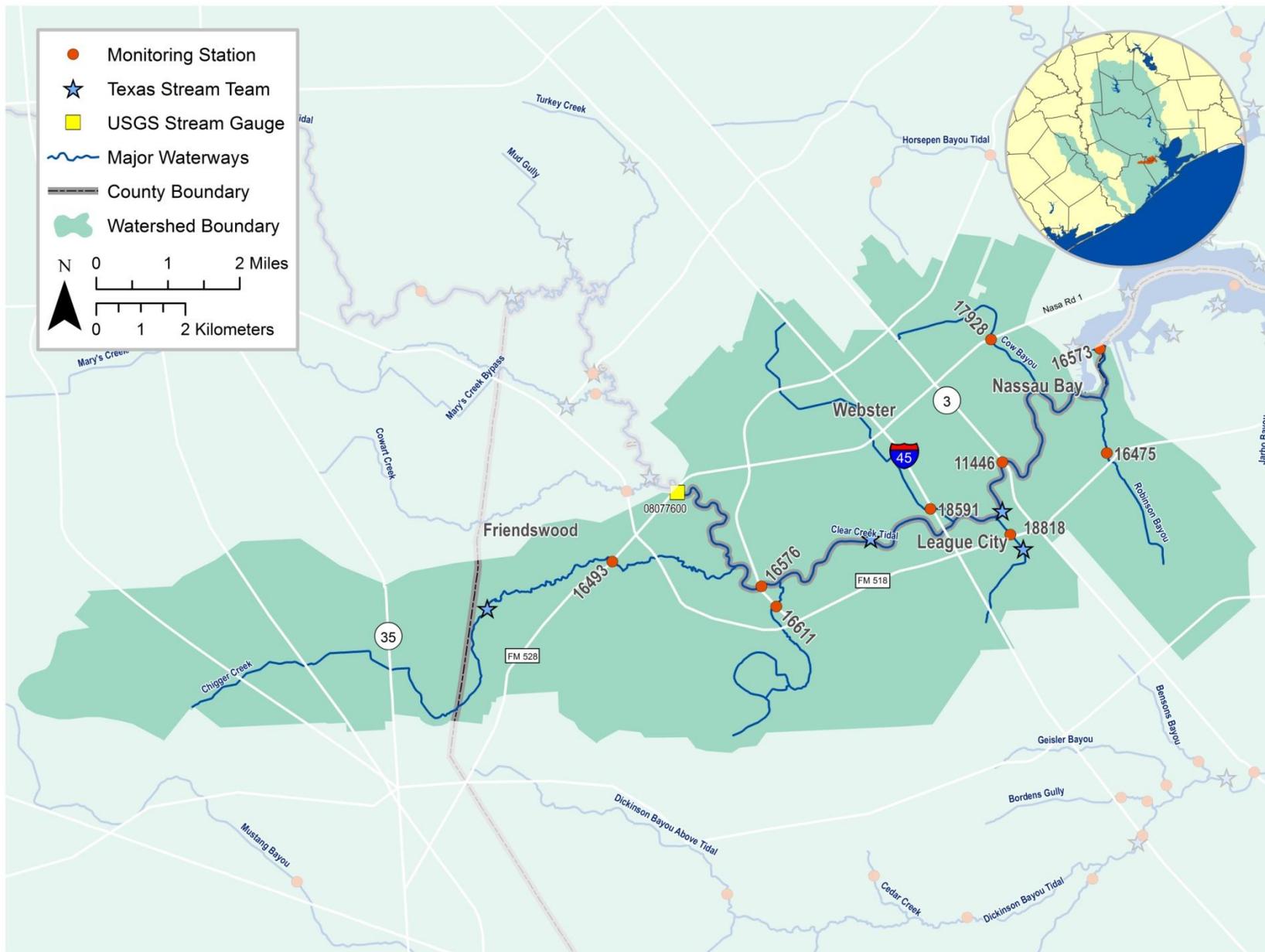
