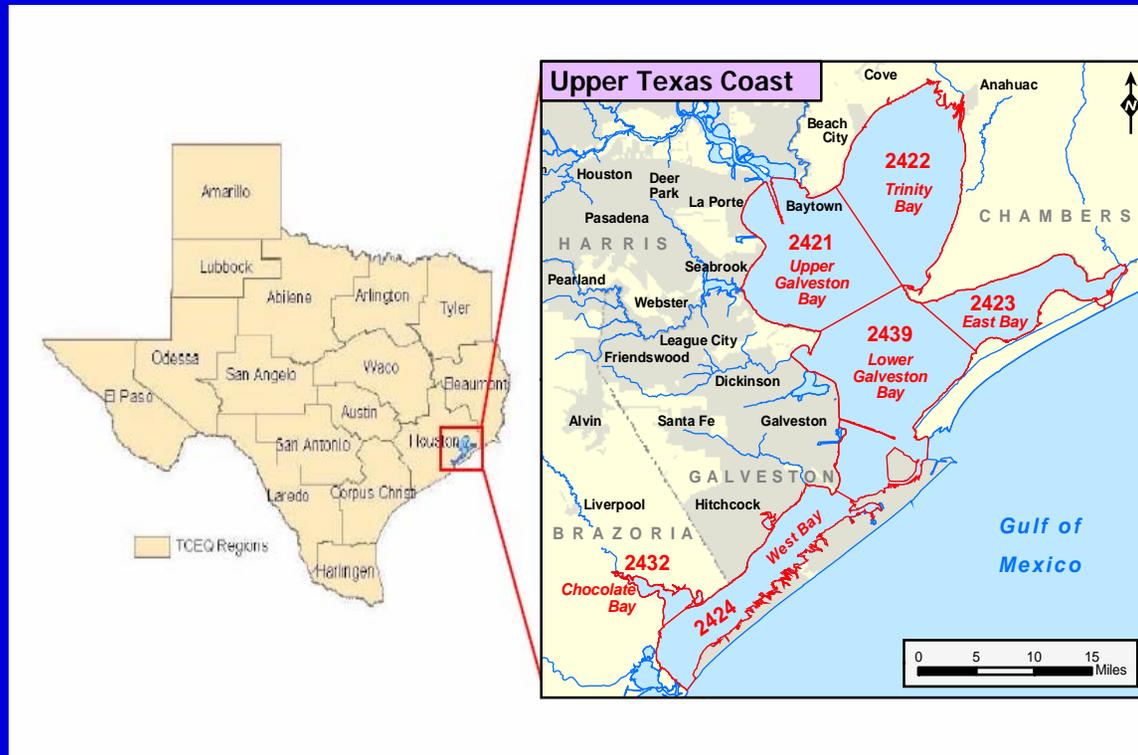


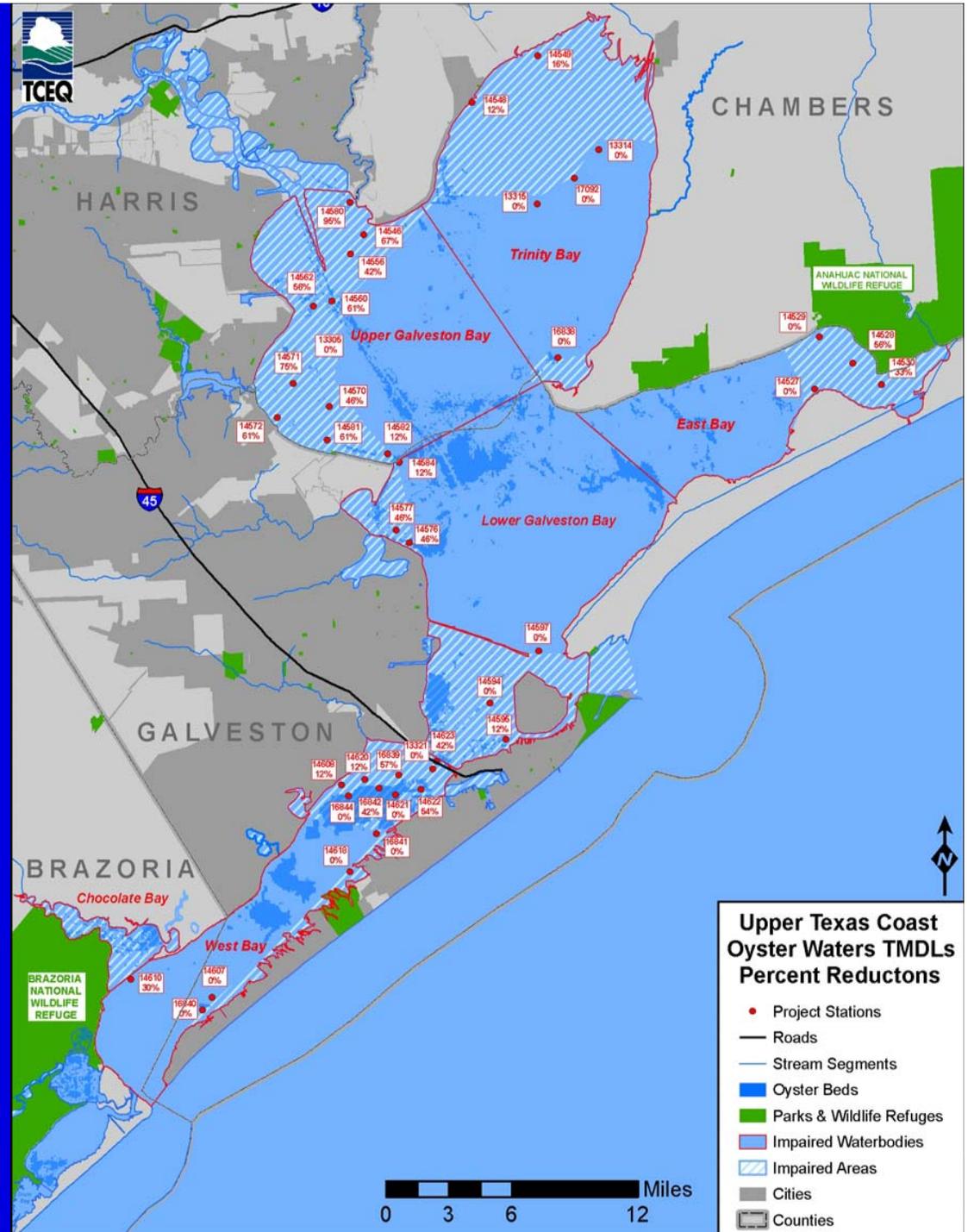
Upper Coast Oyster Water TMDL for Bacteria



Texas Commission on Environmental Quality
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Upper Coast Oyster TMDL

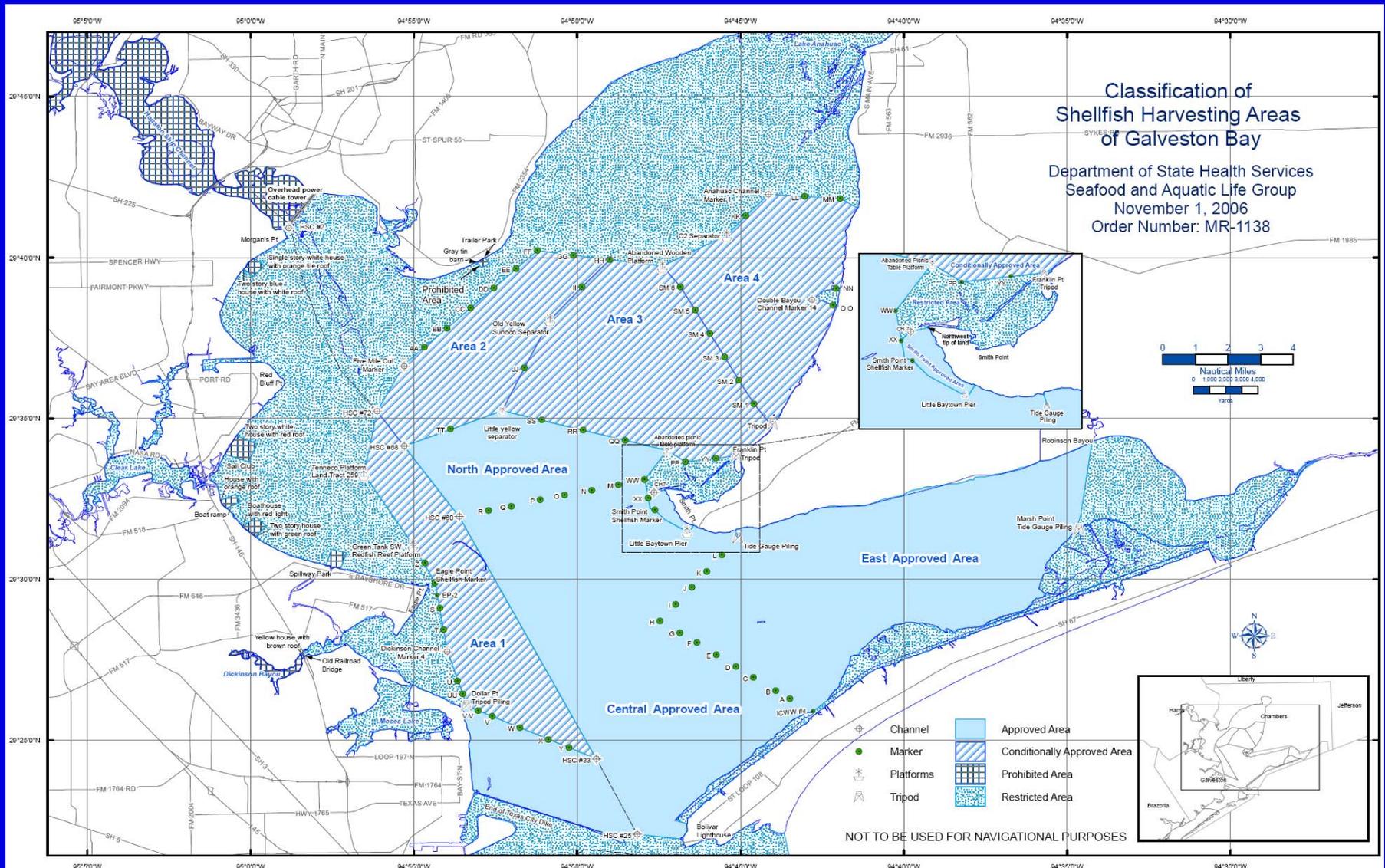
- Project Description
- Where and to what extent is the problem?
- Pollutant Sources
- Concentration Limits



