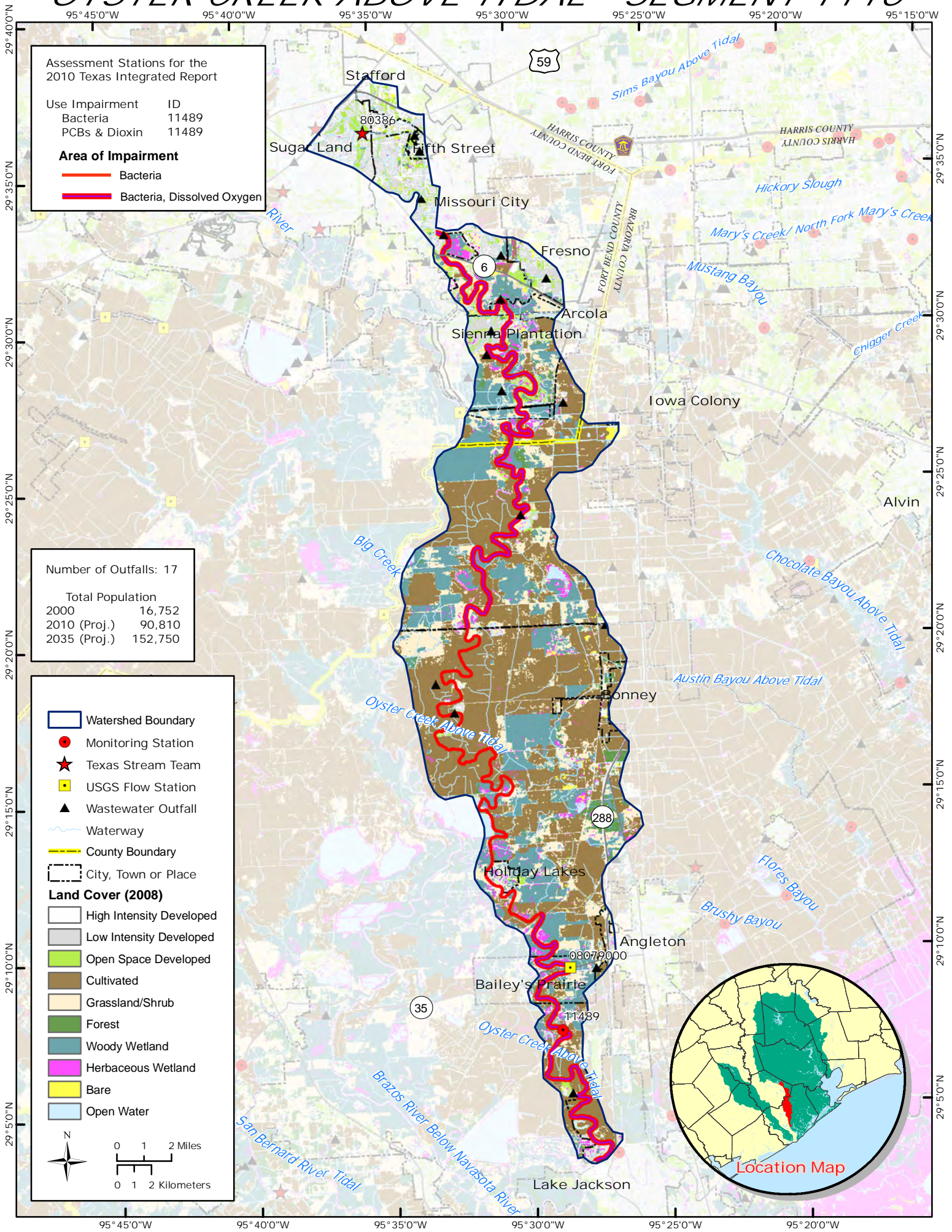


OYSTER CREEK ABOVE TIDAL - SEGMENT 1110



| | | | | | | |
|--|--|------------------------------------|---------------------------------|----------------------------|--|--|
| Segment Number: | 1110 | Name: | Oyster Creek Above Tidal | | | |
| Length: | 77 miles | Watershed Area: | 154 square miles | Designated Uses: | High Aquatic Life; Contact Recreation; Public Water Supply | |
| Number of Active Monitoring Stations: | 1 | Texas Stream Team Monitors: | 0 | Permitted Outfalls: | 20 | |
| Description: | From a point 100 meters (110 yards) upstream of FM 2004 in Brazoria County to the Brazos River Authority diversion dam 1.8 km (1.1 miles) upstream of SH 6 in Fort Bend County | | | | | |

| Degree of Impairment and Overall Trends | | | | | | |
|---|------------------|----------|-----------|-------------|----------------------|-------|
| Segment ID | Dissolved Oxygen | Bacteria | Nutrients | PCBs/Dioxin | Chlorophyll <i>a</i> | Other |
| 1110 | 24 | 58 | | | 24 | |