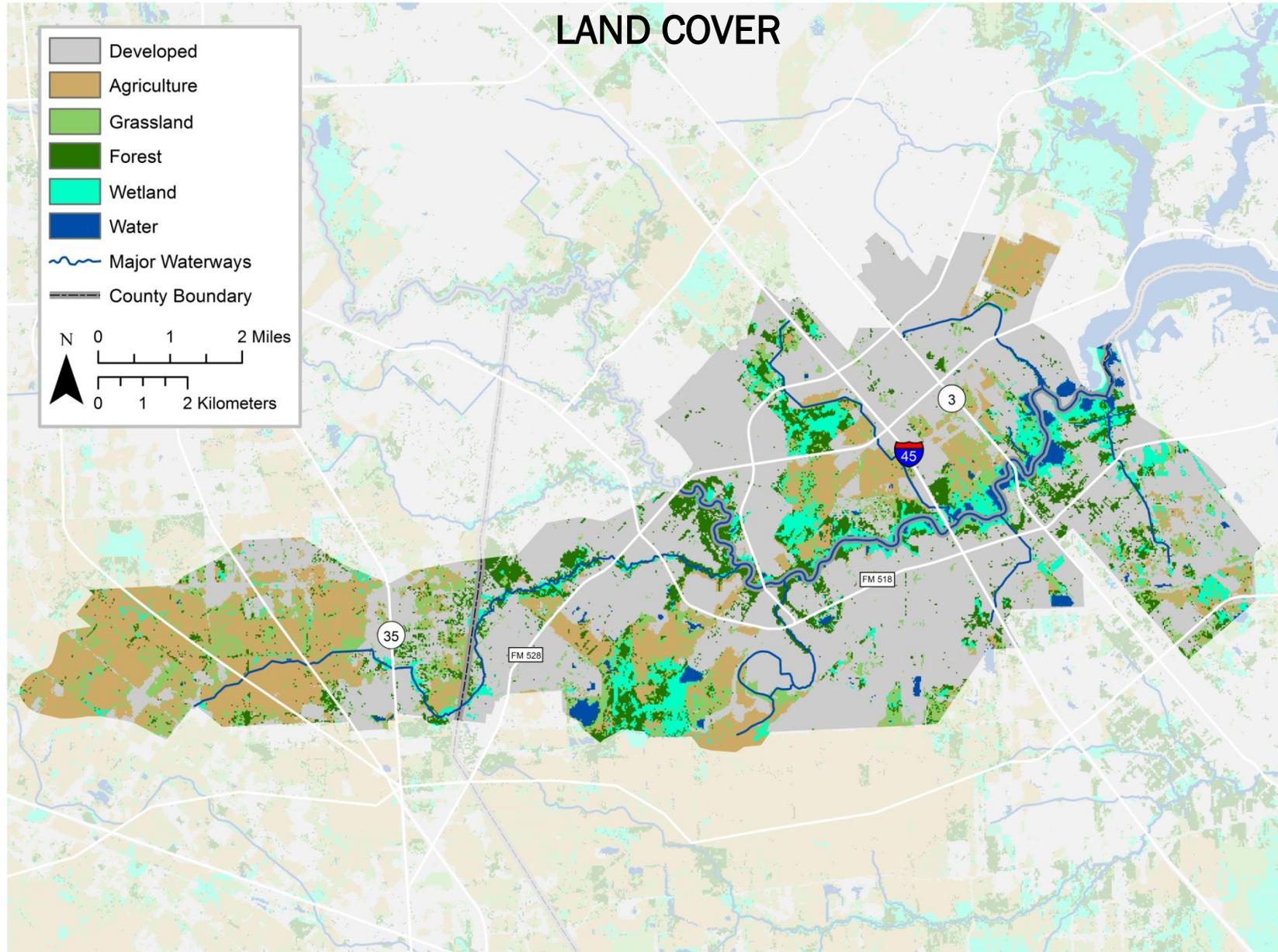