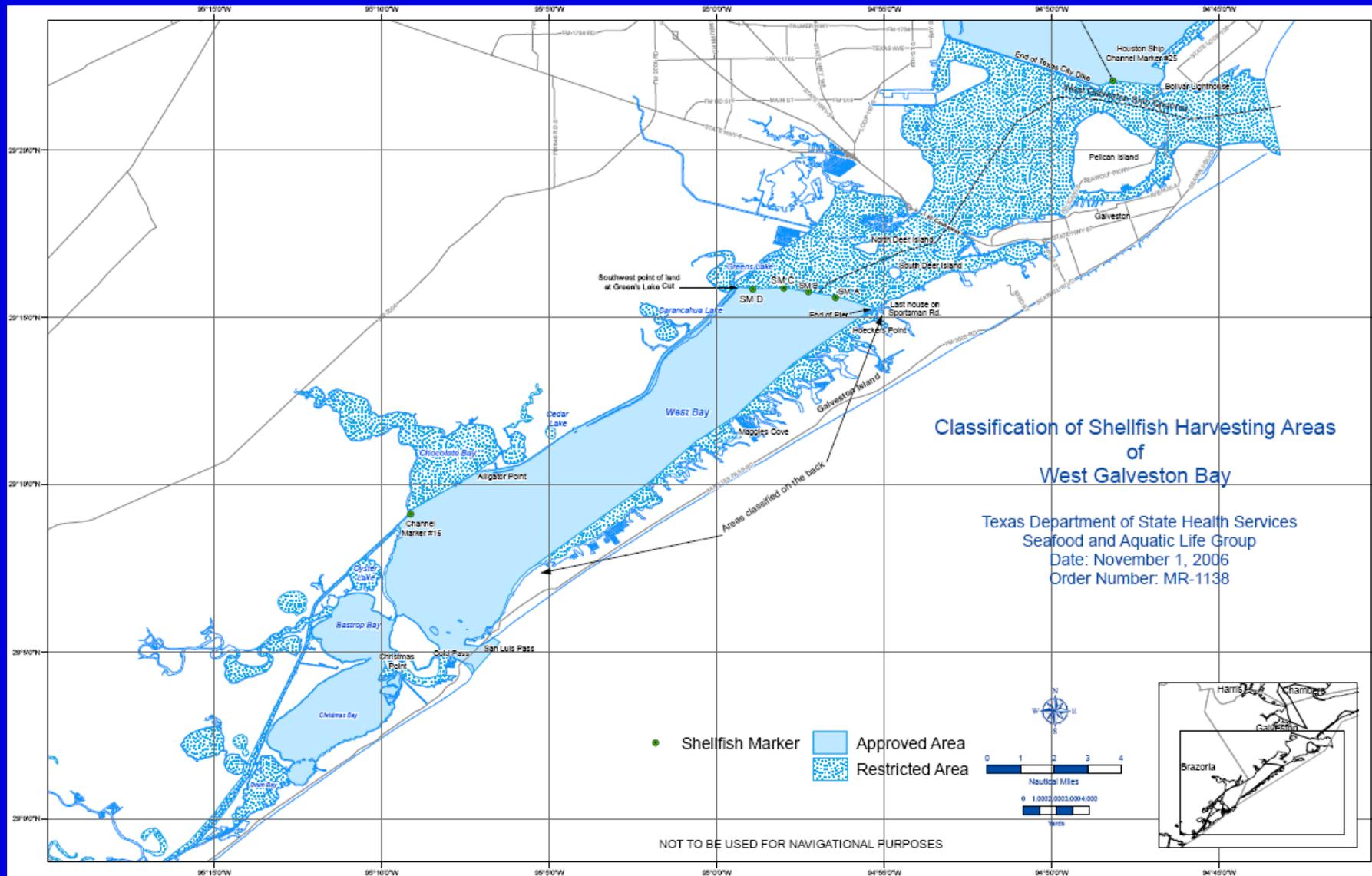
Oyster Project Overview

- Six Bay Segments Listed
- 1000 Foot Shoreline Buffer Zone (Contact Rec.)
- 303(d) Listing
 - Based on TDSHS Maps
 - Restricted Harvest Zones (RHZ) = Impaired
- Oyster Criteria
 - Median
 - 90th Percentile

Oyster Harvesting Map



Oyster Harvesting Map



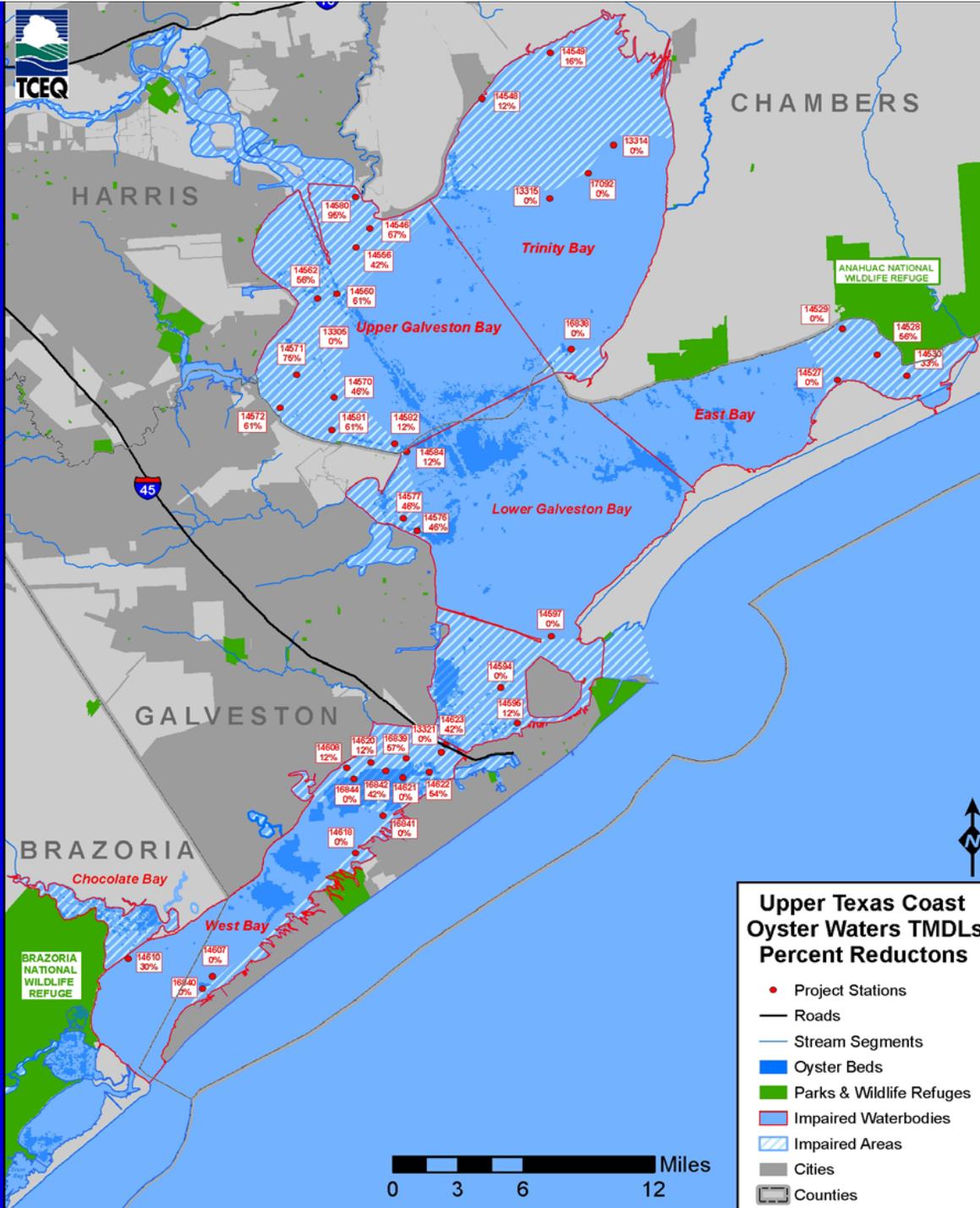
Proportions of RHZ

Segment Name	Year Listed	Area (km²)	Area in the impaired Restricted Harvest Zone
Upper Galveston Bay	1996	299.1	47%
Trinity Bay	2000	317.5	48%
East Bay	1998	148.9	25%
West Bay	1996	195.3	37%
Chocolate Bay	1996	21.1	100%
Lower Galveston Bay	1996	362.4	27%

