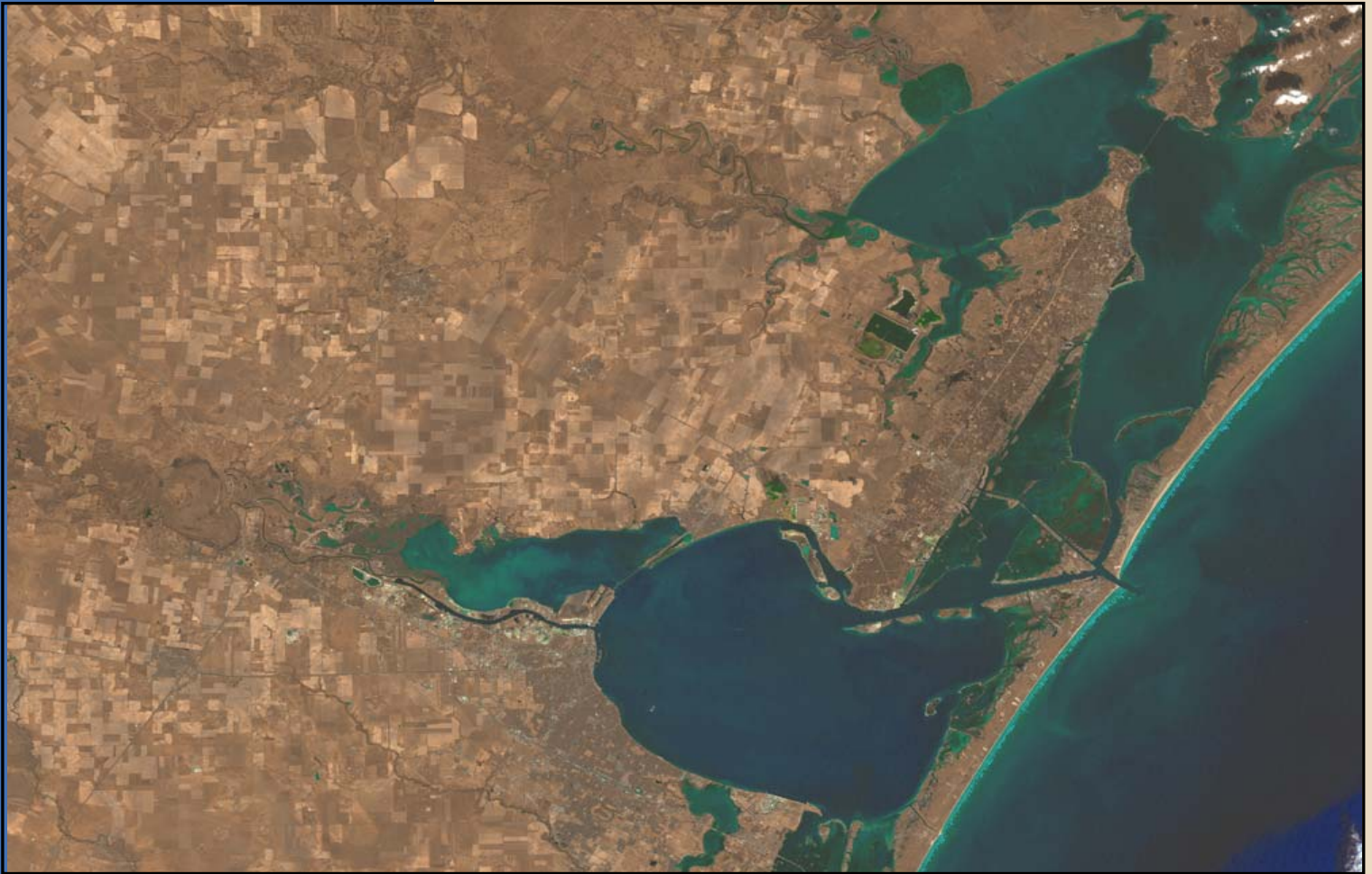




Nueces River Authority

2003 Basin Summary

Nueces River Basin
San Antonio - Nueces Coastal Basin
Nueces - Rio Grande Coastal Basin



Prepared in Cooperation with the
Texas Commission on Environmental Quality
under authorization of the Texas Clean Rivers Act

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EXECUTIVE SUMMARY

INTRODUCTION

In 1991, the 72nd Texas Legislature enacted Senate Bill 818, the Texas Clean Rivers Act in response to growing concerns about the quality of Texas's surface waters. The Texas Clean Rivers Program (CRP) was created under this act. The primary mission of CRP is to maintain and improve water quality within the river and coastal basins throughout the State of Texas.

