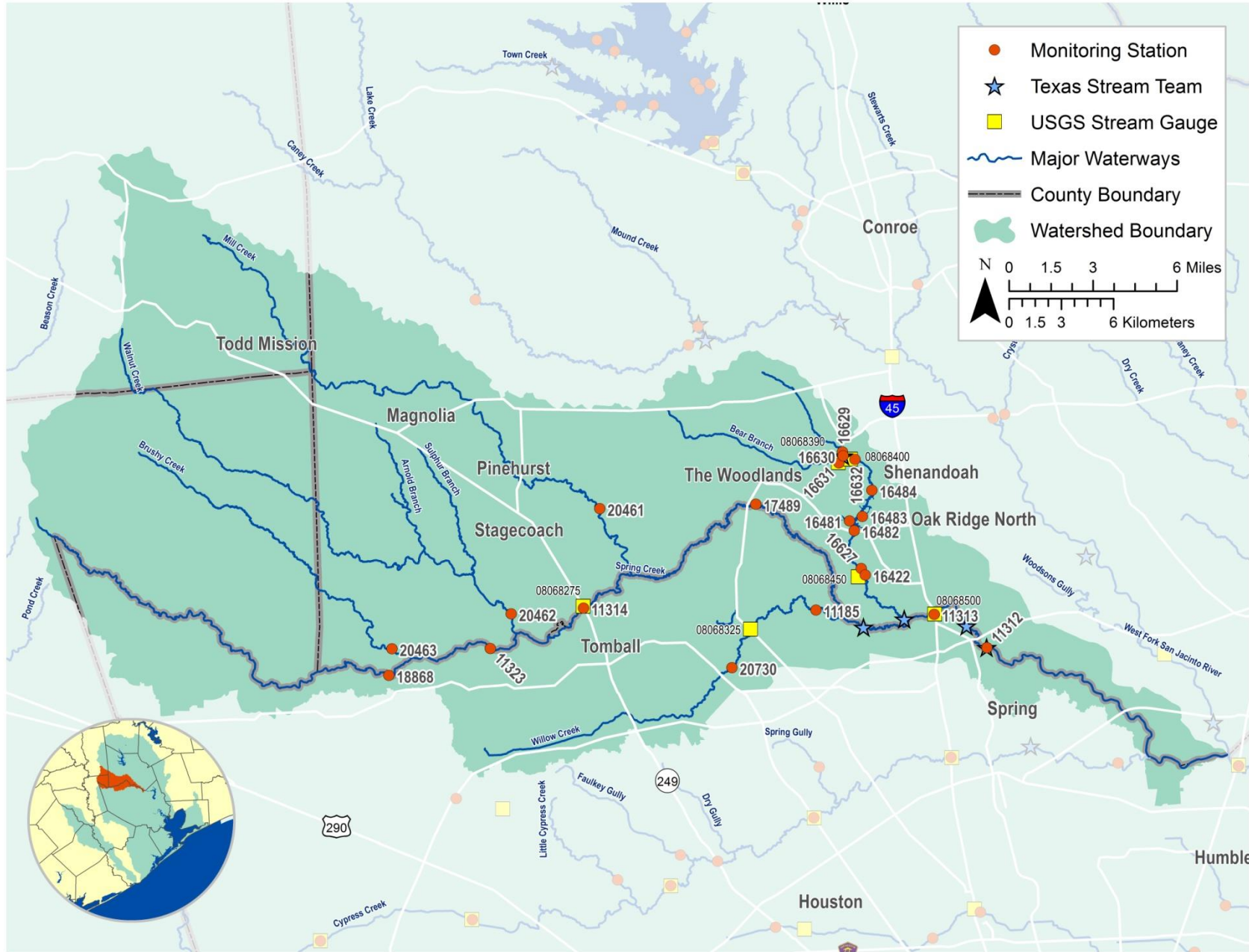
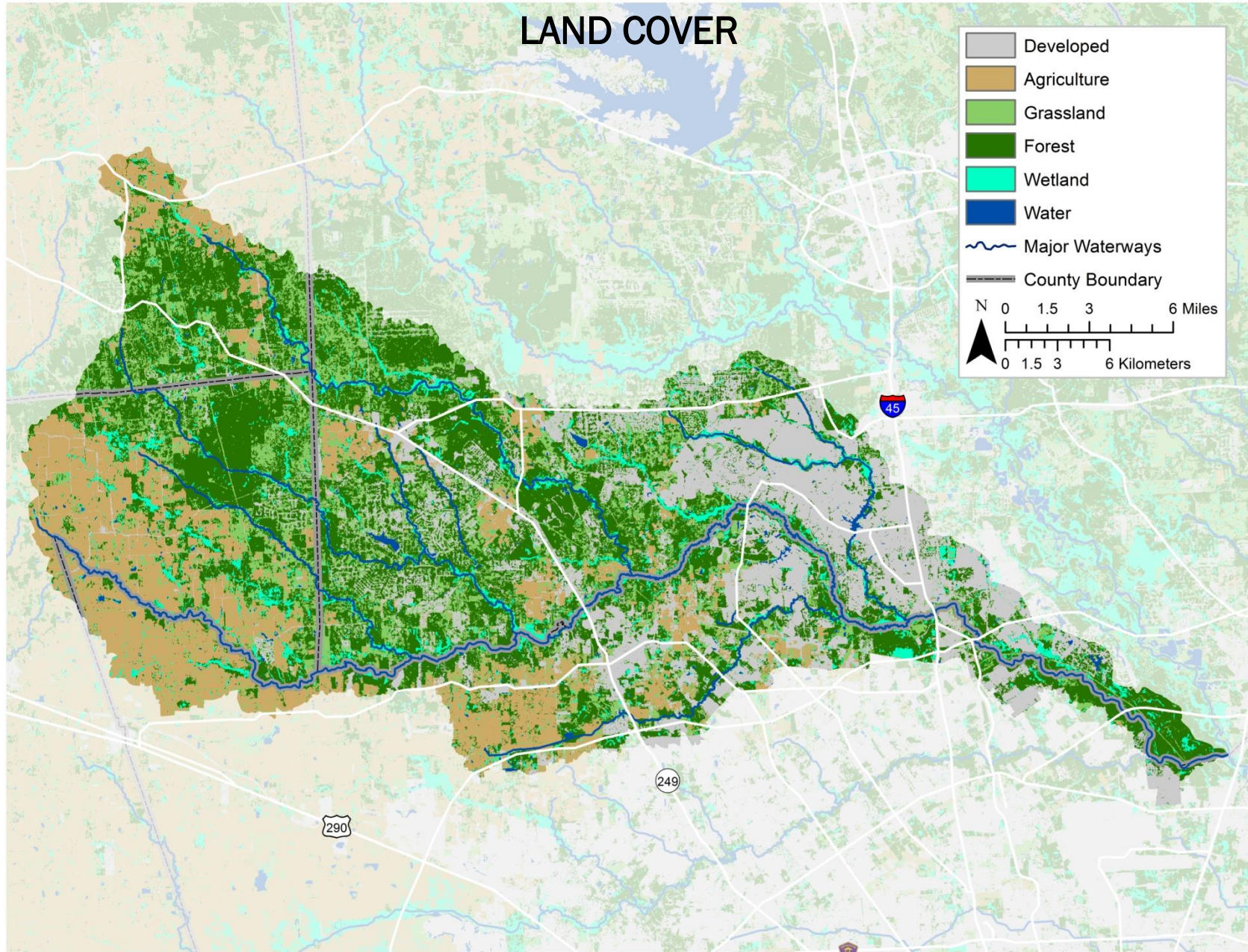


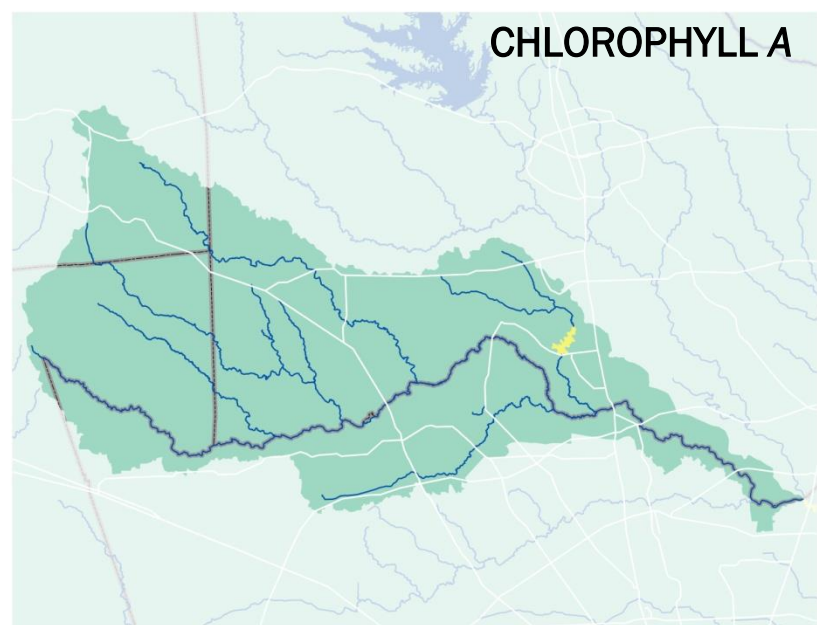
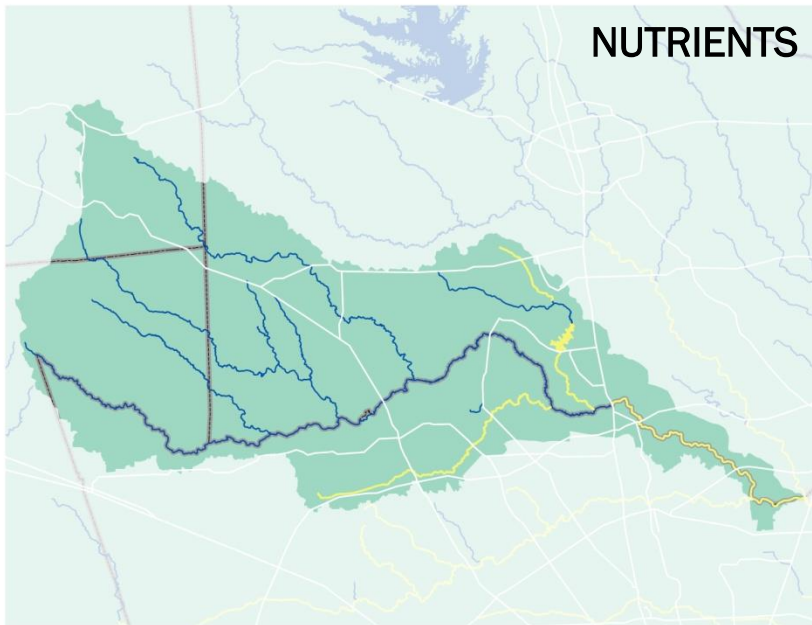
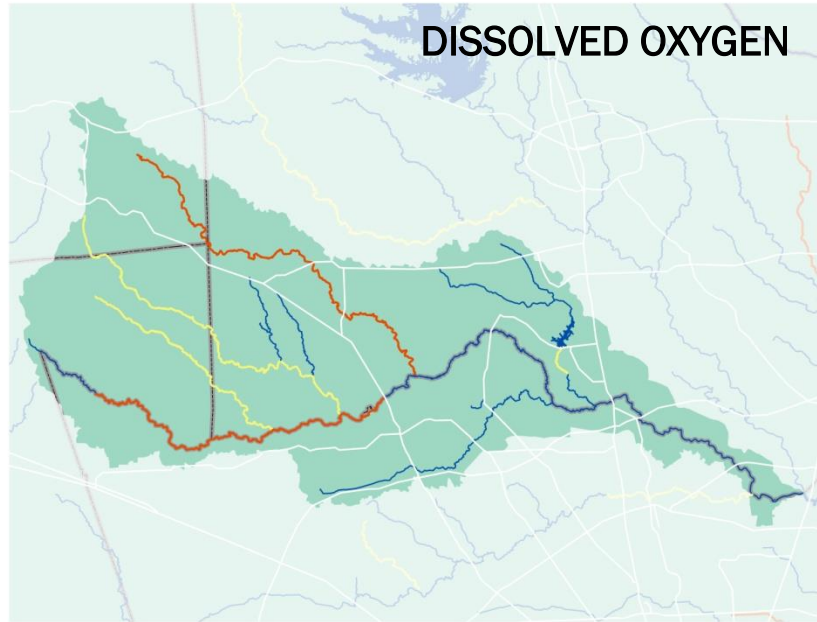
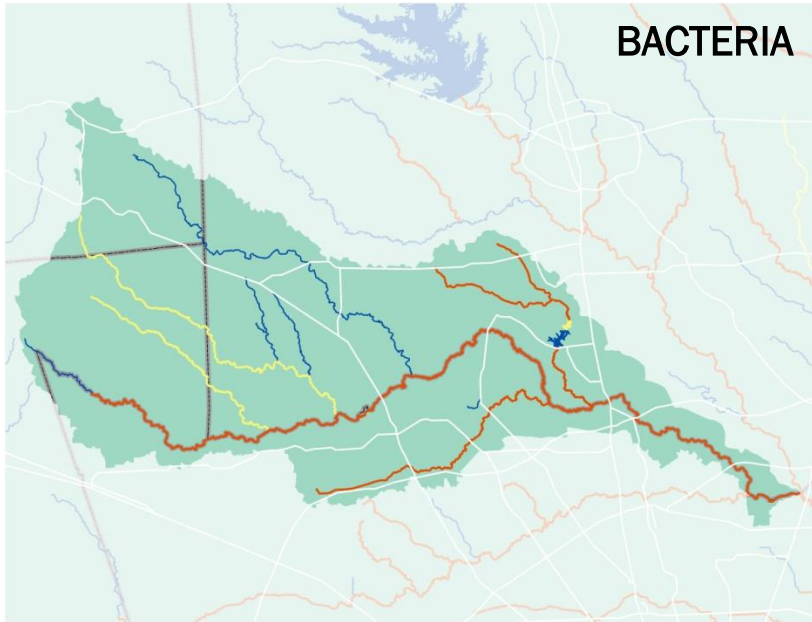
SPRING CREEK - SEGMENT 1008



SPRING CREEK - SEGMENT 1008

LAND COVER





~~~~~ Impairment    ~~~~~ Concern    ~~~~~ Unimpacted

Segment Number: **1008** Name:

## Spring Creek

**Length:** 71 miles **Watershed Area:** 441 square miles **Designated Uses:** Primary Contact Recreation 1; High Aquatic Life; Public Water Supply

**Number of Active Monitoring Stations:** 21 **Texas Stream Team Monitors:** 4 **Permitted Outfalls:** 74

### Description:

Segment 1008 (Perennial Stream w/ high ALU): From the confluence with the West Fork San Jacinto River in Harris/Montgomery County to the most upstream crossing of FM 1736 in Waller County

Segment 1008A (Perennial Stream w/ intermediate ALU): Mill Creek (unclassified water body)—Perennial stream from the normal pool elevation of Neidigk Lake upstream to the confluence of Hurricane Creek and Kickapoo Creek

Segment 1008B (Intermittent with Pools w/ limited ALU): Upper Panther Branch (unclassified water body)—From the normal pool elevation of 125 feet of Lake Woodlands upstream to Old Conroe Road confluence

Segment 1008C (Perennial Stream w/ intermediate ALU): Lower Panther Branch (unclassified water body)—From the Spring Creek confluence upstream to the dam impounding Lake Woodlands in Montgomery County

Segment 1008D (Intermittent with Pools): Intermittent stream with perennial pools (unclassified water body) - From the confluence of Cannon Gully up to 0.1 mi below Kuykendahl Road

Segment 1008E (Intermittent with Pools w/ limited ALU): Bear Branch (unclassified water body)—From the Upper Panther Branch confluence to south of FM 1488 in Montgomery County

Segment 1008F (Reservoir w/ high ALU): Lake Woodlands (unclassified water body)— From Lake Woodlands Dam to confluence with Upper Panther Branch Creek in Montgomery County (impounds Upper Panther Branch)

Segment 1008G: Retired segment description

Segment 1008H (Perennial Stream w/ high ALU): Willow Creek (unclassified water body)—From the Spring Creek confluence to a point 0.3 mi north of Juergen Road

Segment 1008I (Perennial Stream w/ high ALU): Walnut Creek (unclassified water body)—From the Spring Creek confluence to a point 25.5 mi upstream

Segment 1008J (Perennial Stream w/ high ALU): Brushy Creek (unclassified water body)—From the Spring Creek confluence to a point 3.5 mi upstream of FM 1488

Segment 1008K (Intermittent Stream with perennial pools): Arnold Branch (unclassified water body): Intermittent stream with perennial pools from the confluence with Mink Branch upstream to the headwaters just upstream of FM 1774

Segment 1008L (Perennial Stream): Mink Branch (unclassified water body) – Perennial stream from the confluence with Walnut Creek upstream to the confluence with an unnamed tributary approximately 1.0 km (0.6 mi) upstream of Nichols-Sawmill Road

Segment 1008M (Intermittent Stream with perennial pools): Sulphur Branch (unclassified water body) – Intermittent stream with perennial pools from an unnamed

reservoir, known locally as Lake Apache, upstream to FM 1774. The unnamed reservoir impounds Sulphur Branch approximately 0.8 km (0.5 mi) upstream of the confluence with Walnut Creek

### Percent of Stream Impaired or of Concern

| Segment ID | PCBs/Dioxin | Bacteria | Dissolved Oxygen | Nutrients | Chlorophyll a | Other |
|------------|-------------|----------|------------------|-----------|---------------|-------|
| 1008       | -           | 91       | 34               | 23        | -             | 34    |
| 1008A      | -           | -        | 100              | -         | -             | -     |