Criteria for Oyster Waters

- **Texas Criteria (Fecal coliform)**
 - Median (<14cfu/100mL)
 - 90th Percentile (<43cfu/100mL)
- States must adopt water quality criteria that protect the designated use. *From 40 CFR Section 131.11*

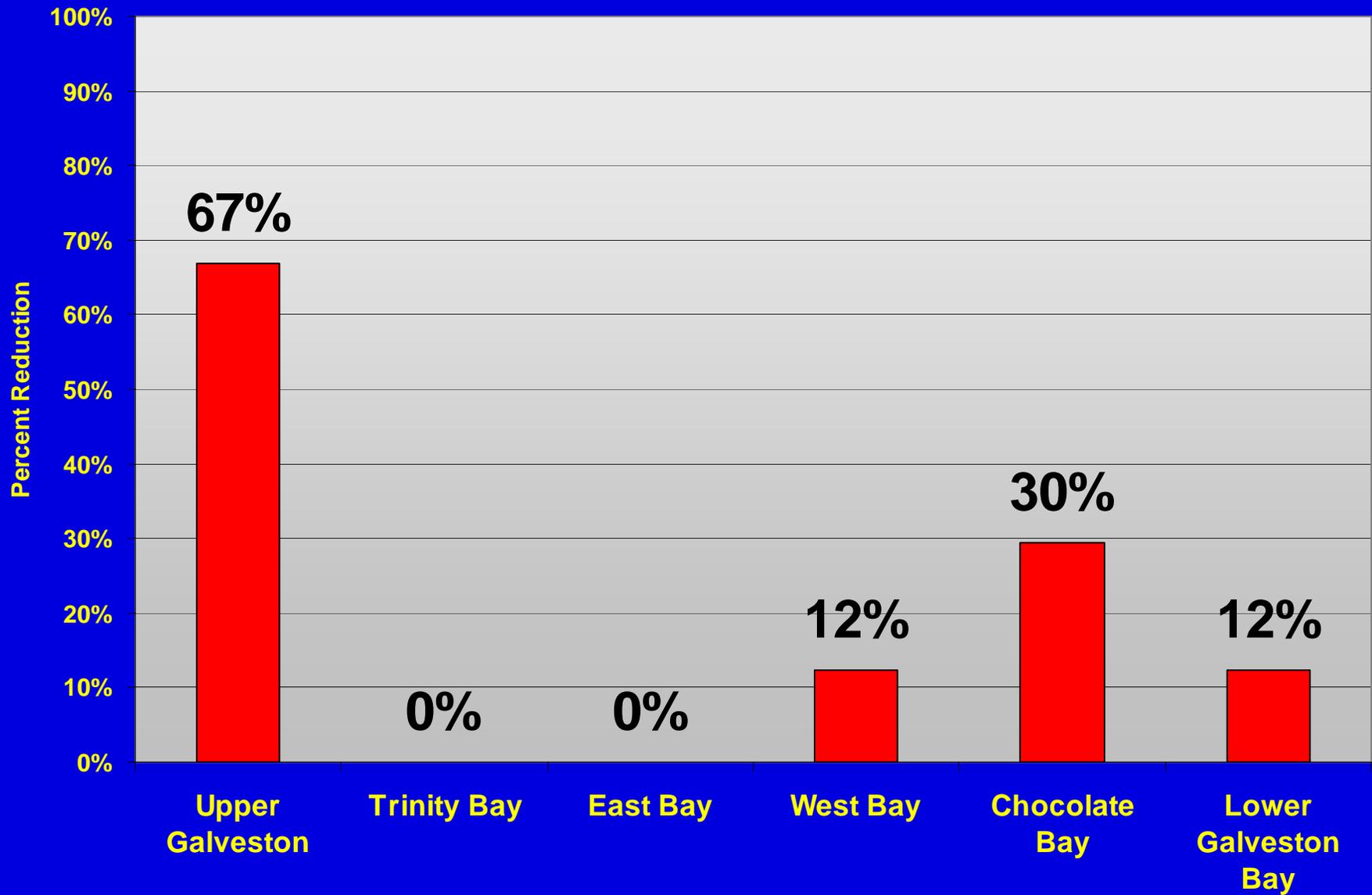
Do Oyster Waters meet Water Quality Criteria?



RHZ Breakdown by Segment

Segment Name	Number of Samples from RHZ	Median in RHZ (CFU of Fecal Coliform)	90th Percentile in RHZ (CFU of Fecal Coliform)	Local Exceedance in RHZ?
Upper Galveston Bay	947	8.0	130.0	Yes
Trinity Bay	376	2.0	33.0	Yes
East Bay	199	2.0	36.2	Yes
West Bay	515	5.0	49.0	Yes
Chocolate Bay	37	5.0	61.0	Yes
Lower Galveston Bay	707	2.0	49.0	Yes

