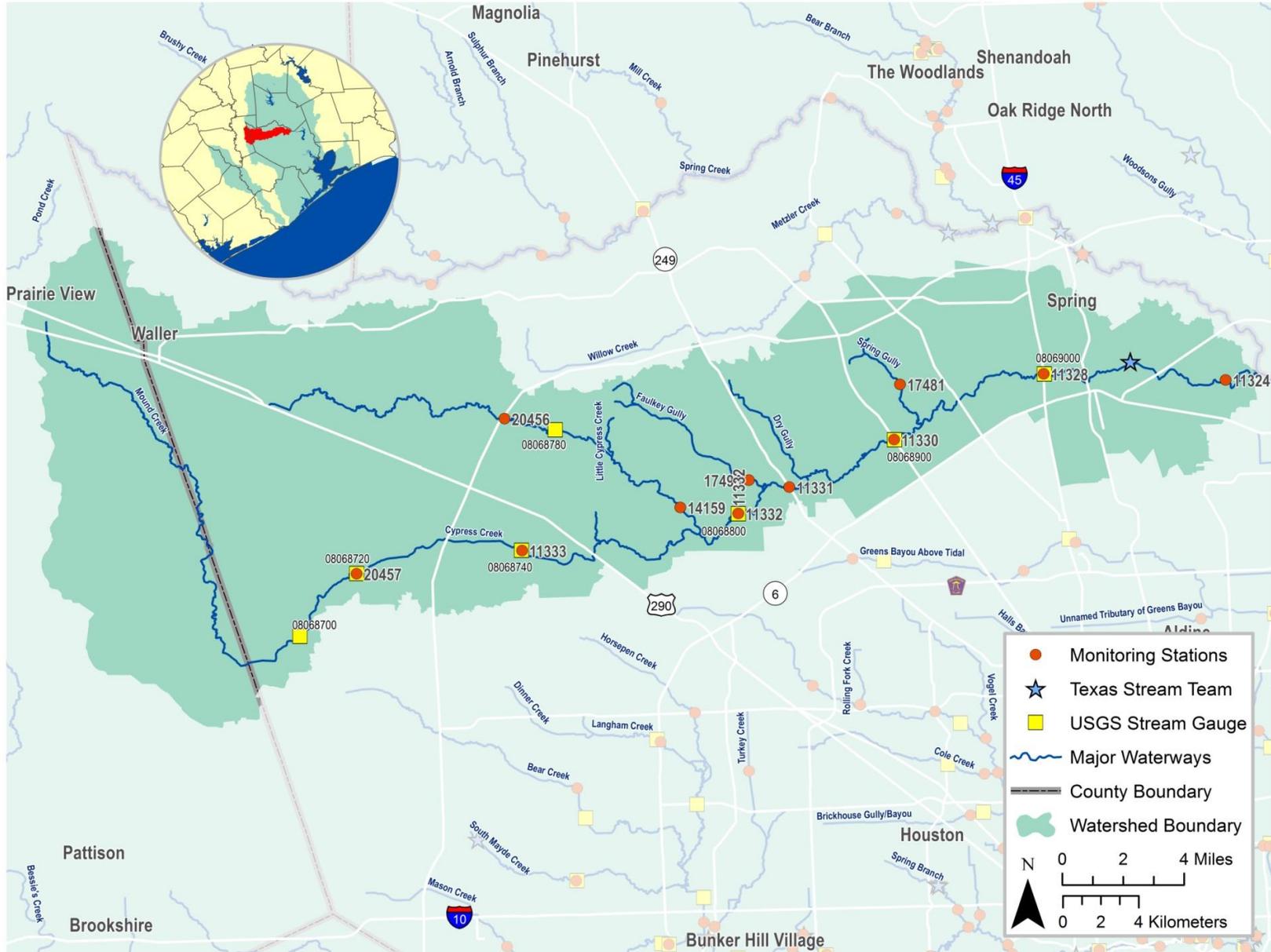