| 1008B      | -           | 100      | -                | 25        | -             | -     |
| 1008C      | -           | 100      | 61               | 100       | -             | -     |
| 1008E      | -           | 100      | -                | -         | -             | -     |
| 1008F      | -           | 28       | -                | 100       | 100           | -     |
| 1008H      | -           | 100      | -                | 100       | -             | -     |
| 1008I      | -           | 100      | 100              | -         | -             | -     |
| 1008J      | -           | 100      | 100              | -         | -             | -     |

### Segment 1008

| Standards                                     | Screening Levels |           |                      |
|-----------------------------------------------|------------------|-----------|----------------------|
|                                               | Perennial Stream | Reservoir | Intermittent w/ Pool |
| Temperature (°C/°F):                          | 32 / 90          | 32 / 90   | 32 / 90              |
| Dissolved Oxygen (24-Hr Average) (mg/L):      | 5.0 / 4.0 / 3.0  | 5.0       | 3.0                  |
| Dissolved Oxygen (Absolute Minima) (mg/L):    | 3.0              | 3.0       | 2.0                  |
| pH (standard units):                          | 6.5-9.0          | 6.5-9.0   | 6.5-9.0              |
| <i>E. coli</i> (MPN/100 mL) (grab):           | 399              | -         | -                    |
| <i>E. coli</i> (MPN/100 mL) (geometric mean): | 126              | 126       | 126                  |
| Chloride (mg/L as Cl):                        | 100              | 100       | 100                  |
| Sulfate (mg/L as SO <sub>4</sub> ):           | 50               | 50        | 50                   |
| Total Dissolved Solids (mg/L):                | 450              | 450       | 450                  |
| Drinking Water Human Health - Fluoride (mg/L) | 4.0              | 4.0       | -                    |
| Drinking Water Human Health - Nitrate (mg/L)  | 10.0             | 10.0      | -                    |

## FY 2016 Active Monitoring Stations

| Site ID | Site Description                                | Frequency         | Monitoring Entity | Parameter Groups                                                                    |
|---------|-------------------------------------------------|-------------------|-------------------|-------------------------------------------------------------------------------------|
| 11185   | Willow Creek at Gosling Road                    | Nine Times / Year | COH / HHS         | Field, Conventional, Bacteria                                                       |
| 11312   | Spring Creek at Riley Fuzzel Road               | Nine Times / Year | COH / HHS         | Field, Conventional, Bacteria, Flow                                                 |
| 11313   | Spring Creek Bridge at IH-45                    | Bimonthly         | COH / WQC         | Field, Conventional, Bacteria, Flow                                                 |
| 11313   | Spring Creek Bridge at IH-45                    | Ten Times / Year  | USGS              | Field, Conventional, Bacteria, Flow, 24-Hour DO, Metals in Water, Organics in Water |
| 11313   | Spring Creek Bridge at IH-45                    | Daily             | USGS              | Field, Flow, 24-Hour DO                                                             |
| 11314   | Spring Creek at SH 249                          | Nine Times / Year | COH / HHS         | Field, Conventional, Bacteria, Flow                                                 |
| 11314   | Spring Creek at SH 249                          | Daily             | USGS              | Flow                                                                                |
