

# Offshore Geosequestration Potential in the Gulf of Mexico

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Gulf Coast Carbon Center  
Bureau of Economic Geology  
University of Texas at Austin,

## Carbon Sequestration Opportunities in the North Sea Conference

24 – 25 March, 2010



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# Acknowledgements

- Gulf Coast Carbon Center researchers: Susan Hovorka, Tip Meckel, Jiemin Lu, JP Nicot, Katherine Romanak, Changbing Yang, David Carr, Becky Smyth, Jong-Won Choi
- BEG Associate Director: Ian Duncan
- BEG Director: Scott Tinker
- Funding organizations: The Department of Energy National Energy Technology Laboratory, Southeast Regional Carbon Sequestration Partnership

## GCCC sponsors



# OVERVIEW

## I. Previous Work / Status

A. GCCC

B. Regional Partnerships (U.S. & Canada)

C. SECARB

## II. Current Studies / Future

A. SECARB III – Task 15

B. Texas Offshore Miocene

1. U.S. Department of Energy

2. Texas General Land Office



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# PREVIOUS GCCC EFFORTS

## Brine Formations Atlas

- Approach – Critical Constraints
  - Static Parameters
    - Reservoir Depth, Thickness, Mineralogy,  $\Phi$
    - Net Sand, Heterogeneity, % Shale
    - Seal Thickness & Discontinuities
  - Dynamic Parameters
    - Formation Pressure, Temperature, Salinity,  $k$
    - Brine Age & Chemistry, CO<sub>2</sub> Reactions
    - Hydrologic regime, Dissolution, etc.



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# Regional Carbon Sequestration Partnerships

- **Seven Partnerships**
- **350+ Organizations**
  - State Agencies
  - 4 Canadian Provinces
  - 3 Native American Organizations
  - Universities
  - Private Companies
- **NATCARB Atlas**

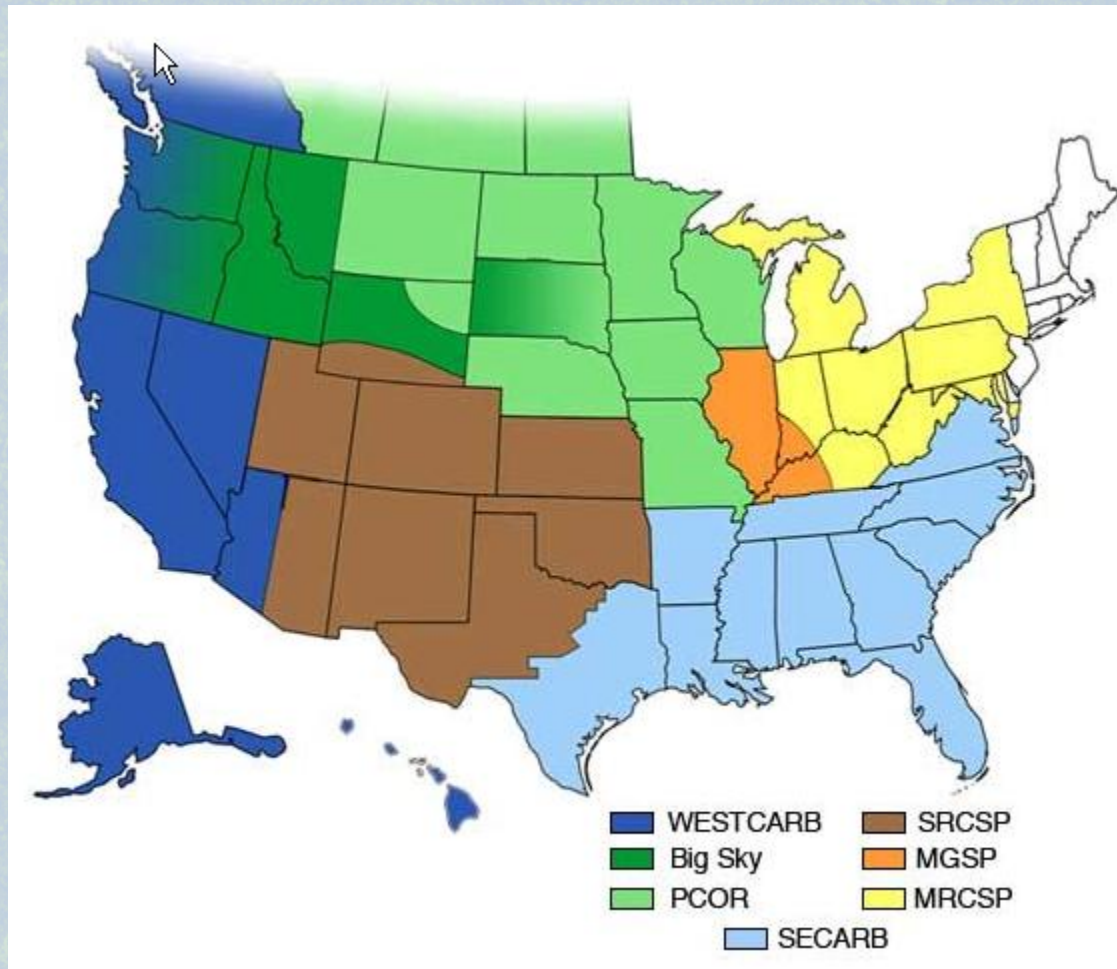


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# Southeast Regional Carbon Sequestration Partnership (SECARB)