Throughout its existence, CRP has been effective in monitoring and addressing surface water quality concerns. This is accomplished by applying an integrated and coordinated watershed management approach which applies monitoring and management tools to evaluate water quality in the watershed as a whole.

The Nueces River Authority (NRA) is delegated by CRP to be responsible for the Nueces River Basin, the San Antonio – Nueces Coastal Basin, and the Nueces – Rio Grande Coastal Basin; an area comprised of roughly 30,500 square miles, ranging from the hill country in Edwards County to San Antonio Bay in Refugio County to the Brownsville Ship Channel in Cameron County. There are 23 stream segments, 3 reservoir segments, and 16 bay and estuary segments.

NRA and the Texas Commission on Environmental Quality (TCEQ) work together to apply a watershed management approach to the Nueces River Basin and the adjoining coastal basins. Both NRA and TCEQ collect quality assured data from surface water bodies, evaluate the results, and assess each segment's condition. Subsequently, any identified water quality concerns are prioritized and targeted for future studies and remedial action under CRP or other water quality programs.

The San Antonio – Nueces Coastal Basin is approximately 3,100 square miles, covering all or part of 7 counties. The basin is bordered by the San Antonio River Basin to the north, the Lavaca-Guadalupe Coastal Basin to the northeast, bays, estuaries, and the Gulf of Mexico to the east, the Nueces-Rio Grande Coastal Basin to the south, and the Nueces River Basin to the northwest.

The Nueces River Basin covers approximately 17,000 square miles, encompassing all or part of 23 counties in South-Central Texas. Other rivers within the basin include the Frio, Leona, Sabinal, and Atascosa Rivers. The basin is bordered by the Colorado, Guadalupe, and San Antonio River Basins to the north, the San Antonio – Nueces Coastal Basin to the southeast, the Nueces – Rio Grande Coastal Basin to the south, and the Rio Grande River basin to the south and southwest.

The Nueces – Rio Grande Coastal Basin covers approximately 10,400 square miles, encompassing all or part of 12 counties in South Texas. The basin is bordered by the Nueces River Basin and the San Antonio – Nueces Coastal Basin to the north, bays, estuaries, and the Gulf of Mexico to the east, and the Rio Grande River Basin to the south and southwest.

COOPERATION / COORDINATION WITH OTHER BASIN ENTITIES

Cooperation and coordination among different entities which address water quality issues are essential to the success of the CRP program and to understanding the water quality of the coastal basins. TCEQ, NRA, other river authorities, state agencies, and federal agencies work together to provide water quality data for the statewide database, TCEQ Regulatory Activity and Compliance System (TRACS), and, subsequently, for water quality assessments. Throughout this assessment period, data and information have been shared and

provided by a variety of entities so that a more complete picture can be drawn about water quality within the Nueces River Basin and the adjoining coastal basins.

Each year, in an effort to maintain a complete water quality database with no duplicative efforts or wasted resources, TCEQ and each CRP partner develop a coordinated monitoring schedule for each individual partner's area of responsibility. The schedule is designed to keep all entities involved and informed of what is being sampled, where it is being sampled, why it is being sampled, and who is sampling it.

SUMMARY OF BASIN'S WATER QUALITY CHARACTERISTICS

All of the water bodies are used for one or more of the major uses for which water quality standards are applied; aquatic life use, contact recreation, public water supply, and fish consumption. On whole, the water quality for the three basins is considered good. However, as expected, there are areas of concern and areas of impairment where the water quality does not either partially or fully meet the established water quality standards (see the Watershed Summaries Section for more information on what defines a concern or an impairment). This can be attributed to a long history of activities and growth in the area involving agriculture, ranching, oil drilling, and industrial and municipal discharge. However, some natural causes can be held responsible for some degradation of water quality as defined by the water quality standards.

To measure whether or not the quality of water bodies meet the Texas Surface Water Quality Standards (TSWQS), water samples must be collected and analyzed. A variety of parameters are collected based on each segment, its uses, and the associated standards that have been established.

Field and conventional parameters are collected to provide a baseline of information about the general quality of the water within the basins. Field parameters include dissolved oxygen (DO), water temperature, specific conductance, and pH. These parameters are measurements that are collected on site in the field. Other field parameters measured on site include environmental characteristics such as air temperature, water color, water odor, estimated flow, wind direction and intensity, and the amount of rainfall within the past 7 days.

