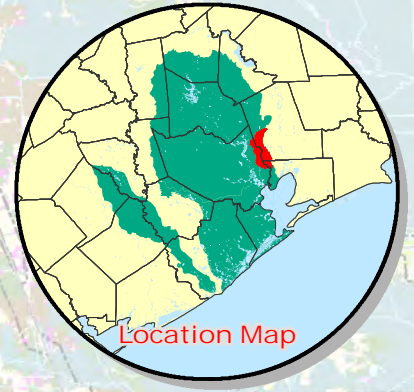


CEDAR BAYOU ABOVE TIDAL - SEGMENT 0902

95°5'0"W 95°0'0"W 94°55'0"W 94°50'0"W

Assessment Stations for the
2010 Texas Integrated Report

Use Impairment
None



30°5'0"N

30°0'0"N

29°55'0"N

29°50'0"N

30°5'0"N

30°0'0"N

29°55'0"N

29°50'0"N

Number of Outfalls: 20

Total Population

2000	6,883
2010 (Proj.)	16,900
2035 (Proj.)	140,410

- Watershed Boundary
- Monitoring Station
- USGS Flow Station
- Texas Stream Team
- Wastewater Outfall
- Major Road
- Waterway
- County Boundary
- City, Town or Place

Land Cover (2008)

- High Intensity Developed
- Low Intensity Developed
- Open Space Developed
- Cultivated
- Grassland/Shrub
- Forest
- Woody Wetland
- Herbaceous Wetland
- Bare
- Open Water

N

0 1 2 Miles

0 1 2 Kilometers

Luce Bayou

HARRIS COUNTY
LIBERTY COUNTY

Cedar Bayou Above Tidal

Crosby

Barrett

Dayton

Mont Belvieu

LIBERTY COUNTY
CHAMBERS COUNTY

90

10

95°5'0"W

95°0'0"W

94°55'0"W

Segment Number:	0902	Name:	Cedar Bayou Above Tidal			
Length:	25 miles	Watershed Area:	145.5 square miles	Designated Uses:	Contact Recreation; High Aquatic Life; Public Water Supply	
Number of Active Monitoring Stations:	2	Texas Stream Team Monitors:	0	Permitted Outfalls:	18	
Description:	From a point 2.2 km (1.4 miles) upstream of IH 10 in Chambers/Harris County to a point 7.4 km (4.6 miles) upstream of FM 1960 in Liberty County					

Degree of Impairment and Overall Trends						
Segment ID	Dissolved Oxygen	Bacteria	Nutrients	PCBs/Dioxin	Chlorophyll <i>a</i>	Other
0902	100					

Indicates general improvement
 Indicates general degradation
 Numbers indicate percent of segment impaired

FY 2011 Active Monitoring Stations				
Site ID	Site Description	Frequency	Monitoring Entity	Parameter Groups
11120	Cedar Bayou at US 90 NE of Crosby	Quarterly	H-GAC	Conventional, Field, Bacteria, Flow
11111	Cedar Bayou at US 90 NE of Crosby	Quarterly	TRA	Conventional, Field
11117	Cedar Bayou at FM 1960 NE of Huffman	Quarterly	H-GAC	Conventional, Field, Bacteria, Flow

Segment 1001			
Standards		Screening Levels	
Temperature (°C):	32	Dissolved Oxygen (mg/L) (grab):	5.0
Dissolved Oxygen (24-Hr Average) (mg/L):	5.0	Ammonia (mg/L):	0.33
Dissolved Oxygen (Absolute Minima) (mg/L):	3.0	Nitrate-N (mg/L):	1.95
pH (standard units):	6.5-9.0	Orthophosphate Phosphorus (mg/L):	0.37
<i>E. coli</i> (MPN/100 mL) (grab):	394	Total Phosphorus (mg/L):	0.69
<i>E. coli</i> (MPN/100 mL) (geometric mean):	126	Chlorophyll- <i>a</i> (µg/L):	14.1
Chloride (mg/L as Cl):	200		
Sulfate (mg/L as SO ₄):	150		
Total Dissolved Solids (mg/L):	700		

Water Quality Issues Summary					
Issue	2008 Assessment	Draft 2010 Assessment	Affected Area	Possible Causes/Influences / Concerns Voiced by Stakeholders	Possible Solutions / Actions To Be Taken

