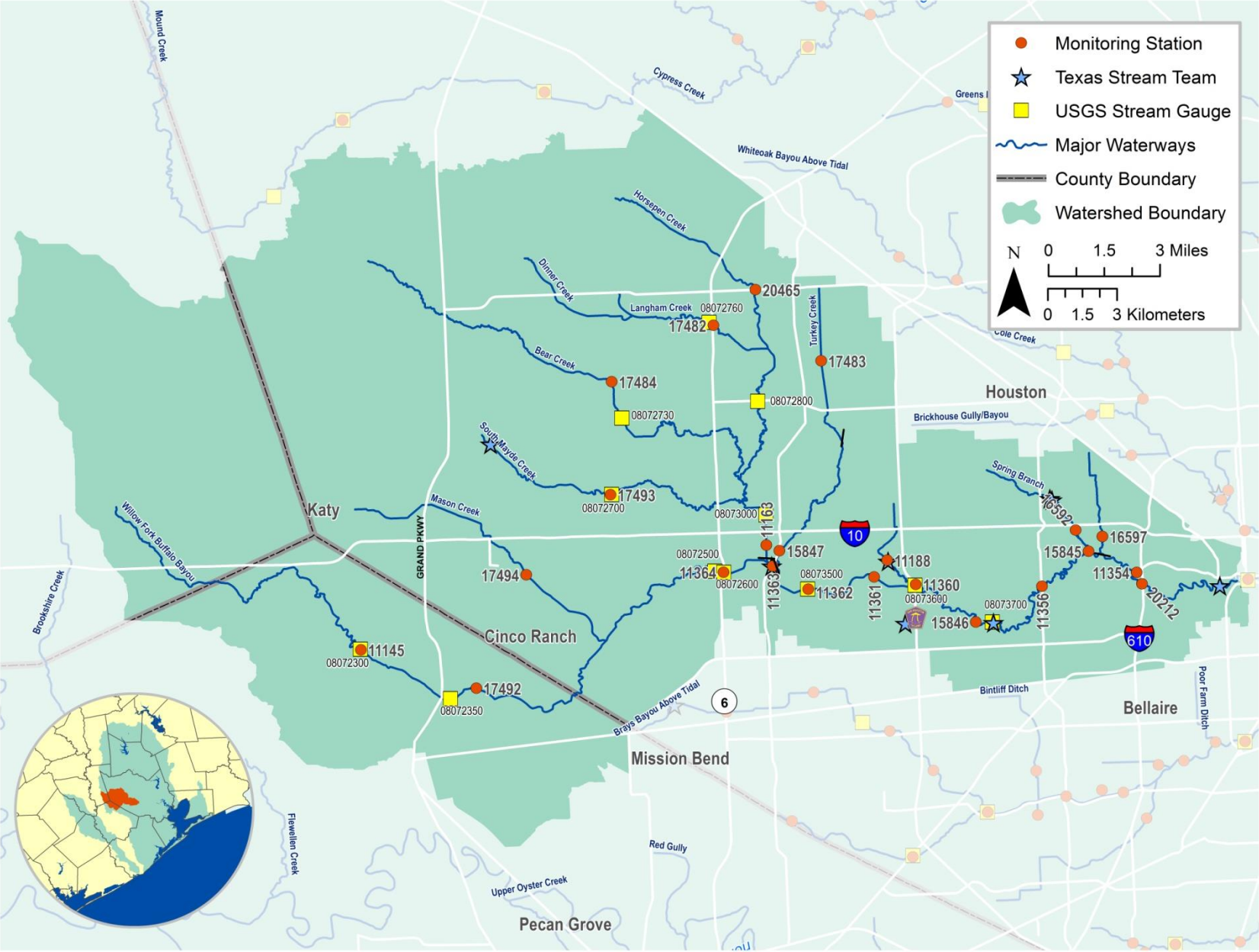
