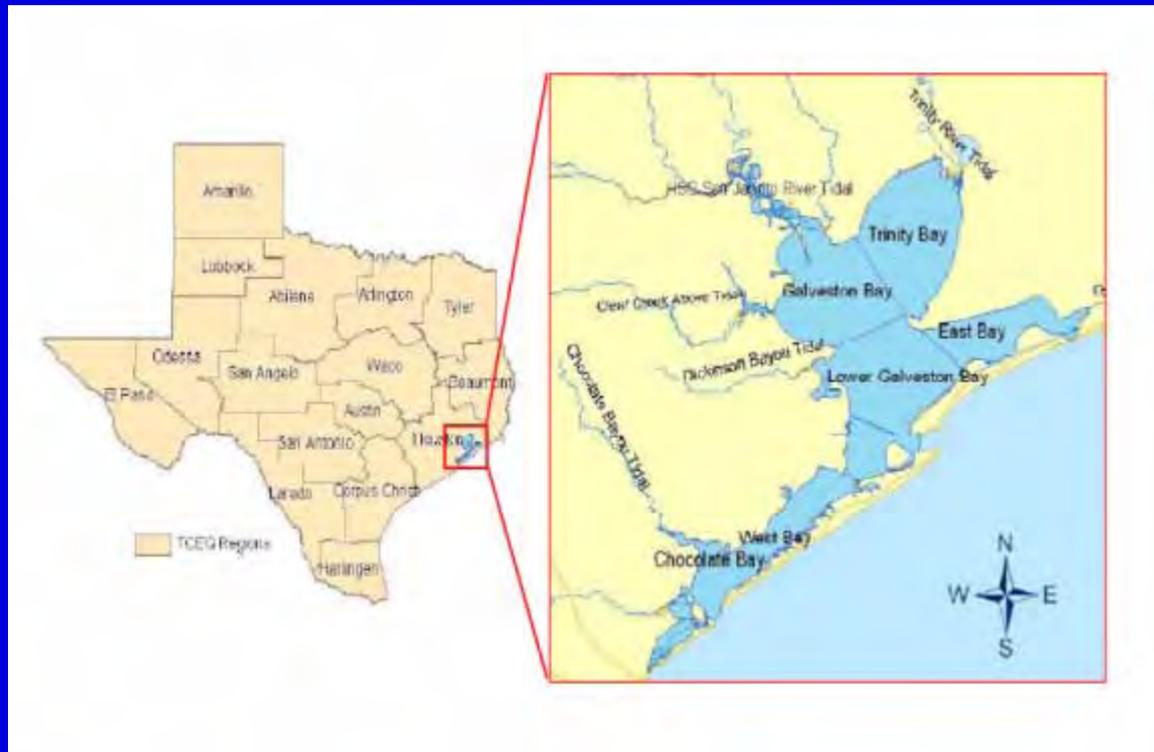


Upper Coast Oyster Water TMDL for Bacteria



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Ron Stein***

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TMDL Process Milestones

1st Milestone – Process and important terms to be discussed in this presentation.

Place Water Body on 303(d) List

2nd Milestone – Determine limits to pollutant loads

TMDL Document

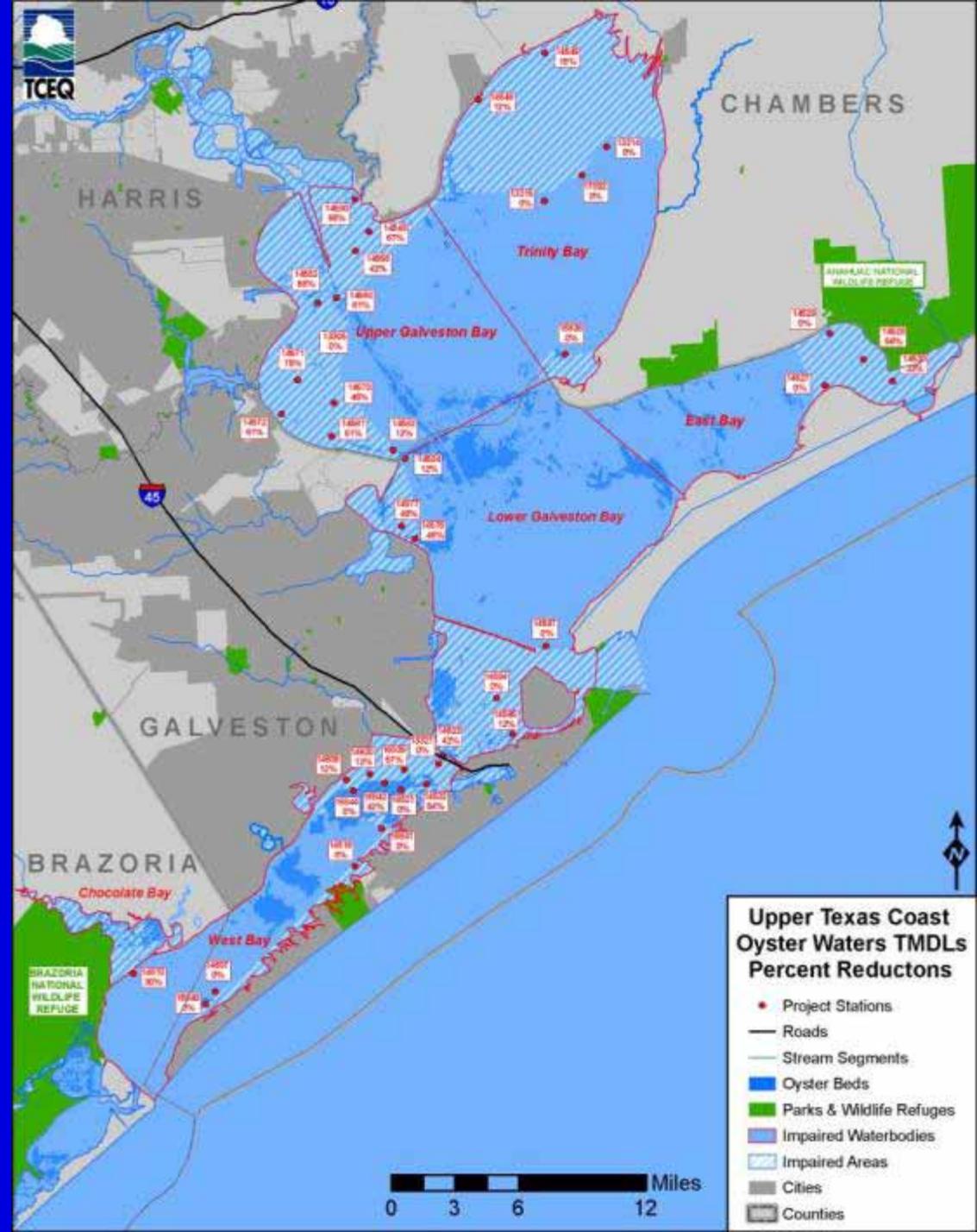
3rd Milestone – Develop plan to improve water quality