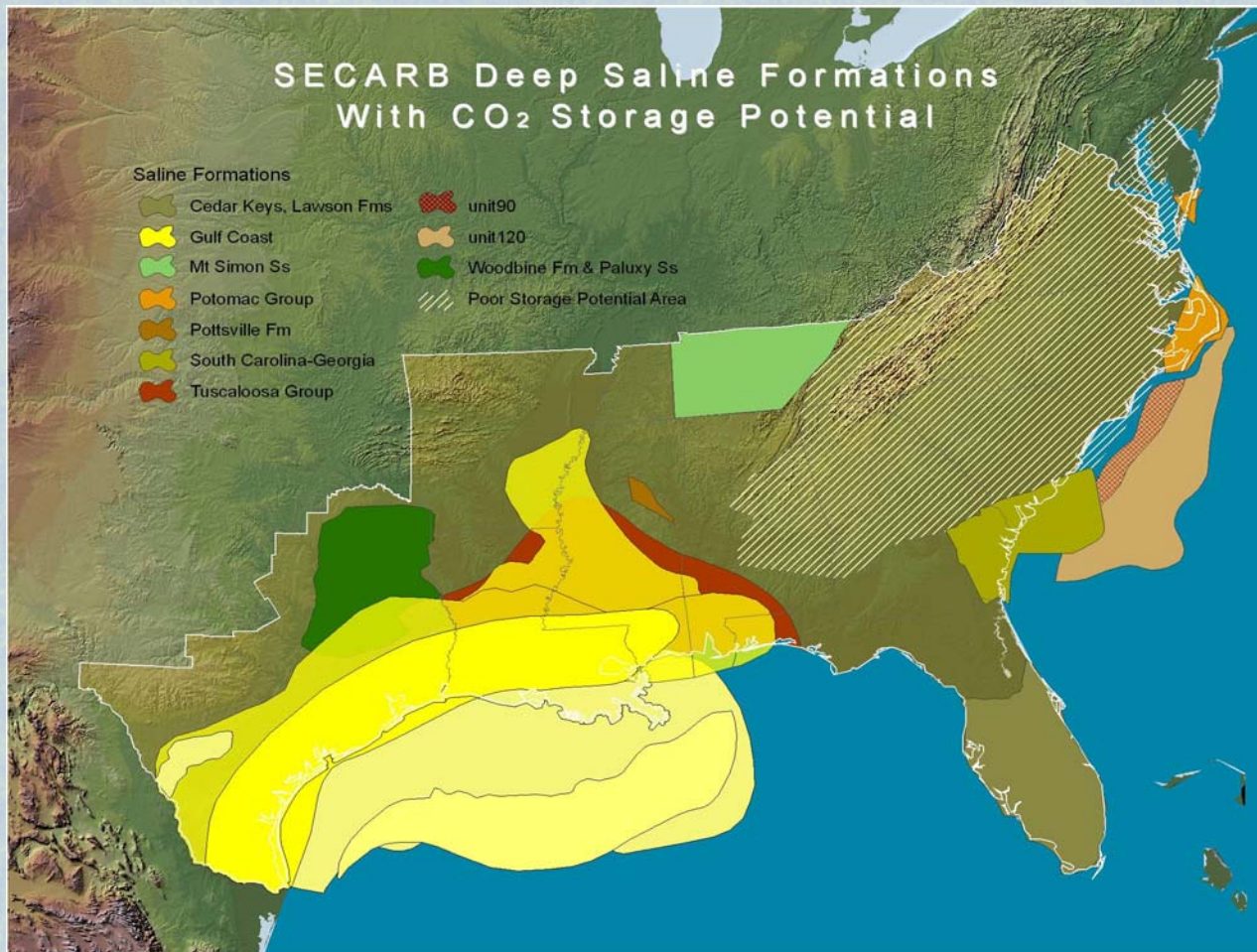


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# PREVIOUS GCCC & SECARB EFFORTS



## NatCarb Atlas II



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# Special Acknowledgement

- **SECARB's NatCarb Atlas II Contribution**
- **Data & Interpretive Contributions:**
- ***Gulf Basin Depositional Synthesis* Consortium**
  - **Dr. Bill Galloway, et al.**
  - Institute for Geophysics**
  - Jackson School of Geosciences**
  - University of Texas at Austin**



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# OVERVIEW

## I. Previous Work (GCCCC)

## II. Current Studies

### A. SECARB III – Task 15

1. U.S. Dept. of Energy (DOE)

### B. Texas Offshore Miocene

1. U.S. Dept. of Energy (DOE)
2. Texas General Land Office (GLO)



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# Geologic Database – Petra (IHS)

**PETRA Main [v3.2.6.0] - MIOCENE\_OFFSHORE\_CO2 - Offshore GOM Miocene Regional Assessment, CO2 Sequestration Potential**

Project Wells Zones Logs Compute Tools Units View Help Last

Wsn:29927 WELL: 17-711-00505-00 (OCS 00346 #028S0B0)

Well

WSN	Unique Well ID	Well Label
30738	177110049001	OCS 00067 #019S1B0
30737	177110049070	OCS 00067 #019S0B1
32276	177110049100	OCS G01230 #001S0B0
31776	177110049200	OCS G12355 #F006S0B0
30399	177110049300	OCS 00814 #035S0B0
46773	177110049400	OCS G01010 #004S0B0
31773	177110049500	OCS G12355 #F003S0B0
31774	177110049600	OCS G12355 #F004S0B0
31775	177110049700	OCS G12355 #F005S0B0
30051	177110049800	OCS G01000 #001S0B0
31141	177110049900	OCS 00420 #008S0B1
31140	177110049970	OCS 00420 #008S0B0
31134	177110050000	OCS 00420 #0003S0B0
30049	177110050100	OCS G00999 #001S0B0
31508	177110050200	OCS G01017 #001S0B0
1523	177110050300	OCS G03347 SL 04525 #00
57463	17711005040000	SL 04523 #2
29927	177110050500	OCS 00346 #028S0B0
29895	177110050600	OCS 00345 #008S0B0
30015	177110050700	OCS 00336 #002S0B0
32353	177110050800	OCS G01023 #001S0B0
31139	177110050900	OCS 00420 #007S0B0
32696	177110051000	OCS G01021 #001S0B0
32041	177110051100	OCS 00827 #005S0B0
29896	177110051200	OCS 00345 #009S0B0
57464	17711005130000	SL 03590 #1
57465	17711005140000	SL 04469 #1
32139	177110051500	OCS 00828 #C001S0B1
32138	177110051570	OCS 00828 #C001S0B0
31509	177110051600	OCS G01017 #002S0B0
57466	17711005170000	SL 04470 #2
29988	177110051800	OCS 00335 #005S0B0
30055	177110051900	OCS G01001 #001S0B0
30059	177110052000	OCS G01002 #003S0B0
30235	177110052100	OCS G01003 #001S0B0
30853	177110052200	OCS G01014 #003S0B0