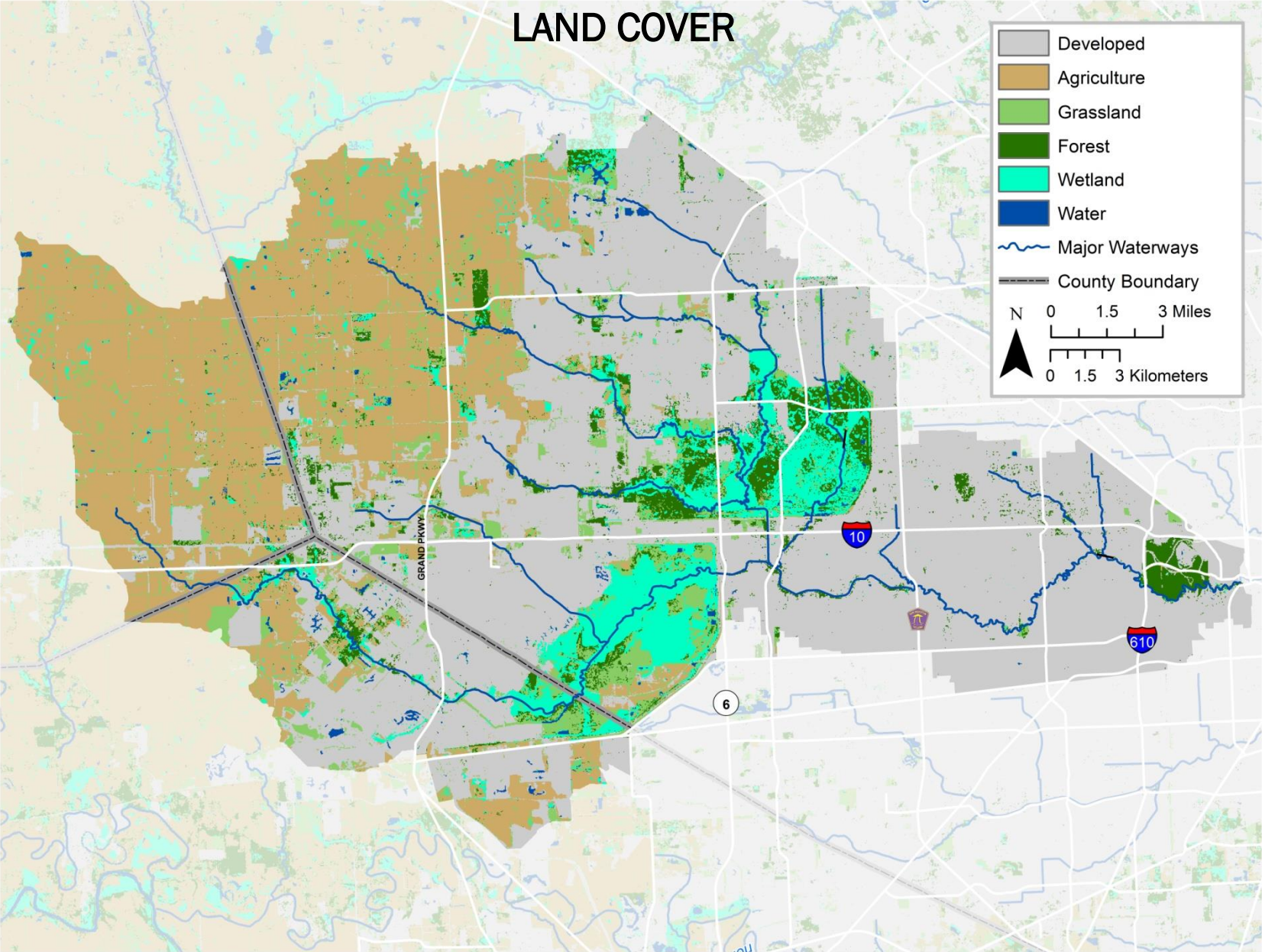