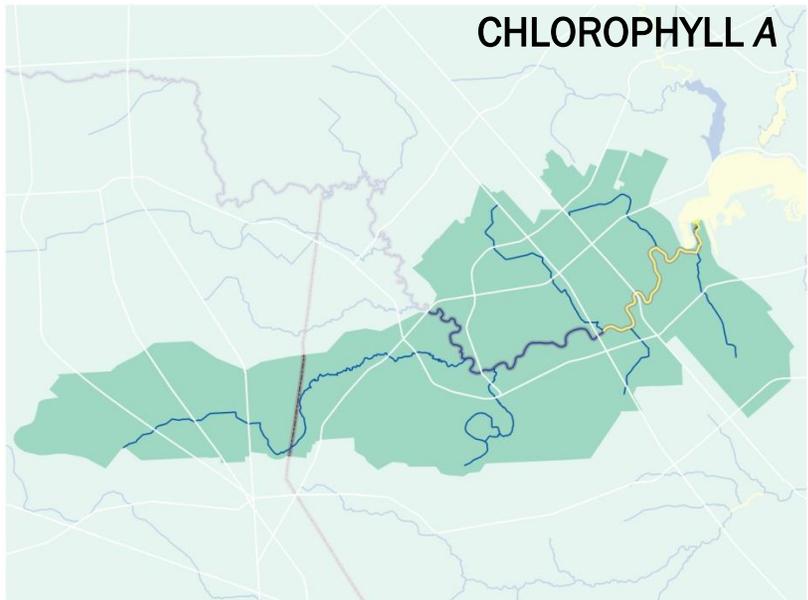
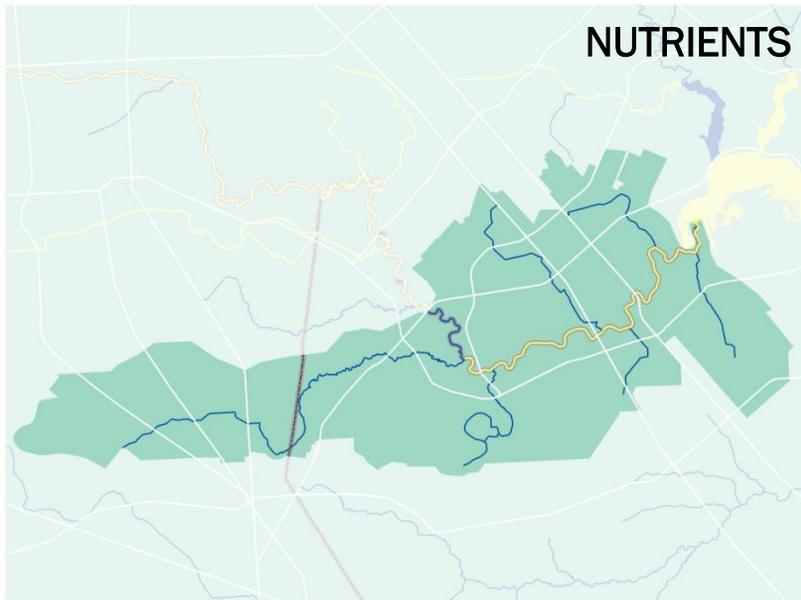