Low DO Concentrations in grab samples only	C	C	Entire segment	<ul style="list-style-type: none"> - Excessive nutrients and organic matter from malfunctioning OSSFs, agricultural operations, illegal disposal of grease trap waste, and biodegradable solid waste such as grass clippings and pet waste 	<ul style="list-style-type: none"> - Increase septic system inspections, maintenance, and repairs - More outreach to farmers in watershed to minimize fertilizer runoff - More public education regarding pet waste disposal - More public education about proper disposal of household fats, oils, and grease - More public education about OSSF maintenance - Conserve or plant canopy trees and habitat along waterways to maintain/create vegetated riparian buffer zones - Work with drainage districts and agencies to change practices of clear cutting and channelizing waterways.
Degraded Macroinvertebrate Community	I	C	Entire segment	<ul style="list-style-type: none"> - Loss of habitat due to channelization of waterway - On going maintenance of modified channel 	<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 and slow bank erosion

Segment Discussion:

Watershed Characteristics: Cedar Bayou Above Tidal lies in the coastal plain between the Trinity and San Jacinto rivers. Residential development is concentrated in the extreme southern portion of the watershed in the city of Mount Belvieu near Baytown. Some residential development occurs northwest of U.S. Highway 90, but the majority of the watershed is used for agricultural purposes with small ranchettes scattered throughout. Principal crops include turf/sod, rice, and hay. OSSFs are the primary method used for disposing of sewage throughout the watershed.

Water Quality Issues: In the *Draft* 2010 Texas Integrated Report, this segment has no identified impairments; however, the macroinvertebrate community impairment was carried forward from the 2008 assessment but was changed to a concern. Since most of this segment has been channelized for flood control at one time or another, finding an impaired benthic community is not unexpected. Even today, at least one bank of the main waterway continues to be void of trees and shrubby vegetation throughout most of the watershed. There are very few bends or meanders left from the original channel. The biological assessment should be repeated to determine whether the macroinvertebrate community is truly impaired or not. The segment is also identified as having a concern for DO in the single grab sample because 11 out of 90 measurements (12%) were below the grab screening criteria of 5.0 mg/L in 2010. The average of the 11 samples was 4.21 mg/L. In 2008, 17% (8 out of 47) of the DO grab measurements were below 5.0 mg/L.

During 2008 and again in the 2010 assessment, this segment is fully supportive of its general use with dissolved solids being very low and nutrient screening levels rarely being exceeded. Even though only 2 out of 70 chlorophyll *a* results exceeded the level of 14.1 µg/L, the average of the two was 45.5 µg/L which is three times greater than the screening level. Investigators appear to have captured a couple of algal blooms occurring in the waterway.

In the 2008 Texas Integrated Report (IR), the geometric mean for *E. coli* was calculated as 120 MPN to the standard of 126 MPN. This result was within the state standard but close to exceedance. In the *Draft* 2010 IR, the geometric mean dropped to 91 MPN. However, when exceedances did occur (there were 7 out of 36 results), the total bacteria concentration was greater than 8,500 MPN. This average is also considerably greater than the single grab criteria of 394 MPN *E. coli*.

Special Studies/Projects: This segment has not been included in any special study in the past but will be included in the future watershed protection plan for Cedar Bayou.

Trends: With data from 1995 through 2010, site 11120 is the only station in this segment having enough data to determine whether a trend exists or not. There are six trends identified for this site. The parameters chlorophyll *a*, dissolved oxygen (DO), orthophosphate phosphorus (OP), total phosphorus (TP), and pH having increasing trends while *E. coli* appears to be decreasing. Both OP and TP trends indicate that concentrations are increasing however, only 2 of 76 OP results and 3 of 79 TP results exceeded the screening levels. Those higher results were recorded in 2008, which could be the cause of the trend being significant. All other results were well below the screening levels for both parameters. Likewise, the chlorophyll *a* results indicate a significant trend, but the highest measured concentration was 11 µg/L, which is below the screening level of 14.1 µg/L. It should be noted that the highest concentration of chlorophyll *a* were measured when the highest concentrations of OP and TP were measured. While a significant trend, pH measurements at this site range from 6.7 to 8.3 SU, clearly indicating no concern at this time. In 15 years of data, only 1 DO measurement was below the grab minimum of 3.0 mg/L. Additionally, only four grab DO measurements were less than the grab screening criteria of 5.0 mg/L since the beginning of 2007. The last station trend was found in bacteria concentrations. Data for *E. coli* only goes back to 2001, but the number of exceedances has decreased in the more recent years. However, over the period of record, 34% (16 of 47) of all samples exceeded the standard of 394 MPN. The highest concentration since 2001 was measured at 20,000 MPN. The declining trend may be due to drier weather over the past several years. There have been many extended periods with no rainfall. Rainfall occurred during fewer high volume events with significant runoff. All these trends need to be monitored over the next few years to determine whether the trends continue or increase in significance.

