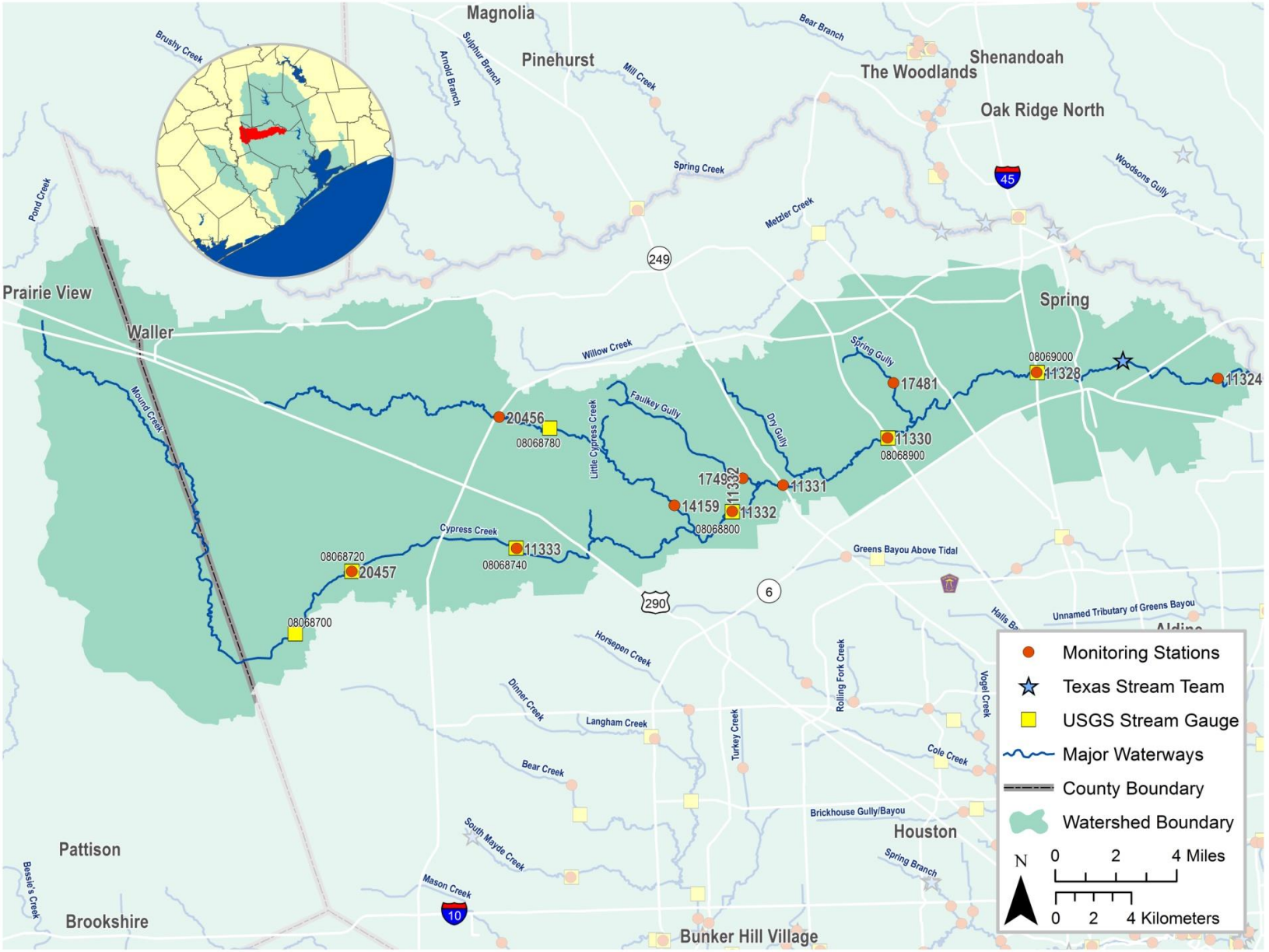