Reductions in RHZs - 90th Percentile



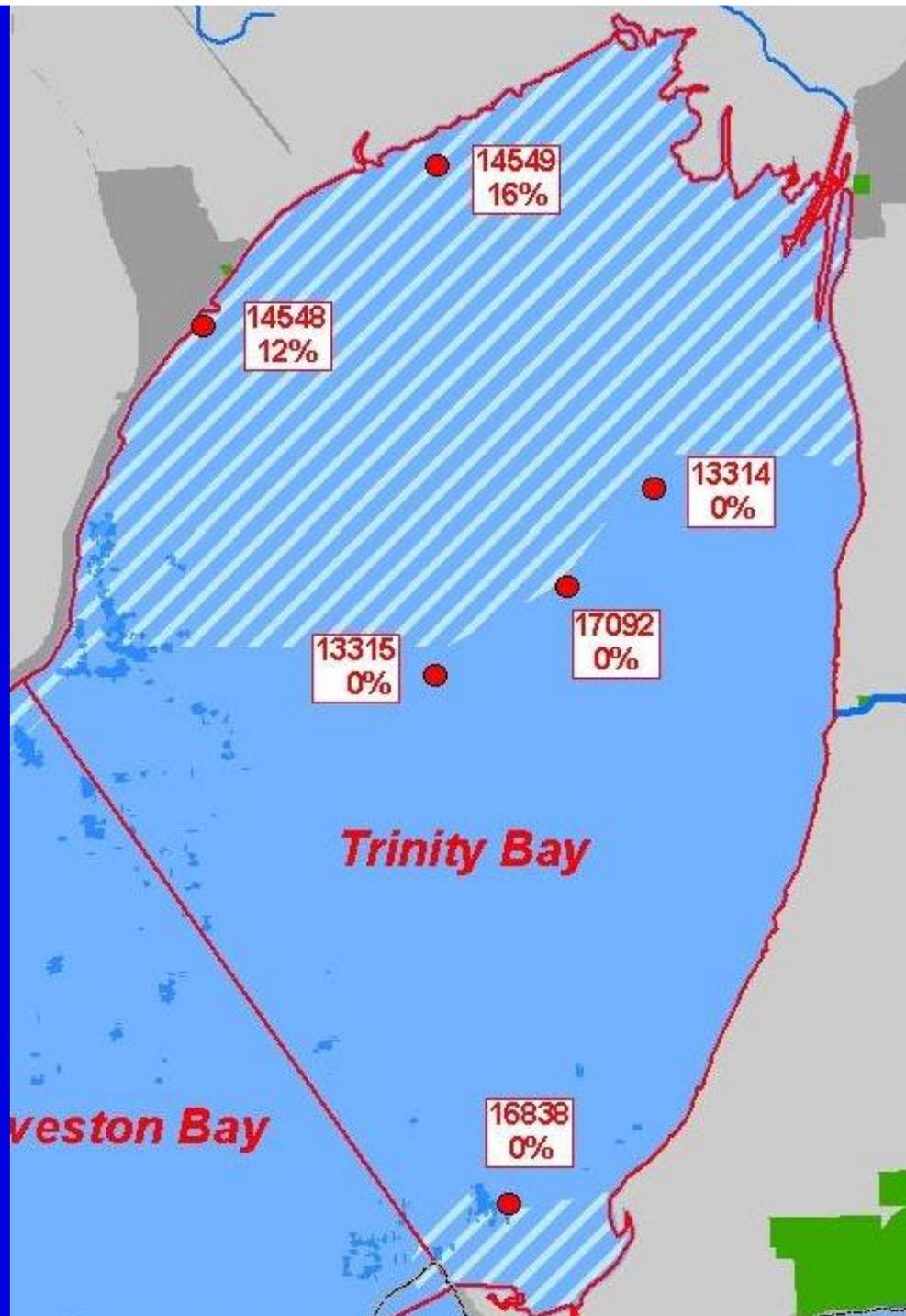
Calculations Review

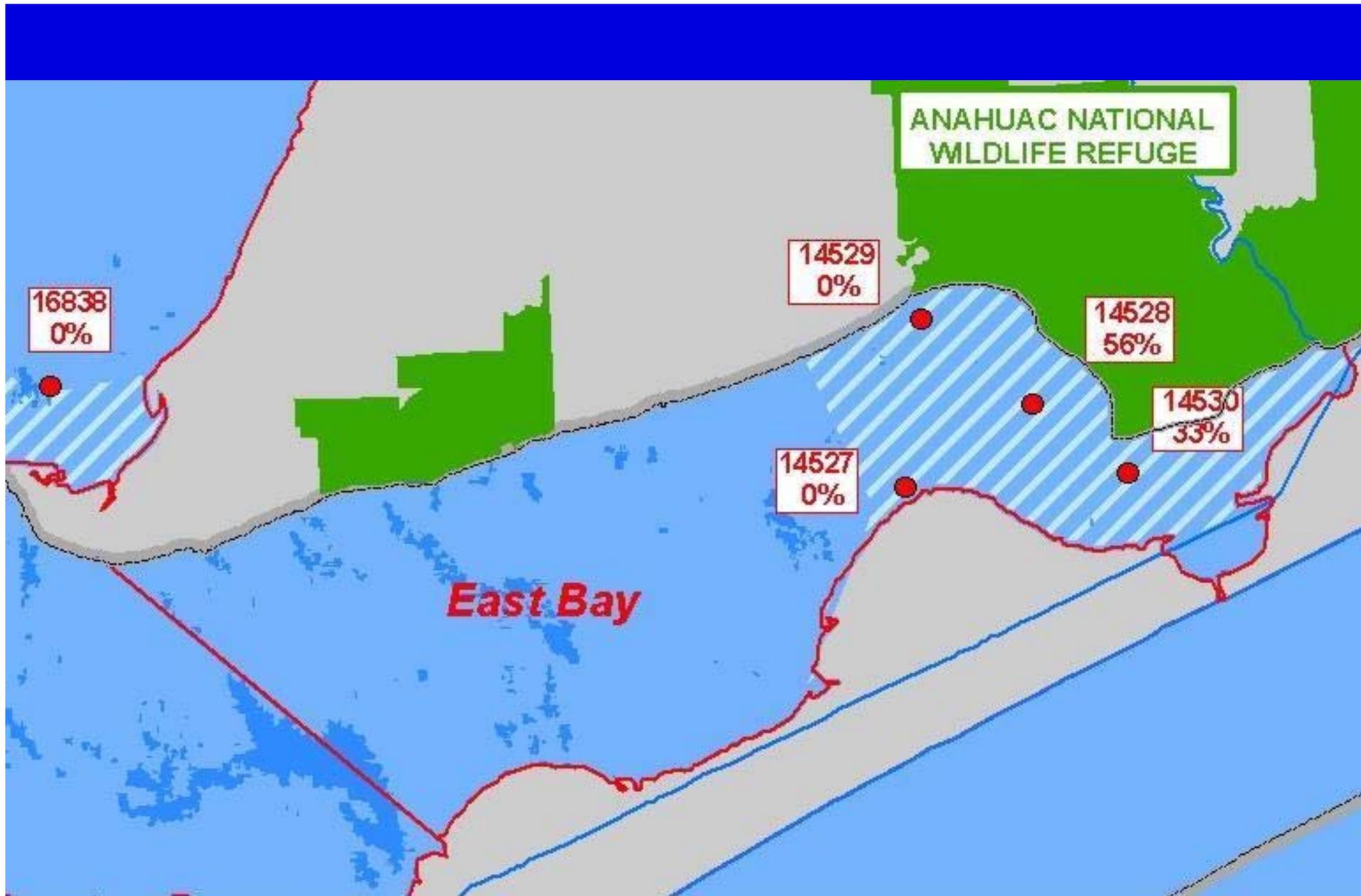


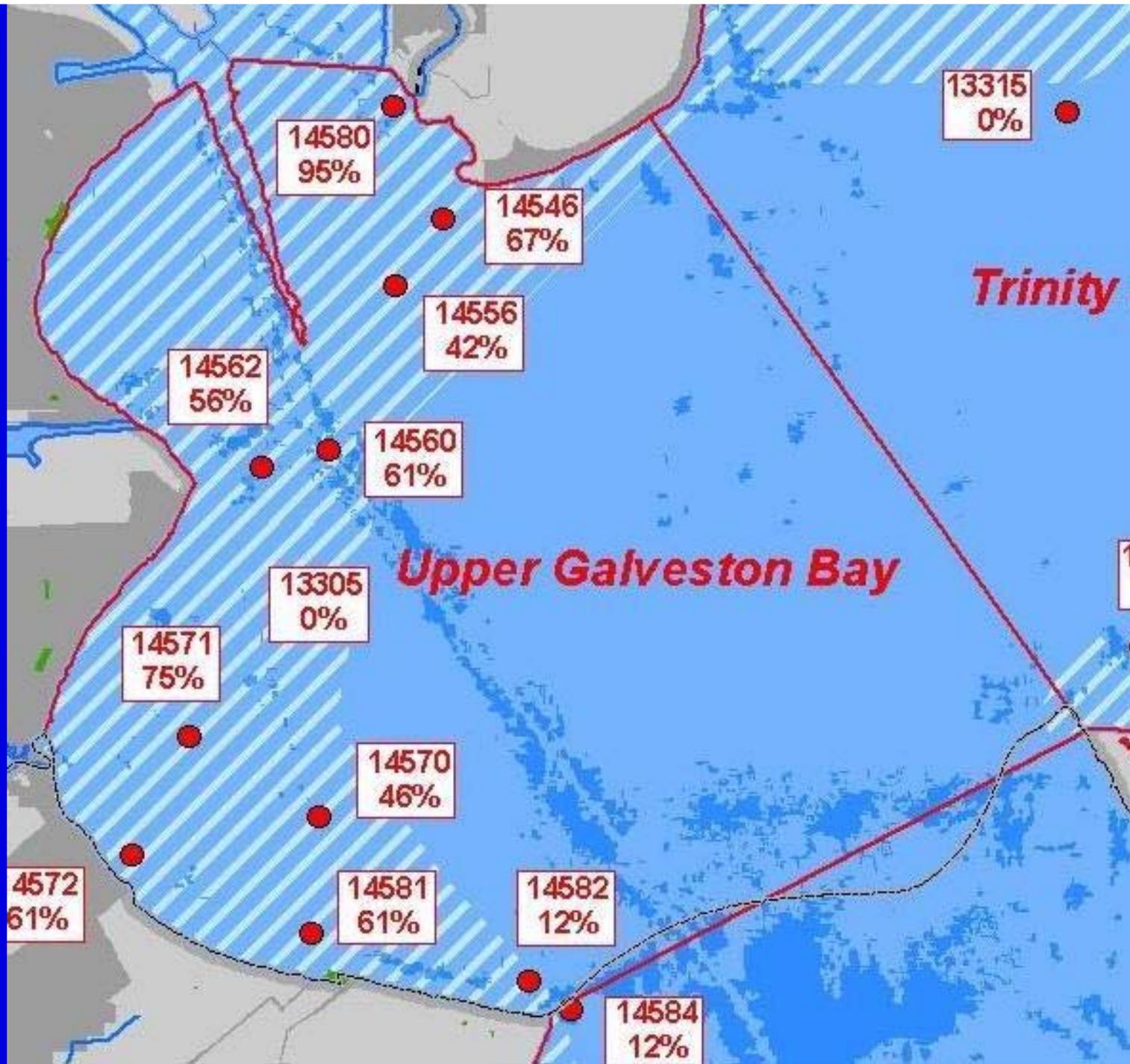
Concentration Based Analysis