Only one trend was identified when all the data from the segment was combined. Total organic carbon (TOC) is a trend that was found when data from the entire segment was combined. The decline in TOC may be due to lack of rainfall and/or the channelization of the waterway. Not only have there been fewer rain events to wash organic matter into the waterway, the bayou was also cleaned out during the channelization activities and all vegetative material removed to enhance drainage.

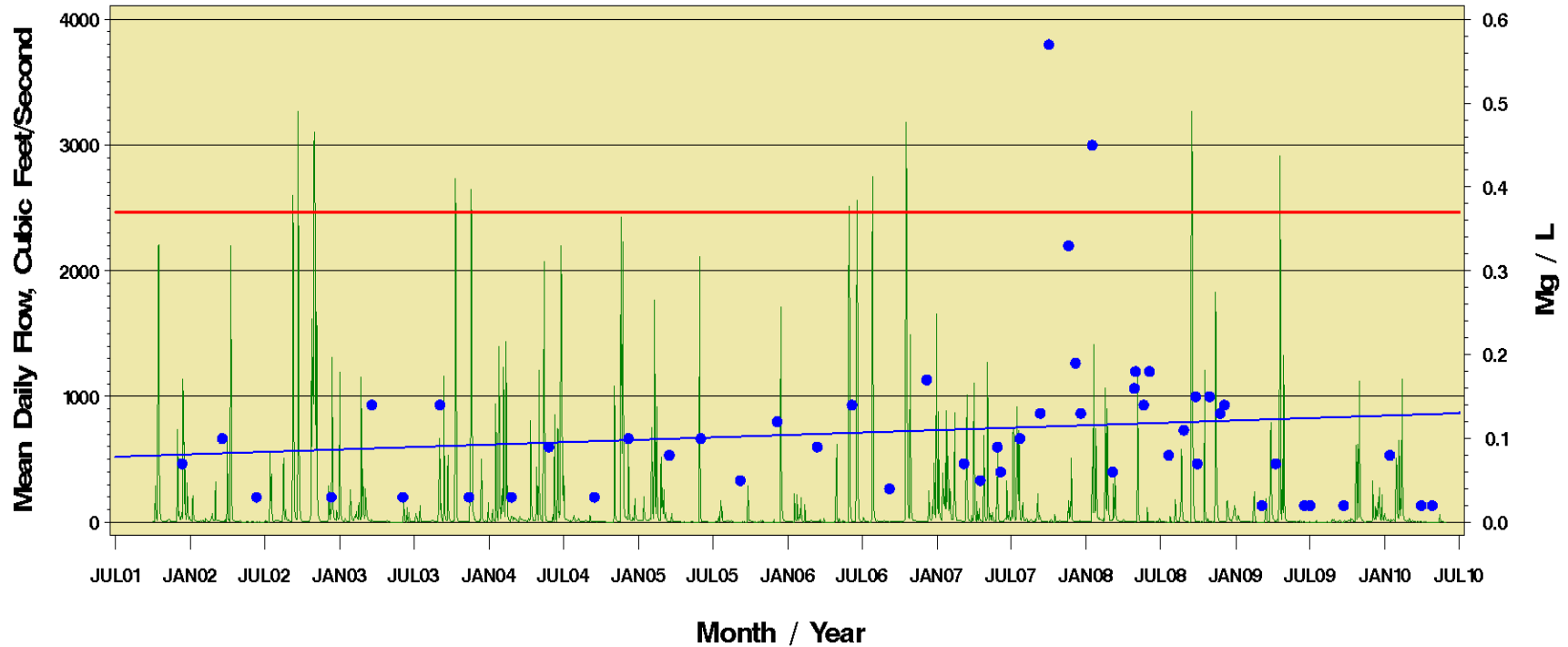
Recommendations:

- Develop watershed protection plan for Cedar Bayou. In December 2010, H-GAC finalized a contract with the Texas State Soil & Water Conservation Board to develop a Watershed Protection Plan for Cedar Bayou. Through stakeholder participation, H-GAC will address the various concerns found in this segment summary. Include efforts to determine why the trends are occurring.
- Continue collecting water quality data to support actions associated with WPP development and future modeling.
- Pursue a new local partner to Clean Rivers Program to collect additional data that would help better isolate problem areas.
- Work with local partner and contract labs to lower detection limits for nutrients since chlorophyll *a* concentrations are increasing and nutrients have a direct effect.

