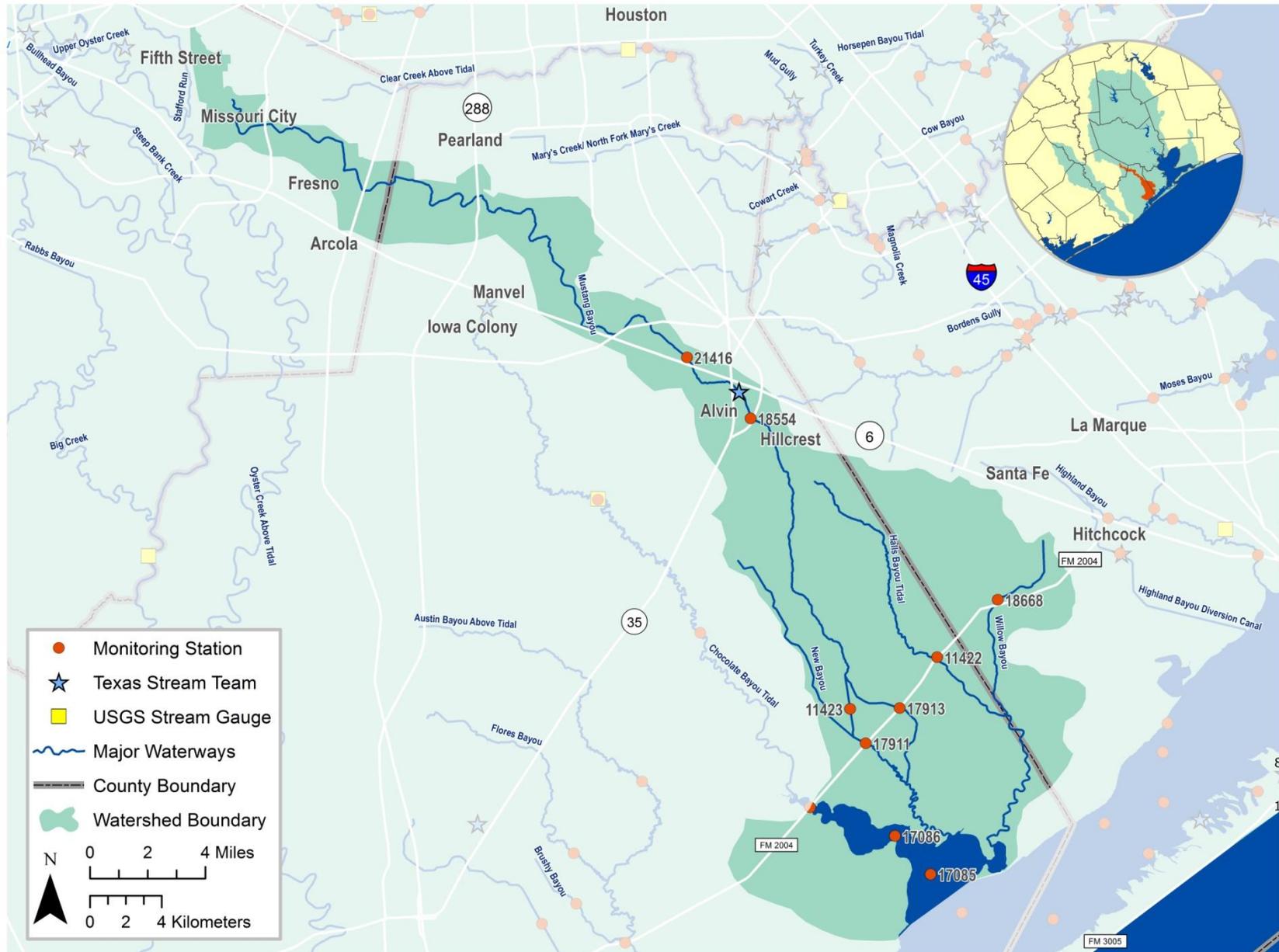
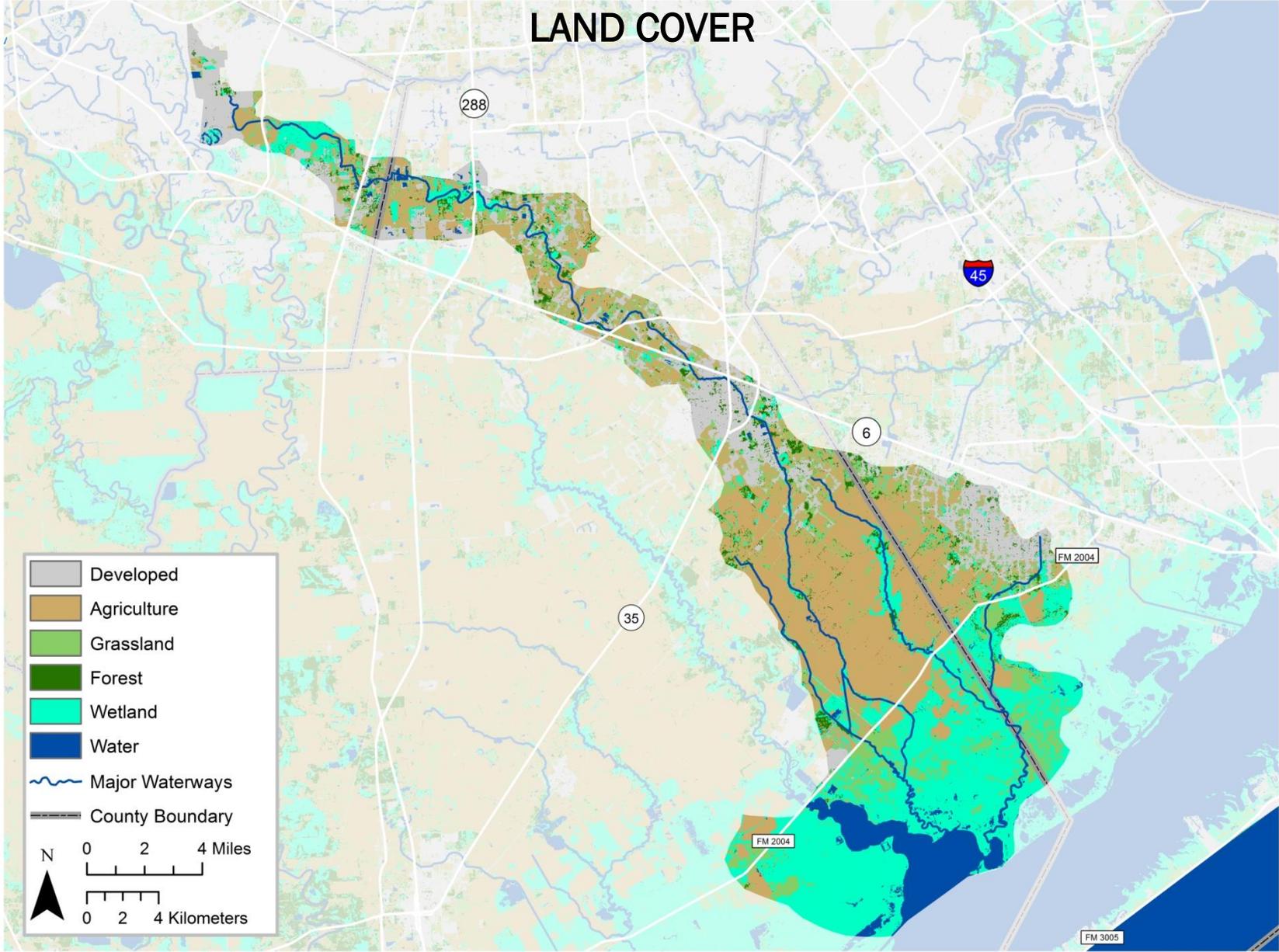