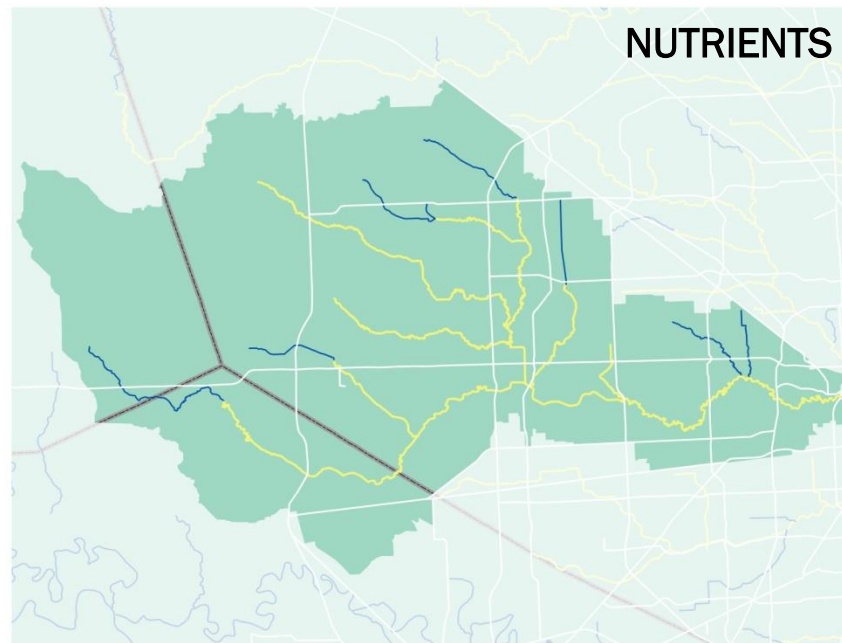
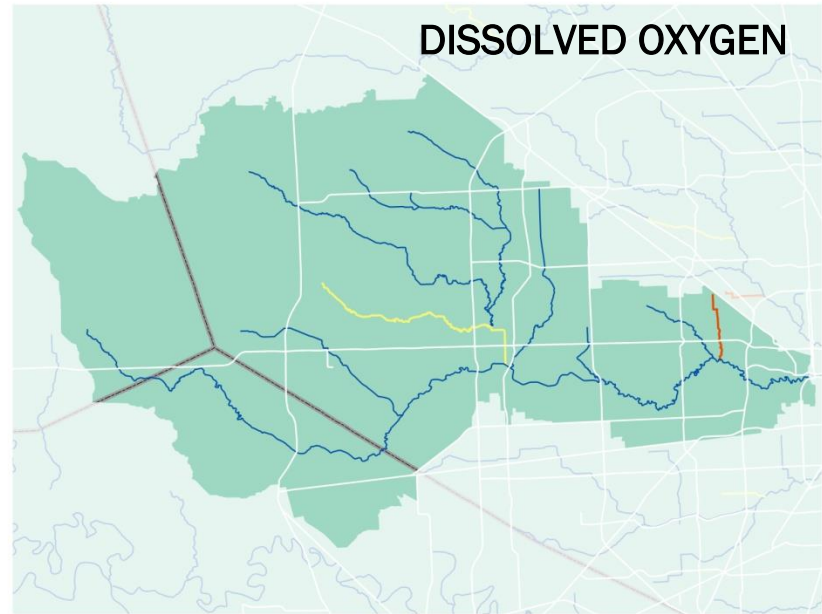
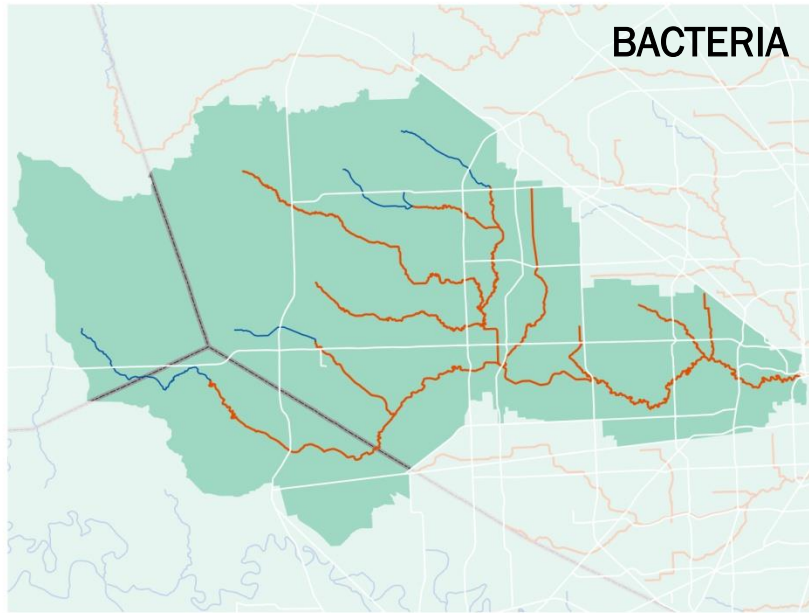
BUFFALO BAYOU ABOVE TIDAL - SEGMENT 1014