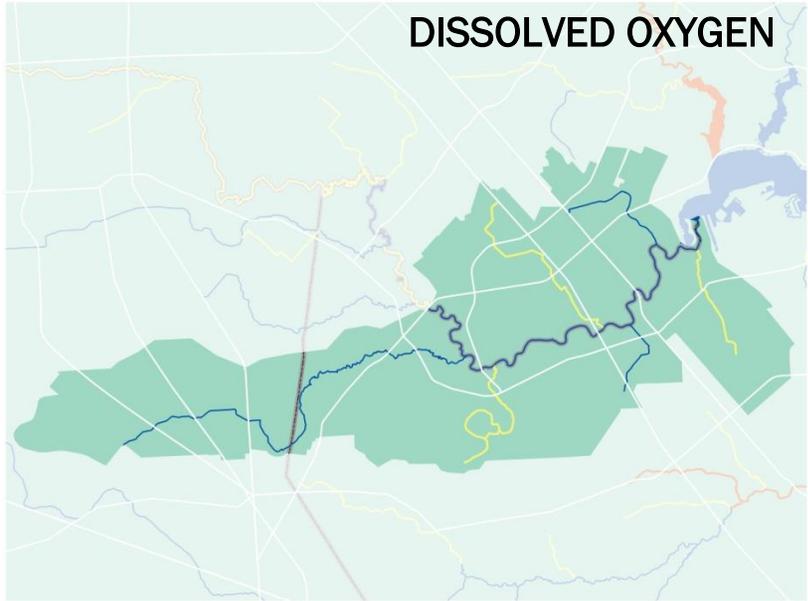
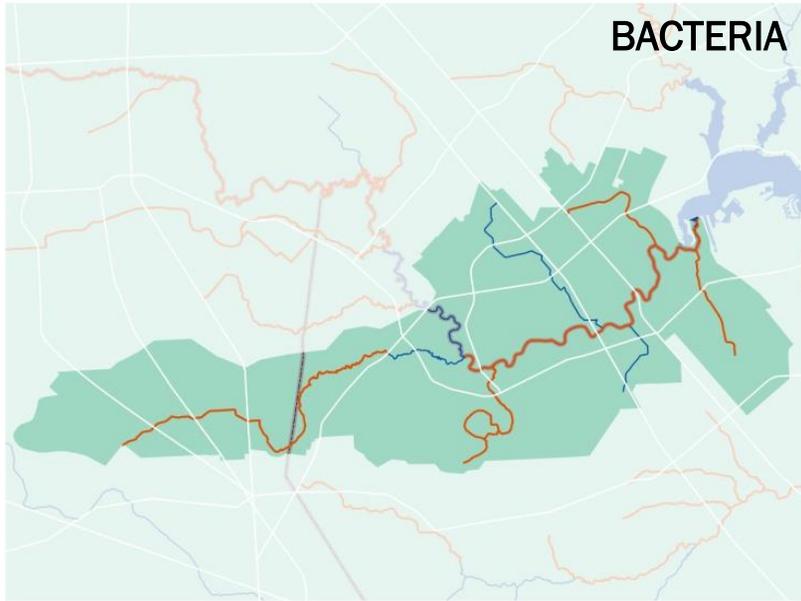
CLEAR CREEK TIDAL - SEGMENT 1101