Project Well Location FmTops Zones Logs IP Tests Fm Tests Cores Perfs/Shows Production Prod Cums Rasters

UWI 177110050500 Label OCS 00346 #028S0B0 Sort Key 177110050500

Well No 028S0B0 Well Symbol and Desc [GAS] - Gas Well

Name 28

Operator KERR-MCGEE CORP

Hist Oper

Lease OCS 00346

LeaseNo 346 TD 16,250

Field SHIP SHOAL BK 28

Fm at TD 654MOCNM

Prod. Fm 654MOCNM

Remark Added 10/01/2009 Chgd 03/03/2010

Active Datum ELEV\_KB 68

County SHIP SHOAL State LA

Zone Favorites...  Show  SSTVD

Name	Value	Quality	Zone
COMP_DA...	03/19/1966		WELL
TD	16,250		WELL
TVD(IHS)	16,250		WELL
DIR_IND(I...	V		WELL
ELEV_KB	68		WELL
ELEV_DF			WELL
ELEV_GR			WELL
ELEV_SEIS			WELL
INITCLAS...	MULTIPLE CO...	6	WELL

Well Status: GAS  
 Projected Formation: 000UNKWN (UNKNOWN)  
 Activity Code: D  
 IC Number: D  
 Product Objective: UNRPTD  
 Initial Lahee Class: D  
 Final Lahee Class: DG  
 Drig: 2005-12-03 : STATE PAPERWORKSFC LOCATION CHGD FROM 9455 FNL 3689 FWLJ

View As  Imperial  Metric  Raw System Units=Imperial

Datum=NAD27 Version 3.2.6.0



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# SECARB III – TASK 15

- **Preliminary Wells & Infrastructure Assessment**
- **Mapping & Preliminary Capacity Assessment**
- **Integration / NatCarb ATLAS III Update**

*David Carr, Becky Smyth*

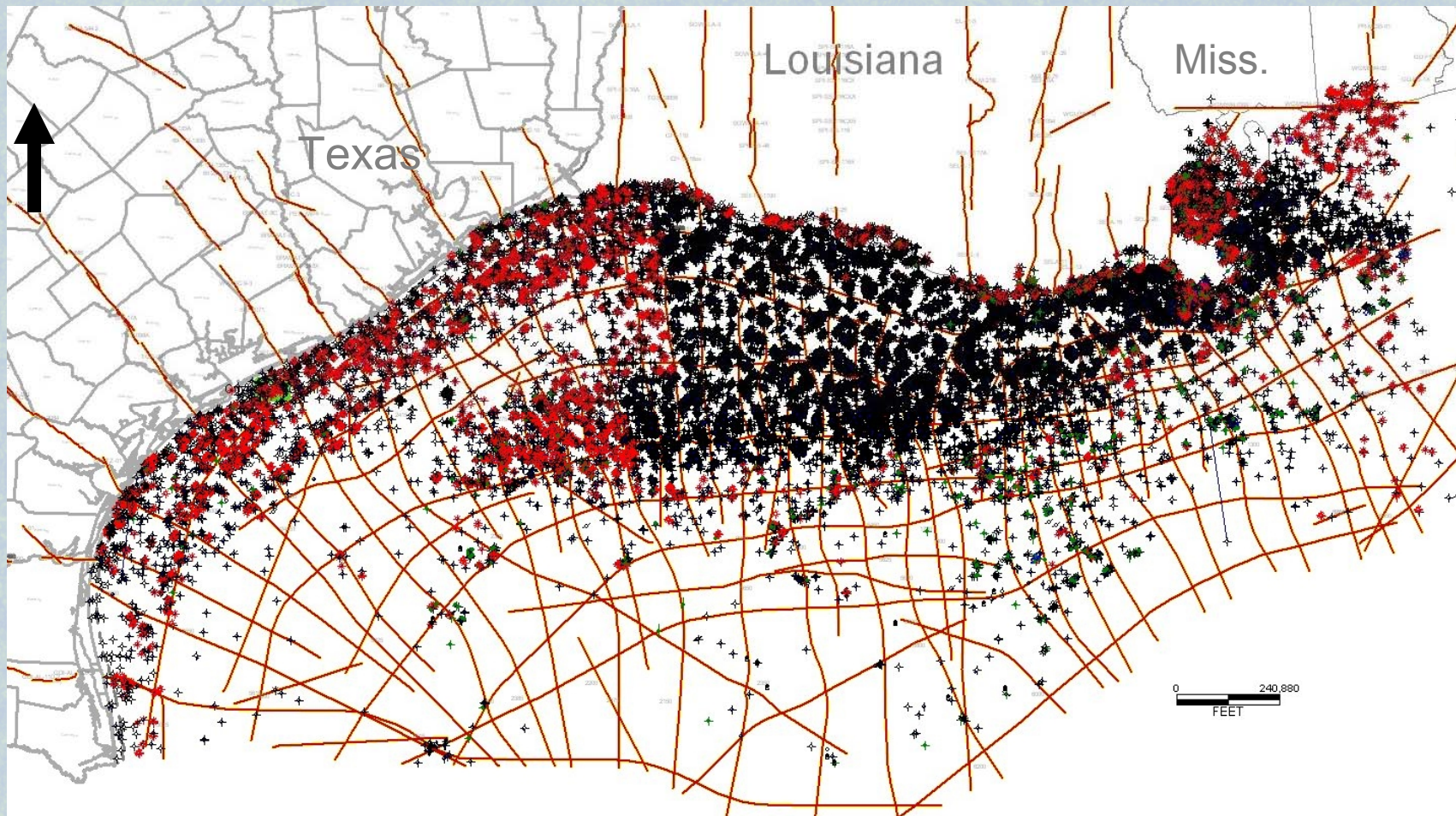


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# Current Dataset



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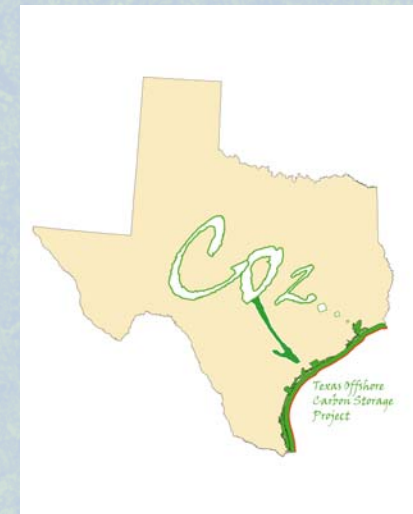
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# TEXAS OFFSHORE MIOCENE