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

| Monitoring Efforts | | | | |
|--------------------|---------------------------------------|-----------|-------------------|--|
| Site ID | Site Description | Frequency | Monitoring Entity | Parameter Groups |
| 11489 | Oyster Creek downstream of Walker St. | Quarterly | TCEQ | Field, Conventional, Bacteria, Chlorophyll-a |

| Segment 1109 | | | |
|---|---------|-----------------------------------|------|
| Standards | | Screening Levels | |
| Temperature (°C): | 32 | Ammonia (mg/L): | 0.33 |
| Dissolved Oxygen (24-Hr Average) (mg/L): | 5.0 | Nitrate-N (mg/L): | 1.95 |
| Dissolved Oxygen (Absolute Minima) (mg/L): | 3.0 | 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): | 394 | Chlorophyll- <i>a</i> (µg/L): | 14.1 |
| <i>E. coli</i> (MPN/100 mL) (geometric mean): | 126 | | |
| Chloride (mg/L as Cl): | 300 | | |
| Sulfate (mg/L as SO ₄): | 150 | | |
| Total Dissolved Solids (mg/L): | 750 | | |

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 |
|-----------------------------|-----------------|-----------------------|--------------------|---|--|
| Elevated Levels of Bacteria | I | I | 1110_01 1110_02 | <ul style="list-style-type: none"> - WWTP non-compliance, overflows, collection system by-passes - Small, privately-run WWTP - Developments with septic tanks - Rapid urbanization and increased impervious cover - Constructed storm water controls failing - Direct and dry weather discharges - Waste haulers illegal discharges/improper disposal - Improper or no pet waste disposal - Animal waste from agricultural production and domestic animal facilities | <ul style="list-style-type: none"> - Increase monitoring requirements for self-reporting - Impose new or stricter bacteria limits than those designated by TCEQ - 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 - Regionalize wastewater treatment to minimize number of small package plants and reduce OSSF dependency - Require larger portions of land in developments platted to use OSSFs - More public education regarding OSSF operations and maintenance - More public education regarding pet waste disposal - Improve storm water controls in new developments by adding bacteria reduction measures - Improve compliance and enforcement of existing storm water quality permits to minimize contaminated runoff - Improve construction oversight to minimize TSS discharges to waterways - Implement stream fencing or alternative water supplies to keep livestock out of or away from waterways - Promote and implement Water Quality |

| | | | | | |
|--|---|---|---------|--|---|
| | | | | | <p>Management Plans for individual agricultural properties</p> <ul style="list-style-type: none"> - Create, develop, and implement Water Quality Management Plans for individual agricultural properties |
| <p>Low Dissolved Oxygen Concentrations</p> | I | I | 1110_01 | <ul style="list-style-type: none"> - Excessive nutrients and organic matter from WWTP effluent, sanitary sewer overflows, malfunctioning OSSFs, illegal disposal of grease trap waste, biodegradable solid waste such as grass clippings and pet waste - Excessive nutrients and organic matter from agricultural production and related activities - Vegetative buffers and canopies removed | <ul style="list-style-type: none"> - Improve compliance and enforcement of existing storm water quality permits - Improve operation and maintenance of existing WWTP and collection systems - Regionalize wastewater treatment to minimize number of small package plants and reduce OSSFs dependency - More public education regarding pet waste disposal - Protect or install vegetative buffers along waterways - More public education regarding disposal of household fats, oils, and grease - More stringent OSSF maintenance and education - Create and implement Water Quality Management Plans for individual agricultural properties - Install and/or maintain riparian buffer areas between agricultural fields and waterways - Conserve or plant canopy trees and habitat along waterways to maintain/create shade to cool water. - Work with drainage districts and agencies to change practices of clear cutting waterways |
| <p>Elevated Chlorophyll <i>a</i> Concentrations</p> | C | C | 1110_01 | <ul style="list-style-type: none"> - Fertilizer runoff from surrounding watershed promote algal growth in waterways - Nutrient loading from WWTPs effluent, sanitary sewer overflows, and malfunctioning OSSFs promote algal growth | <ul style="list-style-type: none"> - Improve storm water controls in new developments - Improve compliance and enforcement of existing storm water quality permits. - Support/continue/initiate public education |