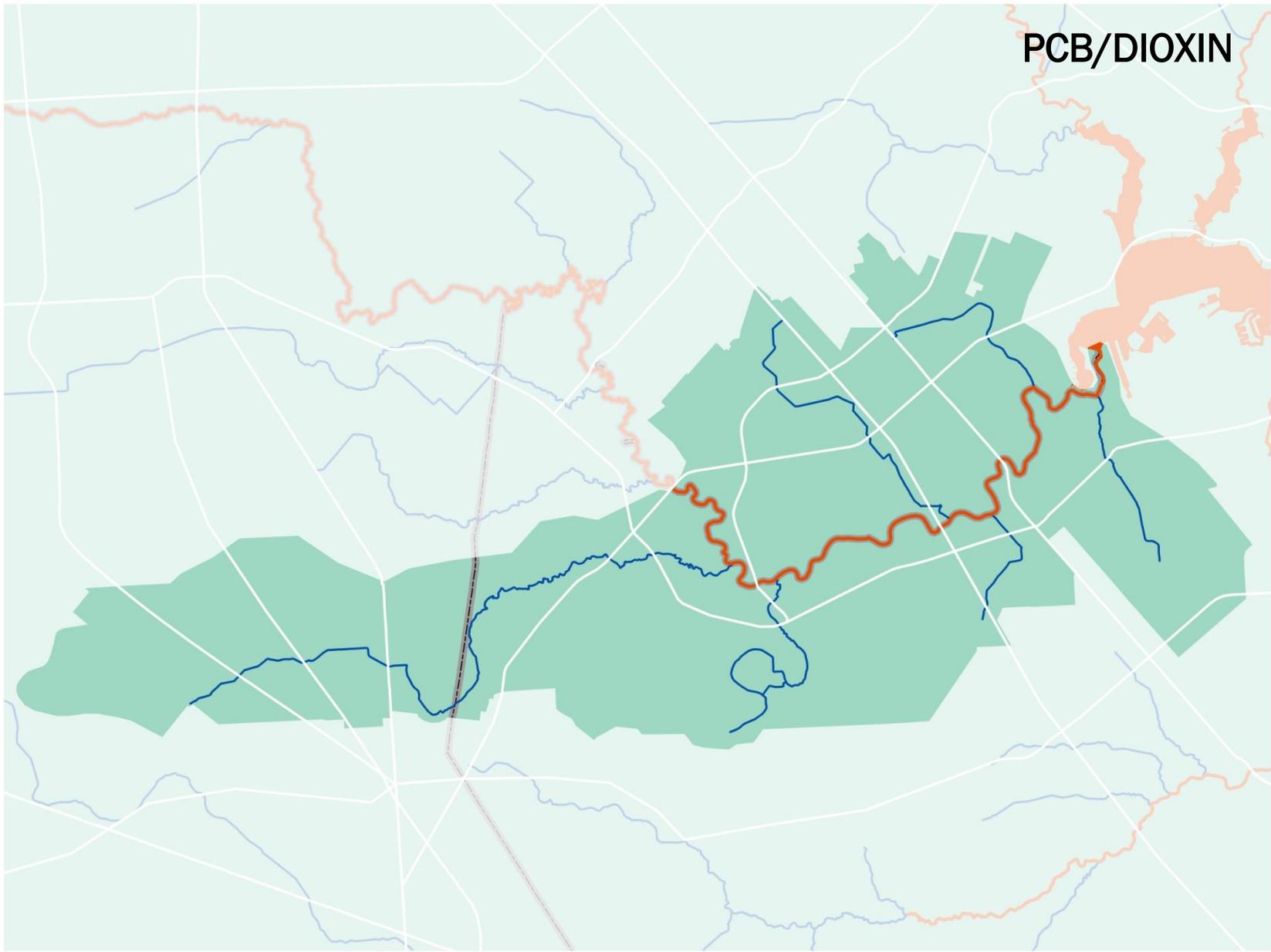
CLEAR CREEK TIDAL - SEGMENT 1101

LAND COVER





 Impairment  Concern  No Impairments or Concerns



PCB/DIOXIN

Impairment Concern No Impairments or Concerns

Segment Number: 1101 Name: Clear Creek Tidal	
Length: 12 miles	Watershed Area: 57 square miles Designated Uses: Primary Contact Recreation 1; High Aquatic Life
Number of Active Monitoring Stations: 9	Texas Stream Team Monitors: 4 Permitted Outfalls: 9
Description:	<p>Segment 1101 (Tidal Stream w/ high ALU): From the Clear Lake confluence at a point 3.2 km (2.0 miles) downstream of El Camino Real in Galveston/Harris County to a point 100 m (110 yards) upstream of FM528 in Galveston/Harris County</p> <p>Segment 1101A (Intermittent Stream with Pools w/ intermediate ALU): Magnolia Creek (unclassified water body) – From the Clear Creek Tidal confluence upstream to 0.8 km (0.5 mi) upstream of the confluence with the second unnamed tributary</p> <p>Segment 1101B (Intermittent Stream with Pools w/ limited ALU): Chigger Creek (unclassified water body) – From the Clear Creek Tidal confluence to the Brazos River Authority Canal near CR 143 in Galveston County</p> <p>Segment 1101C (Tidal Stream w/ high ALU): Cow Bayou (unclassified water body) – From the Clear Creek Tidal confluence to SH 3 in Galveston County</p> <p>Segment 1101D (Tidal Stream w/ high ALU): Robinson Bayou (unclassified water body) – From Clear Creek Tidal 0.33 mi upstream of Webster Street in Galveston County</p> <p>Segment 1101E (Tidal Stream w/ high ALU): Unnamed Tributary (Newport Ditch) of Clear Creek Tidal (unclassified water body)—From Clear Creek Tidal confluence to a point 3.2 km (2.0 mi) immediately downstream of I-45 in Galveston County</p> <p>Segment 1101F (Perennial Stream w/ high ALU): Unnamed Tributary (Cemetery Ditch) of Clear Creek Tidal (unclassified water body) – From Clear Creek Tidal confluence to a point 7.8 km (4.8 mi) upstream</p>