- DOE FOA-33: Site Characterization

- TX General Land Office
  - (DOE Award Cost Match)
  - Offshore CO<sub>2</sub> Repository –
    - Advantages of Offshore



- Task 3 – Capacity Estimates
  - Subtask 3.1: Coordination with NATCARB

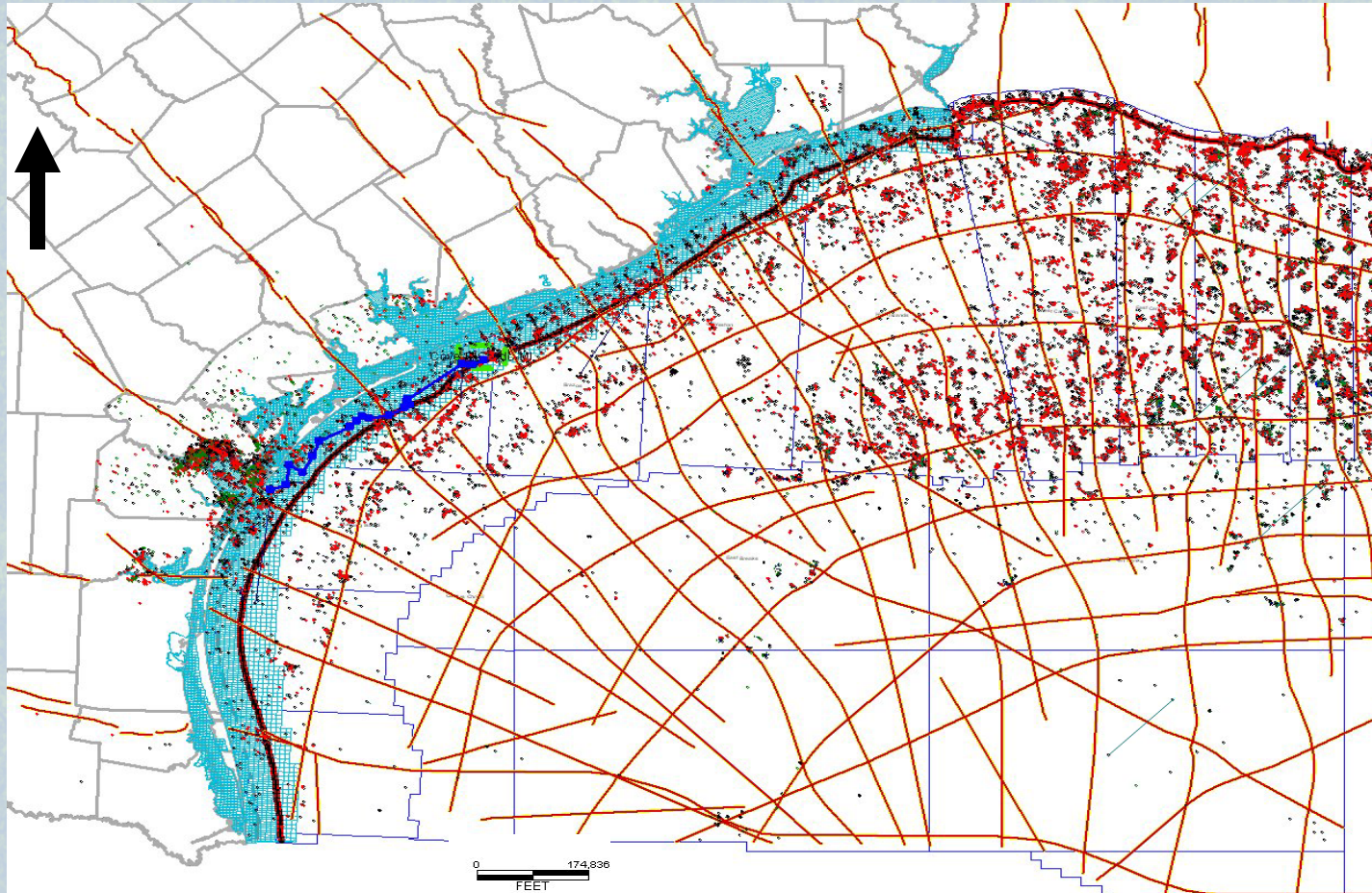


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# Texas Submerged Lands & Adjacent Federal Submerged Lands