| 11323   | Spring Creek at Decker Prairie Rosehill Rd      | Nine Times / Year | COH / HHS         | Field, Conventional, Bacteria                                                       |
| 16422   | Panther Branch at Sawdust Rd                    | Quarterly         | SJRA              | Conventional, Bacteria                                                              |
| 16422   | Panther Branch at Sawdust Rd                    | Monthly           | SJRA              | Field                                                                               |
| 16481   | Lk Woodlands at Western Reach                   | Monthly           | SJRA              | Field                                                                               |
| 16481   | Lk Woodlands at Western Reach                   | Quarterly         | SJRA              | Conventional, Bacteria                                                              |
| 16481   | Lk Woodlands at Western Reach                   | Twice / Year      | SJRA              | Metals in Water                                                                     |
| 16482   | Lk Woodlands at South End                       | Monthly           | SJRA              | Field                                                                               |
| 16482   | Lk Woodlands at South End                       | Quarterly         | SJRA              | Conventional, Bacteria                                                              |
| 16482   | Lk Woodlands at South End                       | Twice / Year      | SJRA              | Metals in Water                                                                     |
| 16483   | Lk Woodlands at Mid Point                       | Monthly           | SJRA              | Field                                                                               |
| 16483   | Lk Woodlands at Mid Point                       | Quarterly         | SJRA              | Conventional, Bacteria                                                              |
| 16483   | Lk Woodlands at Mid Point                       | Twice / Year      | SJRA              | Metals in Water                                                                     |
| 16484   | Lk Woodlands at North End                       | Monthly           | SJRA              | Field                                                                               |
| 16484   | Lk Woodlands at North End                       | Quarterly         | SJRA              | Conventional, Bacteria                                                              |
| 16484   | Lk Woodlands at North End                       | Twice / Year      | SJRA              | Metals in Water                                                                     |
| 16627   | Lower Panther Branch at Sawdust Rd              | Monthly           | SJRA              | Field                                                                               |
| 16627   | Lower Panther Branch at Sawdust Rd              | Quarterly         | SJRA              | Conventional, Bacteria                                                              |
| 16627   | Lower Panther Branch at Sawdust Rd              | Twice / Year      | SJRA              | Metals in Water                                                                     |
| 16629   | Upper Panther Branch upstream of WWTF 2 Outfall | Monthly           | SJRA              | Field                                                                               |
| 16629   | Upper Panther Branch upstream of WWTF 2 Outfall | Quarterly         | SJRA              | Conventional, Bacteria                                                              |