BUFFALO BAYOU ABOVE TIDAL - SEGMENT 1014

LAND COVER

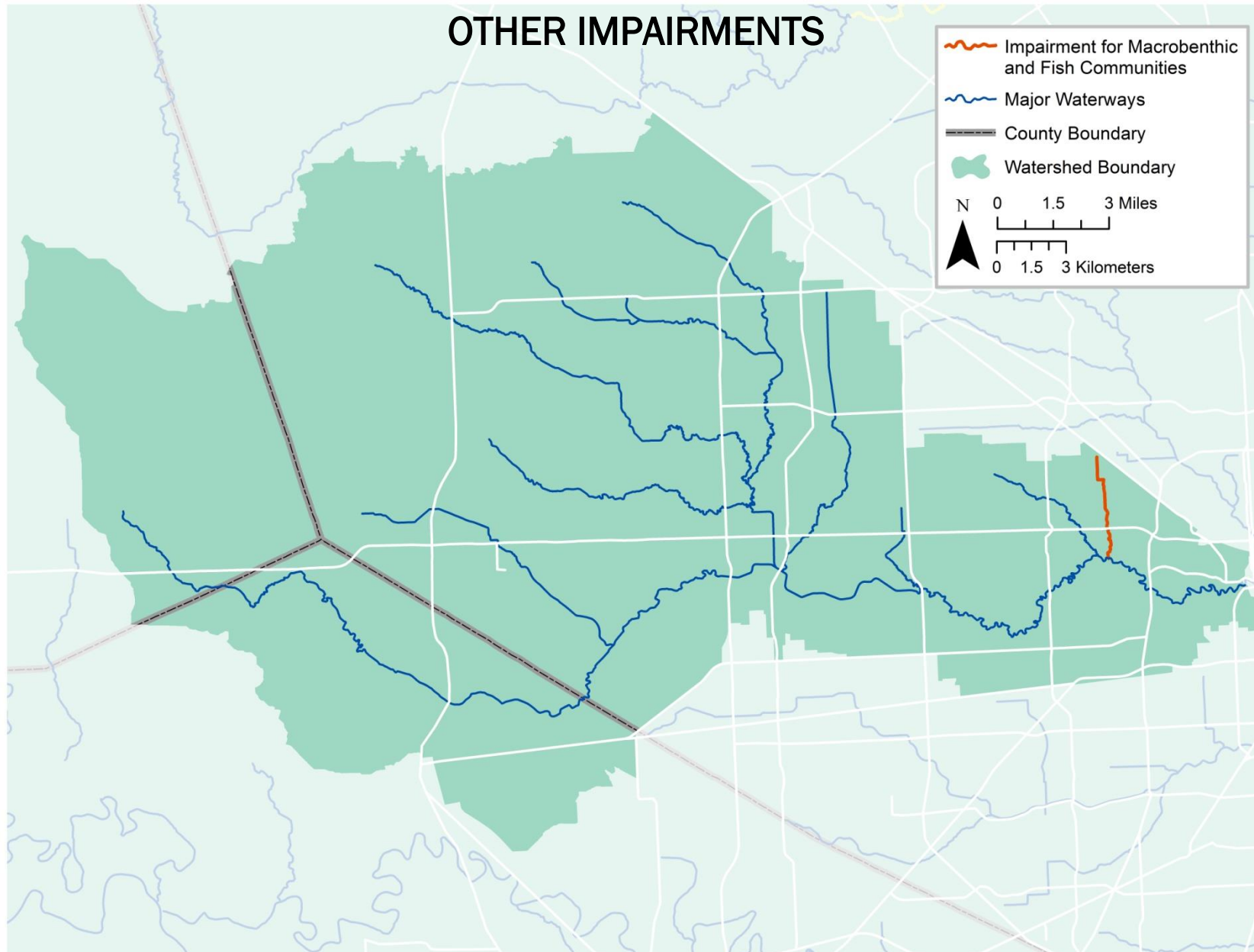




 Impairment  Concern  No Impairments or Concerns

BUFFALO BAYOU ABOVE TIDAL - SEGMENT 1014

OTHER IMPAIRMENTS



Segment Number:	1014	Name:	Buffalo Bayou Above Tidal		
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Length:	23 miles	Watershed Area:	351 square miles	Designated Uses:	Primary Contact Recreation 1; Limited Aquatic Life
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Number of Active Monitoring Stations:	23	Texas Stream Team Monitors:	4	Permitted Outfalls:	122
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Description:	<p>Segment 1014 (Perennial Stream w/ limited ALU): From a point 400 meters (440 yards) upstream of Shepherd Drive in Harris county to SH 6 in Harris County</p> <p>Segment 1014A (perennial Stream w/ intermediate ALU): Bear Creek (unclassified water body) – From the South Mayde Creek confluence to a point upstream of an unnamed tributary 1.24 km (0.77 mi) north of Langenbaugh Road in Harris County</p> <p>Segment 1014B (Perennial Stream w/ intermediate ALU): Buffalo Bayou/Barker Reservoir (unclassified water body) – From Barker Dam (Harris County) upstream to the Willow Fork Buffalo Bayou confluence (Fort Bend County)</p> <p>Segment 1014C (Perennial Stream w/ intermediate ALU): Horsepen Creek (Unclassified water body) – From the Langham Creek confluence upstream to a point 0.1 km (0.06 mi) west of Barker Cypress Road</p> <p>Segment 1014D: Retired segment description</p> <p>Segment 1014E (Perennial Stream w/ intermediate ALU): Langham Creek (unclassified water body) – From the Dinner Creek confluence upstream to FM 529</p> <p>Segment 1014F: Retired segment