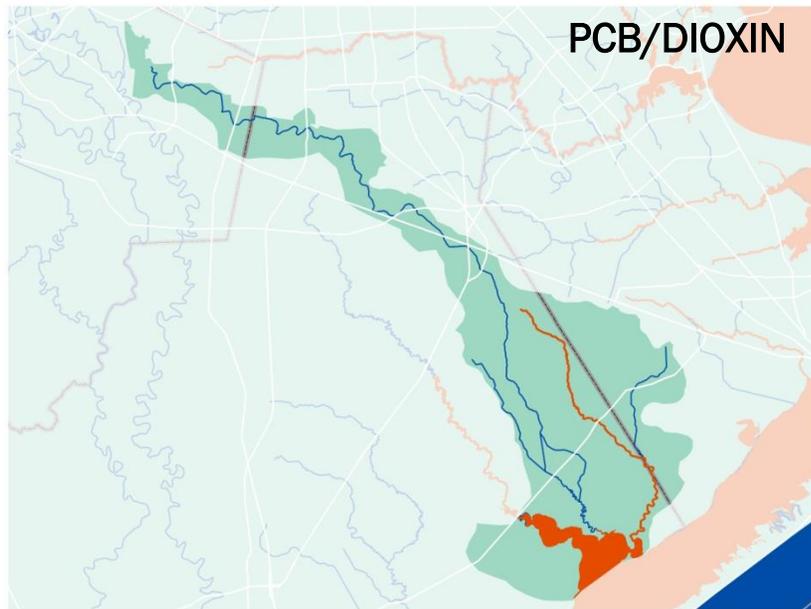