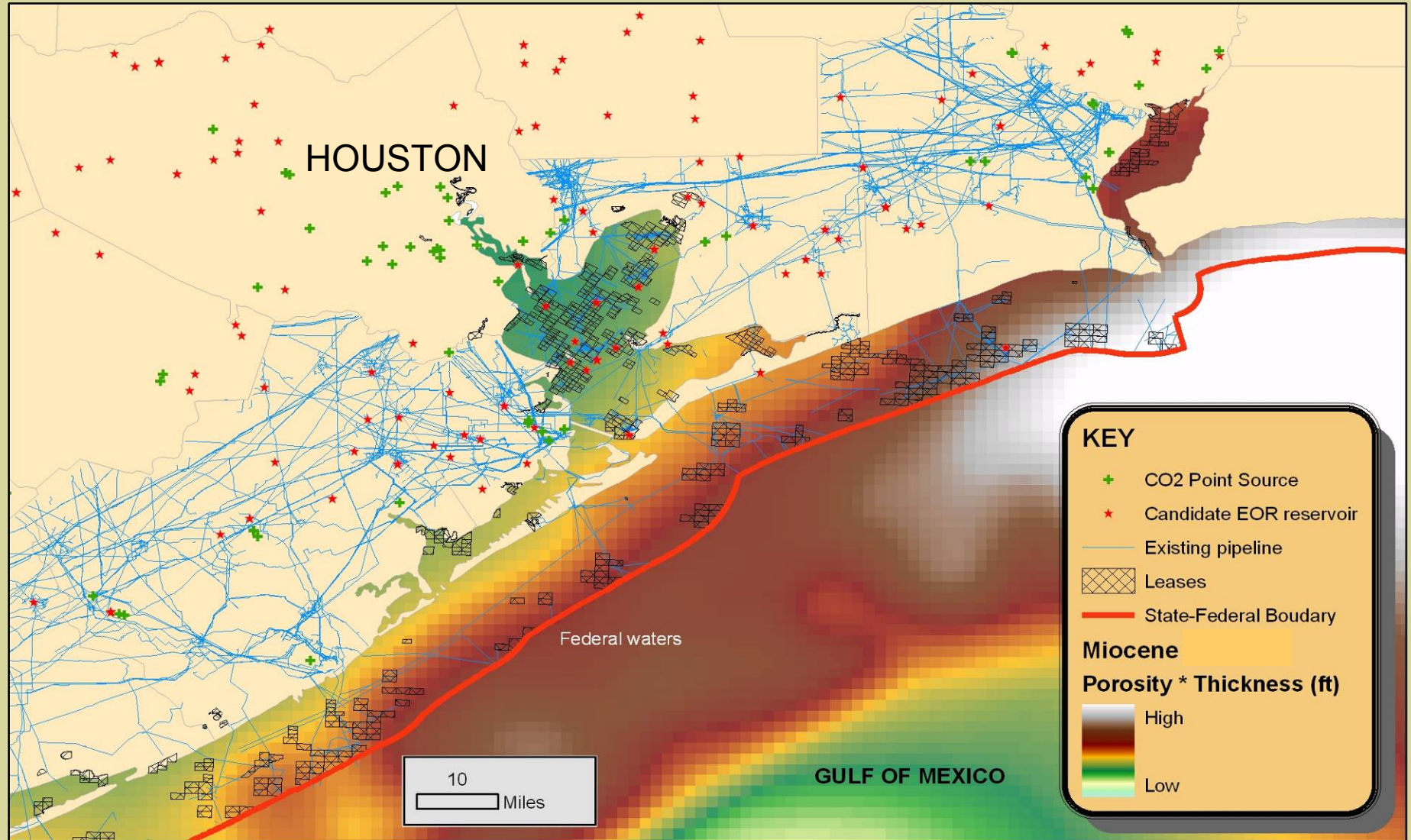
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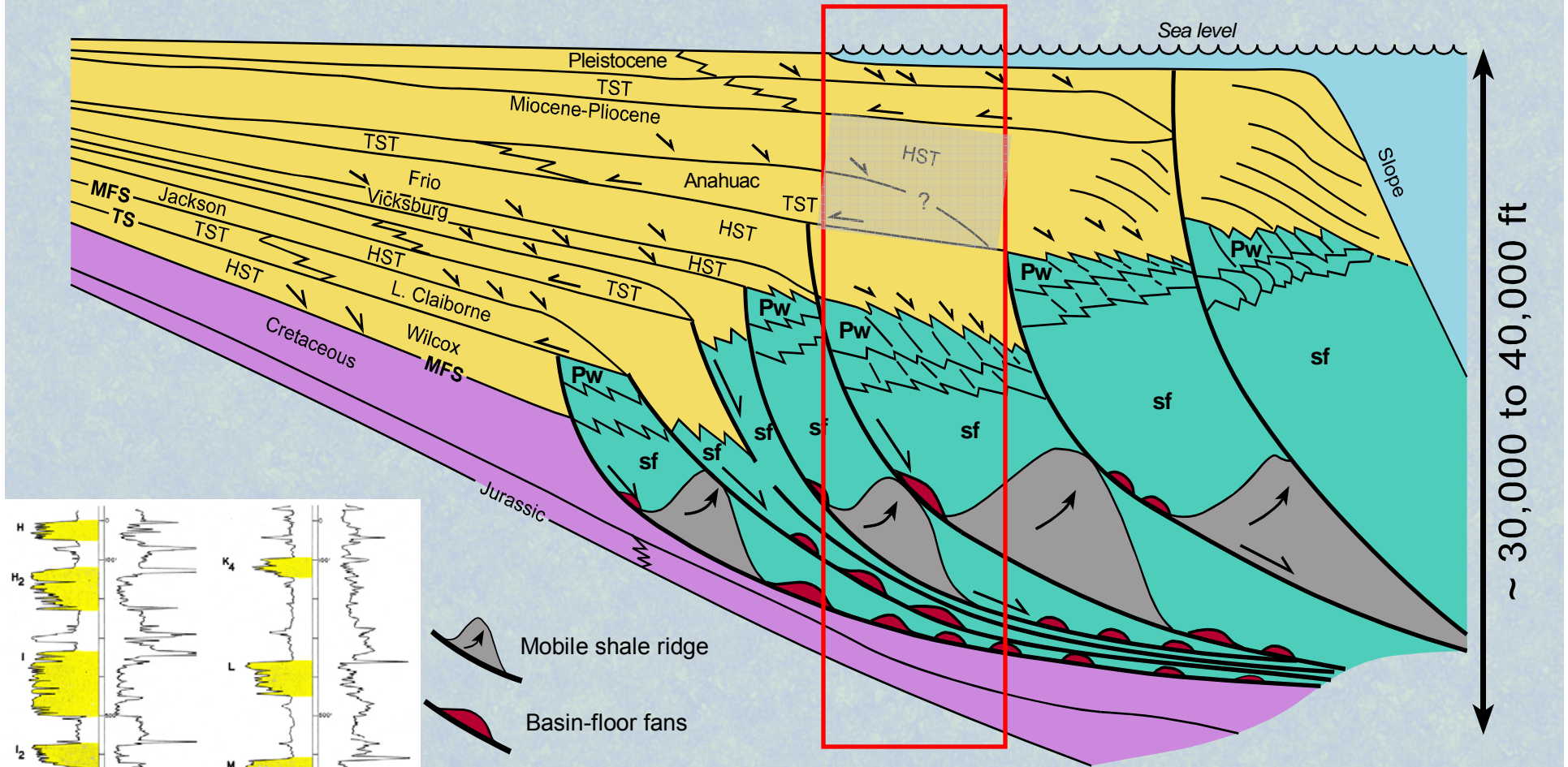
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Coast  
Carbon  
Center