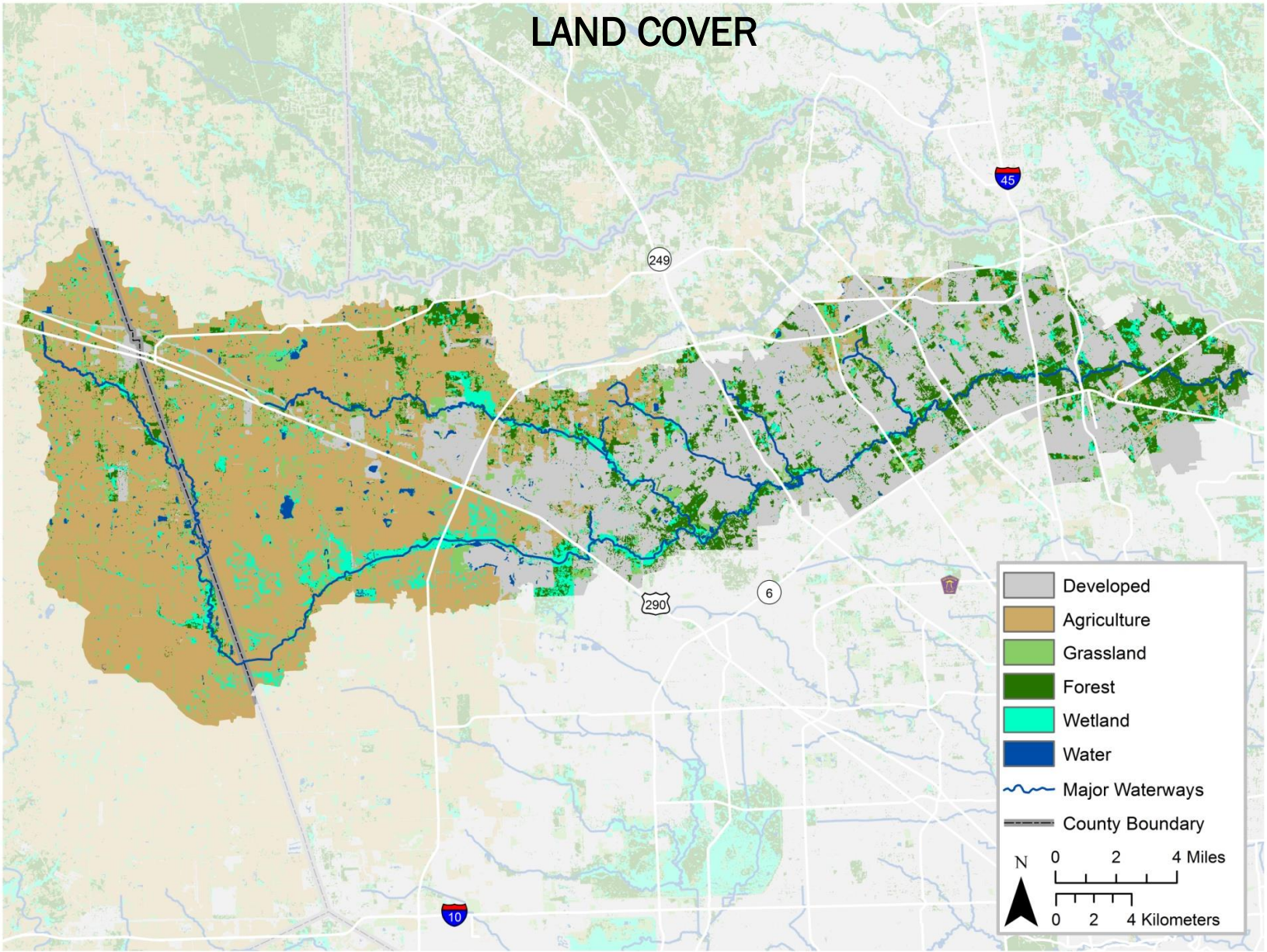