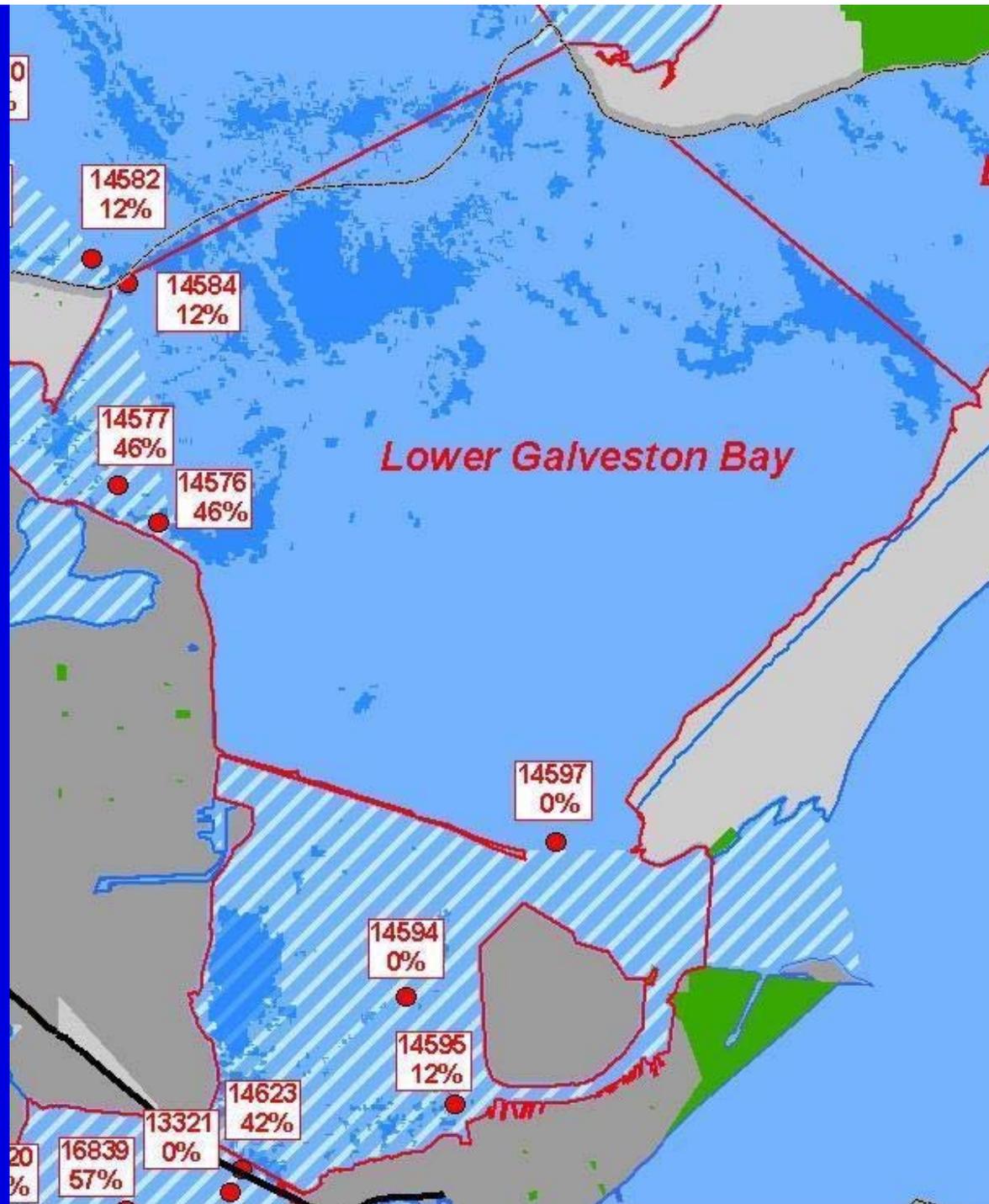
- Some RHZs meet Oyster Water Criteria
- Site specific analysis for each station

$$\frac{(\text{Concentration} - \text{Criteria})}{\text{Criteria}} \times 100 = \% \text{ Reduction}$$