Implementation Plan Document

Final Goal – Meet Water Quality Standards

Upper Coast Oyster TMDL

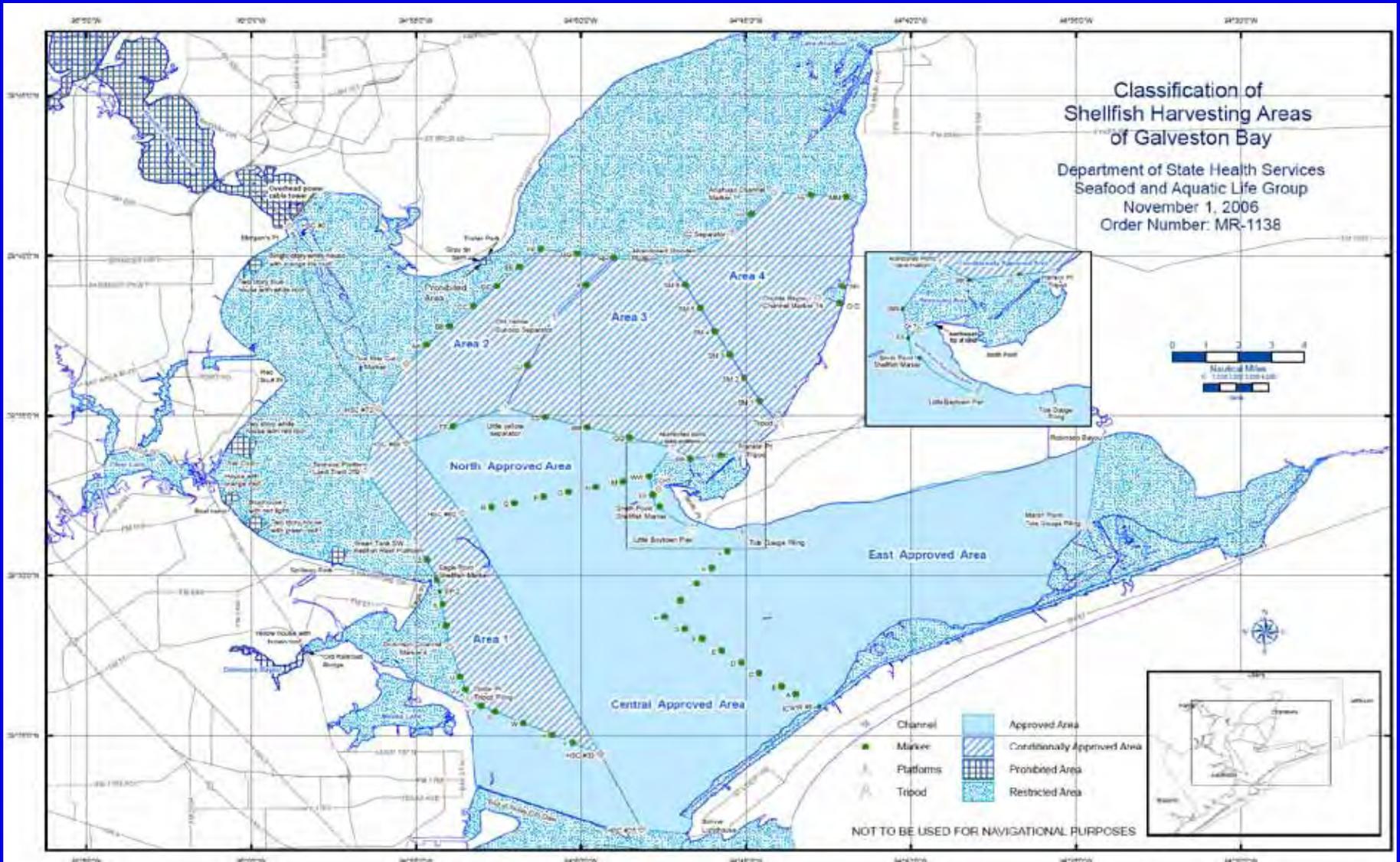
- Project Description
- Where and to what extent is the problem?
- Pollutant Sources
- Concentration Limits, rather than Loads
- Implementation Planning



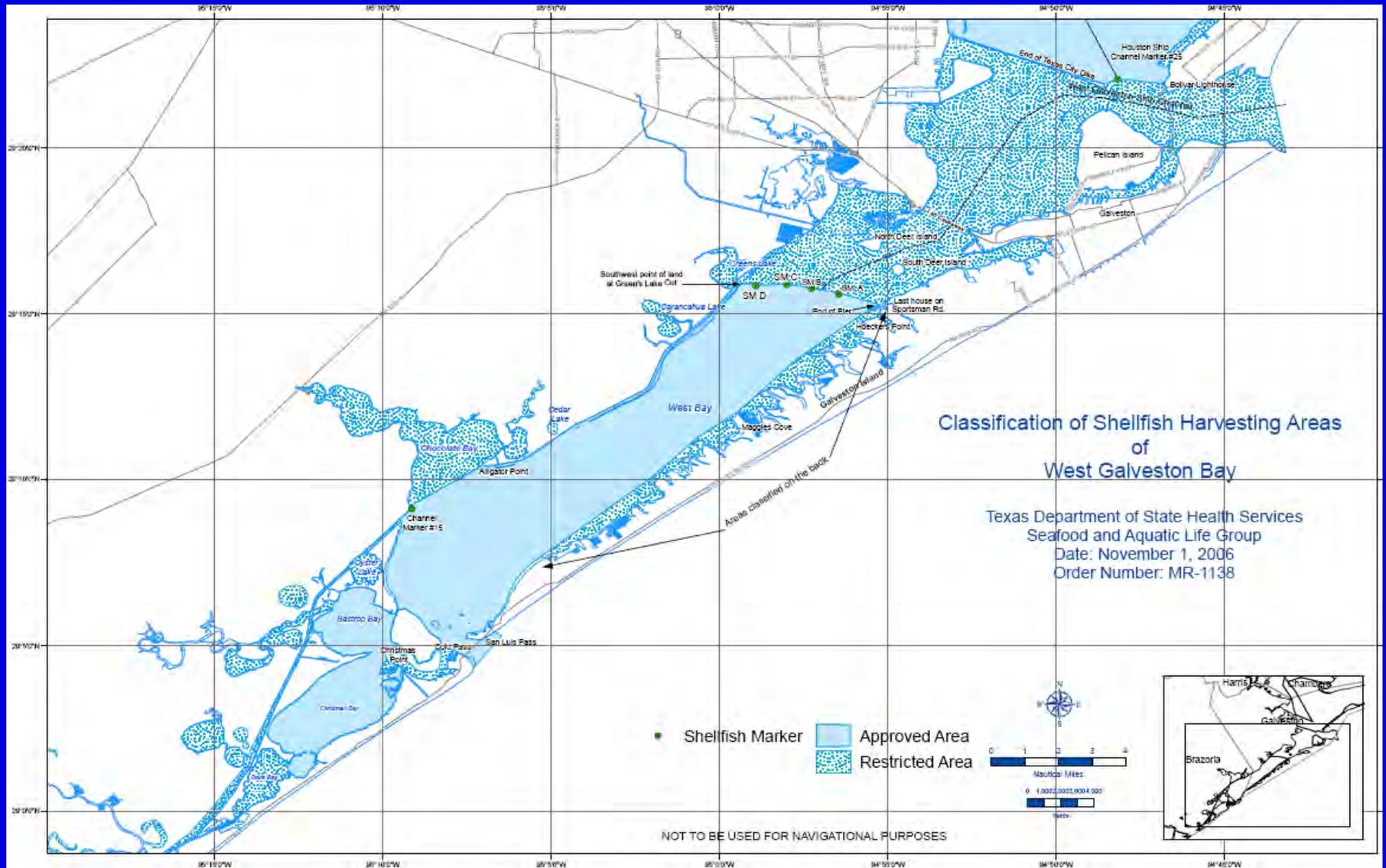
Oyster Project Overview

- Six Bay Segments Listed
- Oyster Criteria
 - Median \leq 14 Fecal/100mL
 - 90th Percentile \leq 43 Fecal/100mL
- 303(d) Listing
 - Based on TDSHS Maps
 - Restricted Harvest Zones (RHZ) = Impaired

Oyster Harvesting Map



Oyster Harvesting Map



Oyster Water Use

- **Oyster Waters** – Waters producing edible species of clams oysters, or mussels.
30 TAC §307.3(a)(37)



Criteria for Oyster Waters

- Texas Criteria (Fecal coliform)
 - Median (<14cfu/100mL)
 - 90th Percentile (<43cfu/100mL)



Criteria Limits Protect Water Quality

How Much Can It Take?

Bacteria →



Limits on What Goes In.