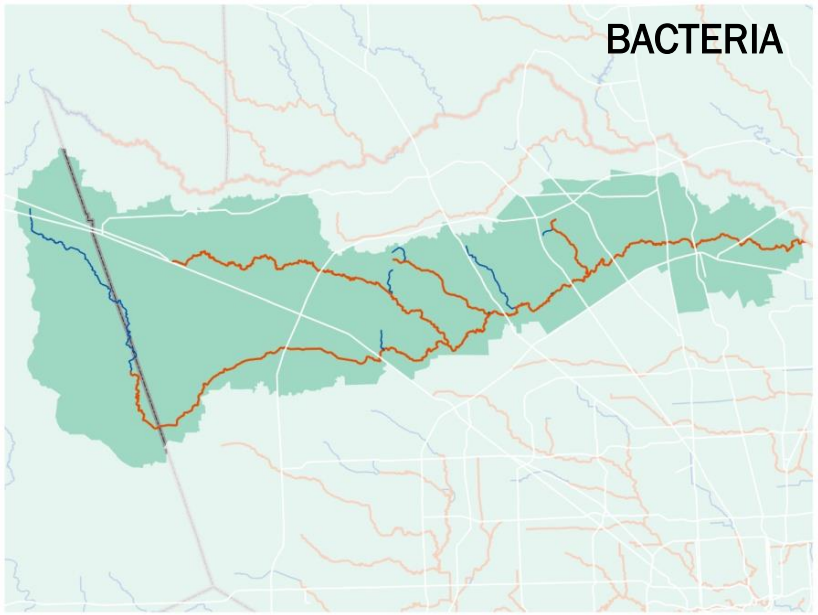
CYPRESS CREEK - SEGMENT 1009