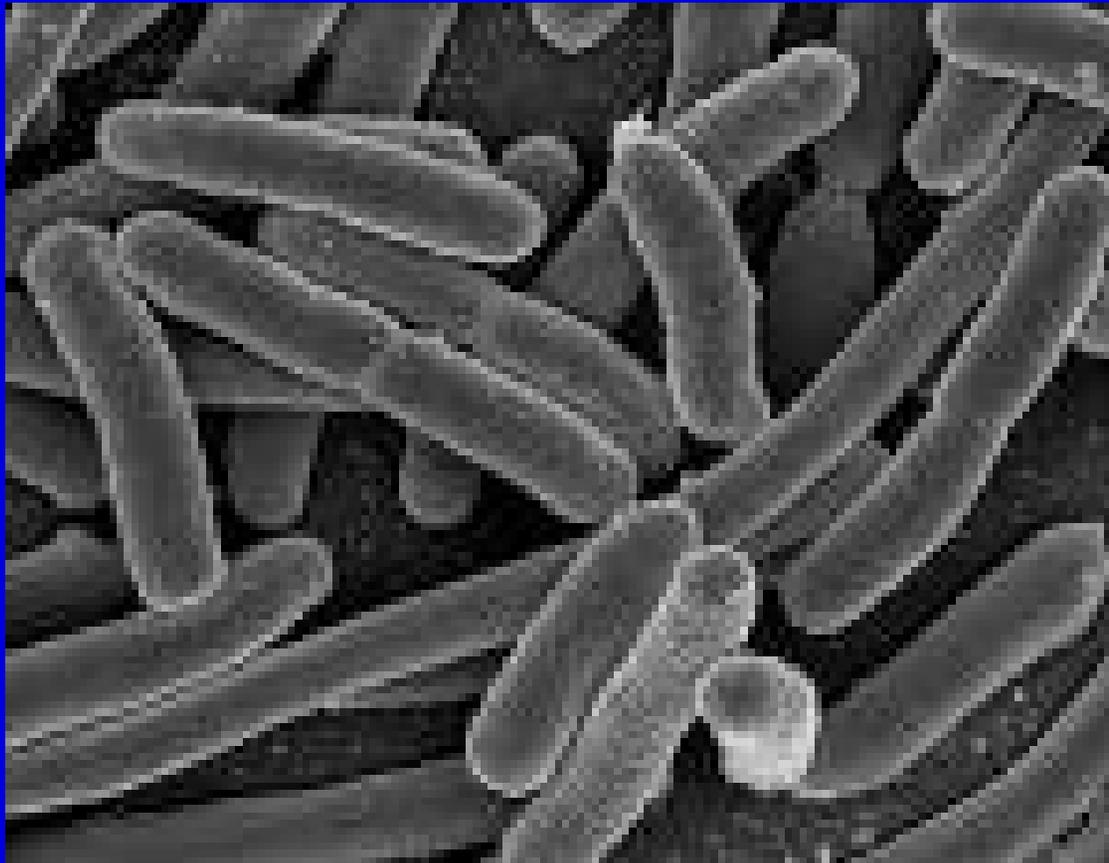






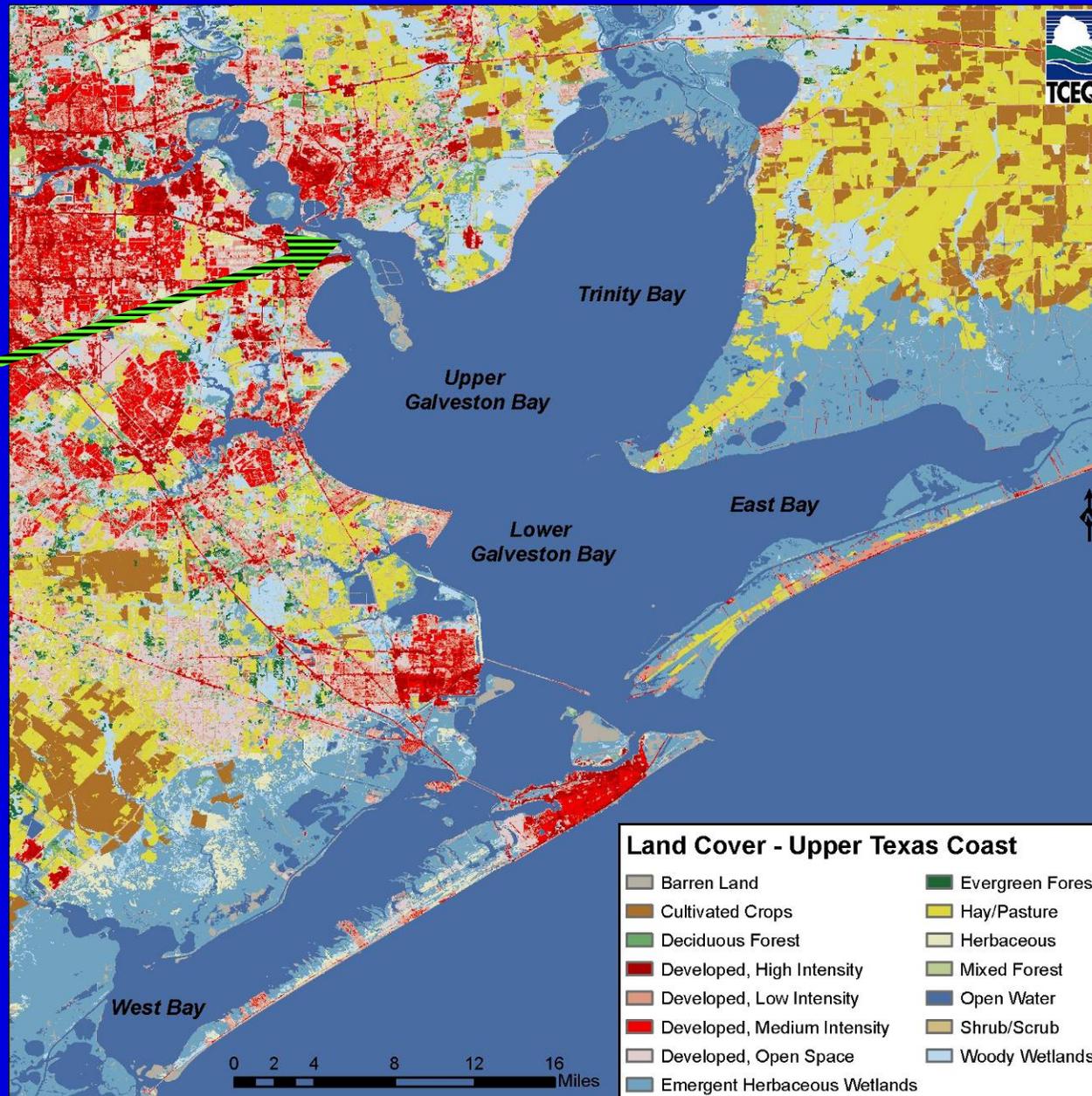


Sources of Bacteria



Land Use

Hog Island



Hog Island



Hog Island Water Quality

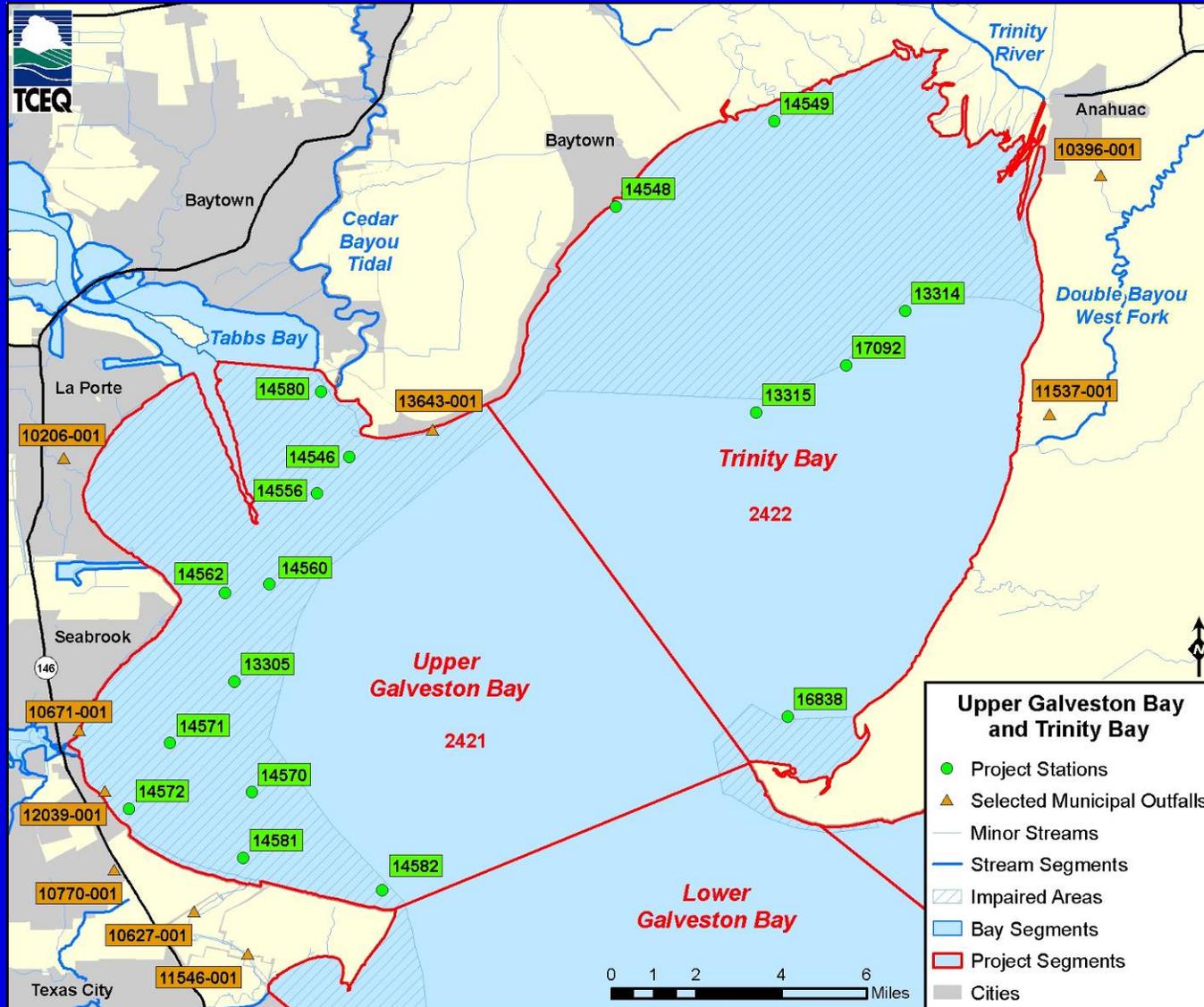
Segment Name	Number of Samples in TDSHS Restricted Harvest Zone	90 th Percentile (CFU of Fecal Coliform)	Median (CFU of Fecal Coliform)
Upper Galveston Bay	947	130	8.0
Hog Island Outside 1000' Buffer	77	79	17.0

- Shoreline runoff effects are difficult to remove from Hog Island water quality analyses. Only limited numbers of samples outside of 1000 feet of a shoreline were available.
- Even with potential shoreline influence, Hog Island's 90th Percentile is less than the Upper Galveston Bay RHZ.

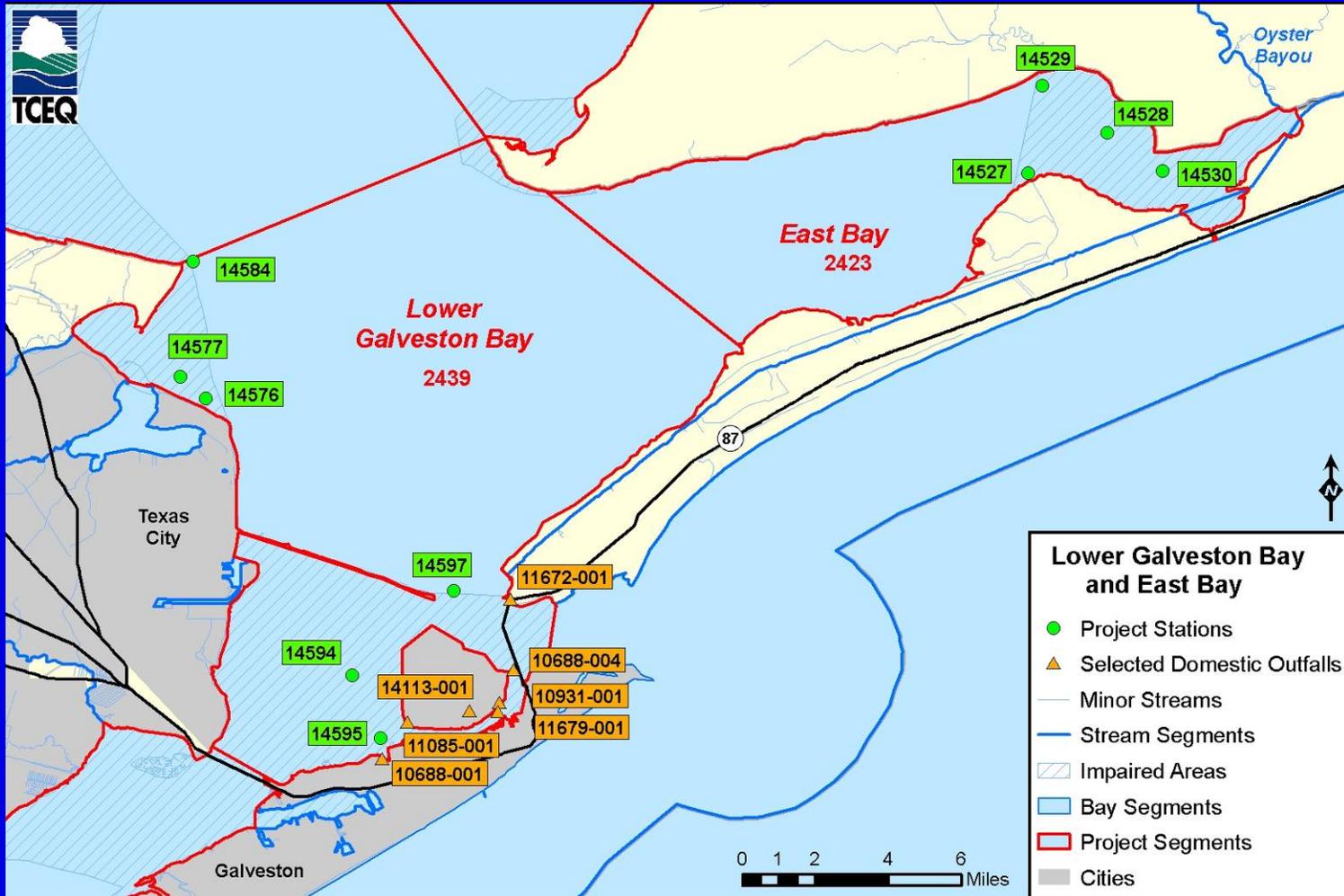
Potential Sources

- Waste Water Treatment Facilities (WWTF)
- Storm Water
- Birds
- Septic Systems
- Marinas