Percent of Stream Impaired or of Concern						
Segment ID	PCBs/Dioxin	Bacteria	Dissolved Oxygen	Nutrients	Chlorophyll a	Other
1101	100	81	-	81	46	-
1101A	-	100	100	-	-	-
1101B	-	83	-	-	-	-
1101C	-	100	-	-	-	-
1101D	-	-	100	-	-	-
1101F	-	-	100	-	-	-

Segment 1101

Standards	Tidal Stream	Perennial Stream	Screening Levels	Tidal Stream	Perennial Stream
Temperature (°C/°F):	35 / 95	35 / 95	Ammonia-N (mg/L):	0.46	0.33
Dissolved Oxygen (24-Hr Average) (mg/L):	4.0 / 3.0	5.0	Nitrate-N (mg/L):	1.10	1.95
Dissolved Oxygen (<i>Absolute Minima</i>) (mg/L):	3.0 / 2.0	3.0	Orthophosphate Phosphorus (mg/L):	0.46	0.37
pH (standard units):	6.5-9.0	6.5-9.0	Total Phosphorus-P (mg/L):	0.66	0.69
Enterococci (MPN/100mL) (grab):	104		Chlorophyll a (µg/L):	21	14.1
Enterococci (MPN/100mL) (geometric mean):	35				
<i>E. coli</i> (MPN/100 mL) (grab):		399			
<i>E. coli</i> (MPN/100 mL) (geometric mean):		126			

FY 2016 Active Monitoring Stations

Site ID	Site Description	Frequency	Monitoring Entity	Parameter Groups
11446	Clear Creek Tidal at SH 3	Quarterly	TCEQ	Field, Conventional, Bacteria, Chlorophyll a
16475	Robinson Bayou at FM 270	Quarterly	EIH	Field, Conventional, Bacteria
16493	Chigger Creek at FM 528 Bridge	Quarterly	EIH	Field, Conventional, Bacteria
16573	Clear Creek Tidal at the confluence with Clear Lake	Monthly	HCPHES	Field, Conventional, Bacteria
16576	Clear Creek Tidal at Brookdale	Quarterly	EIH	Field, Conventional, Bacteria
16611	Magnolia Creek upstream of FM 518	Quarterly	EIH	Field, Conventional, Bacteria
16611	Magnolia Creek upstream of FM 518	Three / Year	H-GAC	Flow, 24-hr DO
17928	Cow Bayou at NASA Rd 1	Quarterly	EIH	Field, Conventional, Bacteria
18591	Trib of Clear Creek (Cemetery Ditch) at I-45	Quarterly	EIH	Field, Conventional, Bacteria
18818	Unnamed Trib of Clear Creek Tidal at FM 518 (Newport Ditch)	Three / Year	H-GAC	Flow, 24-hr DO