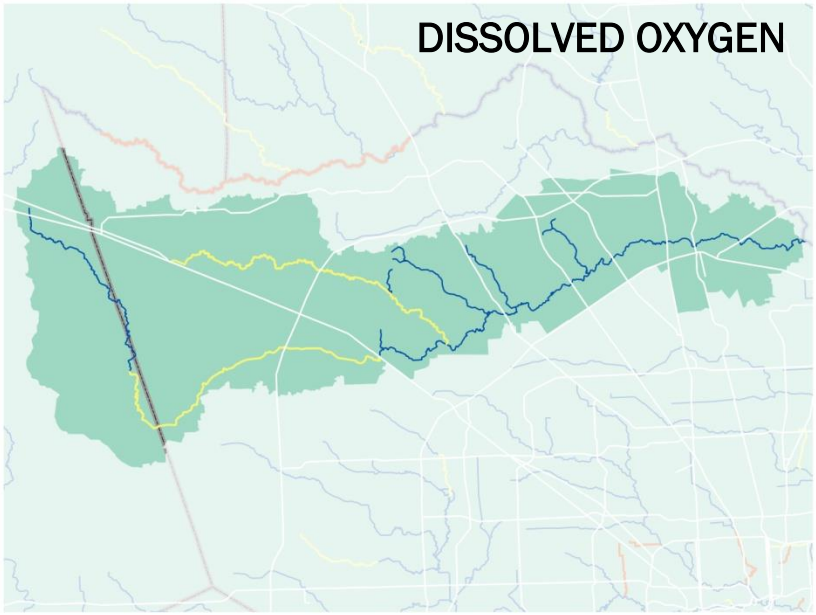


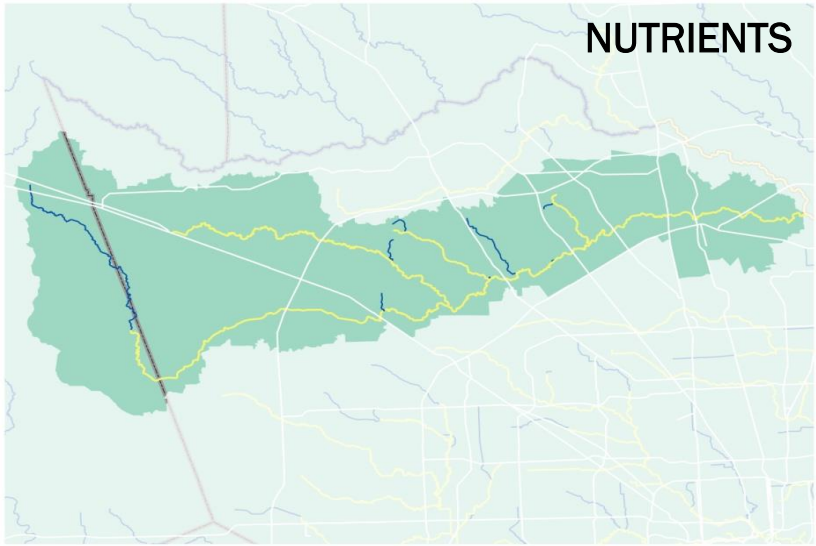
CYPRESS CREEK - SEGMENT 1009

LAND COVER





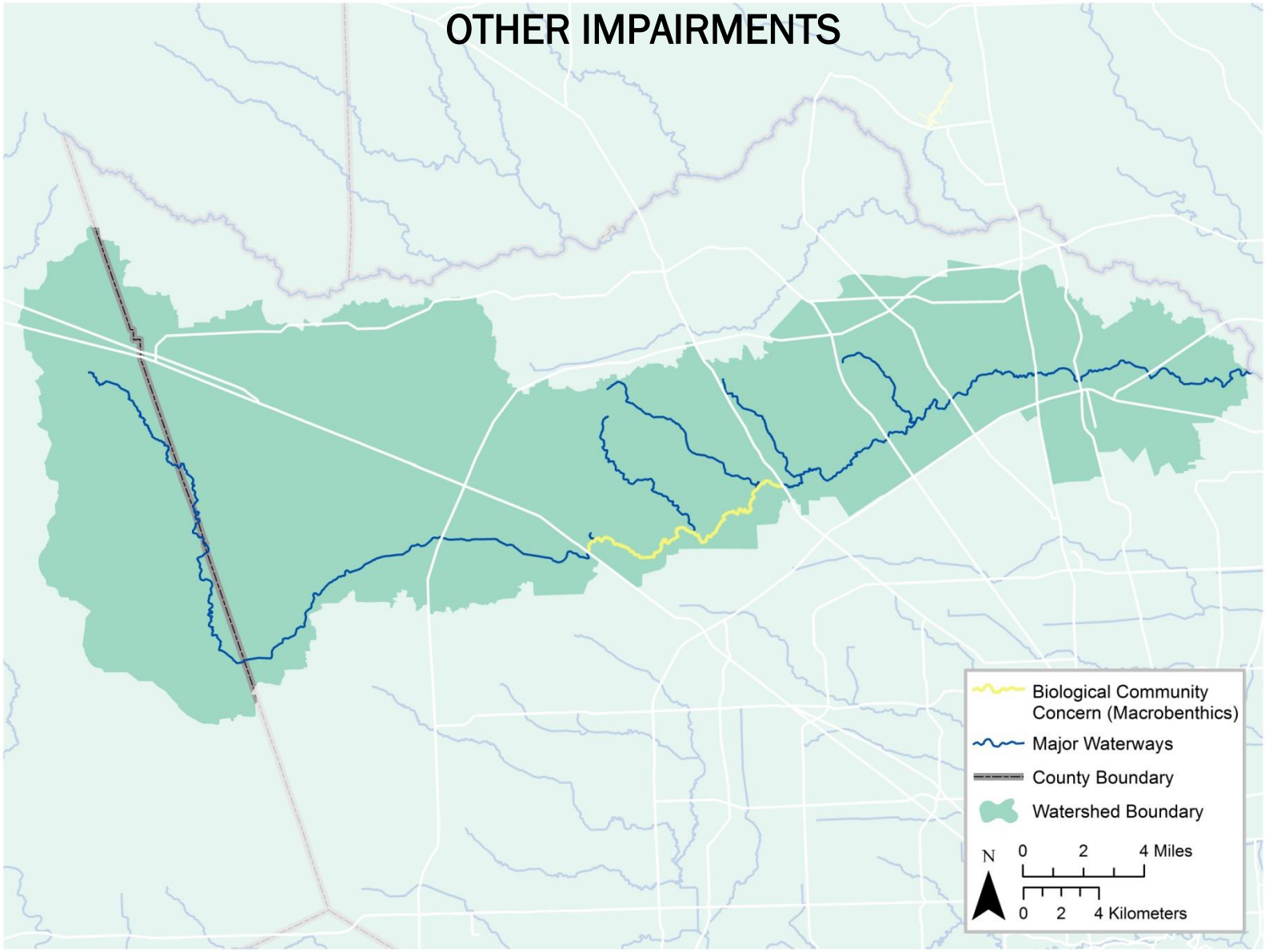




Impairment Concern No Impairments or Concerns

CYPRESS CREEK - SEGMENT 1009

OTHER IMPAIRMENTS



Segment Number:	1009	Name:	Cypress Creek

Length:	52 miles	Watershed Area:	319 square miles	Designated Uses:	Primary Contact Recreation 1; High Aquatic Life; Public Water Supply

Number of Active Monitoring Stations:	11	Texas Stream Team Monitors:	1	Permitted Outfalls:	107

Description:

Segment 1009 (Perennial Stream w/ high ALU): From the confluence with Spring Creek in Harris County to the confluence of Snake Creek and Mound Creek in Waller County

Segment 1009A (Perennial Stream): Dry Creek (unclassified water body) – Perennial stream from the confluence with Cypress Creek upstream to the beginning of channelization at Jarvis Road, 0.6 km upstream from the confluence with Cypress Creek north of Hwy 290