description</p> <p>Segment 1014G: Retired segment description</p> <p>Segment 1014H (Perennial Stream w/ intermediate ALU): South Mayde Creek (unclassified water body) – From the Buffalo Bayou confluence upstream to an unnamed tributary 1.05 km (0.65 mi) south of Clay Road</p> <p>Segment 1014I (Intermittent Stream): Willow Fork Buffalo Bayou (unclassified water body) – Intermittent stream with perennial pools from the confluence with Buffalo Bayou in Fort Bend County up to 1.0 km above US 90 in Waller County</p> <p>Segment 1014J (Perennial stream): Dinner Creek (unclassified water body) – From the confluence with Langham Creek upstream to Frey Road</p> <p>Segment 1014K (Perennial w/ intermediate ALU): Turkey Creek (unclassified water body) – From the South Mayde Creek confluence upstream to 1.1 km (0.68 mi) directly east of FM 529 in Harris County</p> <p>Segment 1014L (Perennial w/ intermediate ALU): Mason Creek (unclassified water body) – From the Buffalo Bayou confluence upstream to Mason Road upstream to 0.32 km (0.2 mi) east of Katyland Drive</p>
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Segment 1014M Perennial Stream w/ intermediate ALU): Newman Branch (Neimans Bayou) (unclassified water body) – From the Buffalo Bayou Above Tidal confluence to 0.1 km (0.06 mi) upstream of Hammerly Blvd in Harris County

Segment 1014N (Perennial w/ intermediate ALU): Rummel Creek (unclassified water body) – From the Buffalo Bayou Tidal confluence to 1.2 km (0.75 mi) upstream to IH-10 in Harris County

Segment 1014O (Perennial w/ intermediate ALU): Spring Branch (unclassified water body) – From the Buffalo Bayou Tidal confluence to 1.4 km (0.87 mi) upstream of Long Point Road in Harris County