# CO<sub>2</sub> Brine Storage Potential

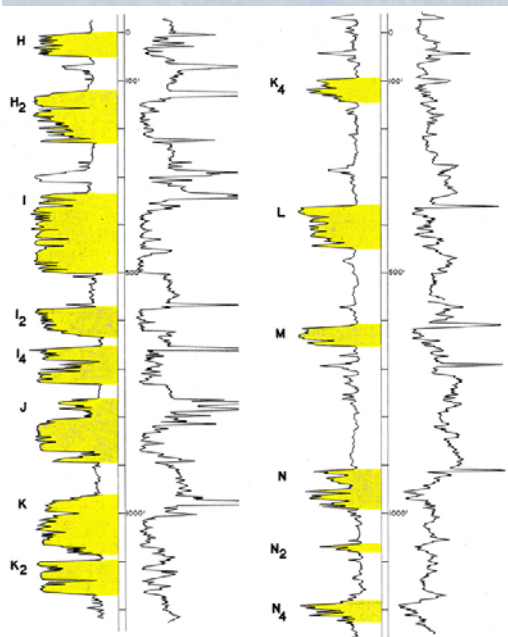


# Tremendous Potential in Offshore Wedge

Prograding wedge (fluvio-deltaic) – Upper Miocene Stratigraphy

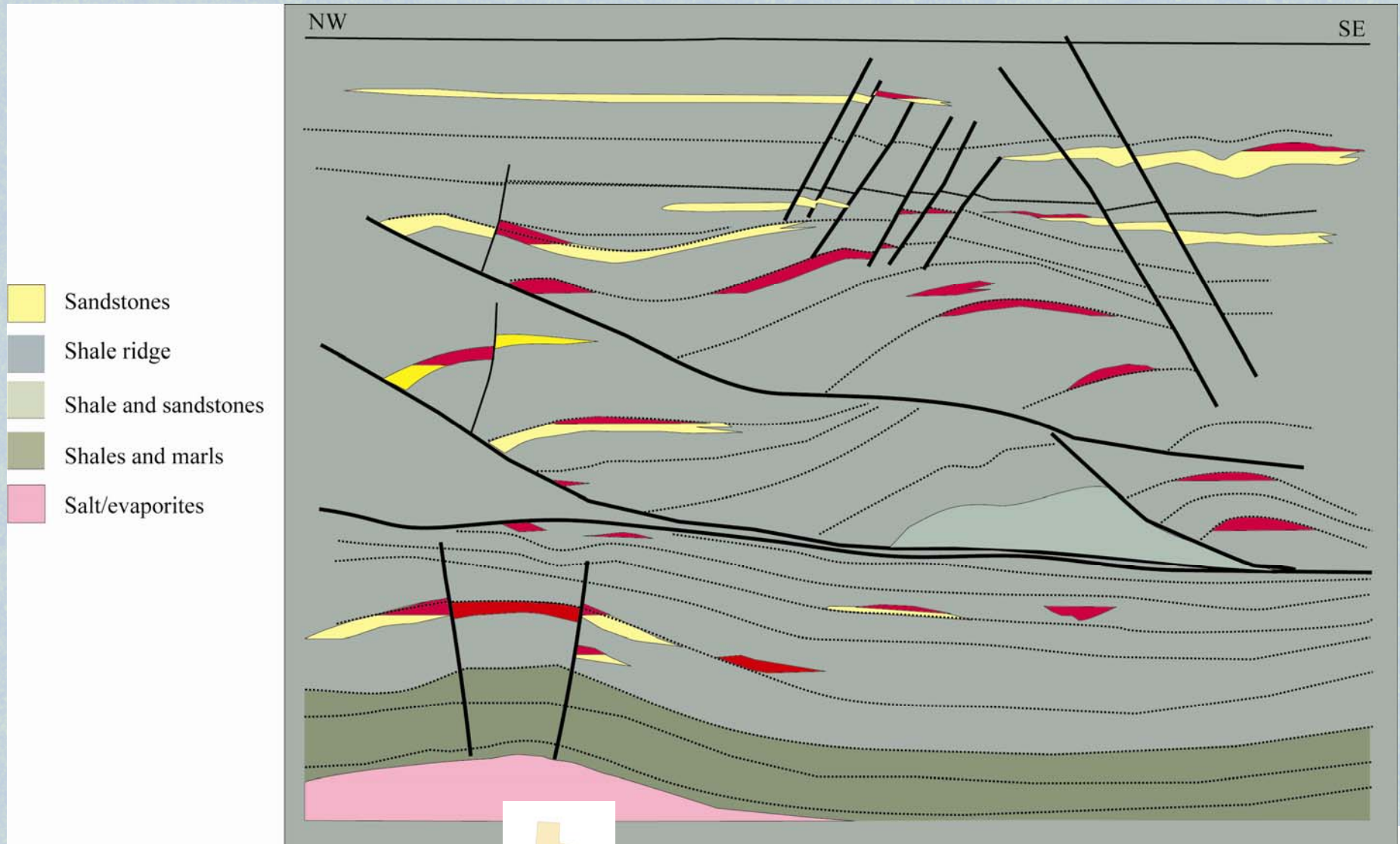


Brown, 2005, Modified from Bebout and Loucks (1981)