Segment 1009B (Perennial Stream): Dry Gully (unclassified water body) – Perennial stream from the point where channelization begins at Jarvis Road, which is 0.6 km upstream of the confluence with Cypress Creek, upstream to Spring Cypress Road, 1.2 km upstream of Jarvis Road north of Hwy 290

Segment 1009C (Intermittent Stream w/ minimal ALU): Faulkey Gully (unclassified water body)—From the Cypress Creek confluence to a point 11.7 km (7.2 mi) upstream

Segment 1009D (Perennial Stream w/ high ALU): Spring Gully (unclassified water body)—From the Cypress Creek confluence upstream to near Spring Cypress Road

Segment 1009E (Perennial Stream w/ high ALU): Little Cypress Creek (unclassified water body)—From the Cypress Creek confluence to a point 11 km (6.8 mi) upstream in Harris County

Segment 1009F (Perennial Stream w/ high ALU): Mound Creek (unclassified water body) – From the confluence with Snake Creek, which together form Cypress, Creek upstream to an unnamed tributary 1.95 km (1/2 mi) upstream of FM 362

Percent of Stream Impaired or of Concern

Segment ID	PCBs/Dioxin	Bacteria	Dissolved Oxygen	Nutrients	Chlorophyll *a*	Other
1009	-	100	36.9	100	-	19.9
1009C	-	100	-	100	-	-
1009D	-	100	-	100	-	-
1009E	-	100	100	100	-	-