Cedar Bayou Above Tidal

Station: 11120 Segment: 0902 Parameter: Orthophosphate—P
2010 Nutrient Screening Level: 0.37 Mg / L
Assessment Unit: 0902_01

Green line represents mean daily flow in CFS from USGS Gaging Station



Trends are considered significant if the p-value is < 0.10

Trend is significant at p=0.0206 R-Square= 0.0703 T-Value= 2.3660 Number of Samples= 76

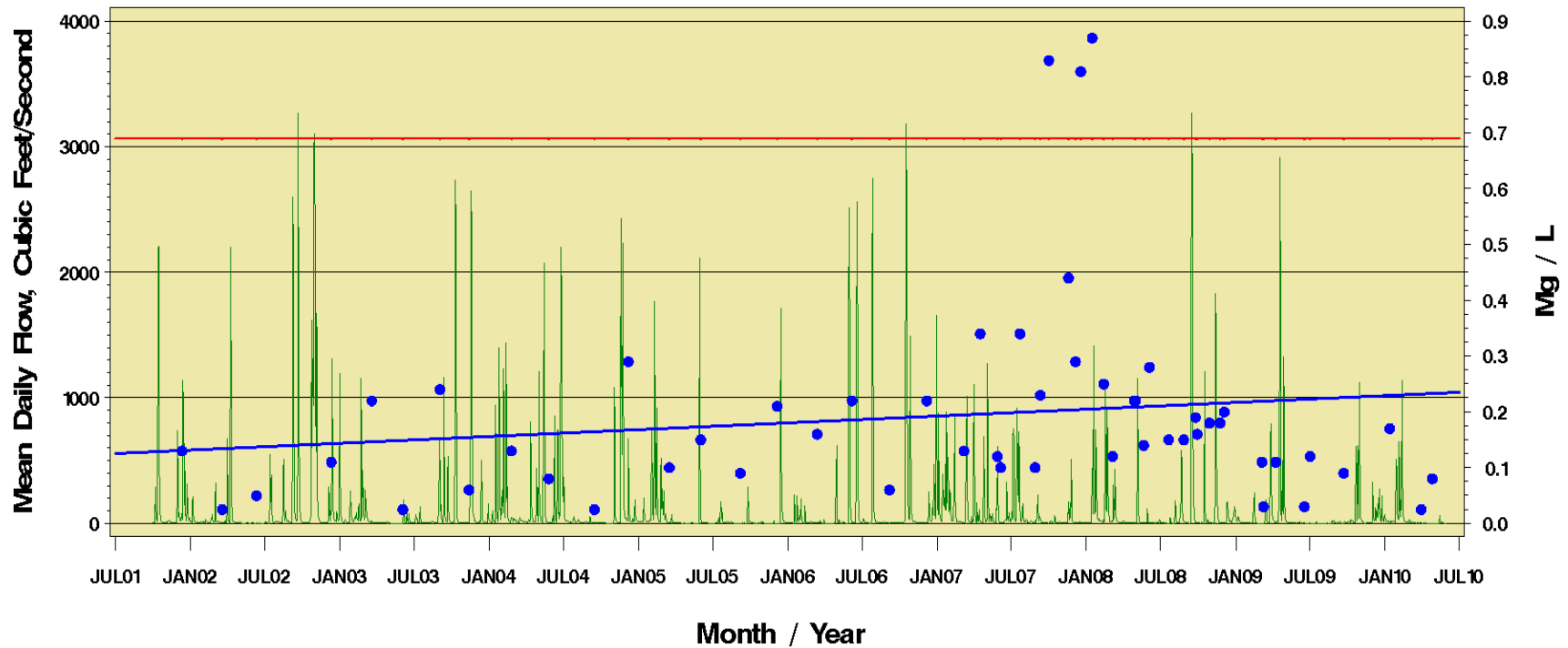
The blue regression line applies to the plot of actual values ; regression statistics are derived from regression of log-transformed data