Bacteria →



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

Proportions of RHZ

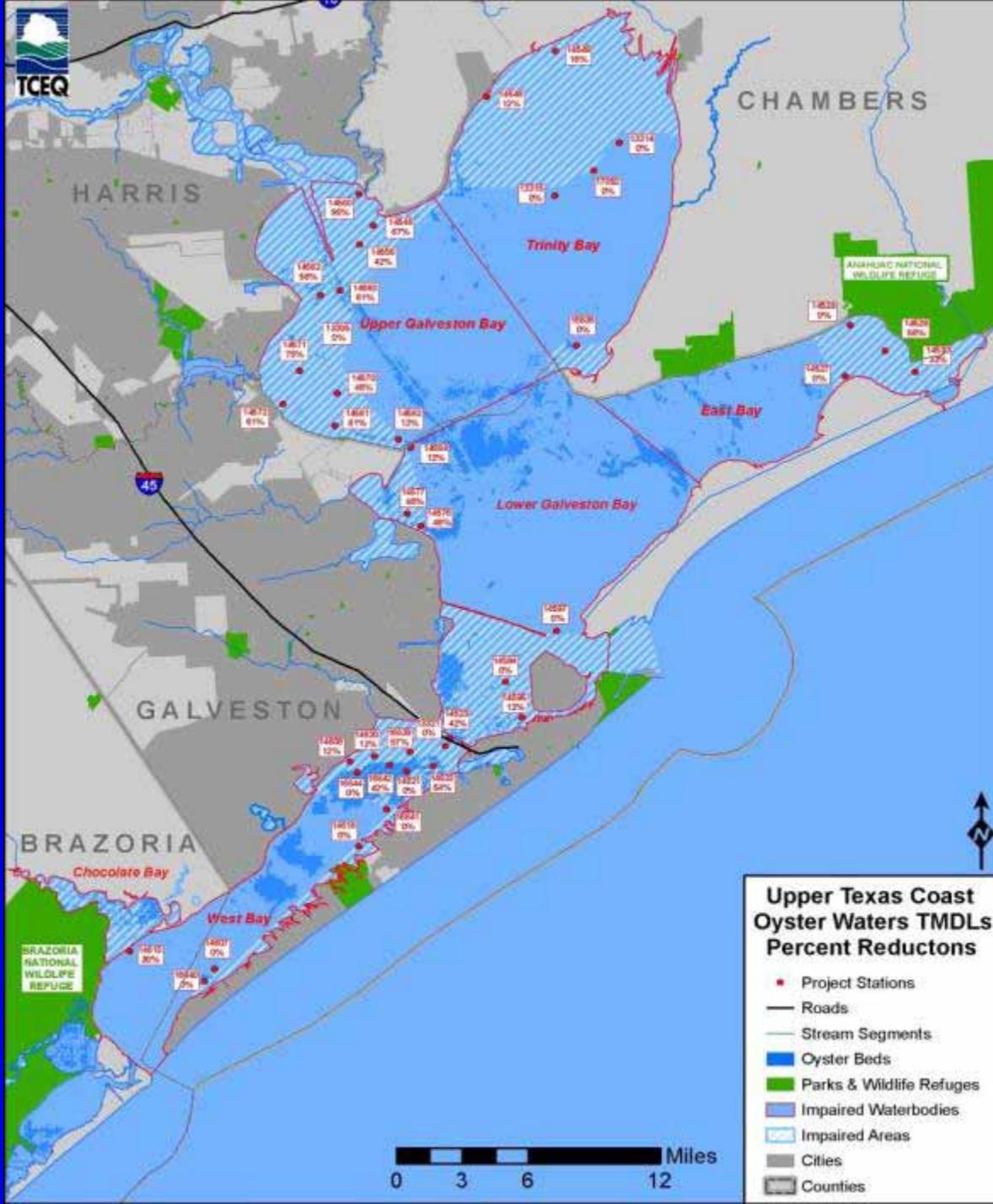
Segment Name	Segment Number	Year Listed	Area (km²)	Area in the impaired Restricted Harvest Zone
Upper Galveston Bay	2421	1996	299.1	47%
Trinity Bay	2422	2000	317.5	48%
East Bay	2423	1998	148.9	25%
West Bay	2424	1996	195.3	37%
Chocolate Bay	2432	1996	21.1	100%
Lower Galveston Bay	2439	1996	362.4	27%

Analysis

- Number of samples and stations
- Calculations
- Seasonal Variation

RHZ Breakdown by Segment

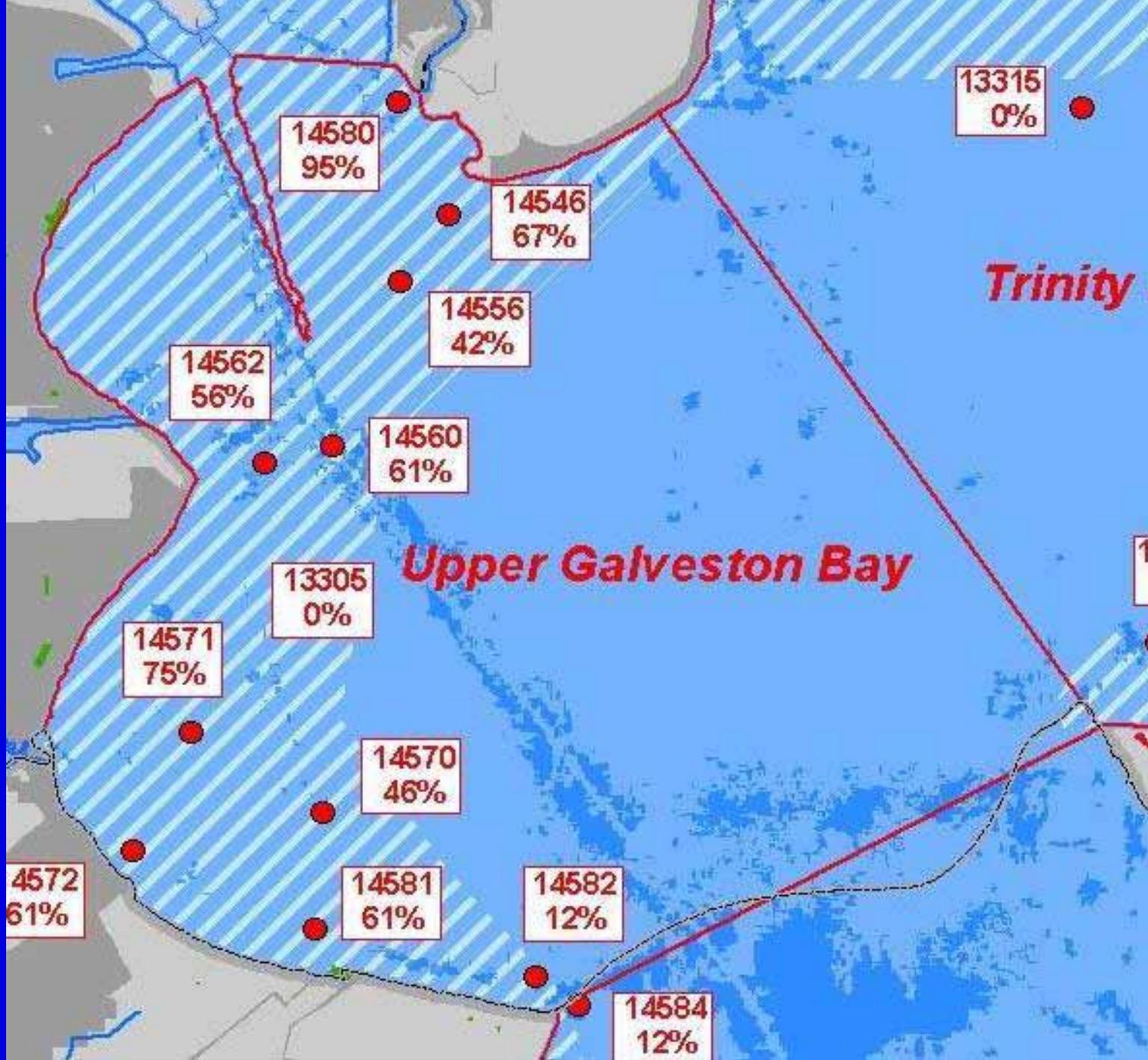
Segment Name	Number of Samples from RHZ	Median in RHZ (CFU of Fecal Coliform)	90th Percentile in RHZ (CFU of Fecal Coliform)	Local Exceedance in RHZ?
Upper Galveston Bay	947	8.0	130.0	Yes
Trinity Bay	376	2.0	33.0	Yes
East Bay	199	2.0	36.2	Yes
West Bay	515	5.0	49.0	Yes
Chocolate Bay	37	5.0	61.0	Yes
Lower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