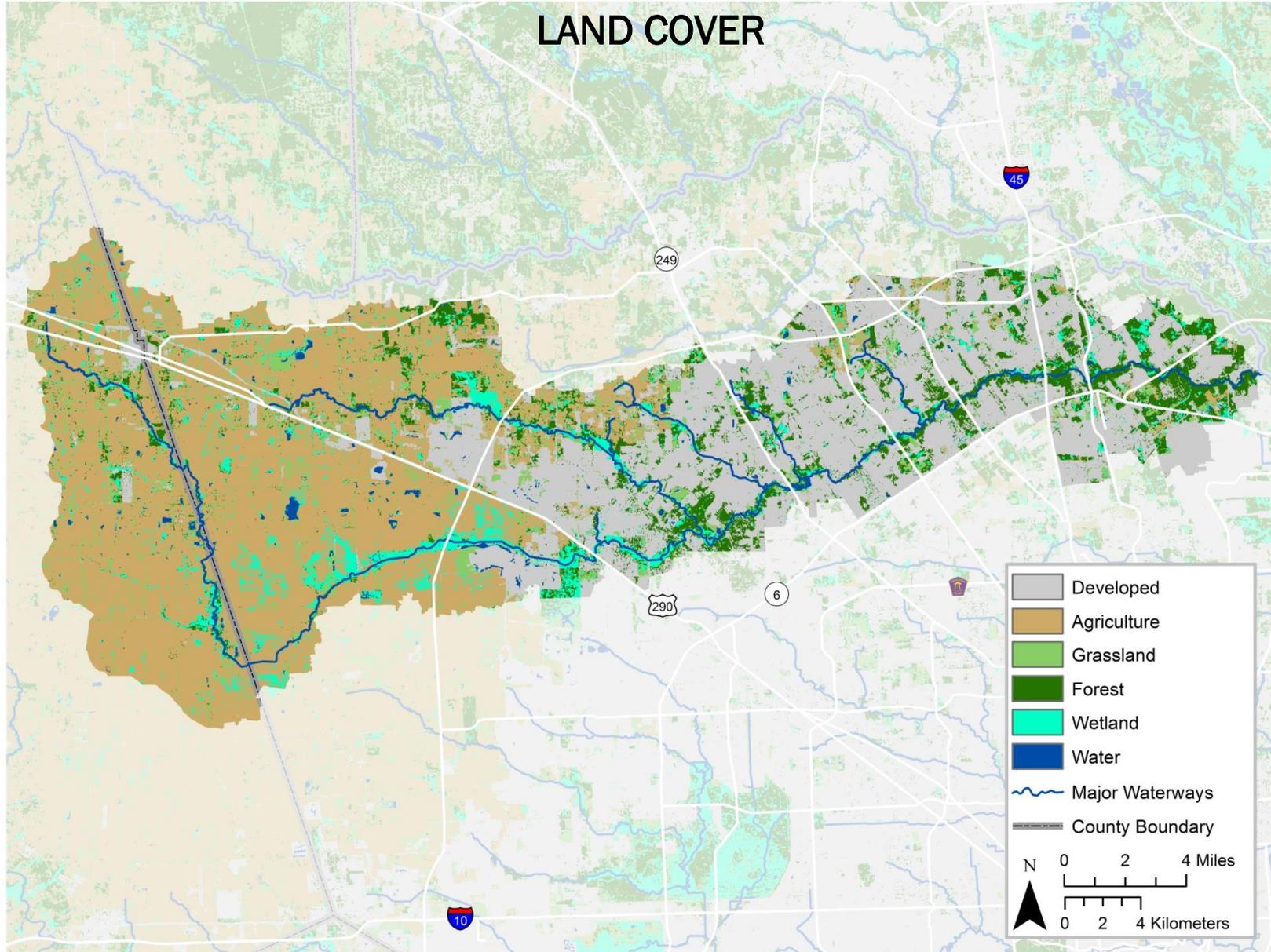