Segment 1009			
Standards	Perennial Stream	**Screening Levels**	Perennial Stream
Temperature (°C/°F):	32 / 90	Ammonia (mg/L):	0.33
Dissolved Oxygen *(24-Hr Average)* (mg/L):	5.0 / 2.0	Nitrate-N (mg/L):	1.95
Dissolved Oxygen *(Absolute Minima)* (mg/L):	3.0 / 1.5	Orthophosphate Phosphorus (mg/L):	0.37
pH (standard units):	6.5-9.0	Total Phosphorus (mg/L):	0.69
E. coli (MPN/100 mL) (grab):	399	Chlorophyll-*a* (µg/L):	14.1
E. coli (MPN/100 mL) (geometric mean):	126		
Chloride (mg/L as Cl):	100		
Sulfate (mg/L as SO_4):	50		
Total Dissolved Solids (mg/L):	600		

FY 2016 Active Monitoring Stations				
Site ID	**Site Description**	**Frequency**	**Monitoring Entity**	**Parameter Groups**
11324	Cypress Creek at Cypresswood Dr	Quarterly	TCEQ	Field, Conventional, Bacteria, Chlorophyll a
11328	Cypress Creek at IH- 45	Bimonthly	COH / WQC	Field, Conventional, Bacteria
11328	Cypress Creek at IH- 45	Ten Times / Year	USGS	Field, Conventional, Bacteria, Flow, 24-Hour DO
11328	Cypress Creek at IH-45	Eleven Times / Year	USGS	Field, Conventional, Bacteria, Flow, 24-Hour DO
11328	Cypress Creek at IH-45	Every Day	USGS	Flow, 24-Hour DO
11330	Cypress Creek at Steubner Airline	Nine Times / Year	COH / HHS	Field, Conventional, Bacteria
11331	Cypress Creek at SH 249	Nine Times / Year	COH / HHS	Field, Conventional, Bacteria
11332	Cypress Creek at Grant Road	Nine Times / Year	COH / HHS	Field, Conventional, Bacteria
11333	Cypress Creek at House Hahl Road	Nine Times / Year	COH / HHS	Field, Conventional, Bacteria
14159	Little Cypress Creek at Kluge Rd	Nine Times / Year	COH / HHS	Field, Conventional, Bacteria
17481	Spring Gully at Spring Creek Oak Dr	Nine Times / Year	COH / HHS	Field, Conventional, Bacteria
17496	Faulkey Gully at Lakewood Forest Dr	Nine Times / Year	COH / HHS	Field, Conventional, Bacteria
20456	Little Cypress Creek at Mueschke Road	Quarterly	H-GAC	Field, Conventional, Bacteria
20457	Cypress Creek at Katy Hockley Road	Quarterly	H-GAC	Field, Conventional, Bacteria

Water Quality Issues Summary			
Issue	**2014 Assessment** *I – Impaired* *C – Of Concern*	**Possible Causes / Influences / Concerns Voiced by Stakeholders**	**Possible Solutions / Actions To Be Taken**
Elevated Levels of Indicator Bacteria	1009 I 1009C I 1009D I 1009E I	▪ Rapid urbanization and increased impervious cover ▪ Constructed stormwater controls failing ▪ Animal waste from agricultural production and domestic animal facilities ▪ Waste haulers illegal discharges/improper disposal ▪ Direct and dry weather discharges ▪ Poorly operated or undersized WWTFs ▪ WWTF non-compliance, overflows, and collection system by-passes ▪ Developments with malfunctioning OSSFs ▪ Improper or no pet waste disposal	▪ Improve compliance and enforcement of existing stormwater quality permits ▪ Improve stormwater controls in new developments by adding bacteria reduction measures ▪ Implement stream fencing or alternative water supplies to keep livestock out of or away from waterways ▪ Encourage Water Quality Management Plans for individual agricultural properties ▪ Increase monitoring requirements for self-reporting ▪ Impose new or stricter bacteria limits than currently designated by TCEQ ▪ Require all systems to develop and implement a utility asset management program and protect against power outages at lift stations ▪ Regionalize chronically non-compliant WWTFs ▪ More public education regarding OSSF operation and maintenance ▪ Ensure proper citing of new or replacement OSSFs ▪ More public education on pet waste disposal
Dissolved Oxygen Concentrations	1009 C 1009E C	▪ Excessive nutrients and organic matter from agricultural production ▪ 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) ▪ Vegetative canopy removed	▪ Improve compliance and enforcement of existing stormwater quality permits ▪ Improve operation and maintenance of existing WWTFs and collection systems ▪ Regionalize chronically non-compliant WWTFs ▪ More public education regarding disposal of household fats, oils, and grease ▪ Improved OSSF maintenance and education ▪ More public education on pet waste disposal ▪ Work with drainage districts and agencies to change