| | | | | | |
|--|--|--|--|--|--|
| | | | | | regarding nutrients and consequences - Reduce or manage fertilizer runoff from agricultural areas |
|--|--|--|--|--|--|

Segment Discussion:

Watershed Characteristics: The majority of the watershed is not developed and is used for agricultural purposes. Much of the area is bottomland forest, grassland, and wetland habitat with numerous oxbow lakes. There are a few pockets of development associated with Arcola, Sienna Plantation, Fresno, Bailey's Prairie, Bonney Village, Angleton, Holiday Lakes, and Lake Jackson. The very top of the watershed is highly developed and is part of Sugar Land and Missouri City.

Water Quality Issues: The aquatic life and recreation uses are not supported in the segment. Levels of *E. coli* bacteria geometric mean of 230 MPN/100mL were found in one of the three assessment units (AUs), this is nearly twice the standard of 126 MPN/100 ml. The segment is also listed as impaired in the *Draft 2010 Texas Integrated Report (IR)* due to low levels of dissolved oxygen (DO). DO 24-hour averages were above the standard of 5 mg/mL in 90% of the measurements in one AU and DO 24-hour minimum reported values above the standard of 3mg/L in 60% of the measurements. There was also an impairment listed for *E. coli* and DO in the 2008 IR. Additionally, there is a water quality concern for chlorophyll *a* in the segment because 45% of the measurements were over the standard of 14.1µg/L. This parameter, along with ammonia nitrogen (ammonia) and orthophosphate phosphorous (OP), was listed as a concern in the 2008 IR.

Special Studies/Projects: A small portion of Oyster Creek Above Tidal, comprising the area within eastern Sugar Land south to the Brazos River, was designated part of the Upper Oyster Creek system. This system, which includes this overlapping area and the watershed upstream of Oyster Creek Above Tidal to the GCWA Shannon pumping station on the Brazos River, has been the subject of two TMDL studies; one for elevated levels of indicator bacteria above the contact recreation standard and one for depressed DO levels. The results of the studies were one adopted TMDL for bacteria and two adopted TMDLs for DO. An Implementation Plan for both bacteria and DO is currently under way in the watershed (as of January of 2011). The anticipated completion for the Implementation Plan is August 31, 2011, with implementation elements to begin on a phased basis over several years. It should be noted that these studies have not and Implementation Plan will not apply to the rest of Oyster Creek Above Tidal.

Trends: All of the data analyzed were collected at station 11489. Statistically-significant trends for chlorophyll *a* and volatile suspended solids were found. The 2010 TCEQ assessment identified chlorophyll *a* as a concern in the watershed and the concentration is trending upwards over time. An unusually high result in 2006 probably introduced a bias into the trend slope. Regardless, most results since 2005 have exceeded the screening level and exceedances were infrequent prior to that time. A plot of chlorophyll *a* results appear follows, along with plots of the concentrations of associated nutrients (nitrate-nitrogen and total phosphorus). Examination of the plots shows some instances where a nutrient trended higher prior to a spike in chlorophyll *a* concentrations but there does not appear to be a direct relationship. A correlation analysis of data reveals some fairly strong associations but only when analyzing the data by station. When all data in the dataset are pooled, the overall correlations are weak. The station-specific correlations do not follow a consistent pattern. In some cases, there is an

inverse relationship between total phosphorus and chlorophyll *a* concentrations but it is always direct for nitrate. Time series analysis of lagged data might provide a clearer picture of the relationship between nutrients and chlorophyll *a* in this watershed.