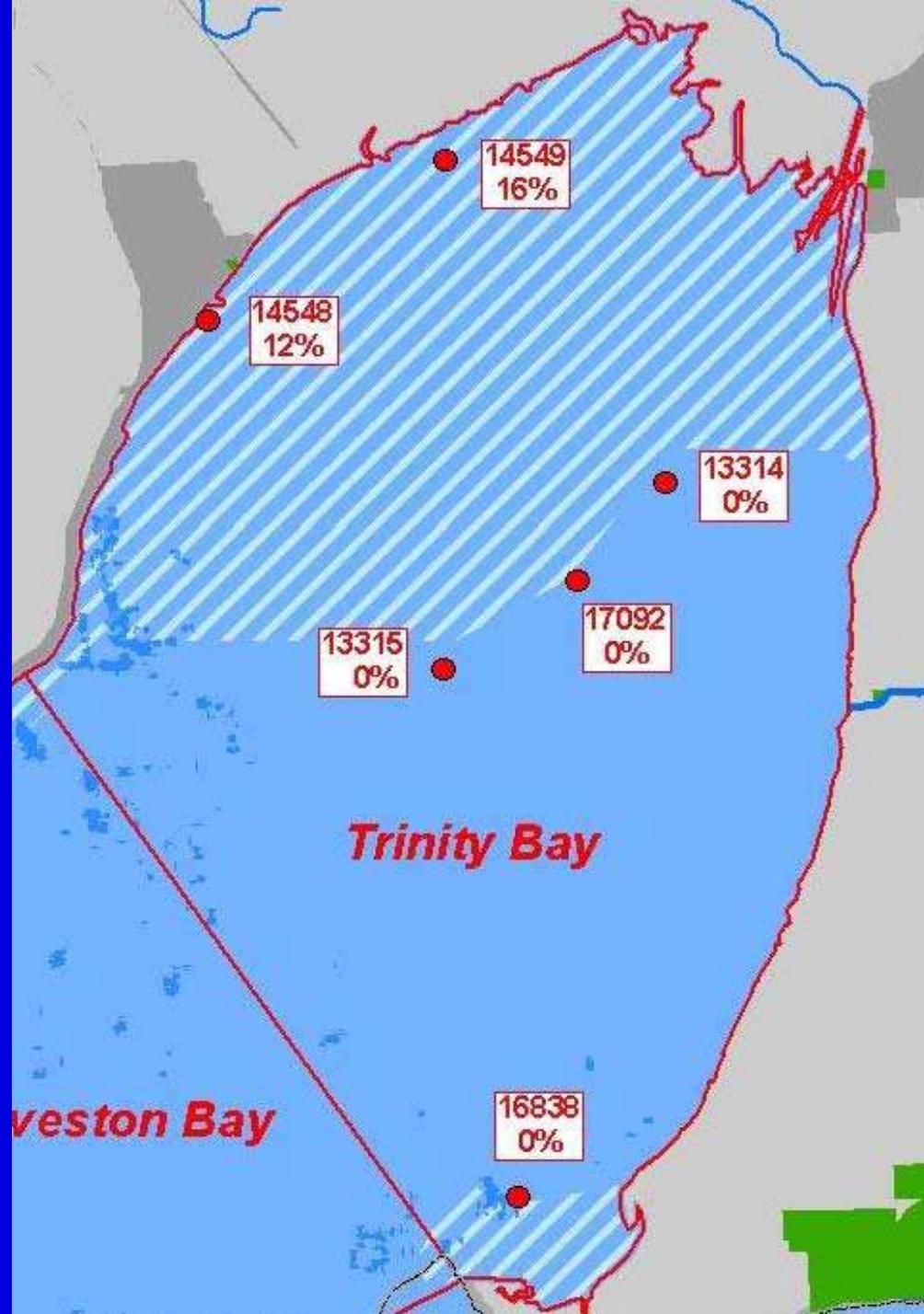


Upper Texas Coast Oyster Waters TMDLs Percent Reductons

- Project Stations
- Roads
- Stream Segments
- Oyster Beds
- Parks & Wildlife Refuges
- Impaired Waterbodies
- Impaired Areas
- Cities
- Counties