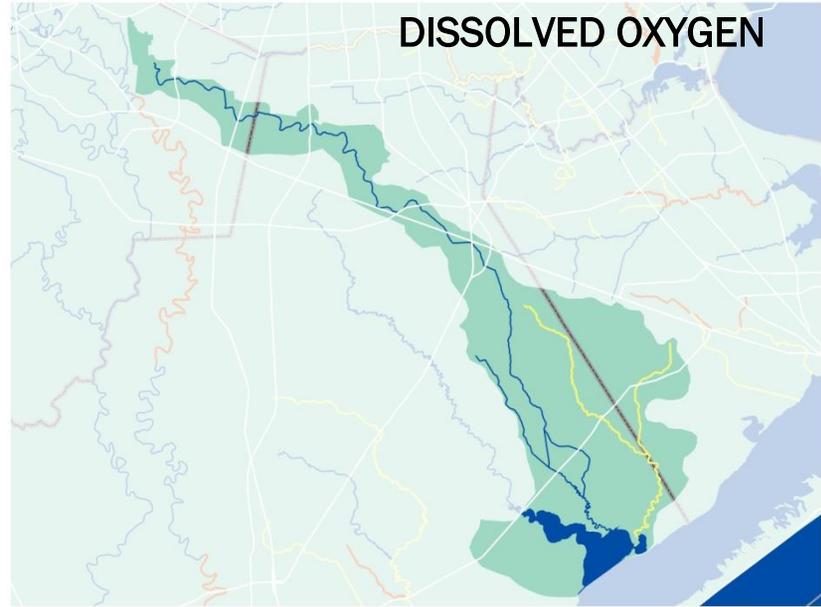
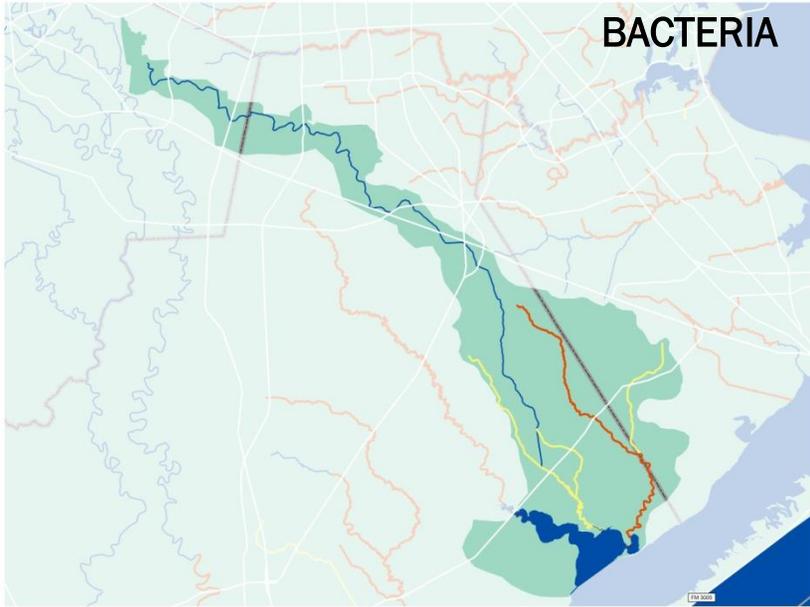