| 16629   | Upper Panther Branch upstream of WWTF 2 Outfall | Twice / Year      | SJRA              | Metals in Water                                                                     |
| 16630   | Upper Panther Branch 60 M downstream of WWTF 2  | Monthly           | SJRA              | Field                                                                               |
| 16630   | Upper Panther Branch 60 M downstream of WWTF 2  | Quarterly         | SJRA              | Conventional, Bacteria                                                              |
| 16630   | Upper Panther Branch 60 M downstream of WWTF 2  | Twice / Year      | SJRA              | Metals in Water                                                                     |
| 16631   | Bear Branch at Research Forest Dr.              | Monthly           | SJRA              | Field                                                                               |
| 16631   | Bear Branch at Research Forest Dr.              | Quarterly         | SJRA              | Conventional, Bacteria                                                              |
| 16631   | Bear Branch at Research Forest Dr.              | Twice / Year      | SJRA              | Metals in Water                                                                     |
| 16632   | Upper Panther Branch at Gosling Rd              | Daily             | USGS              | Field, Flow, & 24-hr DO                                                             |
| 17489   | Spring Creek at Kuykendahl Rd                   | Nine Times / Year | COH / HHS         | Field, Conventional, Bacteria                                                       |
| 18868   | Spring Creek at Roberts Cemetery Rd             | Quarterly         | H-GAC             | Field, Conventional, Bacteria, Flow                                                 |

|       |                                    |                   |           |                                     |
|-------|------------------------------------|-------------------|-----------|-------------------------------------|
| 20461 | Mill Ck at Hardin Store Rd         | Quarterly         | H-GAC     | Flow, 24-Hour DO                    |
| 20461 | Mill Ck at Hardin Store Rd         | Quarterly         | H-GAC     | Field, Conventional, Bacteria, Flow |
| 20462 | Walnut Ck at Decker Prairie Rd     | Quarterly         | H-GAC     | Flow, 24-Hour DO                    |
| 20462 | Walnut Ck at Decker Prairie Rd     | Quarterly         | H-GAC     | Field, Conventional, Bacteria, Flow |
| 20463 | Brushy Ck at Glenmont Estates Blvd | Quarterly         | H-GAC     | Flow, 24-Hour DO                    |
| 20463 | Brushy Ck at Glenmont Estates Blvd | Quarterly         | H-GAC     | Field, Conventional, Bacteria, Flow |
| 20730 | Willow Ck at Tuwa Rd               | Nine Times / Year | COH / HHS | Field, Conventional, Bacteria       |

| Water Quality Issues                         |                                                                 |                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------------------------|-----------------------------------------------------------------|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Issue                                        | 2014 Assessment<br><i>I - Impaired</i><br><i>C - Of Concern</i> | Possible Causes / Influences / Concerns Voiced by Stakeholders | Possible Solutions / Actions To Be Taken                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Elevated Levels of Indicator Bacteria</b> | 1008                                                            | I                                                              | <ul style="list-style-type: none"> <li>▪ WWTF non-compliance, overflows, and collection system by-passes</li> <li>▪ Developments with malfunctioning OSSFs</li> <li>▪ Rapid