ANAHUAC NATIONAL WILDLIFE REFUGE

16838
0%

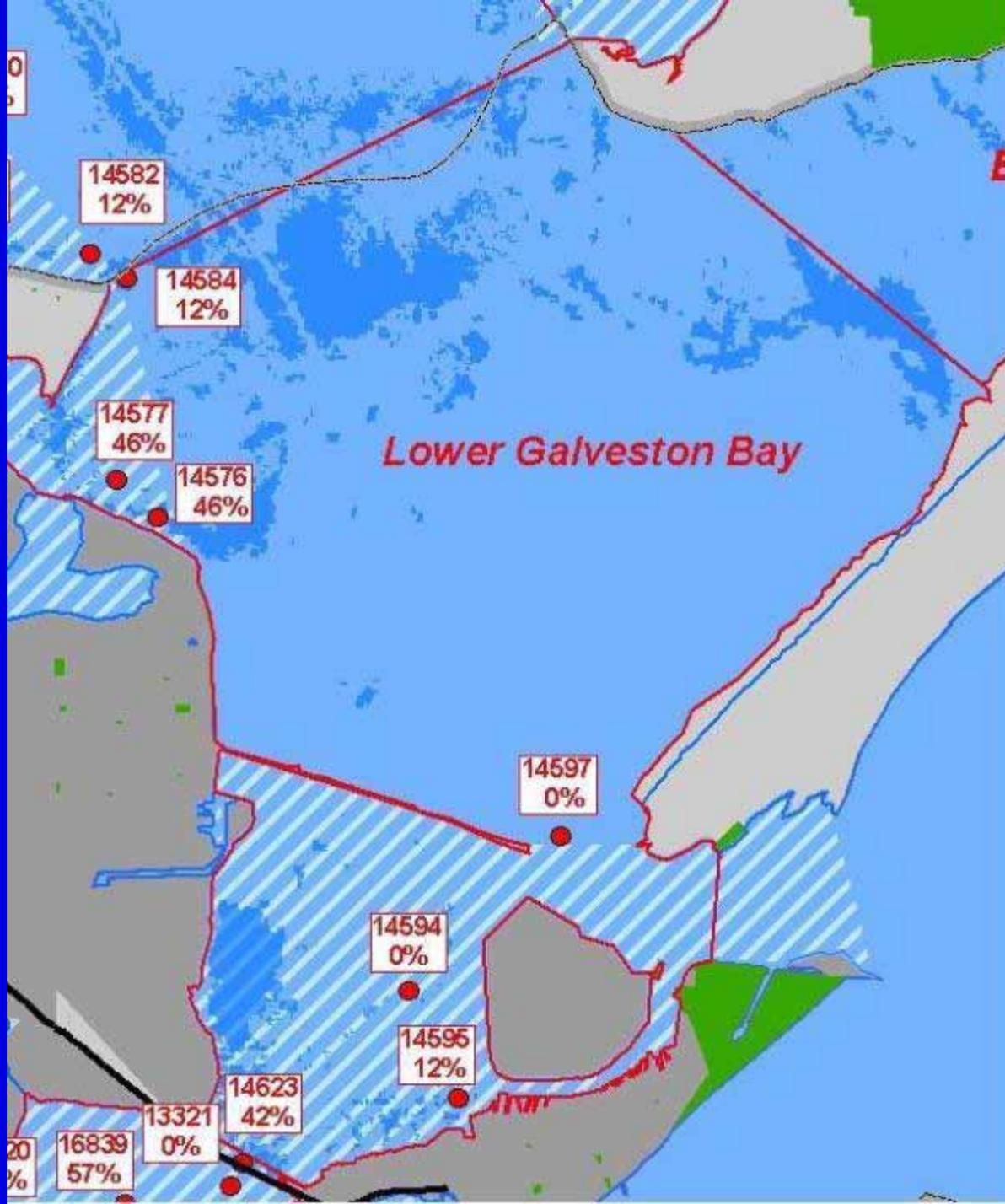
14529
0%

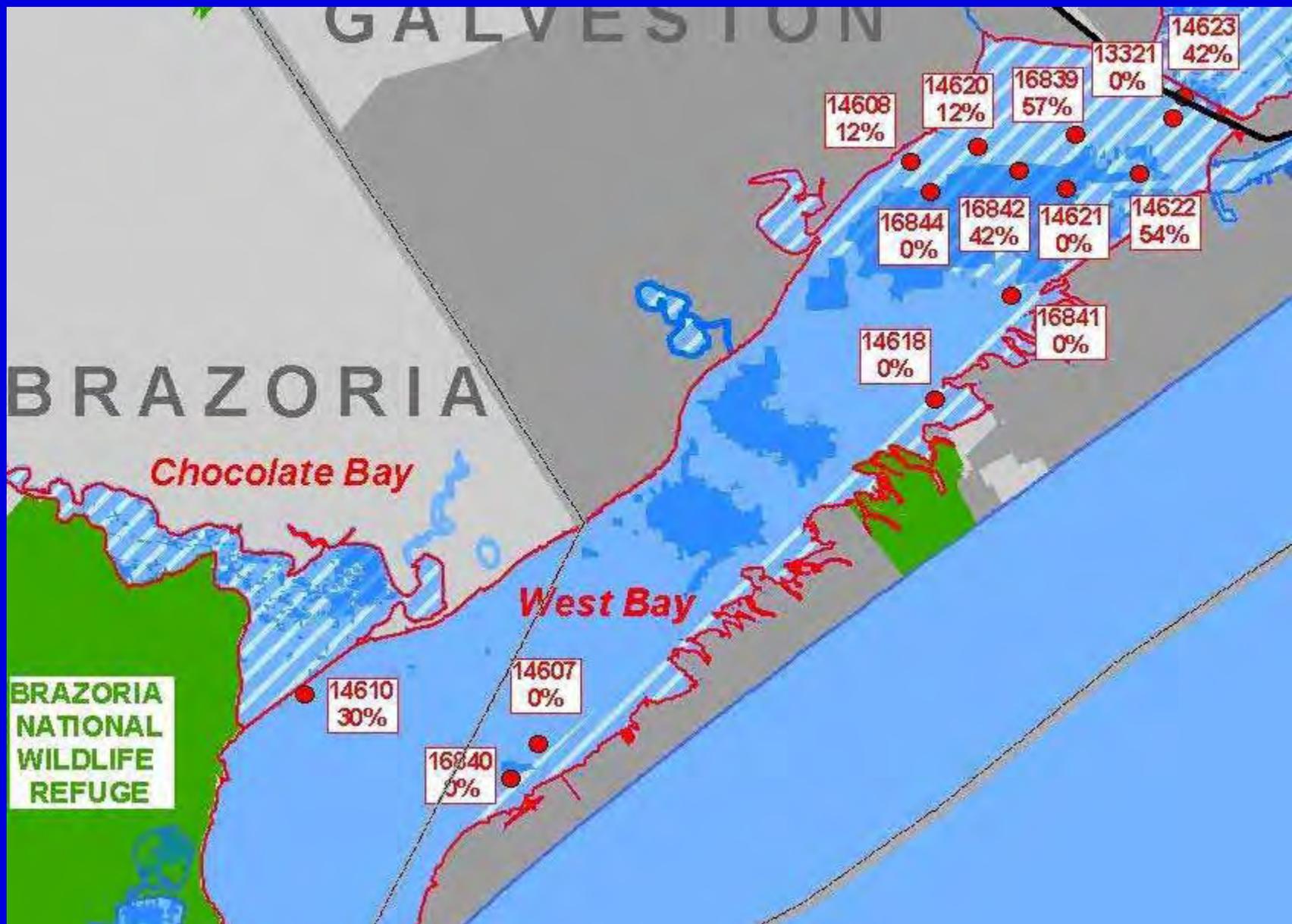
14528
56%

14530
33%

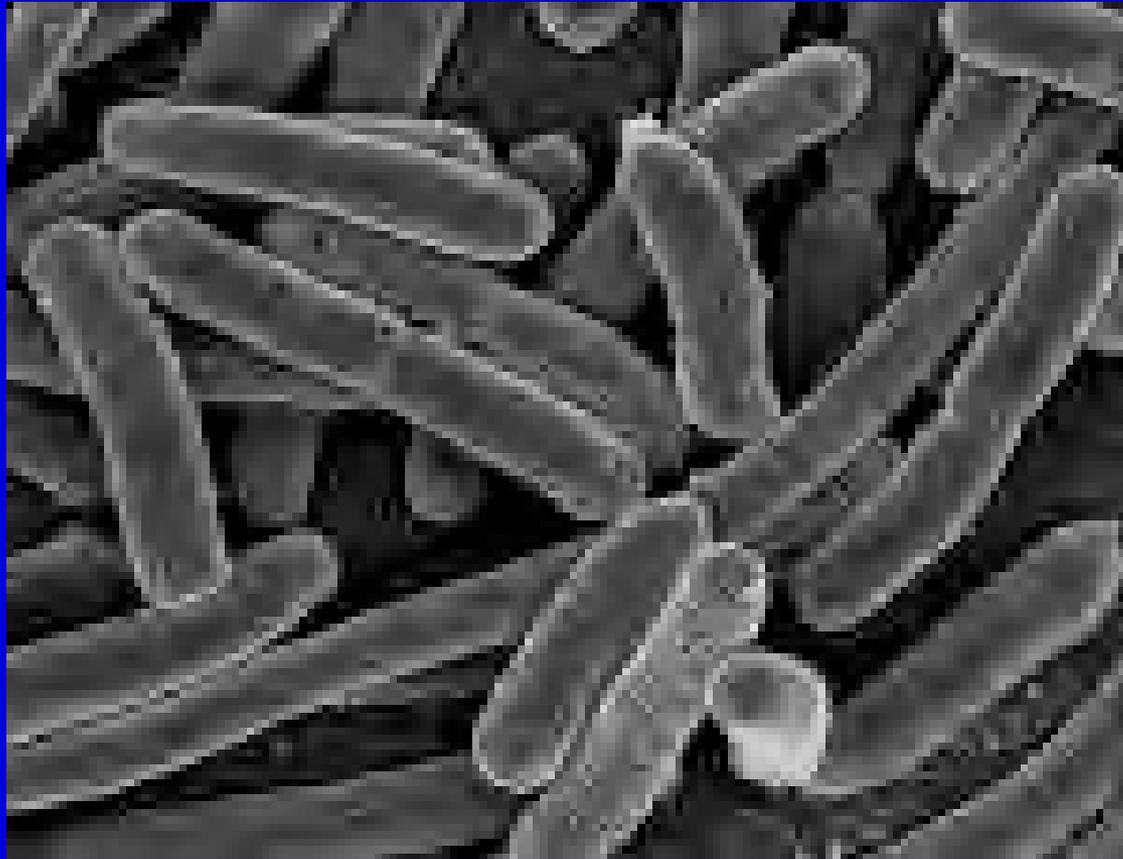
14527
0%

East Bay



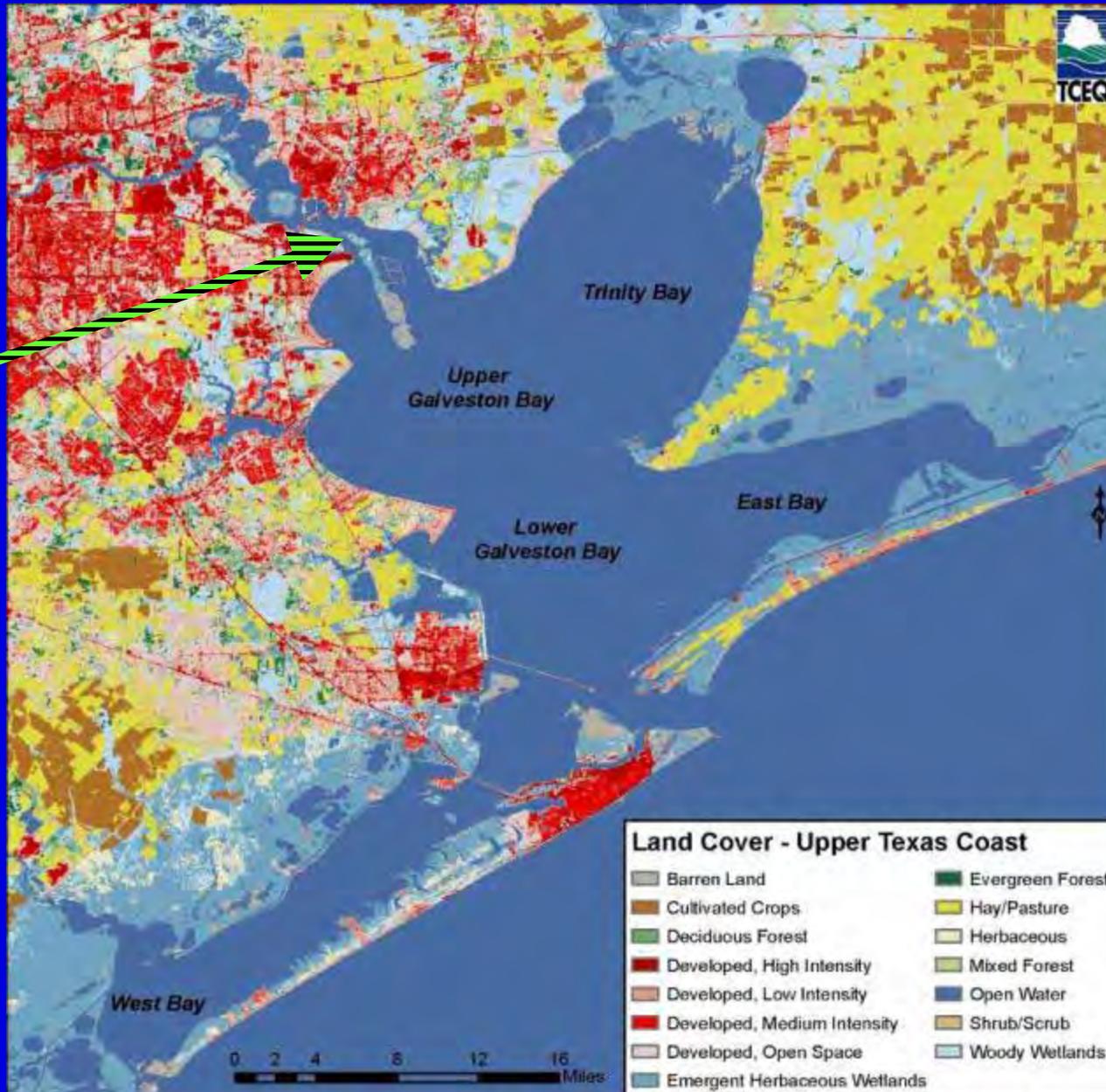


Sources of Bacteria



Land Use

Hog Island



Hog Island



Hog Island Water Quality