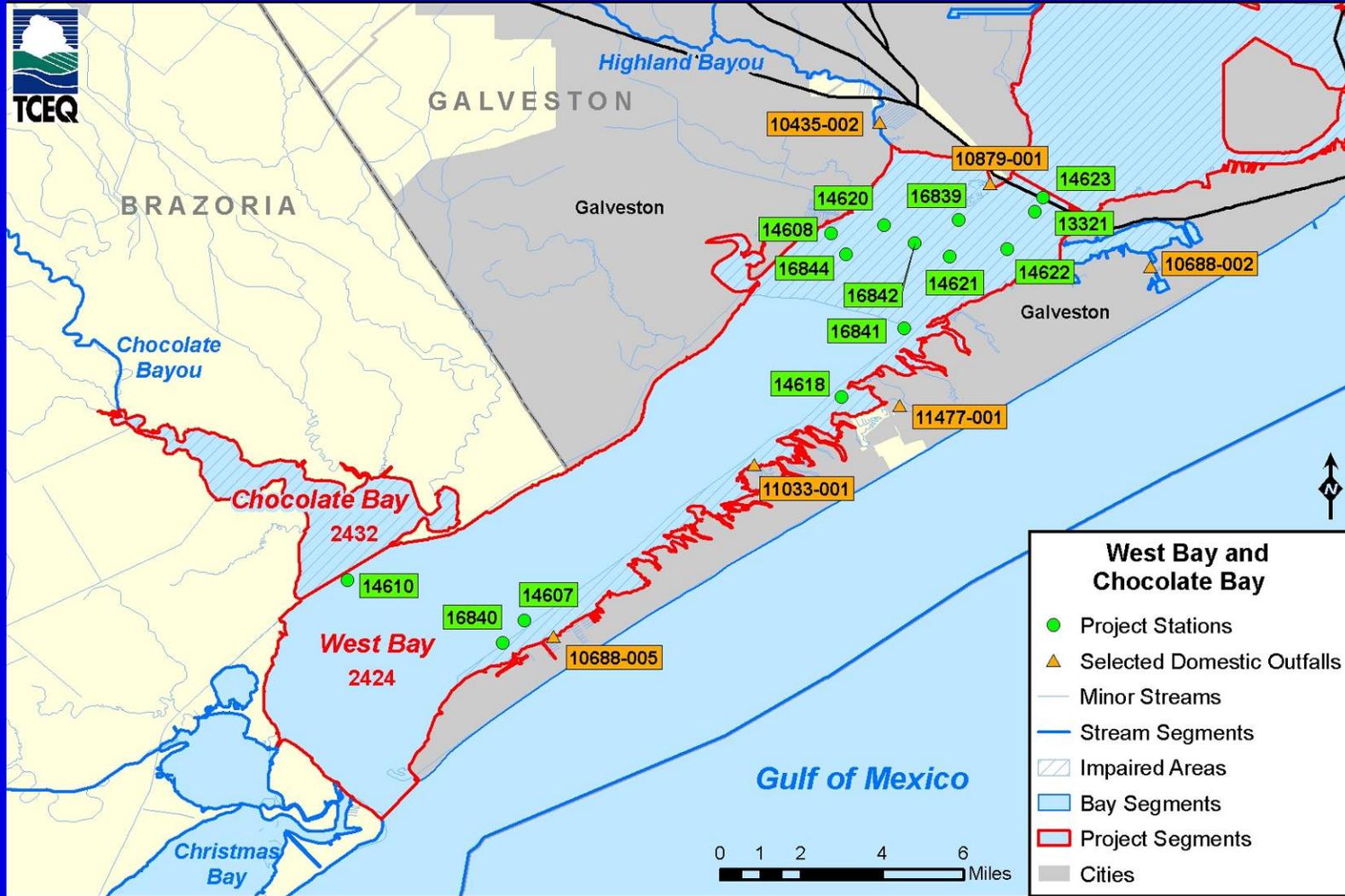
Waste Water Treatment Facilities



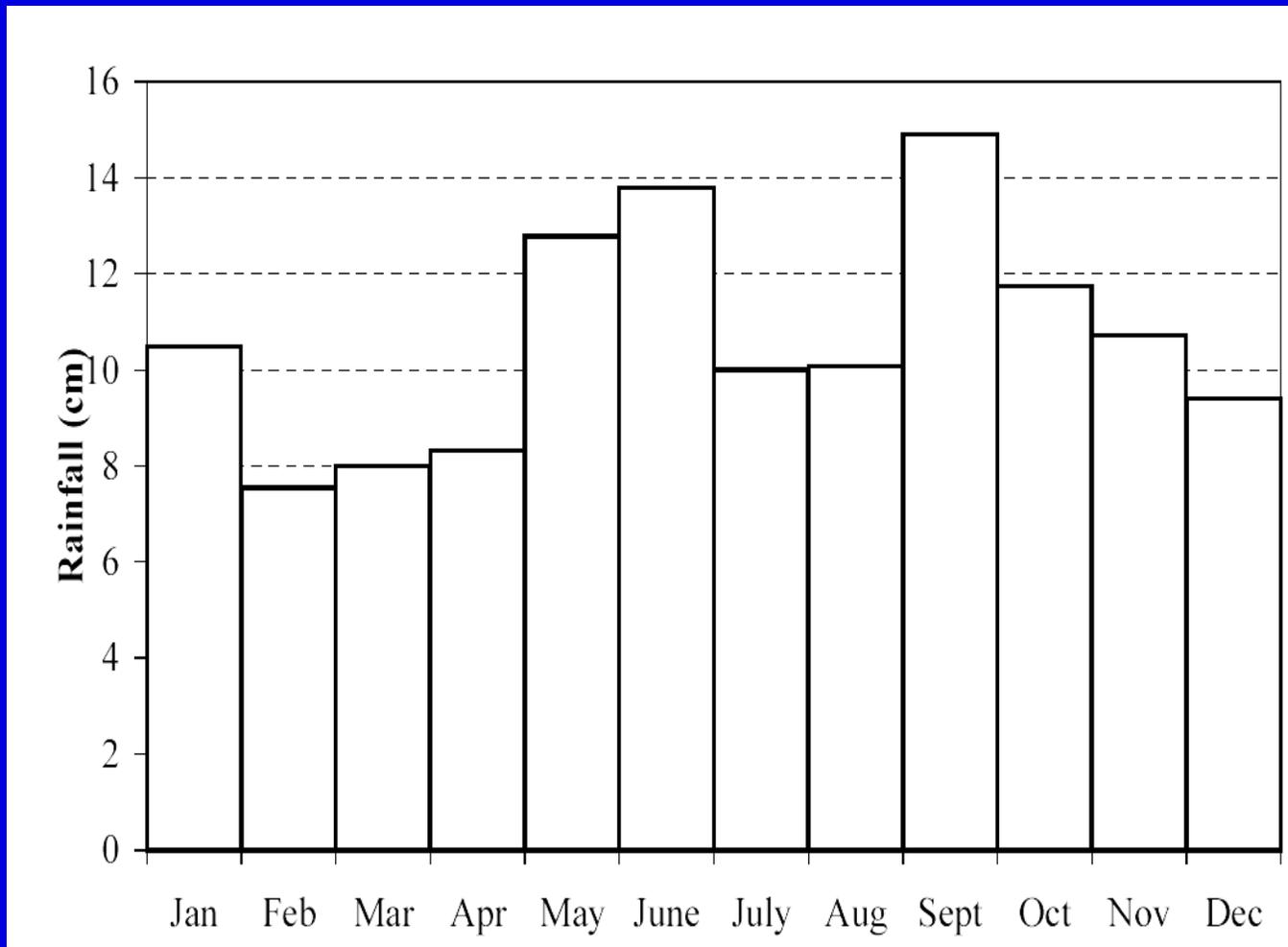
Waste Water Treatment Facilities



Waste Water Treatment Facilities



Average Monthly Rainfall

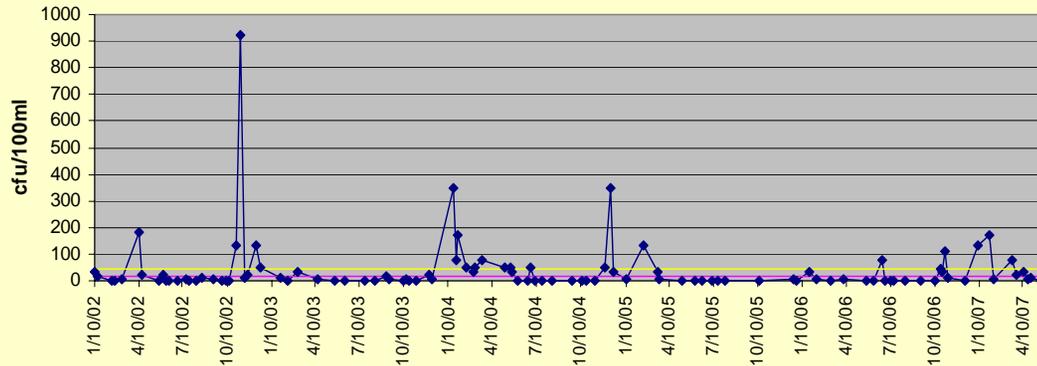


BIRDS

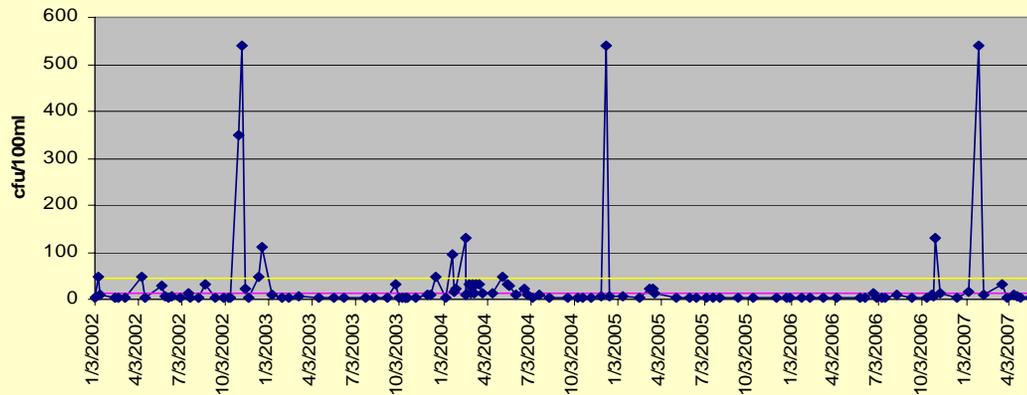
Seasonal Variation Analysis

- Station by Station
- Winter Peaks
- Winter average precipitation tends to be less than summer precipitation.
- Data suggests a link between winter bird migrations and seasonal impairments of water quality sampling stations.