urbanization and increased impervious cover</li> <li>▪ Constructed stormwater controls failing</li> <li>▪ Direct and dry weather discharges</li> <li>▪ Waste haulers illegal discharges/improper disposal</li> <li>▪ Improper pet waste disposal</li> <li>▪ Animal waste from agricultural production</li> </ul> | <ul style="list-style-type: none"> <li>▪ Increase monitoring requirements for self reporting</li> <li>▪ Impose new or stricter bacteria limits than those designated by TCEQ</li> <li>▪ Require all systems to develop and implement a utility asset management program and protect against power outages at lift stations or provide alternative power supplies during outages</li> <li>▪ Regionalize chronically non-compliant WWTFs</li> <li>▪ Ensure proper citing of new or replacement on-site Sewage facilities</li> <li>▪ More public education regarding OSSF operation and maintenance</li> <li>▪ More public education on pet waste disposal</li> <li>▪ Improve stormwater controls in new developments by adding bacteria reduction measures</li> <li>▪ Improve compliance and enforcement of existing stormwater quality permits</li> <li>▪ Improve construction oversight to minimize TSS discharges to waterways</li> <li>▪ Implement stream fencing or alternative water supplies to keep livestock out of or away from</li> </ul> |
|                                              | 1008B                                                           | I                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                              | 1008C                                                           | I                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                              | 1008E                                                           | I                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                              | 1008F                                                           | C                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                              | 1008H                                                           | I                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                              | 1008I                                                           | C                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                              | 1008J                                                           | C                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

|                                                       |       |   |                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------------------------|-------|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                       |       |   | <ul style="list-style-type: none"> <li>waterways</li> <li>Create and implement Water Quality Management Plans for individual agricultural Properties</li> </ul>                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Dissolved Oxygen Concentrations (24-hr DO Avg)</b> | 1008  | I | <ul style="list-style-type: none"> <li>Excessive nutrients and organic matter from WWTF effluent, sanitary sewer overflows, malfunctioning OSSFs, illegal disposal of grease trap waste, and biodegradable solid waste, such as grass clippings and pet waste</li> <li>Excessive nutrients and organic matter from agricultural production</li> </ul> | <ul style="list-style-type: none"> <li>Improve compliance and enforcement of existing stormwater quality permits</li> <li>Improve operation and maintenance of existing WWTF and collection systems</li> <li>Regionalize chronically malfunctioning WWTFs and reduce OSSFs</li> <li>Implement YardWise and Watersmart landscape Practices</li> <li>More public education on pet waste disposal</li> <li>More public education regarding disposal of household fats, oils, and grease</li> <li>More stringent OSSF maintenance and education</li> </ul> |