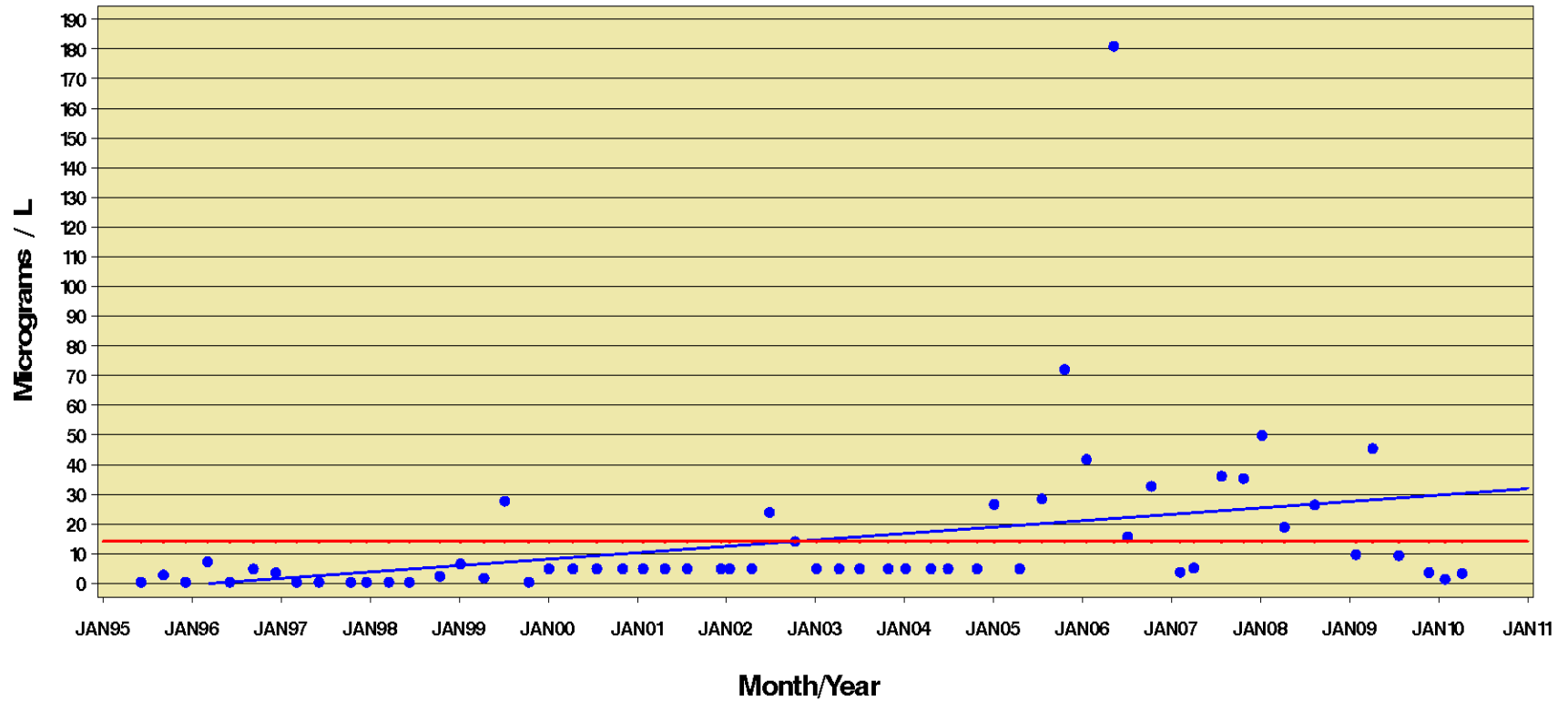
Bacteria are a significant problem at this location with 82% of samples analyzed for *E. coli* exceeding 126 MPN/100 mL.

Recommendations:

- Address the various concerns found in this segment summary through facilitating stakeholder participation in the Implementation Plan and related efforts.
- Continue collecting water quality data to support actions associated with Implementation Plan development and future modeling.
- Evaluate the impact of increasing flows as a result of increased pumping of Brazos River Water into the Upper Oyster Creek System by the Gulf Coast Water Authority to serve surface water conversion efforts in Fort Bend and other counties.
- Pursue new local partners, including the Brazos River Authority, to assist Clean Rivers Program in collecting addition 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 they have a direct effect.