Red line indicates the applicable 2010 Nutrient Screening Level

Cedar Bayou Above Tidal

Station: 11120 Segment: 0902 Parameter: Total Phosphorus
2010 Nutrient Screening Level: 0.69 Mg / L
Assessment Unit: 0902_01

Green line represents mean daily flow in CFS from USGS Gaging Station



Trends are considered significant if the p-value is < 0.10

Trend is significant at $p=0.0748$ R-Square= 0.0406 T-Value= 1.8060 Number of Samples= 79

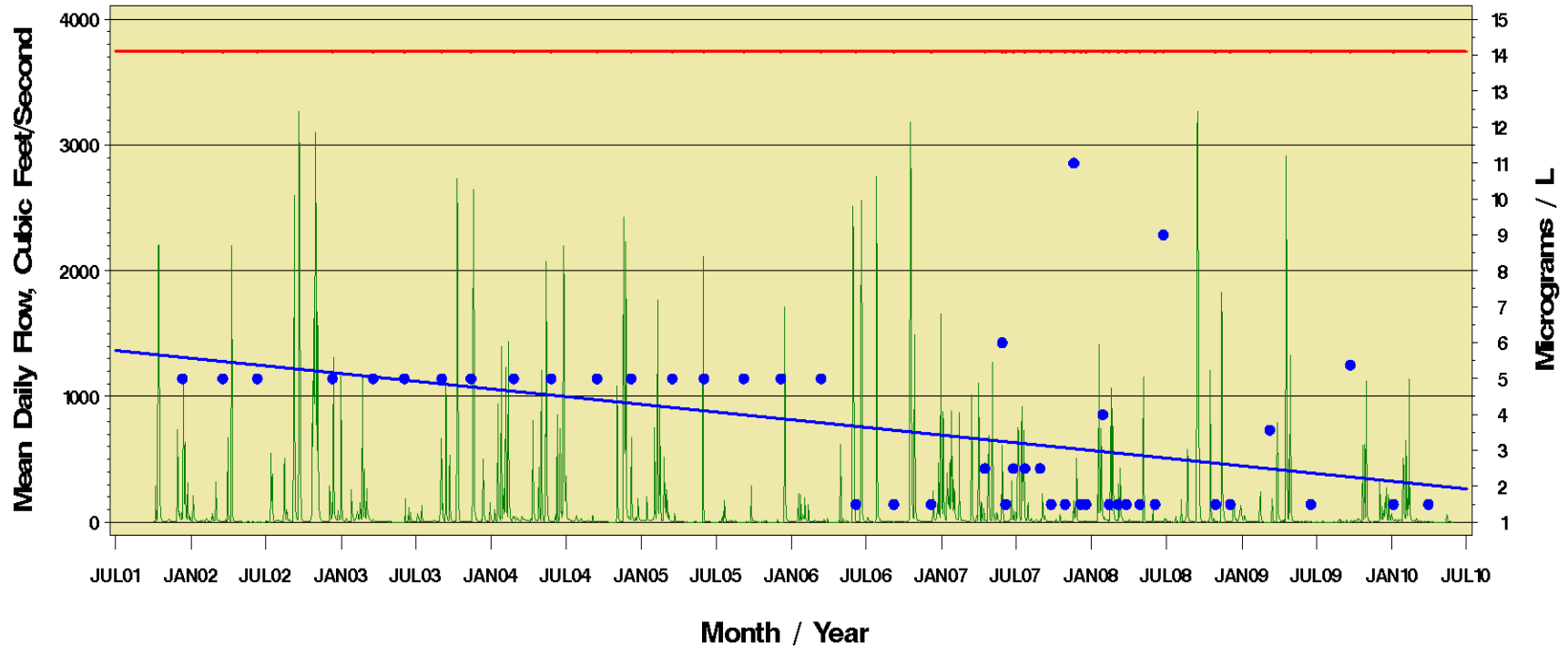
The blue regression line applies to the plot of actual values ; regression statistics are derived from regression of log-transformed data