# Variety of Trap Types



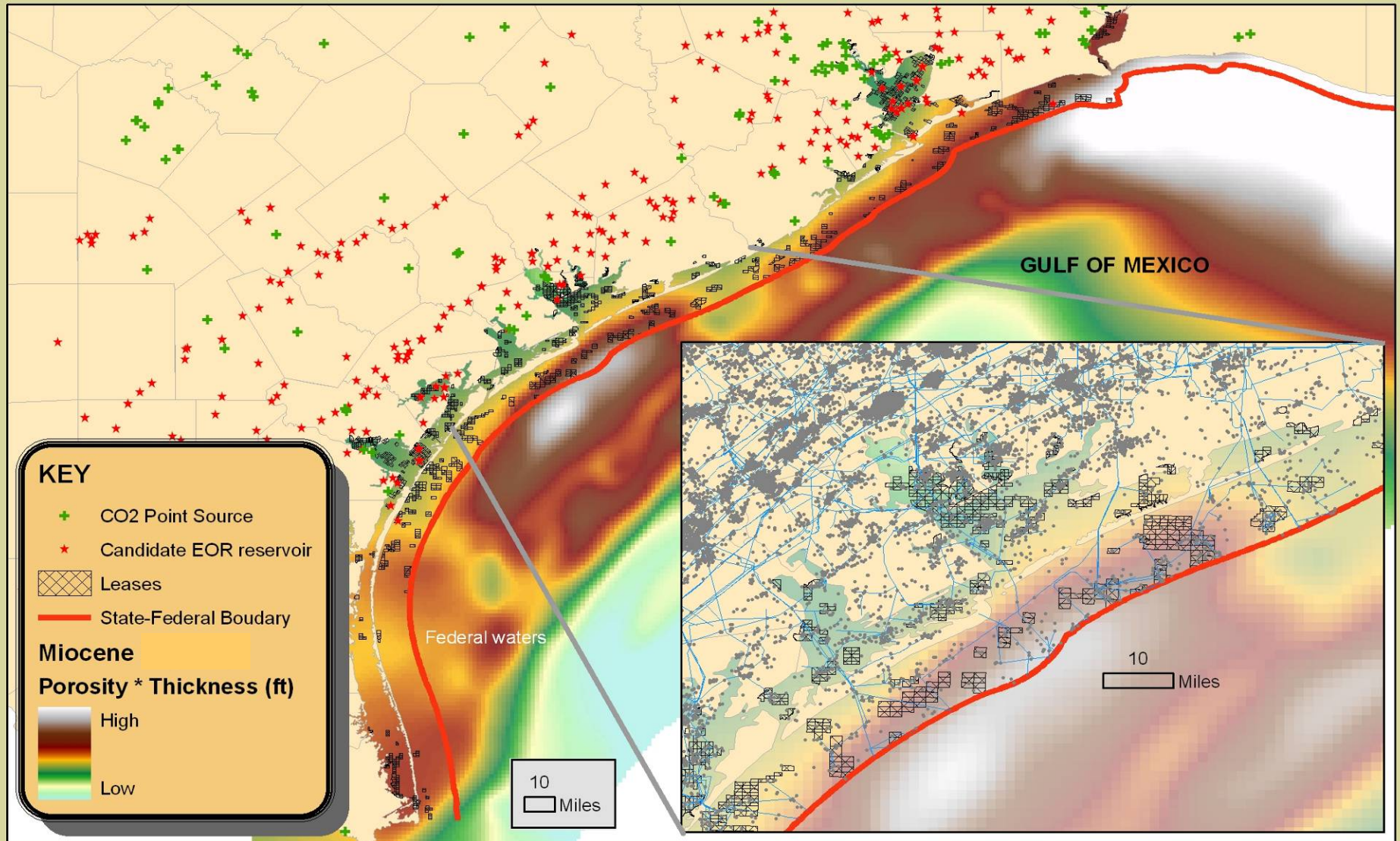
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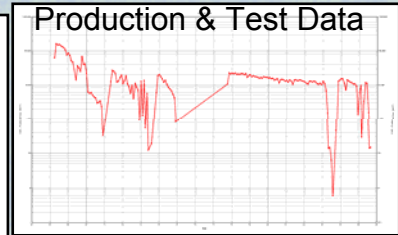
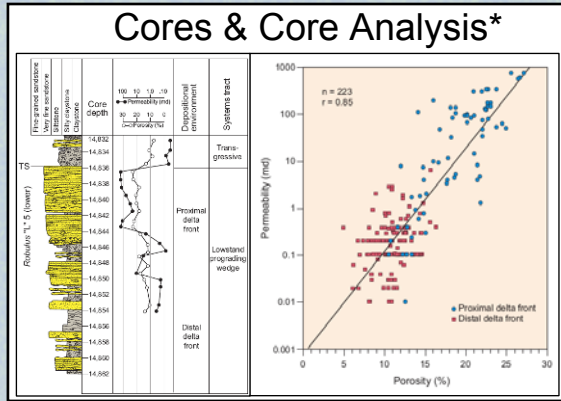