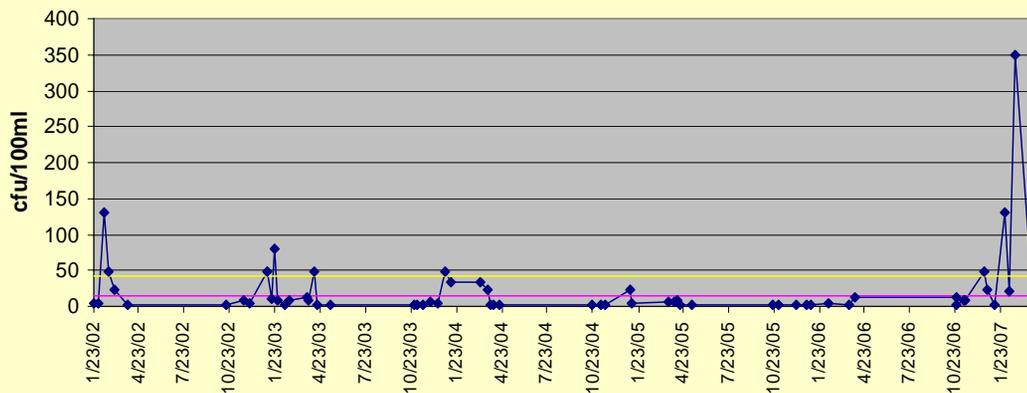
Fecal Coliform - 14562



Fecal Coliform - 14582

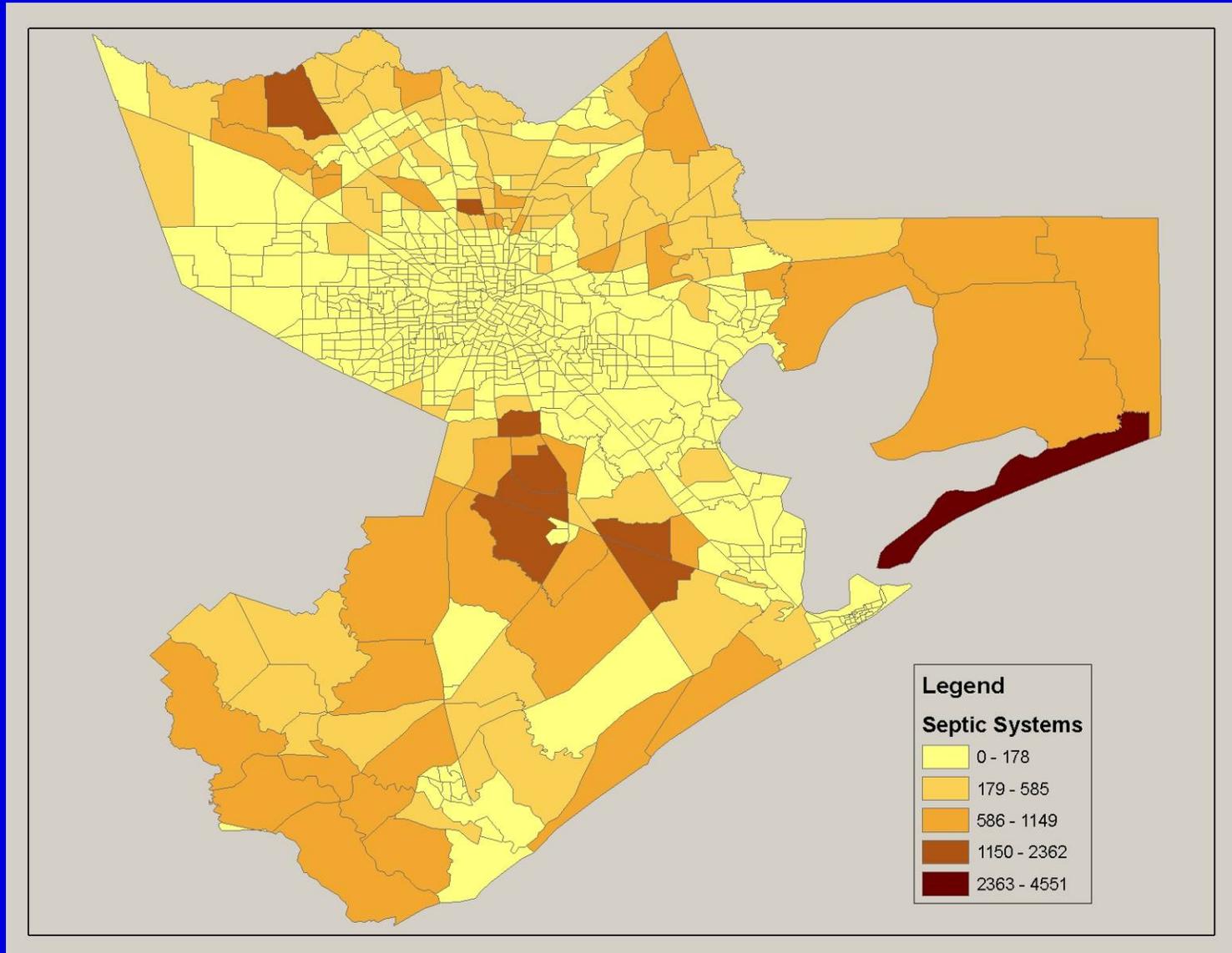


Fecal Coliform - 14548



- **Neither TCEQ nor EPA are proposing the elimination of birds to allow for the attainment of water quality standards.**
- **Managing over-populations of wildlife remains as an option to local stakeholders.**

Septic Systems



Marinas

- 35 Marinas
- 12 Marinas with Pump Out Stations
- Entire Bay System is a No Discharge Zone
 - This is applicable in all marinas and open water recreation areas.

CLEAR LAKE	Wet Slips	Dry Slips	Ramp	Pump Out
Anchorage Apts. & Marina	53	0	0	
Bal Harbor Marina	141	0	0	
Blue Dolphin Yachting Center, Inc.	238	0	0	
Clear Lake Marine Center, Inc.	161	0	0	
El Lago Marina	60	30	0	X
Endeavour Marina	14	350	0	
Kemah Boardwalk Marina	420	0	0	
Lakeside Yachting Center, Inc.	75	0	0	
Lakewood Yacht Club (Private)	375	180	1	X
Landing (The)	76	0	1	
Legend Point	252	0	0	X
Marina Bay Harbor Yacht Club	0	280	0	
Marina Del Sol	331	225	0	X
Nassau Bay Hilton Marina	83	0	0	
Nassau Bay Homes Assoc., Inc.	44	45	1	
Nassau Bay Yacht Club	45	60	2	
Portofino Harbour	212	0	0	X
Seabrook Marina Inc.	700	70	0	X
South Shore Harbour	896	0	0	X
Waterford Harbor Marina	649	0	0	X
Watergate Yachting Center	1150	0	0	X
Wharf at Clear Lake (WSMA)	320	0	0	
GALVESTON BAY				
Eagle Point Fishing Camp, Inc.	62	51	3	
Galveston Yacht Club, Inc.	500	145	2	X
Houston Yacht Club	350	370	2	X
San Leon Marina	81	22	1	
Waterman's Harbor, Inc.	52	0	0	
Harborwalk Marina	156	0	2	X
Payco, Inc.	130	32	1	
Pirates Beach Bait & Tackle	25	0	2	
Teakwood Marina	58	0	1	
Marina Landing Resort	133	25	0	
West Bay Marina	54	80	2	
INTER-COASTAL WATERWAY				
Bolivar Yacht Basin	175	0	1	
TRINITY BAY				
Baytown Marina	50	51	2	

Benefits of Concentration Based TMDL

- Stations can be targeted during Implementation
- Simplifies a very complex bay system
- Allows Stakeholders to devote energy toward improving water quality

Next Steps

1. TMDL Draft in Review.
2. TMDL Document Adopted by TCEQ and EPA.
3. I-Plan developed by residents of the watershed with TCEQ assistance.
4. Improved Water Quality.

For More Information

- Project Website

<http://www.tceq.state.tx.us/implementation/water/tmdl/74-uppercoastoyster.html>

- TCEQ TMDL Program

www.tceq.state.tx.us/implementation/water/tmdl/index.html