Red line indicates the applicable 2010 Nutrient Screening Level

Cedar Bayou Above Tidal

Station: 11120 Segment: 0902 Parameter: Chlorophyll a
2010 Nutrient Screening Level: 14.1 Micrograms / L
Assessment Unit: 0902_01

Green line represents mean daily flow in CFS from USGS Gaging Station



Trends are considered significant if the p-value is < 0.10

Trend is significant at $p=0.0276$ R-Square= 0.0694 T-Value= 2.2520 Number of Samples= 70

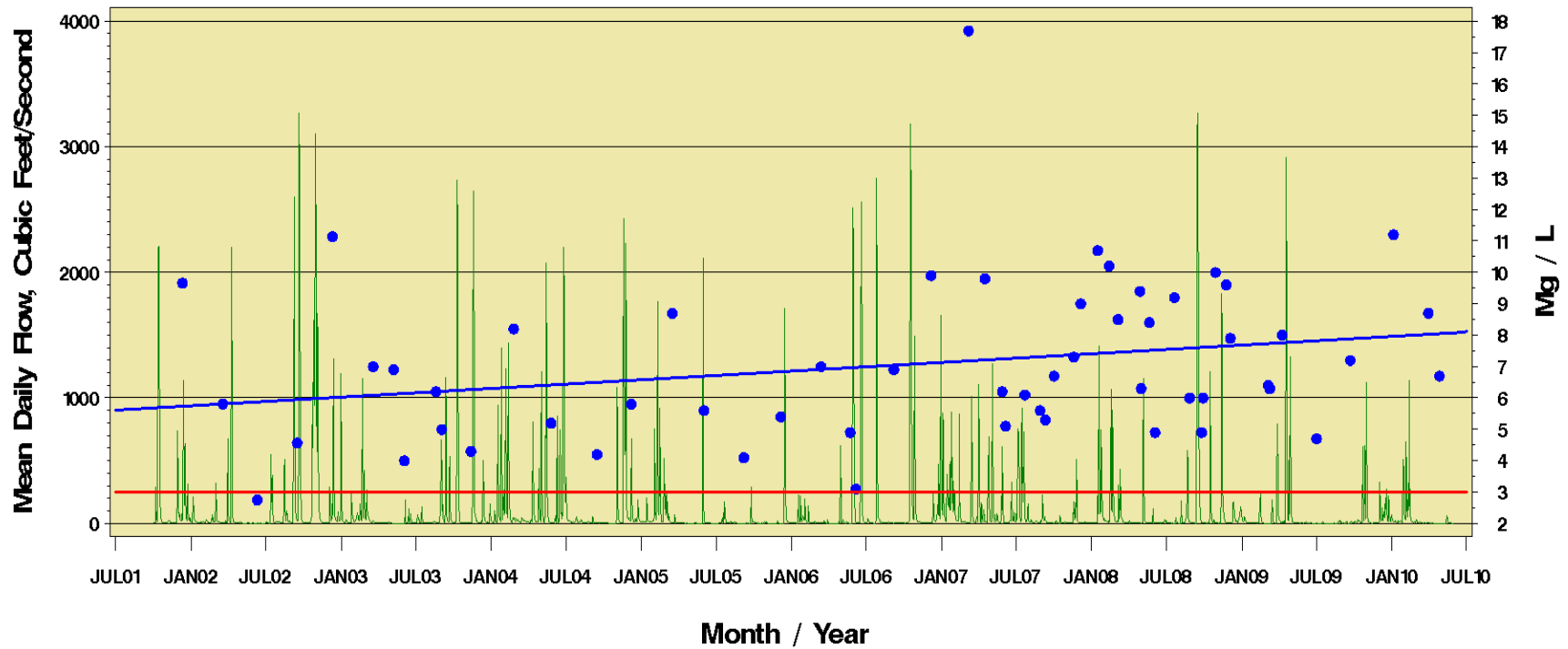
The blue regression line applies to the plot of actual values ; regression statistics are derived from regression of log-transformed data

Red line indicates the applicable 2010 Nutrient Screening Level

Cedar Bayou Above Tidal

Station: 11120 Segment: 0902 Parameter: Dissolved Oxygen
2010 Water Quality Standard: 3.0 Mg / L
Assessment Unit: 0902_01