|                                                       |       |   |                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Dissolved Oxygen Concentrations (Grab Sample)</b>  | 1008  | C |                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                       | 1008A | I |                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                       | 1008C | C |                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                       | 1008F | C |                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                       | 1008I | C |                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                       | 1008J | C |                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Elevated Nutrients</b>                             | 1008  | C | <ul style="list-style-type: none"> <li>WWTF effluent, sanitary sewer overflows, and malfunctioning OSSFs</li> <li>Fertilizer runoff from urbanized properties, such as landscaped areas, residential lawns, and sport fields</li> <li>Agricultural runoff from pastures and fallow fields</li> </ul>                                                  | <ul style="list-style-type: none"> <li>Monitor phosphorus levels at WWTFs to determine if controls are needed</li> <li>Implement YardWise and Watersmart landscape Practices</li> <li>Create and implement Water Quality Management Plans for individual agricultural properties</li> <li>Install and/or conserve riparian buffer areas along waterways</li> </ul>                                                                                                                                                                                     |
|                                                       | 1008B | C |                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                       | 1008C | C |                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                       | 1008F | C |                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                       | 1008H | C |                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |



|                                       |         |                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Elevated Chlorophyll a Concentrations | 1008F C | <ul style="list-style-type: none"> <li>▪ Fertilizer runoff from surrounding watershed promotes algal growth in waterways</li> <li>▪ Nutrient loading from WWTF effluent, sanitary sewer overflows, and malfunctioning OSSFs</li> </ul> | <ul style="list-style-type: none"> <li>▪ Improve stormwater controls in new developments</li> <li>▪ Improve compliance and enforcement of existing stormwater quality permits</li> <li>▪ Support/continue/initiate public education regarding nutrients</li> <li>▪ Reduce or manage fertilizer runoff from agricultural areas</li> </ul> |
| Fish Community                        | 1008 C  | <ul style="list-style-type: none"> <li>▪ Loss of habitat due to channelization of waterway</li> <li>▪ Ongoing maintenance of modified channel</li> </ul>                                                                               | <ul style="list-style-type: none"> <li>▪ Strategically plant vegetation to enhance tree canopy and slow bank erosion to create more habitat</li> <li>▪ Work with local authorities to minimize sediment runoff from construction sites</li> </ul>                                                                                        |