Segment Name	Number of Samples in TDSHS Restricted Harvest Zone	90th 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

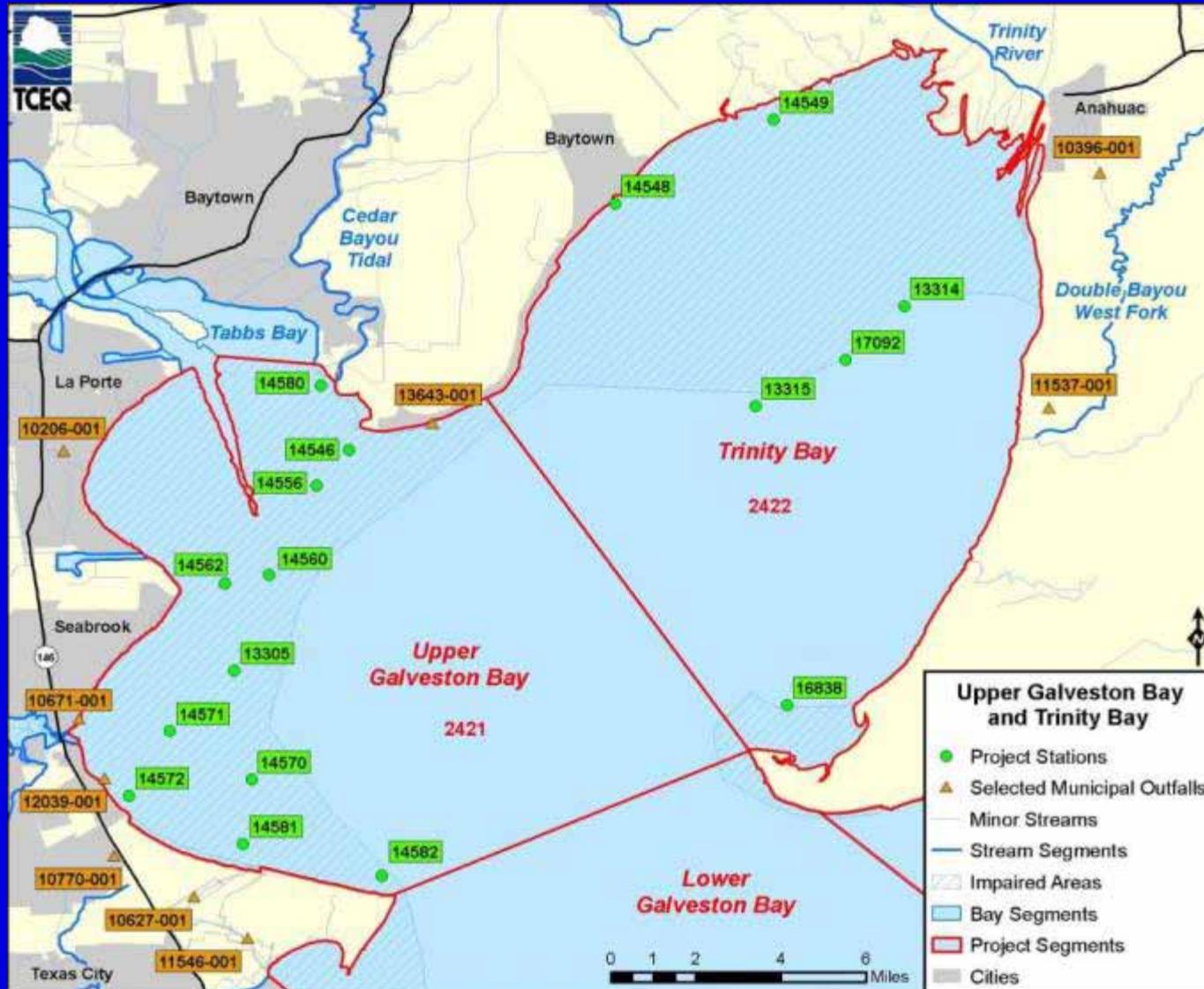
- Shoreline runoff effects are difficult to remove from Hog Island water quality analyses. Only limited numbers of samples outside of 1000 feet of a shoreline were available.
- Even with potential shoreline influence, Hog Island's 90th Percentile is less than the Upper Galveston Bay RHZ.