Conventional parameters, which are analyzed in laboratories from water samples collected on site, supply information about a segment's reaction to excessive plant growth or how pollutants are dispersed. These parameters include alkalinity, total suspended solids (TSS), volatile suspended solids (VSS), ammonia, bacteria, nitrate+nitrite nitrogen (nitrogen), total phosphorus, orthophosphorus, total organic carbons (TOC), chloride, sulfate, total dissolved solids (TDS), turbidity, and hardness.

The field and conventional parameters are considered routine and are therefore collected on a consistent basis. Under CRP, there are three main types of monitoring: routine, systematic, and targeted. Generally, routine monitoring occurs throughout the state by all entities contributing to TRACS. Routine monitoring involves consistent sampling for field and conventional parameters on a quarterly basis for each fixed site. This monitoring results in a historical database. Systematic monitoring may involve field and conventional parameters but it may only involve monitoring sites for a short period. This type of monitoring is utilized to detect suspected water quality concerns. Targeted monitoring affects sites that are identified by TCEQ as lacking sufficient data. Because CRP is a cooperative program, CRP partners sample much of the identified sites that need additional data collection.

The draft 2002 Texas 303(d) List as of October 1, 2002, contains a list of water bodies that do not meet applicable water quality standards or is threatened for one or more designated uses by one or more pollutants, and are considered top priorities for Total Maximum Daily Load (TMDL) studies. These listed segments are divided into three subcategories: (a) a TMDL is underway, scheduled, or will be scheduled; (b) a review of the water quality standards for this water body will be conducted before a TMDL is scheduled; and (c) additional data and information will be collected before a TMDL is scheduled. The water bodies falling under the “a” subcategory are:

- 2110 Lower Sabinal River for nitrogen
- 2202 Arroyo Colorado Above Tidal for organic compounds in fish tissue
- 2204 Petronila Creek Above Tidal for chloride, sulfate, and TDS
- 2462 San Antonio Bay/Hynes Bay/Guadalupe Bay for bacteria in oyster waters
- 2472 Copano Bay/Port Bay/Mission Bay for bacteria in oyster waters
- 2482 Nueces Bay for zinc in oyster tissue, and
- 2501 Gulf of Mexico for mercury in king mackerel > 43 inches

A complete review of all segments and all concerns and impairments is include in section 3.3 of this report.

2002 IN REVIEW

During the first half of the 2002, the region was still undergoing a new “drought of record” that began in 1993. However, three significant rainfall events of tropical origin led to severe flooding with the following counties having been declared federal disaster areas: Aransas, Duval, Jim Wells, Live Oak, McMullen, Nueces, and San Patricio. An estimated 2.92 million acre-feet (AF) of inflow to the Lake Corpus Christi/Choke Canyon Reservoir System (Reservoir System) was recorded in 2002 marking the largest flood since Hurricane Beulah in 1967. The Nueces River downstream from Wesley Seale Dam on Lake Corpus Christi was at or above flood stage for 53 days between July 5th and November 11th.

Beginning in late June, heavy rain episodes caused by a slow moving tropical weather system began to occur over much of south and central Texas. Although the rainfall followed a significant dry spell in the watershed, the duration and intensity of the precipitation event quickly inundated creeks and rivers. Some portions of the watershed in Live Oak and McMullen counties received in excess of 10 inches of rain during the event. By July 2nd, all major tributaries upstream from the Reservoir System were at flood stage and rising; some segments went from no flow to flood stage in less than two days. Widespread and intense flooding ensued for weeks along the Frio and Nueces Rivers forcing the evacuation of residents in low lying areas. For the Frio River at Tilden, a record gauge height reading of 30.11 feet (ft) was set on July 10, 2002, surpassing the 29 ft recorded in June 1997. (Flood stage is 22 ft above mean sea level (msl)).

July 12th officially marked the end of this new drought of record when the Reservoir System reached full capacity (936,512 AF). Within two weeks, 511,170 AF of measured inflow attributed to the filling of the Reservoir System for the first time since July 3, 1993. Subsequent inflow could not be contained and was spilt downstream into the Lower Nueces River where it flows into Nueces Bay and Estuary. At the peak of the July event, Choke Canyon Reservoir had all of its seven floodgates opened, sending as much as 13,500 cubic feet per second (cfs) of water downstream into the Frio River. By July 16th, Wesley Seale Dam had all 27 crest gates on the South Dam spilling as much as 50,700 cfs downstream to the Lower Nueces River.