Oyster Creek Above Tidal

Station: 11489 Segment: 1110 Parameter: Chlorophyll a
2010 Nutrient Screening Level: 14.1 Micrograms / L
Assessment Unit: 1110_01



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

Trend is significant at p=0.0000 R-Square= 0.3927 T-Value= 6.0700 Number of Samples= 59

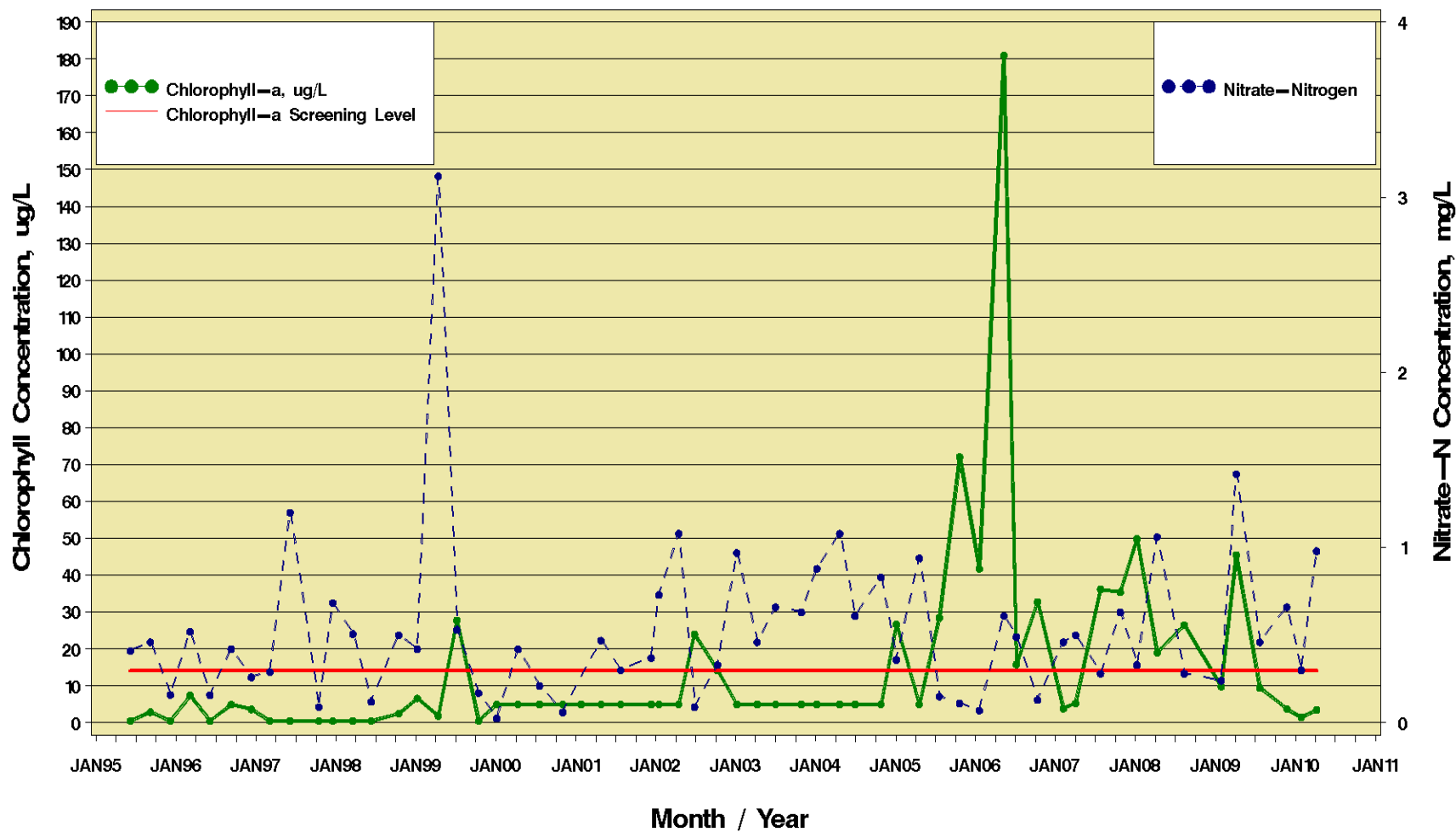
The blue regression line applies to the plot of actual values ; regression statistics are derived from regression of log-transformed data