Percent of Stream Impaired or of Concern

Segment ID	PCBs/Dioxin	Bacteria	Dissolved Oxygen	Nutrients	Chlorophyll a	Other
1014	-	100	-	100	-	-
1014A	-	100	-	100	-	-
1014B	-	100	-	100	-	-
1014C	-	38	-	38	-	-
1014E	-	92	-	92	-	-
1014H	-	100	100	100	-	-
1014K	-	100	-	57	-	-
1014L	-	58	-	58	-	-
1014M	-	100	100	-	-	100
1014N	-	100	-	100	-	-
1014O	-	100	-	-	-	-

Segment 1014

Standards	Perennial Stream	Screening Levels	Perennial Stream
Temperature (°C/°F):	33.3 / 92	Ammonia (mg/L):	0.33
Dissolved Oxygen (24-Hr Average) (mg/L):	4.0 / 3.0	Nitrate-N (mg/L):	1.95
Dissolved Oxygen (Absolute Minima) (mg/L):	3.0 / 2.0	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):	110		
Sulfate (mg/L as SO ₄):	65		
Total Dissolved Solids (mg/L):	600		

FY 2016 Active Monitoring Stations

Site ID	Site Description	Frequency	Monitoring Entity	Parameter Groups
11145	Buffalo Bayou at Greenbusch Road	Quarterly	H-GAC	Field, Conventional, Bacteria, Flow
11163	South Mayde Creek at Memorial Drive	Nine Times / Year	COH / HHS	Field, Conventional, Bacteria
11188	Rummel Creek at Memorial Drive	Nine Times / Year	COH / HHS	Field, Conventional, Bacteria
11354	Buffalo Bayou at Woodway Drive	Quarterly	TCEQ	Field, Conventional, Bacteria, Chlorophyll a
11356	Buffalo Bayou at Voss Road	Nine Times / Year	COH / HHS	Field, Conventional, Bacteria
11360	Buffalo Bayou at West Beltway 8	Nine Times / Year	COH / HHS	Field, Conventional, Bacteria
11361	Buffalo Bayou at Wilcrest Drive	Nine Times / Year	COH / HHS	Field, Conventional, Bacteria
11362	Buffalo Bayou at Dairy-Ashford	Nine Times / Year	COH / HHS	Field, Conventional, Bacteria
11362	Buffalo Bayou at Dairy-Ashford	Quarterly	TCEQ	Field, Conventional, Bacteria, Chlorophyll a, Flow
11363	Buffalo Bayou at Eldridge Road	Nine Times / Year	COH / HHS	Field, Conventional, Bacteria
11364	Buffalo Bayou at SH 6	Nine Times / Year	COH / HHS	Field, Conventional, Bacteria
15845	Buffalo Bayou at Chimney Rock Road	Nine Times / Year	COH / HHS	Field, Conventional, Bacteria
15846	Buffalo Bayou at Briar Forest Avenue	Nine Times / Year	COH / HHS	Field, Conventional, Bacteria
15847	Turkey Creek at Memorial Drive	Nine Times / Year	COH / HHS	Field, Conventional, Bacteria
16592	Spring Branch Creek at Wirt Rd	Nine Times / Year	COH / HHS	Field, Conventional, Bacteria
16597	Neimans Bayou at Memorial Dr	Nine Times / Year	COH / HHS	Field, Conventional, Bacteria
17482	Langham Creek at SH 6	Nine Times / Year	COH / HHS	Field, Conventional, Bacteria
17483	Turkey Creek SE of Tanner Road & north of Eldridge Parkway	Nine Times / Year	COH / HHS	Field, Conventional, Bacteria
17484	Bear Creek at Old Greenhouse Road	Nine Times / Year	COH / HHS	Field, Conventional, Bacteria

17492	Buffalo Bayou at South Mason /PeekRoads	Nine Times / Year	COH / HHS	Field, Conventional, Bacteria
17493	South Mayde Creek at Groeschke/Dulaney Roads	Nine Times / Year	COH / HHS	Field, Conventional, Bacteria
17494	Mason Creek at Park Pine Drive	Nine Times / Year	COH / HHS	Field, Conventional, Bacteria
20212	Buffalo Bayou at Loop 610 southbound Feeder Road	Nine Times / Year	COH / HHS	Field, Conventional, Bacteria
20465	Horsepen Creek at FM 529	Quarterly	H-GAC	Field, Conventional, Bacteria, Flow