# CHOCOLATE BAY - SEGMENT 2432



# CHOCOLATE BAY – SEGMENT 2432 LAND COVER





 Impairment     Concern     No Impairments or Concerns

<b>Segment Number:</b> 2432		<b>Name:</b> Chocolate Bay	
<b>Area:</b> 7.4 square miles	<b>Miles of Shoreline:</b> 25 miles	<b>Designated Uses:</b> Primary Contact Recreation 1; High Aquatic Life Use; Oyster Waters	
<b>Number of Active Monitoring Stations:</b> 10	<b>Texas Stream Team Monitors:</b> 0	<b>Permitted Outfalls:</b> 18	
<b>Description:</b>	<p>Adjoining the northwest side of West Galveston Bay at the Gulf Intracoastal Waterway and extending upstream to confluence with Chocolate Bayou approximately <math>\frac{3}{4}</math> mile downstream of FM 2004 in southeast Brazoria County</p> <p>Segment 2432A (Perennial Stream w/ intermediate ALU): Mustang Bayou (unclassified water body) – From the New Bayou confluence upstream to an unnamed tributary 0.3 km (0.19 mi) upstream of State Hwy 35 to an unnamed tributary downstream of Cartwright Road</p> <p>Segment 2432B (Perennial Stream w/ high ALU): Willow Bayou (unclassified water body) – From the Halls Bayou confluence to a point 9.7 km (6 mi ) upstream</p> <p>Segment 2432C (Tidal Stream w/ high ALU): Halls Bayou Tidal (unclassified water body) – From the Chocolate Bay confluence upstream to a point 31.5 km (19.6 mi) upstream</p> <p>Segment 2432D (Perennial Stream w/ high ALU): Persimmon Bayou (unclassified water body)—From the New Bayou confluence upstream to the Mustang Bayou confluence</p> <p>Segment 2432E (Perennial Stream w/ high ALU): New Bayou (unclassified water body)—From the Chocolate Bay confluence upstream 25.4 km (15.8 mi) to an unnamed tributary</p> <p>Segment 2432OW (Oyster Water )</p>		

Percent of Stream Impaired or of Concern						
Segment ID	PCBs/Dioxin	Bacteria	Dissolved Oxygen	Nutrients	Chlorophyll a	Other
2432	100	-	-	-	-	-
2432B	-	100	100	-	-	-
2432C	100	100	100	-	-	-
2432D	-	100	-	-	-	-
2432E	-	100	-	-	-	-
2432OW	-	100	-	-	-	-