Red line indicates the applicable 2010 Nutrient Screening Level

Chlorophyll-a and Nitrate-Nitrogen Trends

Segment: 1110 Watershed: Oyster Creek Above Tidal

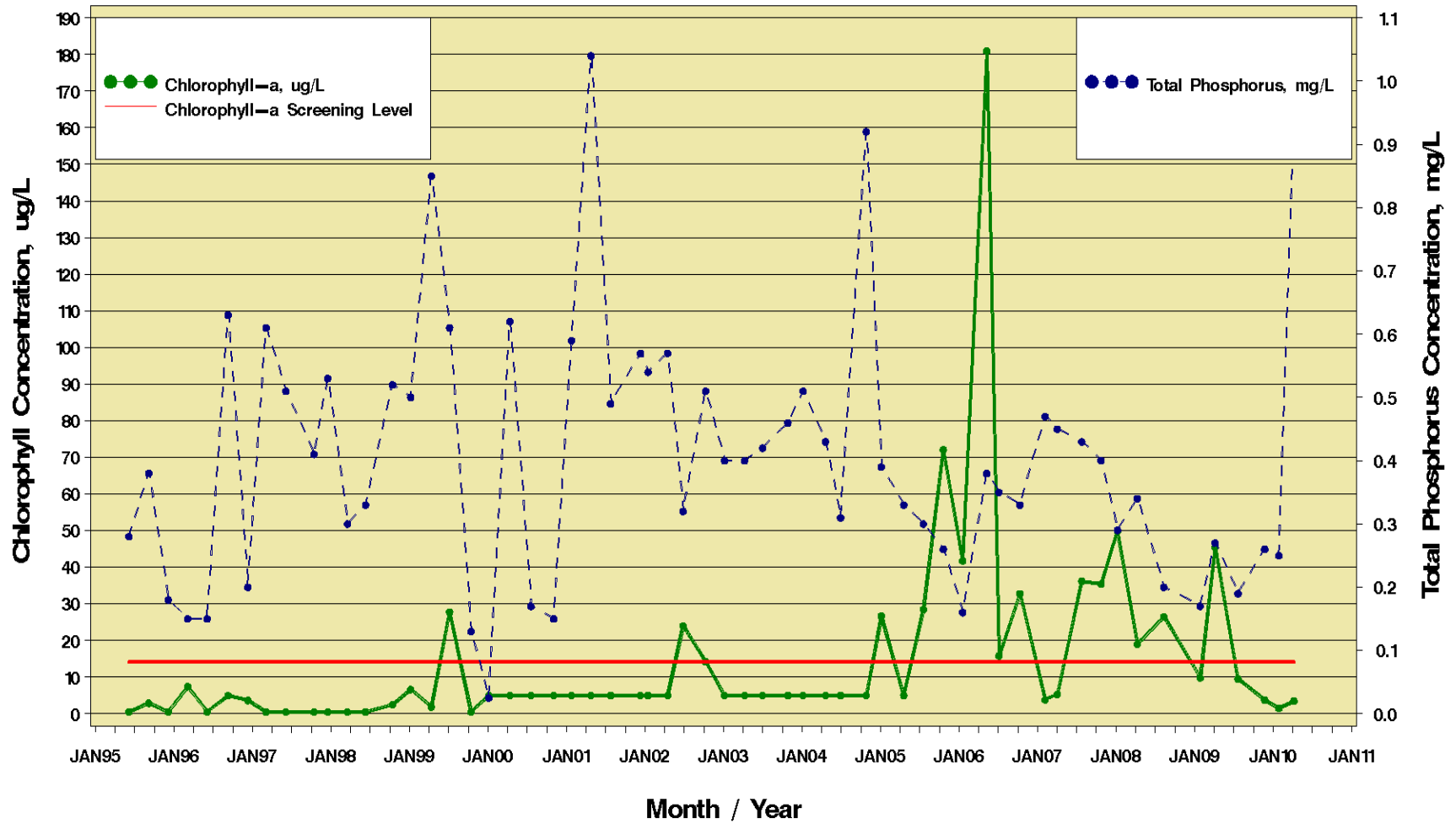
Station: 11489 Assessment Unit: 1110_01



Chlorophyll-a and Total Phosphorus Concentrations

Segment: 1110 Watershed: Oyster Creek Above Tidal

Station: 11489 Assessment Unit: 1110_01



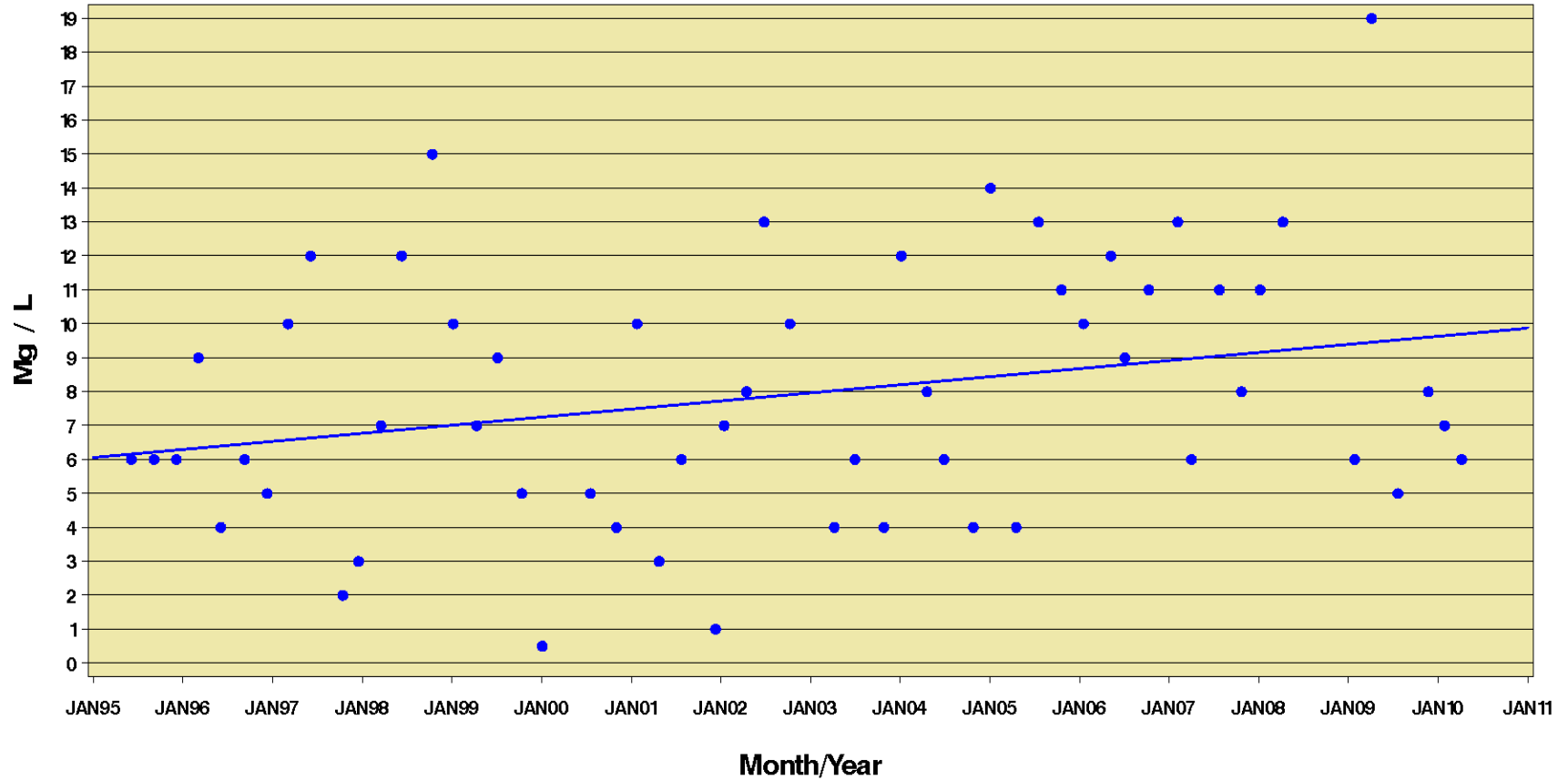
Oyster Creek Above Tidal

Station: 11489

Segment: 1110

Parameter: Volatile Suspended Solids

Assessment Unit: 1110_01



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

Trend is significant at p=0.0599 R-Square= 0.0640 T-Value= 1.9220 Number of Samples= 56

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

Percent Excursion of 2010 Water Quality Standard
Oyster Creek Above Tidal Segment: 1110 Parameter: E.coli
2010 Water Quality Standard: 126 MPN / 100 mL