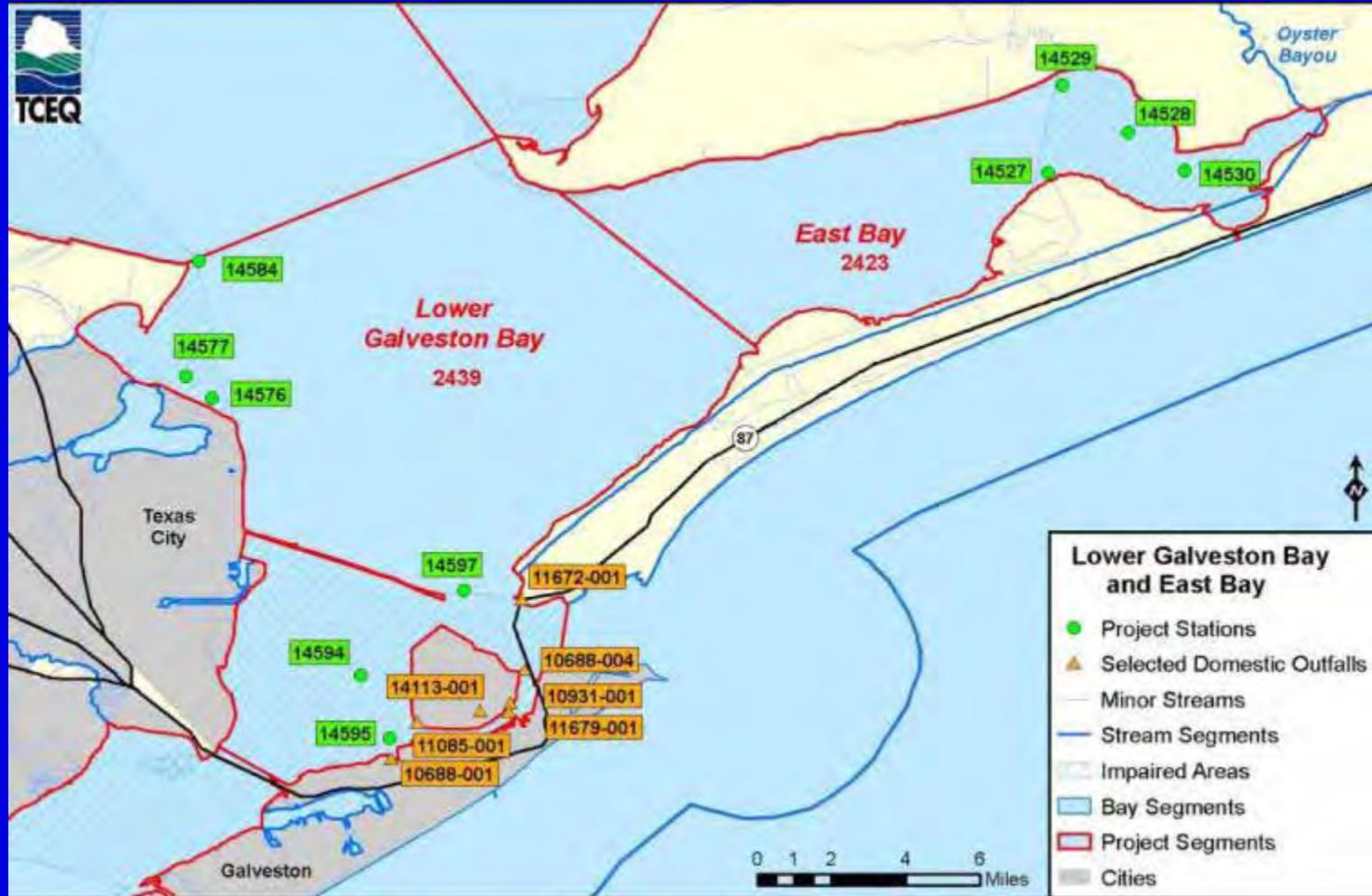
Potential Sources

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

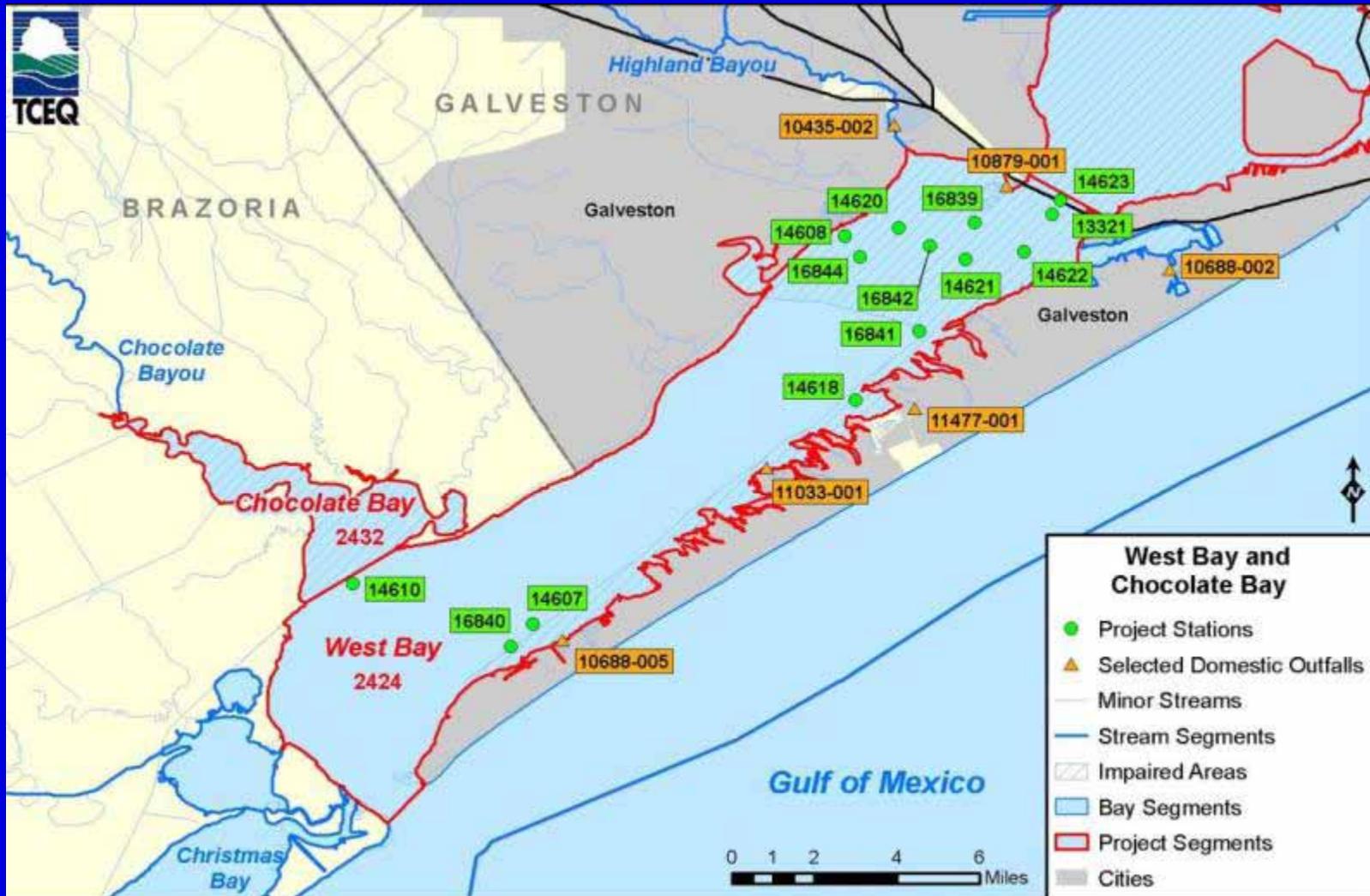
Waste Water Treatment Facilities



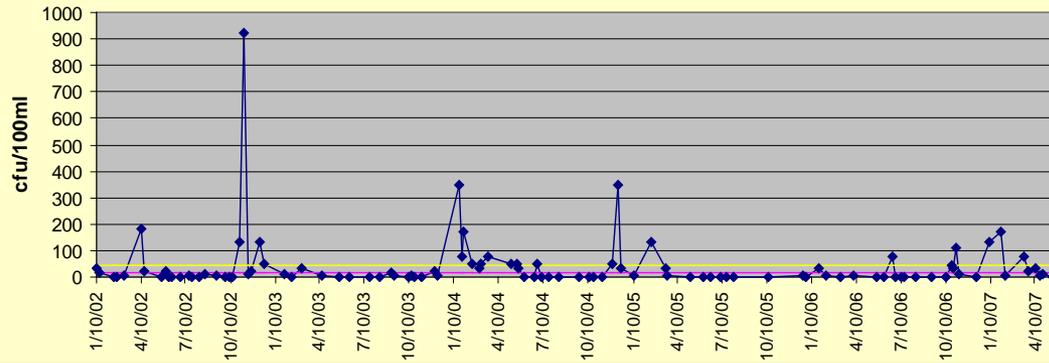
Waste Water Treatment Facilities



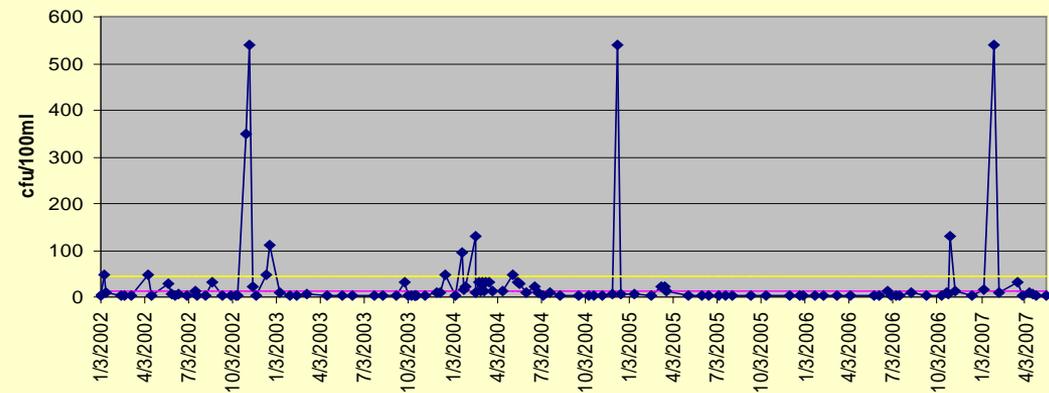
Waste Water Treatment Facilities



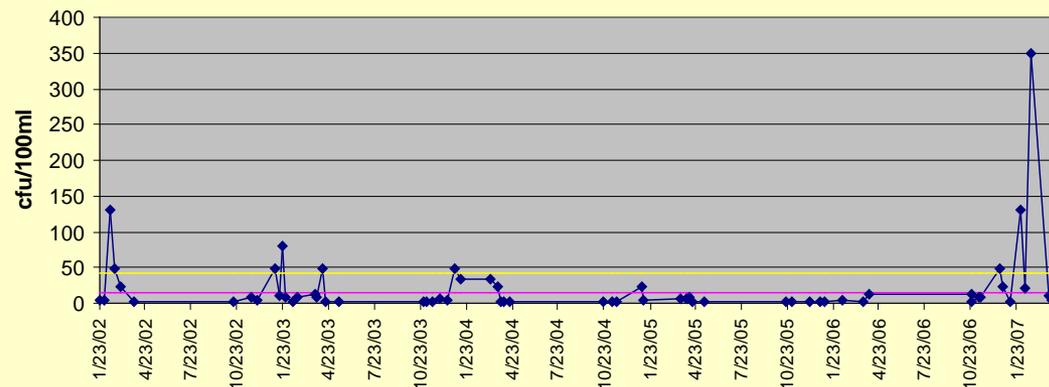
Fecal Coliform - 14562



Fecal Coliform - 14582



Fecal Coliform - 14548



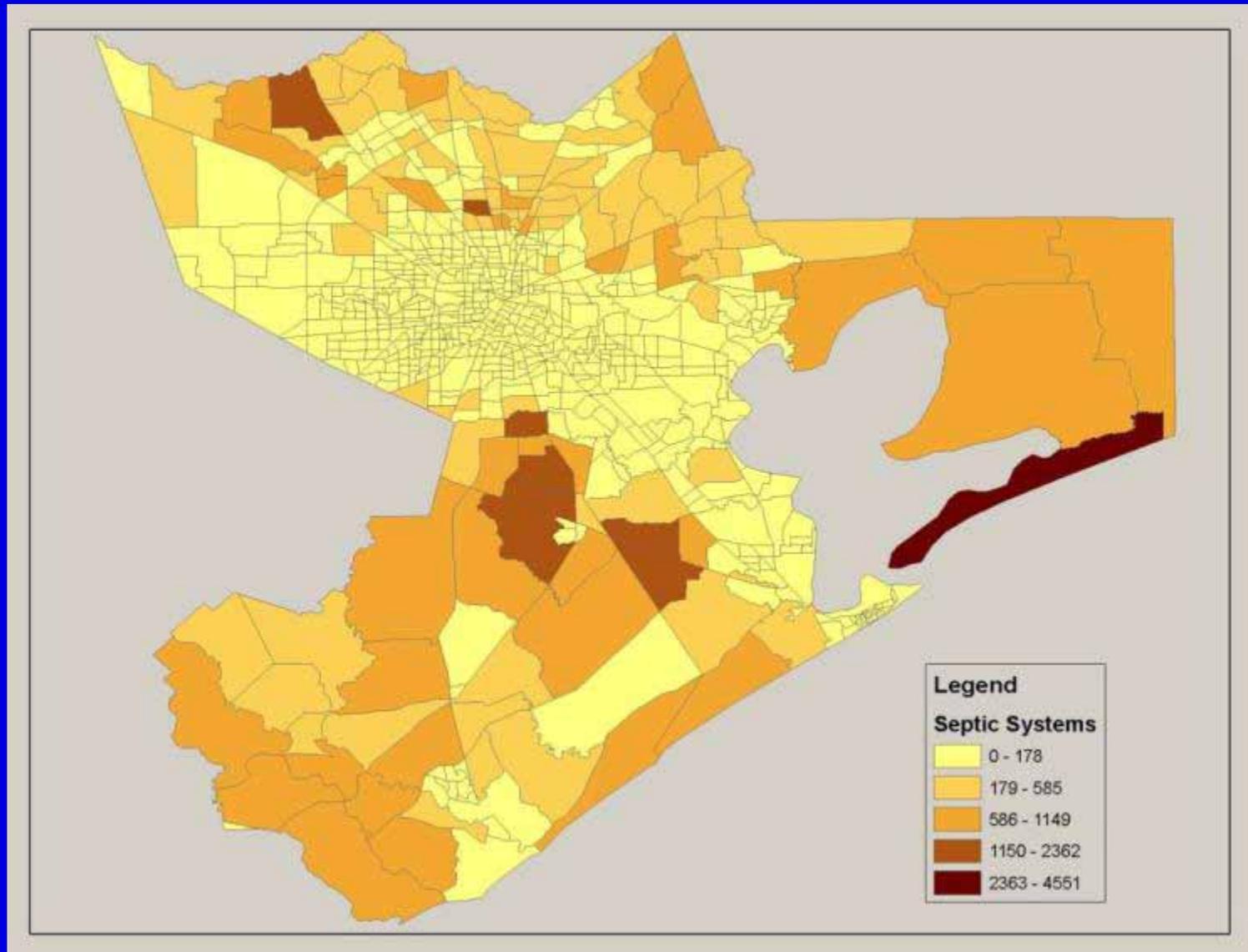
BIRDS

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.

- **Neither Texas nor EPA are proposing the elimination of wildlife to allow for the attainment of water quality standards.**
- This is obviously an impractical and wholly undesirable action. While managing over-populations of wildlife remains as an option to local stakeholders, the reduction of wildlife or changing a natural background condition is not the intended goal of a TMDL. The pollutant reductions for the interim goal are applied only to controllable, anthropogenic sources identified in the TMDL, setting aside any control strategies for wildlife.

Septic Systems (OSSFs)



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	

Concentration Based Analysis

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

Benefits of Concentration Based TMDL

- Stations can be targeted during Implementation
- Simplifies a very complex bay system
- Allows Stakeholders to devote energy toward problem-solving

Preliminary Concentration Allocations

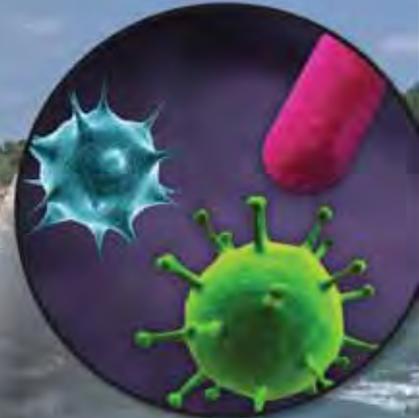
Problem

Bacteria concentrations **exceed** the regulatory requirements for safe contact recreation.



Goal

Bacteria concentrations **meet** the regulatory requirements for safe contact recreation.



Pollutant Load Allocations^a

	For Discharges to the Restricted Harvest Zone (RHZ)	For Discharges to Adjacent Watersheds and the TDSHS Buffer Zone
Onsite Sewage Systems	Discharges directly to the RHZ are not possible ^c	0 per 100 mL
Recreational Boat and Ship Discharges	0 per 100 mL	0 per 100 mL
Marina	Discharges directly to the RHZ are not possible ^c	0 per 100 mL
Non-Regulated Municipal Runoff	Discharges directly to the RHZ are not possible ^c	