			practices of clear cutting and channelizing waterways to protect from solar heating ▪ Conserve or restore trees and habitat along waterways to maintain/create shade to cool water
Elevated Nutrients	1009 C 1009C C 1009D C 1009E C	▪ Agricultural runoff from row crops, pastures, and fallow fields ▪ Fertilizer runoff from urbanized properties, such as landscaped areas, residential lawns, and sport fields ▪ WWTF effluent, SSOs, and malfunctioning OSSFs	▪ Encourage Water Quality Management Plans for individual agricultural properties ▪ Implement YardWise and Watersmart landscape practices ▪ Install and/or conserve riparian buffer areas along all waterways ▪ Monitor phosphorus levels at WWTFs to determine if controls are needed
Macrobenthic Community	1009 C	▪ Loss of habitat due to channelization of waterway ▪ Ongoing maintenance of modified channel ▪ Bank erosion and erosion of construction sites	▪ Work with drainage districts to install/construct habitat that doesn't interfere with water movement ▪ Re-connect oxbows and lost channels to augment water storage and retention ▪ Strategically plant vegetation to enhance tree canopy to reduce bank erosion and increase habitat

Segment Discussion:

Watershed Characteristics: The middle and eastern portions of the watershed have seen rapid development since 2005 resulting dense urban and suburban development. The area is now dominated by residential developments within forested lands where subdivisions and commercial buildings are common, especially along the I-45 corridor. The western portion of the watershed is dominated by rice fields and grasslands used for cattle grazing. Many fields are rotated and allowed to go fallow for years at a time. Many larger farms in the area use on-site sewage facilities (OSSFs) as their primary method of waste disposal while developments or commercial operations built off U.S. Hwy 290 are on sanitary sewer.

Water Quality Issues: This segment is not supporting its contact recreation use designation. The entire segment and all of the tributaries to Cypress Creek are listed as impaired for bacteria in the 2014Texas Integrated Report. A summary of geometric means and samples exceeding the grab standard from the 2014 TCEQ assessment and H-GAC analysis illustrates the extent of the bacteria impairment in this watershed.

Assessment Unit	TCEQ Assessment 2005-2012 Geomean (MPN/100 mL) / % Grab Exceedance	HGAC Analysis 2001-2008 Geomean (MPN/100 mL) / % Grab Exceedance	HGAC Analysis 2008-2015 Geomean (MPN/100 mL) / % Grab Exceedance
1009_01	207	317 / 39.2	162 / 26.5
1009_02	419	469 / 46.7	342 / 33.9
1009_03	853	817 / 64.7	543 / 54.0
1009_04	535	477 / 40.7	516 / 44.4
1009C_01	489	649 / 45.8	315 / 44.3
1009D_01	488	654 / 61.1	341 / 51.7
1009E_01	251	525 / 54.7	192 / 31.4

Plots of rolling seven-year geometric means for the main segment and for segment 1009E suggest that *E. coli* levels are falling in the impaired AUs.

Nutrients remain a concern in this watershed. Detailed screening level exceedance statistics for AU listed as a concern for nutrient screening levels in the 2014 IR are below.