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Coast  
Carbon  
Center


# Miococene Porosity x Thickness



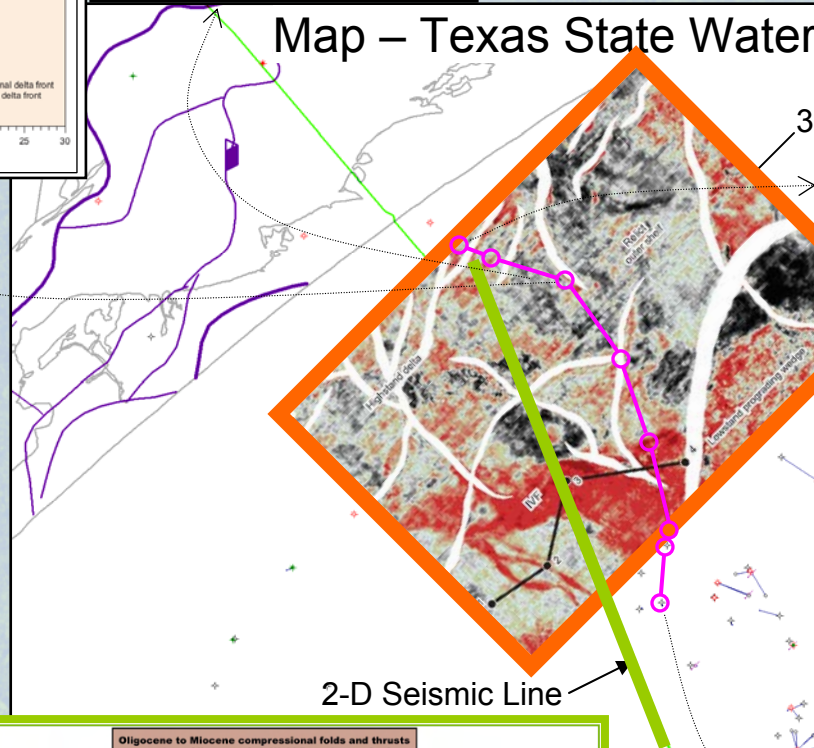
# Examples of Characterization Data



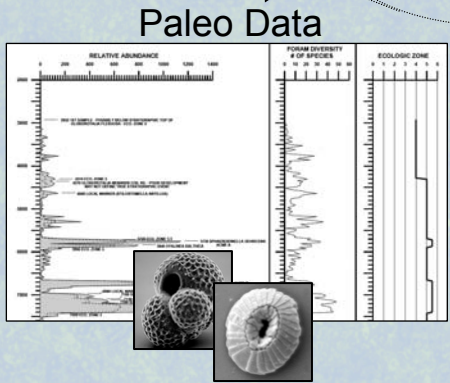
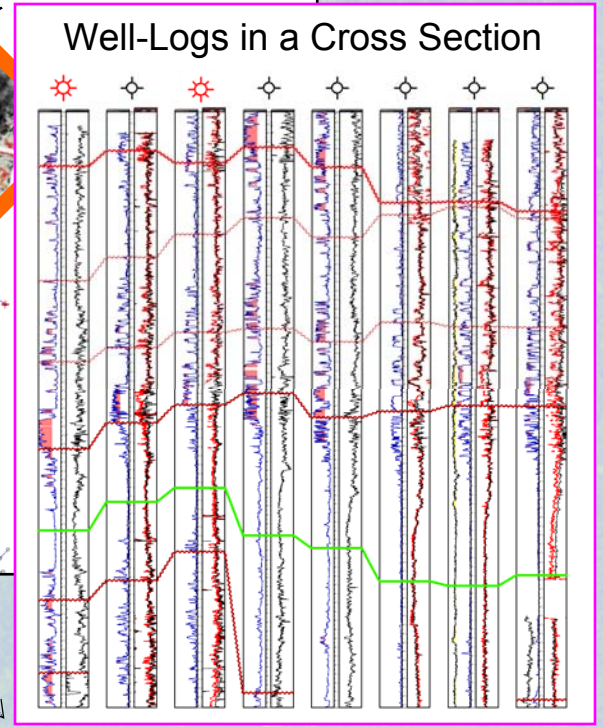
AMOCO PROD CO  
 APACHE CORPORATION  
**ST TR 00487-L SW/4 #2**  
 MATGORD IL B 519L  
 42703303400000

  
**16,000**  
 654MOCN  
 654MOCN  
**68,373,087 MCF**  
**103,239 BBLs**  
**149,670 BBLs**

## Map – Texas State Waters

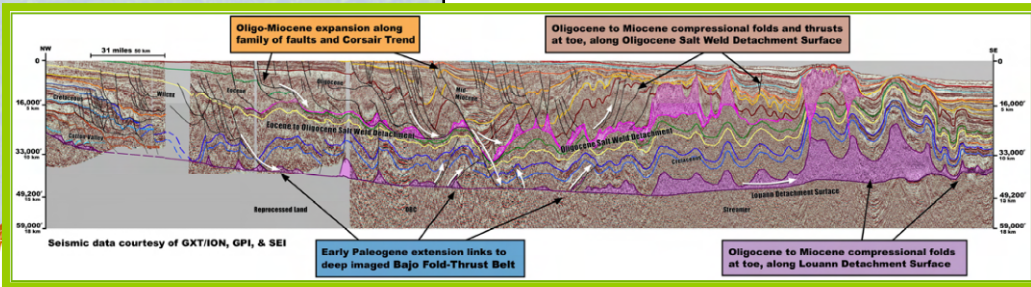


3-D Seismic Survey\*\*



## 2-D Seismic Line

## 2-D Seismic Line



\* From Dutton and Hentz (2002)

\*\* From Zeng and Hentz (2004)



# Research Strategy

## Goals:

1. Identify uncertainties
2. Characterize and collect data
3. Reduce uncertainties
4. Facilitate near-term commercial utilization.

Years 1-2: Regional assessment effort & Site Identification

### • Capacity Estimate by:

- Injectivity evaluation
- Stratigraphic containment
- Confining unit capacity
- Brine containment
- Mineralization containment
- "Seepage" pathways

Year 3: Uncertainty reduction via additional data collection

- Test well, core measurements

- Equivalent surface monitoring design and demonstration + modeling & simulation

- Marine survey (shallow seismic / bathymetry / water column)



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# SUMMARY

- **Building on Past Research / Results**
- **Current Gulf of Mexico Research Aims:**
  - **Better Quantify Static Capacity**
    - Large Volume Brine-Saturated Sandstones
  - **Understand Limits / Dynamic Capacity**
    - Seepage Risks
    - Compartmentalization & Pressure Build-up
  - **Prepare “Storage Ready” Sites**
    - Incentivize Use



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# **Gulf Coast Carbon Center**

**[www.gulfcoastcarbon.org](http://www.gulfcoastcarbon.org)**