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
Elevated Levels of Indicator Bacteria	1101 1101A 1101B 1101C	<ul style="list-style-type: none"> ▪ Rapid urbanization and increased impervious cover ▪ Constructed stormwater controls failing ▪ Animal waste from agricultural production and domestic animal facilities ▪ WWTF non-compliance, overflows, and collection system by-passes ▪ Direct and dry weather discharges ▪ Poorly operated or undersized WWTFs ▪ Waste haulers illegal discharges/improper disposal ▪ Improper or no pet waste disposal ▪ Developments with malfunctioning OSSFs 	<ul style="list-style-type: none"> ▪ Improve compliance and enforcement of existing stormwater quality permits ▪ Improve construction oversight to minimize TSS discharges to waterways ▪ Add water quality features to stormwater systems ▪ Increase monitoring requirements for self-reporting ▪ Require all systems to develop and implement a utility asset management program and protect against power outages at lift stations ▪ More public education on pet waste disposal ▪ More public education regarding OSSF operation and maintenance ▪ Ensure proper citing of new or replacement OSSFs
Dissolved Oxygen Concentrations	1101A C 1101D C 1101F C	<ul style="list-style-type: none"> ▪ Fertilizer runoff from urbanized properties, such as landscaped areas, residential lawns, and sport fields ▪ Excessive nutrients and organic matter from WWTF effluent, SSOs, malfunctioning OSSFs, illegal disposal of grease trap waste, agricultural production, and biodegradable solid waste (e.g., grass clippings and pet waste) ▪ Vegetative canopy removed 	<ul style="list-style-type: none"> ▪ Implement YardWise and Watersmart landscape practices ▪ Improve compliance and enforcement of existing stormwater quality permits ▪ Conserve or restore riparian buffer areas between agricultural fields and along all waterways ▪ Create and implement Water Quality Management Plans for individual agricultural properties ▪ Improve operation and maintenance of existing WWTF and collection systems ▪ More public education on pet waste; household fats, oils, and grease disposal; and OSSF maintenance ▪ Work with drainage districts and agencies to change practices of clear cutting and channelizing waterways to protect from solar heating
Elevated Nutrients	1101 C	<ul style="list-style-type: none"> ▪ Fertilizer runoff from urbanized properties, such as landscaped areas, residential lawns, and sport fields ▪ WWTF effluent, sanitary sewer overflows, and malfunctioning OSSFs 	<ul style="list-style-type: none"> ▪ Implement YardWise and Watersmart landscape practices ▪ Improve compliance and enforcement of existing stormwater quality permits ▪ Improve operation and maintenance of existing WWTF and collection systems

			<ul style="list-style-type: none"> More public education on pet waste; household fats, oils, and grease disposal; and OSSF maintenance
PCBs/Dioxin in Edible Fish Tissue	1011 I	<ul style="list-style-type: none"> Waste pit located along the San Jacinto River immediately upstream of I-10 bridge Concentrated deposits outside boundaries of the waste pits located adjacent to San Jacinto River and I-10 bridge Unknown industrial or urban sources 	<ul style="list-style-type: none"> Encourage regulators and responsible parties to work together to remediate Superfund site Remove or contain contamination from locations already identified Encourage additional testing to locate all unknown sources/deposits
Elevated Chlorophyll a Concentrations	1101 C	<ul style="list-style-type: none"> Fertilizer runoff from surrounding watershed promote algal growth in waterways Nutrient loading from WWTF effluent, sanitary sewer overflows, and malfunctioning OSSFs promotes algal growth 	<ul style="list-style-type: none"> Improve compliance and enforcement of existing stormwater quality permits Improve stormwater controls in new developments More public education regarding nutrients and consequences

Segment Discussion:

Watershed Characteristics: The Clear Creek Tidal watershed has experienced rapid growth of residential and commercial development over the past decade. Areas of grasslands and forestlands have been developed, but there are still a few plots of undeveloped grassland and cultivated fields present, particularly in the western and southern parts of the watershed. Most of the higher intensity development is centered along the I-45 corridor in the eastern side of the watershed in the cities of Nassau Bay, Webster, Friendswood, and League City. The Johnson Space Center and the Baybrook Mall are located within this watershed. The majority of the high intensity development is served by wastewater treatment facilities (WWTF), but some of the surrounding lower intensity development) in the unincorporated areas relies upon on-site sewage facilities (OSSF).

Water Quality Issues: The majority of assessment units (AUs) in segment 1101 (Clear Creek Tidal) are not supporting their contact recreation use designations. Segments 1101A, 1101B, 1101C, 1101D, and the main segment of Clear Creek Tidal are listed as being impaired for bacteria in the 2014 Texas Integrated Report. Refer to the table below for a breakdown of enterococci geomeans and percent exceedances.

Assessment Unit	HGAC Analysis 2001-2008		HGAC Analysis 2008-2015	
	Geomean (MPN/100 mL)	% Grab Exceedance	Geomean (MPN/100 mL)	% Grab Exceedance
1101A	Insufficient Data		563	92.9
1101B	Insufficient Data		410	93.3
1101C	93	80.9	347	90.5
1101D	106	74.1	580	85.7
1101F	68	64.3	60	57.1

Nutrients are also listed as a concern in the 2014 Integrated Report for the main segment. Over 56% of samples collected since 2008 have exceeded the screening criteria for nitrate-nitrogen. Orthophosphate and total phosphorous (TP) exceedances are more significant with over 80% and 70% of samples collected exceeding the screening criteria, respectively.

