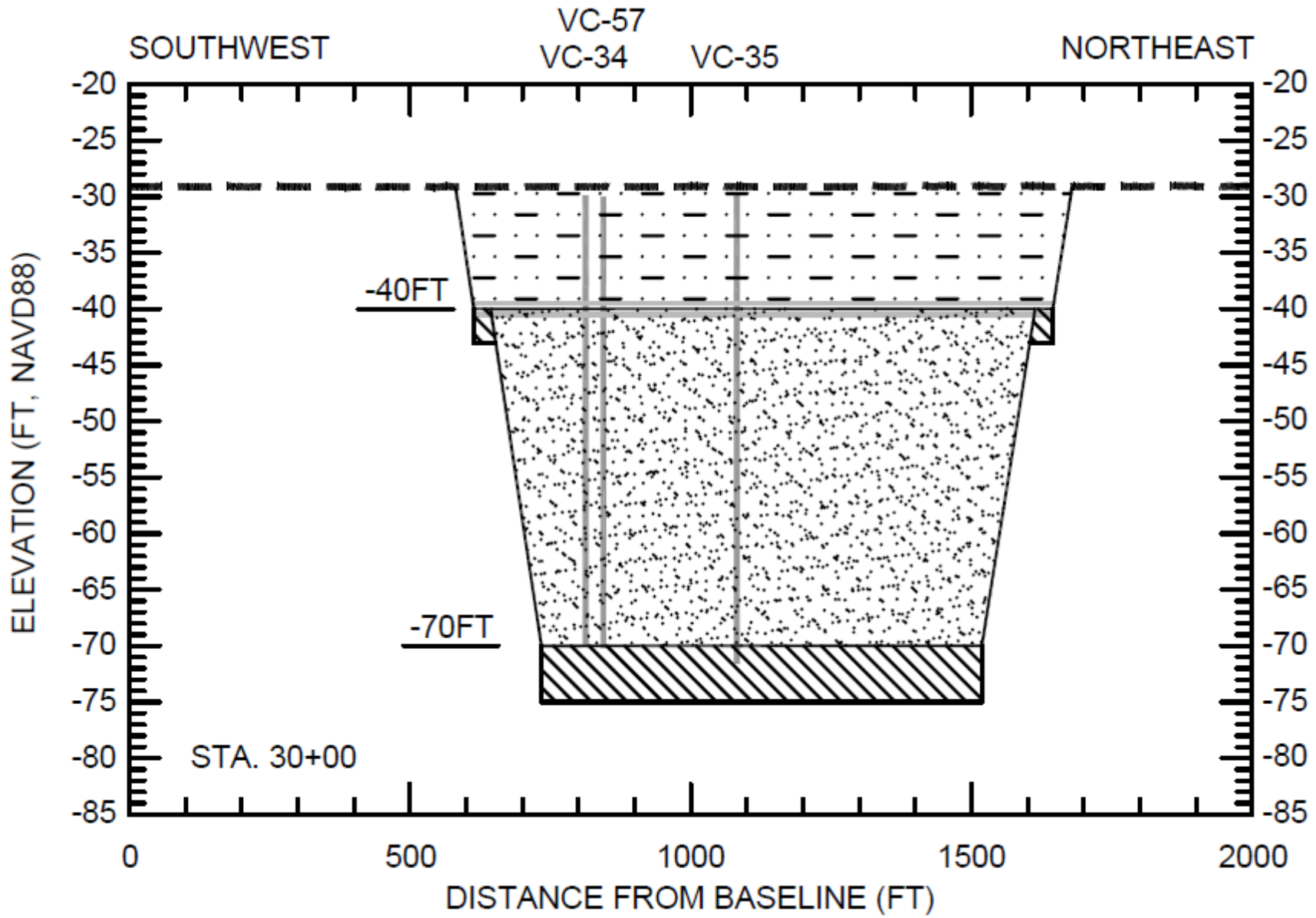
Distributary Channel Sediment Resources



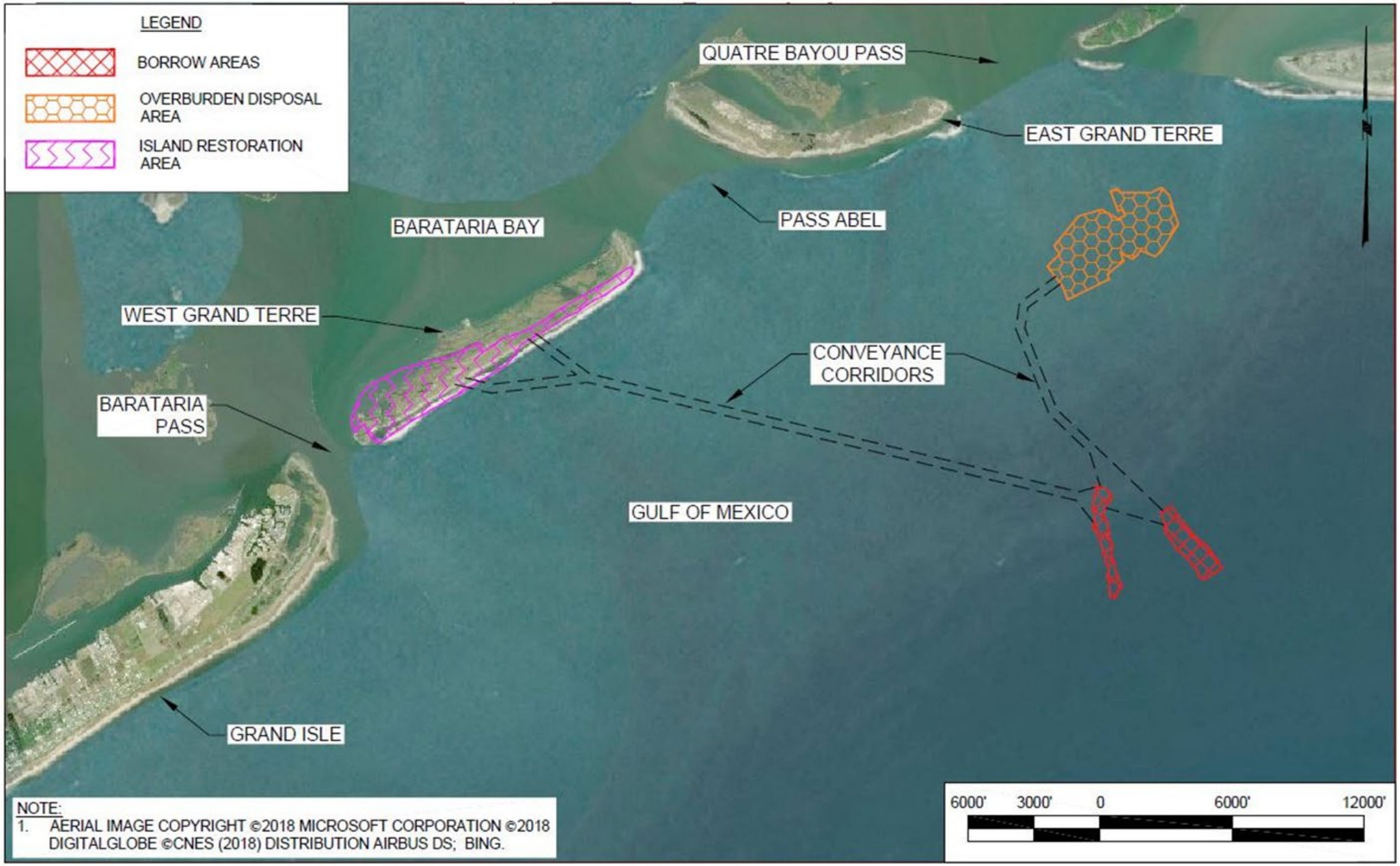
Suitable Sand Resources



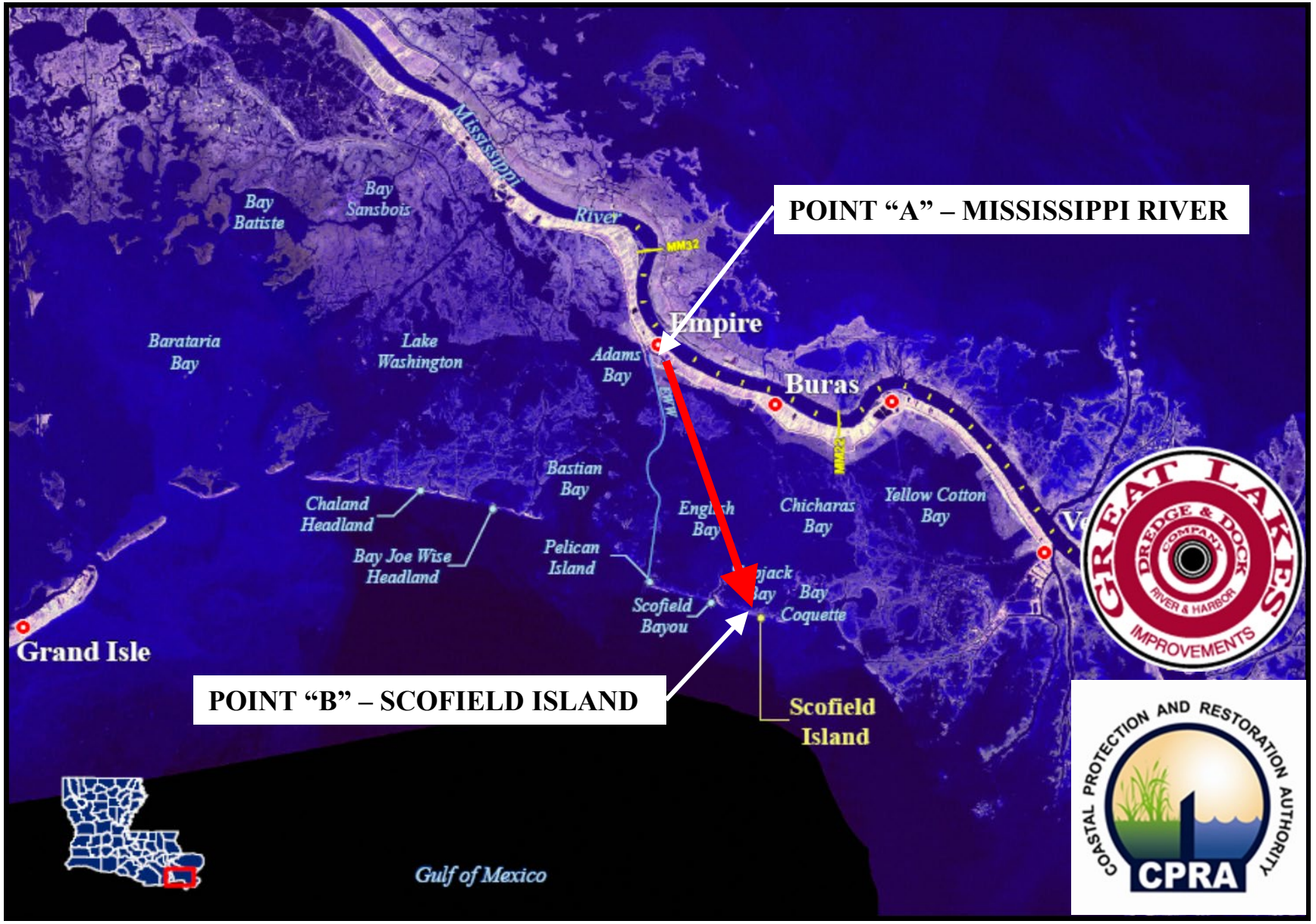
Borrow Area Typical Section



Project Overview – Overburden Sidecast



Riverine Sand Source-Cutterhead Direct



River to Levees

Cutterhead Dredge in MR

Levees to Island

Texas General Land Office Sediment Workshop 2

Panel Discussion: Coordination and Permitting for Borrow Areas and Placement Areas

Kristi McMillan
Lead, Central Unit Evaluation Branch, Regulatory Division
USACE Galveston District

Jessica Mallindine
Marine Biologist, Marine Minerals Program
BOEM

Dianna Ramirez
Upper Coast Regional Manager, Coastal Field Operations
GLO

Amy Borgens
State Marine Archeologist Archeology Division
Texas Historical Commission

Rhonda Gregg Hirsch
Project Director
Atkins

Texas General Land Office Sediment Workshop 2

Panel Discussion: Local Sediment Management Plans

Kristina Boburka
Shoreline Director
City of South Padre Island

Brandon Hill
Coastal Resources Manager
City of Galveston

Juan Moya
Principal Geoscientist/ Geomorphologist, Coastal Restoration Lead - Gulf of Mexico
Mott McDonald

Coraggio Maglio
Hydraulics and Hydrology Branch Chief
USACE Galveston District

Seth Jones
Operations Project Manager
USACE Galveston District

Texas General Land Office Sediment Workshop 2

We Want Your Feedback!

www.surveymonkey.com/r/GLOsediment