## Segment 2432

Standards	Bays & Estuaries	Tidal Streams	Perennial Stream	Screening Levels	Bays & Estuaries	Tidal Streams	Perennial Stream
Temperature (°C/°F):	35 / 95	35 / 95	35 / 95	Ammonia-N (mg/L):	0.10	0.46	0.33
Dissolved Oxygen (24-Hr Average) (mg/L):	4.0	4.0	5.0 / 4.0	Nitrate-N (mg/L):	0.17	1.10	1.95
Dissolved Oxygen (Absolute Minima) (mg/L):	3.0	3.0	3.0 / 3.0	Orthophosphate Phosphorus (mg/L):	0.19	0.46	0.37
pH (standard units):	6.5-9.0	6.5-9.0	6.5-9.0	Total Phosphorus-P (mg/L):	0.21	0.66	0.69
Enterococci (MPN/100mL) (grab):	104	104	104	Chlorophyll a (µg/L):	11.6	21	14.1
Enterococci (MPN/100mL) (geometric mean):	35	35	35				
Fecal Coliform in Oyster Waters (CFU/100mL) (median/grab):	14/43						

## FY 2016 Active Monitoring Stations

Site ID	Site Description	Frequency	Monitoring Entity	Parameter Groups
11422	Halls Bayou at FM 2004	Quarterly	EIH	Field, Conventional, Bacteria
11422	Halls Bayou at FM 2004	Quarterly	TCEQ	Field, Conventional, Bacteria, Chlorophyll a
11423	Mustang Bayou at FM 2917	Quarterly	EIH	Field, Conventional, Bacteria
16228	Chocolate Bay at 97gb034	Quarterly	TCEQ	Field, Conventional, Bacteria, Chlorophyll a
17085	Chocolate Bay Near Wharton Bayou	Quarterly	EIH	Field
17086	Chocolate Bay NW of Horse Grove Point	Quarterly	TCEQ	Field, Conventional, Bacteria, Chlorophyll a
17911	New Bayou at FM 2004	Quarterly	EIH	Field, Conventional, Bacteria
17913	Persimmon Bayou at FM 2004	Quarterly	EIH	Field, Conventional, Bacteria
18554	Mustang Bayou at SH 35	Quarterly	EIH	Field, Conventional, Bacteria
18668	Willow Bayou at Baker Street	Quarterly	EIH	Field, Conventional, Bacteria
21416	Mustang Bayou at Heights-Manvel Rd	Quarterly	EIH	Field, Conventional, Bacteria

## Water Quality Issues Summary

Issue	2014 Assessment <i>I – Impaired</i> <i>C – Of Concern</i>	Possible Causes / Influences / Concerns Voiced by Stakeholders	Possible Solutions / Actions To Be Taken
<b>Elevated Levels of Indicator Bacteria in Recreational and Oyster Waters</b>	2432B I 2432C I 2432D C 2432E C 24320W I	<ul style="list-style-type: none"> <li>▪ Animal waste from agricultural production, hobby farms, and riding stables</li> <li>▪ Rapid urbanization and increased impervious cover</li> <li>▪ Constructed stormwater controls failing</li> <li>▪ Developments with malfunctioning OSSFs</li> <li>▪ Improper or no pet waste disposal</li> <li>▪ Waste haulers illegal discharges/improper disposal</li> <li>▪ Direct and dry weather discharges</li> <li>▪ Poorly operated or undersized WWTFs</li> <li>▪ WWTF non-compliance, overflows, and collection system by-passes</li> </ul>	<ul style="list-style-type: none"> <li>▪ Implement stream fencing or alternative water supplies to keep livestock out of or away from waterways</li> <li>▪ Encourage Water Quality Management Plans or similar projects for agricultural properties</li> <li>▪ Install and/or conserve vegetative buffer areas along all waterways</li> <li>▪ Improve compliance and enforcement of existing stormwater quality permits</li> <li>▪ Improve construction oversight to minimize TSS discharges to waterways</li> <li>▪ Add water quality features to stormwater systems</li> <li>▪ More public education regarding OSSF operation and maintenance</li> <li>▪ Ensure proper citing of new or replacement OSSFs</li> <li>▪ More public education on pet waste disposal</li> <li>▪ Increase monitoring requirements for self-reporting</li> <li>▪ Regionalize chronically non-compliant WWTFs</li> <li>▪ Require all systems to develop and implement a utility asset management program and protect against power outages at lift stations</li> <li>▪ Impose new or stricter bacteria limits than currently designated by TCEQ</li> </ul>
<b>Dissolved Oxygen Concentrations</b>	2432B C 2432C C	<ul style="list-style-type: none"> <li>▪ Excessive nutrients and organic matter from agricultural production, and related activities</li> <li>▪ Excessive nutrients and organic matter from WWTF effluent, SSOs, malfunctioning OSSFs, illegal disposal of grease trap waste, and biodegradable solid waste (e.g., grass clippings and pet waste)</li> <li>▪ High temperature discharges from industrial WWTFs</li> <li>▪ Vegetative canopy removed</li> </ul>	<ul style="list-style-type: none"> <li>▪ Encourage Water Quality Management Plans or similar projects for agricultural properties</li> <li>▪ Install and/or maintain riparian buffer areas between agricultural fields and waterways</li> <li>▪ Improve compliance and enforcement of existing stormwater quality permits</li> <li>▪ More public education regarding OSSF operation and maintenance</li> <li>▪ Ensure proper citing of new or replacement OSSFs</li> <li>▪ More public education on pet waste disposal</li> <li>▪ More public education regarding disposal of</li> </ul>