Special Studies/Projects: H-GAC has been tasked by the TCEQ to implement a basin-wide approach for addressing bacterial impairments for the San Jacinto-Brazos Coastal Basin which includes Clear Creek. Development for the basin-wide TMDL began in September of 2015 and will result in a final Basin 11 Summary Report in September of 2016 that will summarize basin characteristics, water quality impairments, potential bacteria sources, and recommendations for bacterial reduction. This segment is also part of the geographic area for the Bacteria Implementation Group (BIG) TMDL and is included in the Galveston Bay System Survey for Dioxins and PCBs. For more information, please refer to the detailed discussions about current TMDL and I-Plans in the Public Involvement and Outreach section of the 2016 Basin Summary Report.

Trends: Regression analysis identified 28 significant water quality parameter trends for the majority of classified and unclassified segments in the Clear Creek Tidal watershed. The main segment of Clear Creek Tidal had 11 significant trends including increasing ammonia, nitrate, salinity, Secchi transparency, specific conductance (SPCond), total dissolved solids (TDS), and TP while alkalinity, chlorophyll *a*, pH, and total suspended solids (TSS) are decreasing over time. Seven significant trends were detected for segment 1101A including increasing ammonia, dissolved oxygen (DO), instantaneous flow, nitrate, Secchi transparency, and TP while TSS is decreasing. Segment 1101B had three significant trends – decreasing *E. coli* and TSS and increasing Secchi transparency. An increase in ammonia and TP levels were detected for segment 1101C and an increase in nitrate and Secchi transparency were detected for segment 1101D. Segment 1101F also had three significant parameter trends including increasing Secchi transparency and TDS and decreasing TSS. Conventional and field parameters are not currently being collected on segment 1101E, so no parameter trends were detected for this segment.

Trends of note include the [increasing ammonia](#) trend seen throughout many portions of the watershed. However, the majority of ammonia data collected is below the 0.46 mg/L screening criteria. Additionally, although segment 1101C is the only segment designated as having a concern for nutrients (regression analyses revealed increasing trends in [nitrate](#) and [TP](#)) on the 2014 Integrated Report, the main segment of Clear Creek Tidal is also seeing gradual increases in nutrient levels with nearly half of the samples collected during the period of record exceeding the screening criteria for [nitrate](#).

A bacteria impairment is present for segments 1101, 1101A, 1101B, 1101C, and 1101D. Data collection for stations located on segments 1101A and 1101B began in 2011. Although the available data is relatively short term, bacteria geomeans for these segments have remained above the state water quality standard since data collection began in 2011. Other than a temporary bacteria reduction between 2008 to 2010, the [main segment of Clear Creek Tidal](#) has also maintained enterococci geomeans exceeding the 35 MPN/100 mL standard since 2005. Moving bacteria geomeans for segments [1101C](#) and [1101D](#) show a significant increase in *E. coli* geomeans since around 2013 and 2011, respectively.

DO levels have remained relatively stable or have shown slight improvements over time for segments currently listed as having a concern for DO in this watershed. The majority of the DO data collected during the period of record are in compliance with only a small portion of samples collected at [1101D](#) and [1101F](#) falling below the 3.0 mg/L minimum levels.

Clear Creek passes through highly developed residential and commercial areas of Friendswood, League City, and the Clear Lake region of Houston. The application of fertilizers to suburban lawns and landscaping is a likely cause of the increasing levels of nutrients and bacteria and decreasing DO observed throughout the watershed.

Recommendations

Address concerns found in this segment summary through stakeholder participation.

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

Continue to work with the BIG to implement the I-Plan recommendations for bacteria reduction.

Continue to work with the Galveston Bay Estuary Program regarding dioxin and PCB contamination.