**Segment Discussion:**

**Watershed Characteristics:** This area continues to experience rapid development. Commercial and residential growth is flourishing in the northeastern and middle portions of the watershed. The areas around Spring, The Woodlands, Shenandoah, and Oak Ridge North have been growing for quite some time and continue to expand. Development around the cities of Tomball and Magnolia, located in the middle of the watershed, has escalated over the last ten years. Highway 249 is the major connector between these communities, which are changing from rural to more suburban landscapes. Farm-to-Market Roads 2920 in the south and 1488 in the north were widened to accommodate increased vehicular traffic in the area. Between I-45 at the west end and U.S. Highway 59 to the east, most of Spring Creek has been preserved as a greenbelt to help minimize flooding. The primary land cover west of Tomball is agricultural and cultivated lands. Grass, hay, and pasture production related to cattle and horse ranches are common. The forested areas in the middle and northwest portion of the watershed are interspersed by subdivisions platted with lots ranging from 0.5 to 5 acres in size. Ranchettes and hobby ranches are also common in that portion of the watershed. On-site sewage facilities (OSSFs) are the primary means of waste disposal in those areas.

**Water Quality Issues:** The public water supply use is the only designated use fully supported in this segment. The recreation use in the three downstream AUs is impaired because the geometric means are greater than the standard of 126 MPN/100 mL. There were at least 88 samples collected from each AU during the seven year assessment period. From upstream to downstream, the geometric means (geomeans) for *Escherichia coli* (*E. coli*) bacteria were 267, 318, 315 MPN/100 mL respectively. The most concentrated urban areas are along the middle and lower portions of the watershed. The tributaries of Upper Panther Branch (1008B\_01 and 02), Lower Panther Branch (1008C\_01 and 02), Bear Branch (1008E\_01), the upper end of Lake Woodlands (1008F\_01), and Willow Creek (1008H\_01) also have recreation use impairments with bacteria geomeans ranging from 137 to 201 MPN/100 mL with 28 or more samples assessed from the seven year reporting period. Two other unclassified tributaries, Walnut Creek (1008I\_01) and Brushy Creek (1008J\_01), are also showing signs of impairment along with a concern about recreation use due to geomeans of 197 and 217 MPN/100 mL respectively. However, there is a lack of data associated with these tributaries where only 18 samples were collected during the assessment period. Additional data needs to be collected to make any further designations.

A nutrient concern was found in the farthest downstream AU on Spring Creek, AU 1008\_04, where 48 out of 88 (55%) nitrate nitrogen (nitrate) samples

exceeded the screening level of 1.95 mg/L and 45 out of 88 (51%) total phosphorus (TP) samples exceeded the screening level of 0.69 mg/L. A review of individual monitoring station data revealed that the majority of the nutrient loadings to Spring Creek were due to flows from two tributaries—Panther Creek and Willow Creek. The two primary nutrients of concern are total phosphorus and nitrate. Upper Panther Branch (1008B\_02), Lake Woodlands (1008F), and Lower Panther Branch (1008C), all have exceedances of these screening levels in more than 75% of the samples collected. In Lake Woodlands, chlorophyll *a* is also above the screening criteria in majority of the samples collected. It should be noted that below the confluence with Bear Branch, there is no nutrient concern. Once in Lake Woodlands, the concentrations again rise above screening levels that then flow out of the reservoir and into Lower Panther Branch and the most downstream AU of Spring Creek (1008\_04). Willow Creek also has elevated concentrations of TP and nitrate with more than 90% of the water samples exceeding the screening criteria.