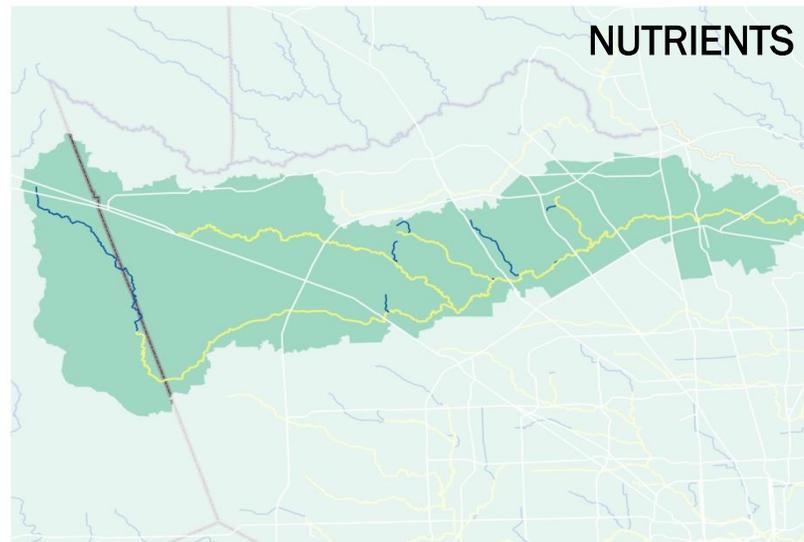
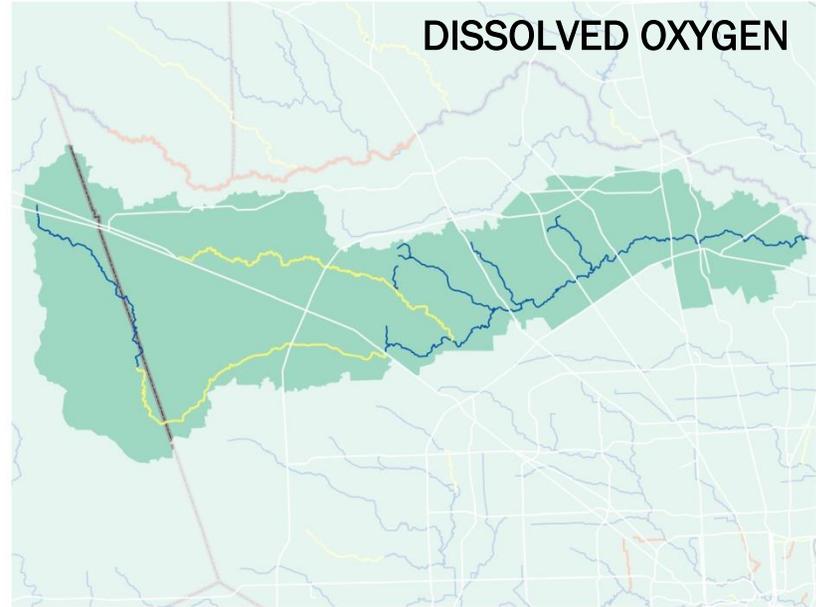
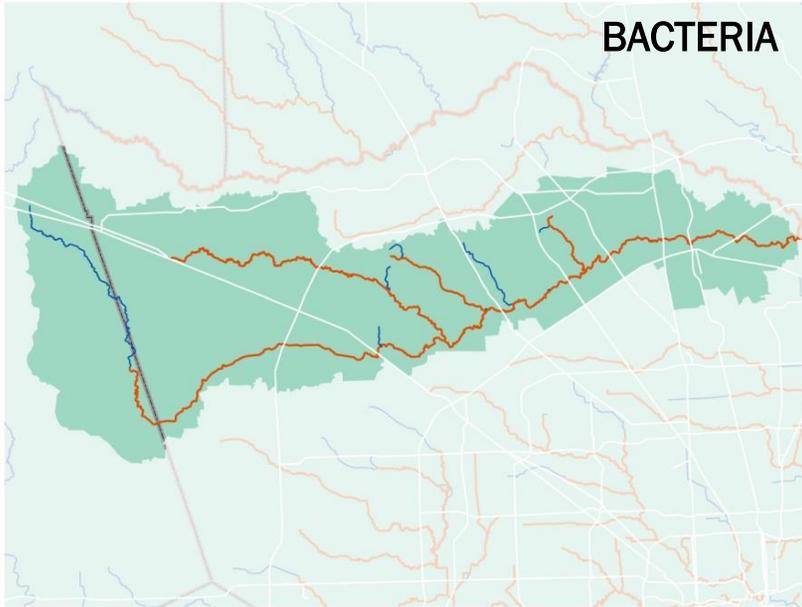
CYPRESS CREEK - SEGMENT 1009