			<ul style="list-style-type: none"> <li>household fats, oils, and grease</li> <li>Improve operation and maintenance of existing WWTF and collection systems</li> <li>Regionalize chronically non-compliant WWTFs</li> <li>Conserve or restore trees and habitat along waterways to maintain/create shade to cool water</li> <li>Work with drainage districts and agencies to change practices of clear cutting and channelizing waterways to protect from solar heating</li> </ul>
PCBs/Dioxin in Edible Fish Tissue	2432 I 2432C I	<ul style="list-style-type: none"> <li>Concentrated deposits outside boundaries of the waste pits located adjacent to San Jacinto River and I-10 bridge</li> <li>Unknown industrial or urban sources</li> </ul>	<ul style="list-style-type: none"> <li>Remove or contain contamination from locations already identified</li> <li>Encourage additional testing to locate all unknown sources/deposits</li> </ul>

**Segment Discussion:**

**Watershed Characteristics:** The Chocolate Bay Watershed is on the northwest side of West Galveston Bay at the Gulf Intercoastal Waterway and extends upstream to the confluence with Chocolate Bayou in Brazoria County. Wetlands and grasslands surround this segment which supports barge traffic servicing the petrochemical industries located upstream. Agriculture, including ranching, is the primary land use throughout the watershed. There are two urban areas in the watershed including the City of Alvin, which is centrally located, and Missouri City, which is located to the north.

**Water Quality Issues:** The 2014 Texas IR lists 2432C\_01 Halls Bayou Tidal as impaired for contact recreation due to high levels of enterococci bacteria. The 2014 IR also lists assessment units 2432B\_01, 2432D\_01, and 2432E\_01 as having concerns for near non attainment due to elevated levels of *E. coli*. Mustang Bayou (AUs 2432A\_01 and 2432A\_02) was not assessed in 2014; however, the *E. coli* data collected suggests that this water body is highly impaired for recreational use.