Direct Deposition Into Segment^d	Median 14 per 100 mL AND 90 th Percentile 43 per 100 mL	Fecal Coliform 200 per 100 mL <i>E. coli</i> 126 per 100 mL Enterococci 35 per 100 mL

- a. Allocations are applicable year-round. Wasteload allocations apply to any sources (existing or future) subject to regulation by a TPDES permit.
- b. Regulated entities may use indicator bacteria other than fecal coliform, as listed in individual TPDES permits. Indicator bacteria concentrations for each permit must be consistent with the applicable water quality standard for the receiving water. Dischargers releasing effluent into a segment bufferzone shall meet those water quality standards.
- c. Discharges to RHZ are not possible because TDSHS implements a bufferzone around this source.
- d. Listed segments contain wildlife and unmanaged animals and are therefore recognized as potential source areas.



Pollutant Waste Load Allocations^a

	For Discharges to the Restricted Harvest Zone (RHZ)	For Discharges to Adjacent Watersheds and the TDSHS Buffer Zone
Wastewater Treatment Facilities^b	Discharges directly to the RHZ are not possible^c	Fecal Coliform 200 per 100 mL <i>E. coli</i> 126 per 100 mL Enterococci 35 per 100 mL
Regulated Municipal Runoff (MS4)^b	Discharges directly to the RHZ are not possible^c	Based on Bacteria Plan found in MS4 Permit

a. Allocations are applicable year-round. Wasteload allocations apply to any sources (existing or future) subject to regulation by a TPDES permit.

b. Regulated entities may use indicator bacteria other than fecal coliform, as listed in individual TPDES permits. Indicator bacteria concentrations for each permit must be consistent with the applicable water quality standard for the receiving water. Dischargers releasing effluent into a segment bufferzone shall meet those water quality standards.

c. Discharges to RHZ are not possible because TDSHS implements a bufferzone around this source.

d. Open space lands and the listed segments contain wildlife and unmanaged animals and are therefore recognized as potential source areas.



Project Status

1. TMDL drafted.
2. TMDL document adopted by TCEQ and EPA.
3. Implementation Plan developed by residents of the watershed with TCEQ assistance.
4. Implementation in an adaptive manner.

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