CYPRESS CREEK - SEGMENT 1009

LAND COVER

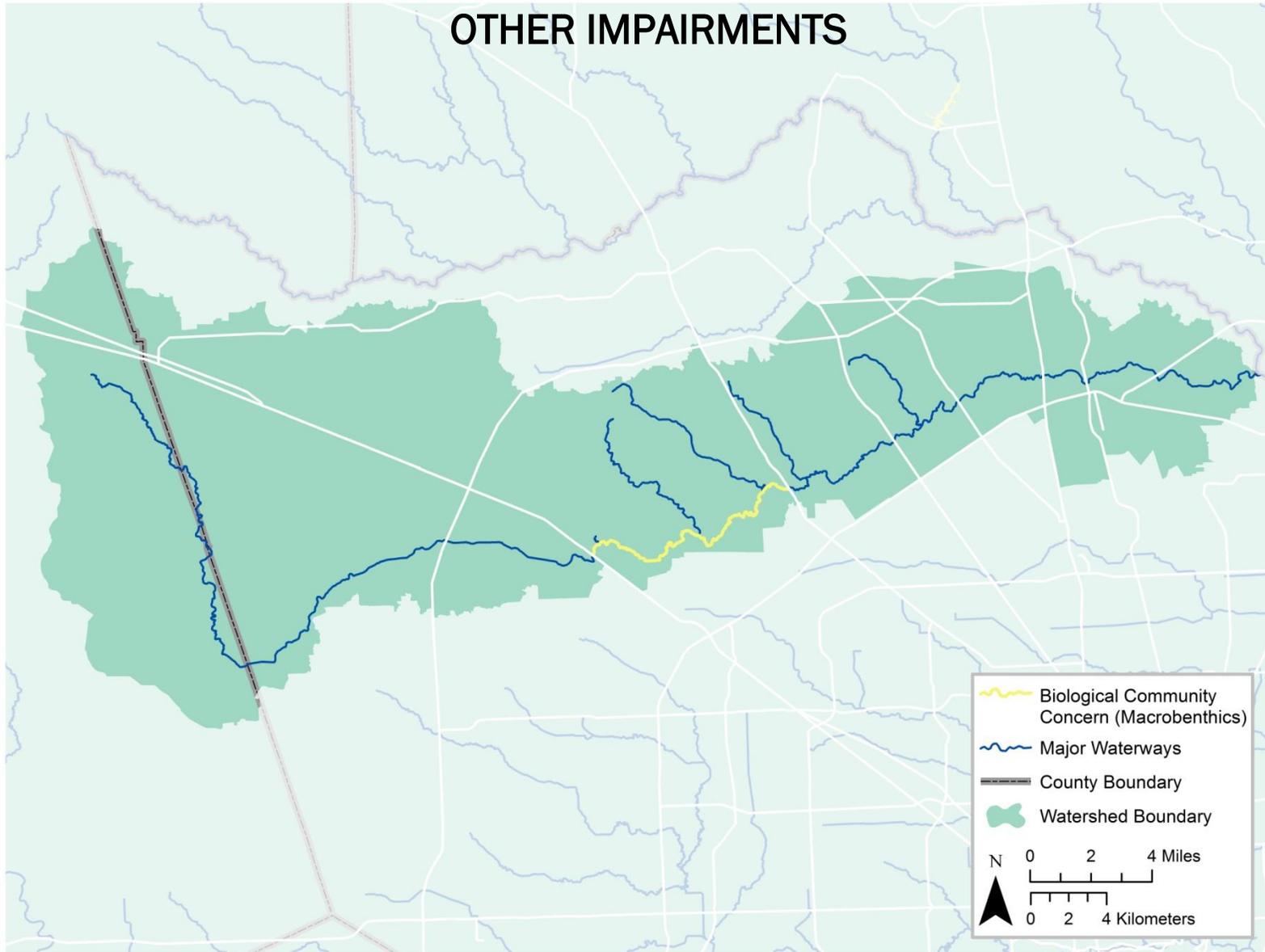




 Impairment  Concern  No Impairments or Concerns

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

| 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 |
| <i>E. coli</i> (MPN/100 mL) (grab): | 399 | Chlorophyll-a (µg/L): | 14.1 |
| <i>E. coli</i> (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>I - Impaired C - Of Concern</i> | 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 | <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 ▪ 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 | <ul style="list-style-type: none"> ▪ 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 | <ul style="list-style-type: none"> ▪ 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 | <ul style="list-style-type: none"> ▪ 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 |

| | | | |
|-------------------------------|---|--|---|
| | | | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> Loss of habitat due to channelization of waterway Ongoing maintenance of modified channel Bank erosion and erosion of construction sites | <ul style="list-style-type: none"> 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 2014 Texas 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 | 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 |
| 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 | HGAC Analysis 2001-2008 | HGAC Analysis 2008-2015 |
|-----------------|------------------|---------------------------|-------------------------|-------------------------|
| | | % Grab Exceedance | % Exceedance | % 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.