Spring Creek was also found to have an aquatic life use concern in the middle AU (1008\_02) due to an impaired fish community caused by depressed dissolved oxygen (DO). This same AU was found to have a concern with the DO grab standard and the AU did not support the 24 hour DO average. Mill Creek (1008A\_01) also demonstrates an impaired aquatic life use due to a concern with the DO grab screening level and depressed grab minimum being repeatedly below the 3.0 mg/L standard. Below the Lake Woodlands dam (1008C\_02) there is a concern for aquatic life use because 19% of the DO grab measurements were less than the criteria of 4.0 mg/L for grab screening levels. Walnut Creek (1008I\_01) and Brushy Creek (1008J\_01) currently have aquatic life use concerns assigned to them because too many grab screening level measurements were less than the 5.0 mg/L criteria. One or both tributaries may eventually demonstrate impairments but currently have only concerns due to the limited number of samples having been measured during the assessment period.

**Special Studies/Projects:** This segment is a 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 for more information about the BIG. Spring 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 analyses of Spring Creek watershed data from 2000 to 2015 identified eight significant parameter trends for the classified segment and 11 for the unclassified tributaries. Ammonia, instantaneous flow, and total dissolved solids (TDS) in the classified segment are decreasing while alkalinity, chloride, specific conductance (SPCond), sulfate, and pH show increasing trends. The unclassified AUs revealed ten increasing trends including pH, ammonia, chloride, SPCond, sulfate, TP, total suspended solids (TSS), DO, nitrate, and TDS. The only parameter with a statistically significant decreasing trend was Secchi transparency.

A common trend seen throughout all classified and unclassified AUs is a gradual increase in turbidity and [SPCond](#) over the past 15 years. This may be partially due to sediment runoff from nearby construction sites, in addition to stormwater runoff and bank erosion. Along with increasing SPCond and decreasing Secchi transparency, many stations within the classified segment are showing increases in nutrient concentrations while bacteria levels decrease. This is especially evident with [nitrate](#) and [TP](#) levels at station 11313 (Spring Creek at I-45 located downstream of the confluences with Lower Panther Branch and Willow Creek). This inverse relationship between nutrients and bacteria levels may be in part related to the impact of effluent discharges from nearby WWTF outfalls. Stations [11314](#) (Spring Creek at SH 249) and [11323](#) (Spring Creek at Decker Prairie Rosehill Rd) have shown improving *E.coli* concentrations since 2000 but the majority of samples continue to exceed the geometric mean standard of 126 MPN/100mL. These spikes in bacteria are likely related to rain events when collection systems overflow, WWTFs and OSSFs malfunction, and pet waste, livestock fields and enclosures lead to higher bacteria levels in stormwater.

Nutrient concerns are present throughout the entire 1008 segment, including the majority of unclassified tributaries. Data show nitrate and TP levels

consistently above the designated screening criteria with significant increasing trends seen throughout the watershed. This is especially evident in [Lower Panther Branch \(1008C\)](#), [Lake Woodlands \(1008F\)](#), and [Willow Creek \(1008H\)](#). As Lake Woodlands is a drinking water supply source, it is notable that both chloride and ammonia concentrations are increasing at monitoring stations located on segment 1008F. [Chloride](#) levels are still below the 100 mg/L standard but if current trends continue, chloride exceedance is imminent. Ammonia levels, however, have been increasing since 2008 and are consistently higher than the 0.33 mg/L screening criteria. Increasing nutrients, and to a lesser extent, increasing chloride and ammonia, could be attributed to runoff from over-fertilized yards and landscaping, agricultural runoff, and WWTF effluent.

Segment 1008 is also impaired for 24 hour DO at station 20461 (Mill Creek at Hardin Store Road) while concerns for grab sample DO are present in both the classified segments and unclassified water bodies. Time series DO concentrations at station 20461 are regularly below the 5.0 mg/L 24 hour DO standard likely due to low flow conditions caused by damming of the waterway downstream of the sample location. Instantaneous flow measurements at station 20461 are usually less than 0.1 cfs due to the blockage downstream. However, grab sample DO levels show gradual improvement in segment 1008 and its unclassified tributaries, overall. The only significant DO trend is seen in Lake Woodlands (1008F) with regression analysis showing gradual improvement in DO concentrations over the past 15 years. Refer to the appendix section of this report to review all water quality graphs and trend analyses for segment 1008 that are not included in this summary.

## 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.

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

Work with local authorities to implement control measures to minimize nutrient runoff throughout the watershed, especially in The Woodlands area.

Continue 24-hour DO testing and biological assessments to determine whether the fish community concern and DO impairment is ongoing and whether the aquatic life use has recovered.