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	1014 1014A 1014B 1014C 1014E 1014H 1014K 1014L 1014M 1014N 1014O	<ul style="list-style-type: none"> ▪ Rapid urbanization and increased impervious cover ▪ Animal waste from agricultural production ▪ Constructed stormwater controls failing ▪ WWTF non-compliance, overflows, and collection system by-passes ▪ Poorly operated or undersized WWTFs ▪ Direct and dry weather discharges ▪ 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 ▪ 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 ▪ Create and implement Water Quality Management Plans for individual agricultural properties ▪ Regionalize chronically non-compliant WWTFs ▪ Impose new or stricter bacteria limits than those designated by TCEQ ▪ 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 operations and maintenance ▪ Ensure proper citing of new or replacement OSSFs
Dissolved Oxygen Concentrations	1014H C 1014M I	<ul style="list-style-type: none"> ▪ Excessive nutrients and organic matter from agricultural production ▪ Excessive nutrients and organic matter from 	<ul style="list-style-type: none"> ▪ Create and implement Water Quality Management Plans for individual agricultural properties ▪ Install and/or conserve riparian buffer areas along all

		<p>WWTF effluent, SSOs, malfunctioning OSSFs, illegal disposal of grease trap waste, and biodegradable solid waste (e.g., grass clippings and pet waste)</p> <ul style="list-style-type: none"> Vegetative canopy removed 	<p>waterways</p> <ul style="list-style-type: none"> Improve compliance and enforcement of existing stormwater quality permits Regionalize chronically non-compliant WWTFs Improve operation and maintenance of existing WWTF and collection systems Increase OSSF maintenance and repairs More public education regarding disposal of household fats, oils, and grease 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	<p>1014 C 1014A C 1014B C 1014C C 1014E C 1014H C 1014K C 1014L C 1014N C</p>	<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, sanitary sewer overflows, and malfunctioning OSSFs 	<ul style="list-style-type: none"> Create and implement 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
Impaired Macrobenthic and Fish Communities	1014M I	<ul style="list-style-type: none"> Loss of habitat due to channelization of waterway Erosion from construction sites including roads, and commercial and residential developments Erosion from agricultural properties 	<ul style="list-style-type: none"> Work with drainage districts to install/construct habitat that doesn't interfere with water movement Strategically plant vegetation to enhance tree canopy and slow bank erosion to create more habitat

Segment Discussion

Watershed Characteristics: This segment extends from the heavily developed areas of Houston's urban core, through dense residential areas, and into the primarily rural and agricultural areas of western Harris County. Buffalo Bayou Above Tidal drains into Buffalo Bayou Tidal and then into the Houston Ship Channel and the Galveston Bay system. It drains an area that includes both Barker and Addicks reservoirs in its western portion and thus is affected greatly by the amount of water being released at any given time from their dams. Large tracts of land in the northwest areas of the segment are dedicated to cultivated crops or ranch activities. East of State Highway 6, the Bayou is primarily a wooded waterway immediately adjacent to parkland (Terry Hershey Park) or primarily affluent urban residential areas and golf courses. There are not an appreciable number of industrial facilities in this segment. Because of the narrow and deep profile of the Bayou, recreational activity consists primarily of canoeing and kayaking and limited swimming in some areas.

Water Quality Issues: Each of the 13 assessment units (AUs) in the watershed are listed in the 2014 IR as impaired for contact recreation use due to high levels of *E. coli*. With the exception of [Horsepen Creek](#) (AU 1014C_01) in the 2001-2008 seven-year period, the geometric mean standard of [126 MPN/100 mL](#) was exceeded throughout the watershed and change over time has been minimal in almost all AUs. There has been improvement in [1014E](#) and [1014N](#) since the 2014 assessment period.