Green line represents mean daily flow in CFS from USGS Gaging Station



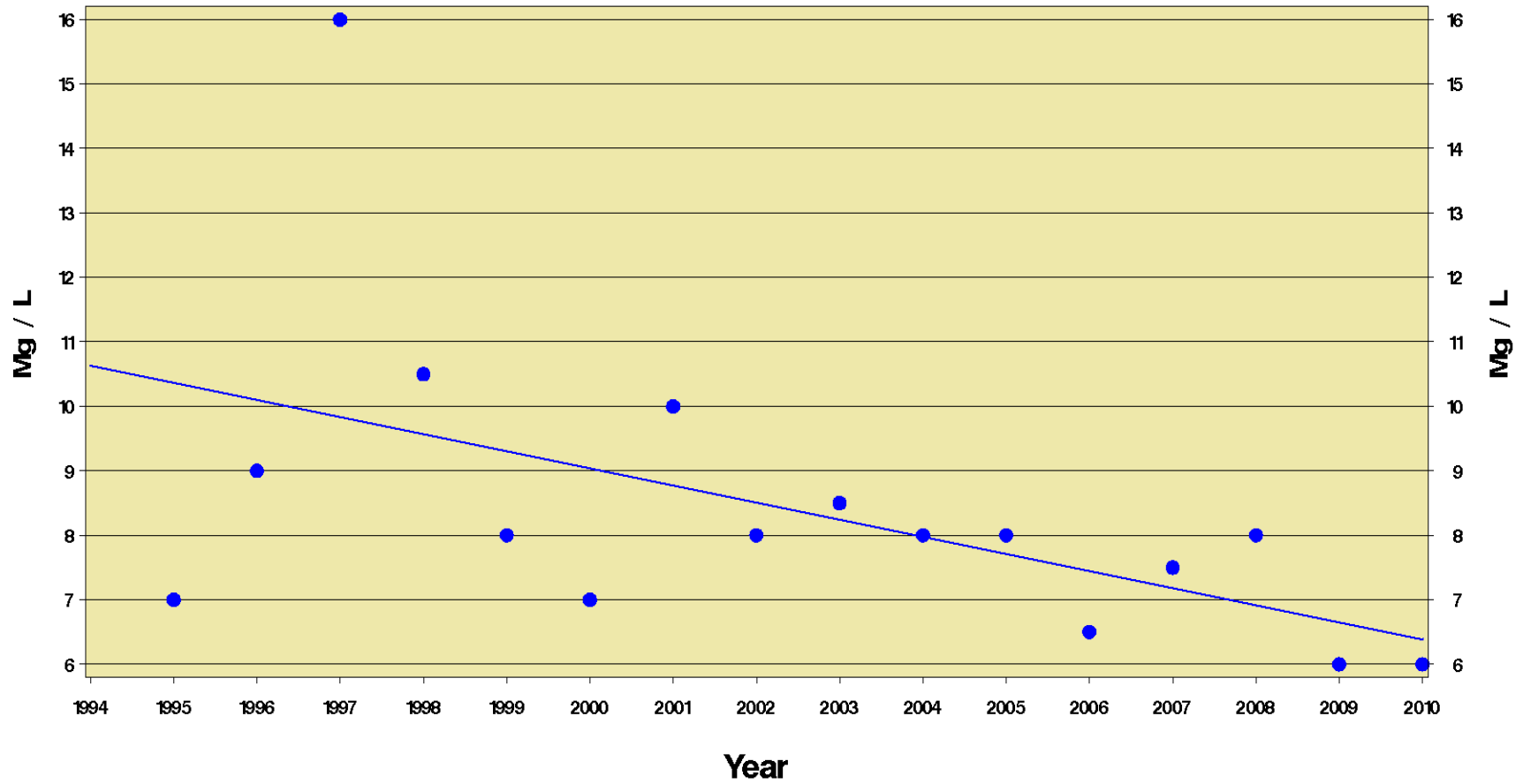
Trends are considered significant if the p-value is < 0.10

Trend is significant at $p=0.0608$ R-Square= 0.0422 T-Value= 1.9010 Number of Samples= 84

The blue regression line applies to the plot of actual values ; regression statistics are derived from regression of log-transformed data

Red line indicates the applicable 2010 Water Quality Standard

Cedar Bayou Above Tidal
Segment: 0902 Parameter: Total Organic Carbon Annual Median



Trends are considered significant if the p-value is < 0.10

Trend is significant at p= 0.0359 R-Square = 0.2778 T-Value = -2.321 Number of samples: 76