Assessment Unit	TCEQ Assessment (2005-2012)	HGAC Analysis 2001-2008	HGAC Analysis 2008-2015
	Geomean (MPN/100 mL) / % Grab Exceedance	Geomean (MPN/100 mL) / % Grab Exceedance	Geomean (MPN/100 mL) / % Grab Exceedance
2432_01	12 / NA	5 / 10.3	17 / 13.0
2432A_01	280 / NA	NA / NA	411 / 33.3
2432A_02	6041 / NA	NA / NA	2144 / 85.7
2432B_01	254 / NA	133 / 50.0	291 / 40.7
2432C_01	94 / NA	29 / 15.8	188 / 56.8
2432D_01	180 / NA	77 / 52.6	994 / 100.0
2432E_01	182 / NA	65 / 47.4	445 / 78.6

Assessment Unit 2432OW\_01, which consists of the entire area of Chocolate Bay, is listed in the 2014 IR as impaired for oyster waters due to elevated levels of fecal coliform bacteria. This assessment unity is closed by the Seafood Safety Division of the Texas Department of State Health Services for the harvesting of oysters and other shellfish for direct marketing. Chocolate Bay is also listed as impaired for fish consumption due to high levels of the dioxin and PCBs found in edible fish tissue. The Texas Department of State Health Services as also issued a Limited Consumption Fish Advisory for this area.

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Willow Bayou (2432B) and Halls Bayou Tidal (2432C) have DO concerns for water quality screening levels. Over 20% of the DO grab measurements in Willow Bayou were 3.0 mg/L minimum. Also approximately 15% of the DO measurements in Halls Bayou Tidal were below the grab standard.

**Special Studies/Projects:** This segment is included in the TMDL for the Galveston Bay System Survey on Dioxin and PCBs, which is currently under way. Chocolate Bay is also included in the Oyster Waters I-Plan for bacteria which began in 2010 after the TMDL was approved by the EPA. The final draft I-Plan was submitted to the TCEQ in August of 2014 and final approval of the draft was given in August of 2015. For more information about these projects, please refer to the detailed discussions located in the Public Involvement and Outreach section of the 2016 Basin Summary Report.

**Trends:** Regression analysis of water quality data revealed 21 statistically significant trends for all classified and unclassified segments located in the Chocolate Bay watershed. The main Chocolate Bay segment had a total of three significant trends including increasing ammonia and enterococci and decreasing chlorophyll *a*. Three increasing trends were detected for segment 2432A, Mustang Bayou, for ammonia, total Kjeldahl nitrogen (TKN), and total phosphorous (TP). However, parameter trends detected for Mustang Bayou are based on a small sample size with large gaps in data availability. Additional long term monitoring on Mustang Bayou is recommended for better evaluation of trends over time. Data for segment 2432B, Willow Bayou, revealed increasing ammonia and *E. coli* trends while specific conductance (SPCond) is decreasing over time. Five increasing trends were detected for segment 2432C, Halls Bayou Tidal – chloride, enterococci, nitrate, salinity, and TKN. Segment 2432D revealed four increasing trends in ammonia, nitrate, salinity, and TP. Finally, segment 2432E, New Bayou, revealed three increasing trends for ammonia, salinity, and TP.

The 2014 Texas Integrated Report lists all unclassified assessment units and Chocolate Bay oyster waters as either impaired or of concern for elevated levels of indicator bacteria. Regression analysis of bacteria data for the impaired segments ([2432B](#) and [2432C](#)) show gradual increasing trends in bacteria concentrations with more than half of the samples collected during the period of record exceeding bacteria standards. Additional data collection is required for segments 2432D and 2432E to better evaluate changes in bacteria over time. Segments [2432B](#) and [2432C](#) are also listed as having a concern for low dissolved oxygen (DO) concentrations in water. Trend analysis of DO data revealed relatively stable concentrations over time with the majority of samples falling in compliance, however, significant dips below the 3.0 mg/L minimum standard for both segments still occurs on an infrequent basis.

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## Recommendations

Continue collecting water quality data to support actions associated with any future watershed protection plan development and possible modeling.

Coordinate education efforts with other local TMDL and watershed protection plan efforts.

Pursue a new local partner to Clean Rivers Program to collect additional data that would help better isolate problem areas.

Support additional sampling to investigate sources of elevated dioxin and PCB levels.

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