Assessment Unit	Parameter	TCEQ Assessment 2005-2012 % Grab Exceedance	HGAC Analysis 2001-2008 % Exceedance	HGAC Analysis 2008-2015 % Exceedance
1009_01	Nitrate	43.5	40.7	49.4
1009_01	Total Phosphorus	55.3	47.2	58.8
1009_02	Nitrate	75.2	61.2	86.1
1009_02	Total Phosphorus	76.1	1.4	5.4
1009_03	Nitrate	82.2	71.5	88.2
1009_03	Total Phosphorus	80.3	69.9	89.2
1009_04	Nitrate	88.5	77.8	88.9
1009_04	Total Phosphorus	92.6	75.0	96.0
1009C_01	Nitrate	76.1	61.5	88.7
1009C_01	Total Phosphorus	88.1	74.5	96.8
1009D_01	Ammonia	25.8	25.4	30.0
1009D_01	Nitrate	85.1	76.9	91.8
1009D_01	Total Phosphorus	87.9	78.4	95.0
1009E_01	Nitrate	59.8	53.7	64.0
1009E_01	Total Phosphorus	64.0	64.8	69.3

The 2014 TCEQ assessment found that the aquatic life use is not fully supported throughout the segment. AU 1009_02 has a concern for habitat and microbenthic community, and depressed dissolved oxygen (DO) was identified as a concern in 1009_01 and 1009E_01; 23.8 and 17.4 percent of grab samples were below the screening level during the assessment period.

Special Studies/Projects: This segment is part of a larger geographic area covered under several TMDLs, collectively known as the Bacteria Implementation Group (BIG) I-Plan. Refer to the Public Involvement and Outreach section of the 2016 Basin Summary Report for more information about the BIG. Cypress Creek will also be the focus of a watershed characterization project starting in 2015, which will seek to further define causes and sources of pollution in the watershed through stakeholder input and computer modeling.

Trends: Regression analysis of segment data revealed statistically significant trends for 21 parameters – four in the classified freshwater stream and a total of 17 in the three unclassified tributaries. Trends for the main segment include increasing nitrate, specific conductance (SPCond), and total phosphorus (TP) while total suspended solids (TSS) is decreasing over time. Unclassified segment 1009C, Faulkey Gully, has a total of eight significant parameter trends including increases in DO nitrate, pH, SPCond, sulfate, and TP while levels of ammonia and TSS are decreasing. Unclassified segment 1009D, Spring Gully, has four significant trends including increasing nitrate, pH, and TP and a decreasing trend in Secchi transparency. Unclassified segment 1009E, Little Cypress Creek, has three decreasing trends including ammonia, *E. coli*, and TSS and two increasing trends for nitrate and TP.

The most common trends seen throughout all classified and unclassified segments are increases in nitrate and TP. The majority of samples collected within the watershed since 2000 have consistently shown nitrate and TP concentrations significantly greater than the set screening criteria. Conversely, ammonia has been decreasing over time in Faulkey Gully and Little Cypress Creek. Improvements in WWTF operations since the early 2000s have likely played a role in decreasing ammonia levels. However, reasons for continued increases in nitrate and TP in area waterways is still unknown. Potential sources may include fertilizer runoff from agricultural areas or impacts from increased urban and suburban development in the eastern portion of the watershed. It is recommended that this segment have its own watershed protection plan (WPP) to address nutrient sources.

Another consistent trend seen throughout the watershed is a gradual increase in SPCond and decrease in TSS, suggesting an increased level of dissolved constituents in water over time. This is likely partially be due to the 2011 droughts but may also be related to increased development resulting in a higher volume of WWTF discharges in area waterways. Bacteria levels remain consistently higher than the 126 MPN/100 mL standard for the entire watershed, however, decreasing trends in *E. coli* are seen in Little Cypress Creek and at station 11331 located on the main stem downstream from its confluence with Faulkey Gully. DO levels also show an improvement in Faulkey Gully at station 17496 but a concern for DO remains on the 2014 Integrated Report for this segment as well a portion of the main segment of Cypress Creek.

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.
Find financial support to develop a watershed protection plan for this watershed.