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
1014_01	674	836 / 68.7	675 / 62.7
1014A_01	347	351 / 44.4	286 / 37.7
1014B_01	310	490 / 49.3	284 / 37.1
1014C_01	219	124 / 0.0	356 / 39.3
1014E_01	592	1103 / 70.8	355 / 54.1
1014H_01	438	431 / 47.3	306 / 34.4
1014H_02	605	520 / 39.4	558 / 53.3
1014K_01	343	714 / 66.2	319 / 41.9
1014K_02	457	900 / 62.9	390 / 45.9
1014L_01	629	1059 / 68.1	470 / 52.5
1014M_01	1023	815 / 62.2	1251 / 68.3
1014N_01	2051	2711 / 86.3	1698 / 77.4
1014O_01	1887	2635 / 87.5	1728 / 78.7

General uses are not supported in most of the watershed due to elevated nutrient concentrations. The 2014 TCEQ assessment identified concerns due to Nitrate-nitrogen (nitrate) in 9 AUs, total phosphorus (TP) in 8 AUs, and ammonia in 6 AUs. Exceedance statistics for TP are presented in the table below. As can be seen, there has been little improvement since 2000.

Assessment Unit	Parameter	TCEQ Assessment (2005-2012)	HGAC Analysis 2001-2008	HGAC Analysis 2008-2015
		% Grab Exceedance	% Exceedance	% Exceedance
1014_01	Total Phosphorus	72.1	61.6	77.9
1014A_01	Total Phosphorus	91.2	74.5	91.9
1014B_01	Total Phosphorus	76.4	61.1	77.8
1014C_01	Total Phosphorus	95.0	100	88.9
1014E_01	Total Phosphorus	92.6	84.3	91.9
1014H_01	Total Phosphorus	86.6	67.3	90.2
1014H_02	Total Phosphorus	94.0	86.0	95.1
1014L_01	Total Phosphorus	91.2	90.0	91.9

Aquatic life uses are not fully supported throughout the watershed. Neimans Bayou (Newman Branch) is listed as impaired for depressed dissolved oxygen (DO), fish community, and macrobenthic community. A DO concern was identified in South Mayde Creek (1014H) on the basis of DO grab samples.

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.

Trends: A total of 54 statistically significant water quality parameter trends were detected for the 11 assessment units located in the Buffalo Bayou Above Tidal watershed. The most common trends seen throughout all classified and unclassified segments include increasing [ammonia](#), [nitrate](#), [sulfate](#), and [TP](#) concentrations. The majority of nitrate and TP samples collected have exceeded the 1.95 mg/L and 0.69 mg/L screening criteria, respectively, during the period of record. However, high bacteria levels remain to be the greatest water quality concern for this watershed.

Regression analysis of bacteria data revealed that *E. coli* concentrations are improving in segments [1014L \(Mason Creek\)](#), [1014E \(Langham Creek\)](#), and [1014K \(Turkey Creek\)](#). The only increasing *E. coli* trend was detected at monitoring stations located on segment [1014M \(Neimans Bayou\)](#). Bacteria trends remain stable for all remaining assessment units; however, the majority of samples remain significantly higher than the 126 MPN/100 mL water quality standard. Refer to the moving seven year geometric mean plots in the Water Quality Issues discussion section of this summary for more information about variations in *E. coli* geometric mean concentrations over time.

A plot of level of [E. coli density and TP concentration as a function of flow rate](#) displays a pattern that suggests Buffalo Bayou at station 11362 is “effluent dominated”, where the chemistry of the water body is significantly influenced by wastewater treatment facility effluent. If this is the case, little improvement in nutrient levels can be expected until treatment processes are modified to remove more phosphorus and nitrogen. The increasing bacteria trend in Neimans Bayou is accompanied by a gradual [decline in dissolved oxygen \(DO\) levels](#). This combination of water quality trends is likely the reason for the current macrobenthic and fish community impairment listing for Neimans Bayou on the 2014 Texas Integrated Report. DO levels for the remainder of the segments in the watershed have been stable since 2000 with the only other significant trend seen in [Rummel Creek](#) where DO levels are decreasing over time.

Recommendations

Address concerns found in this segment summary through stakeholder participation in the BIG.

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