A subsequent rainfall event in early September associated with the remnants of Tropical Storm Fay sent river levels rising above flood stage for the second time during 2002. Most areas of the Nueces River Basin received between 3 and 8 inches of rain, inundating creeks and rivers that had flooded just weeks prior. Choke Canyon Reservoir, at the height of the September event, was spilling a record amount of 22,500 cfs over all its seven flood gates from September 11th – 14th. Lake Corpus Christi's maximum spill rate was 56,200 cfs on September 15th. The maximum recorded spill rate was 138,000 cfs in 1967 during Hurricane Beulah. Downstream from Wesley Seale Dam at the Calallen gauge, the river crested in excess of 13 ft msl during the September event; the maximum recorded level was approximately 16 ft msl, also during Hurricane Beulah. (Flood stage is 7.0 ft msl).

An additional rainfall event, in late October, associated with the remnants of Pacific-born Hurricane Kenna contributed to minor flooding in parts of the Nueces River Basin. Making landfall just north of Puerto Vallarta, Mexico, Hurricane Kenna crossed the Sierra Madre mountain range and ended up soaking South Texas. Though not as severe of a rainmaker as the storms associated with the July and September events, the remnants of Hurricane Kenna combined with a saturated watershed, were sufficient to raise stream levels above flood stage for the third time in 2002.

Fortunately, the floods of 2002 occurred after the completion of a \$22.1 million repair project to strengthen the Wesley Seale Dam's spillway. There were concerns about the dam's stability after a slight bulge in the spillway had been detected. It was suspected that the dam may have slid downstream slightly since its construction in 1958. Repairs, which began in 1999, were completed 10 months ahead of schedule in March 2001. During the repairs, the reservoir was limited to 91 ft msl to ensure the integrity of the dam. The lake was allowed to return to its normal pool elevation of 94 ft msl once the repairs were complete. This 3 ft of storage is equal to 54,978 AF.

OFF-ROAD VEHICLE (ORV) ISSUE

In the Upper Nueces River Basin, use of ORVs in state-owned riverbeds has become an increasingly popular pass-time for hundreds of off-road enthusiasts. Off-roaders use the streambed as a trail and forge through fish beds, degrading sensitive riparian and aquatic habitat. In many areas, it has displaced traditional river recreation (canoeing, picnicking, swimming, snorkeling, and fishing) due to safety concerns associated with multitudes of oncoming ORVs. The vehicles of choice for these off-roaders are modified 4-wheel drive trucks. Other ORVs include motorcycles and all terrain vehicles.

Until recently, there have been no laws restricting ORV use in state-owned streambeds. However, in the 78th Session of the Texas Legislature, a bipartisan group of South Texas lawmakers filed legislation banning, with limited exceptions, the use of any motorized vehicle in a state-owned riverbed. Senate Bill 155 and its companion, House Bill 305, are designed to preserve the public rivers for the enjoyment of future generations and improve public safety. The bill was signed by Governor Rick Perry on June 20, 2003. The effective date is August 1, 2003 and the ban goes into effect January 1, 2004.

VALERO REFINERY

On the Frio River, downstream from Choke Canyon Reservoir in the town of Three Rivers, Texas, Valero Energy Corporation is performing interim corrective action and monitoring in response to the discovery of hydrocarbon seeps that occurred in the vicinity of the river. The hydrocarbon, a light non-aqueous phase liquid, was observed by City of Corpus Christi personnel on March 26, 2001, seeping from the riverbank. Subsequent seeps occurred on April 3, May 29 and 31, 2001.

Due to the discovery of the hydrocarbon seep at the Valero Refinery, water quality monitoring efforts by NRA, through CRP, have been stepped up. An additional quarterly monitored sampling site was added downstream from the remediation site. Analytical testing for volatile organic compounds was added to the new site and a site just upstream to monitor for hydrocarbon contamination occurring in that segment.

PUBLIC INVOLVEMENT

A primary element of CRP is the involvement of the public. NRA depends on public involvement and input from stakeholders to assist in understanding the needs of the basins and the areas of concern. Therefore, NRA works with stakeholders to address concerns within each basin and set water quality monitoring priorities. Historically, NRA has worked with a steering committee, which, as defined in the Texas Clean Rivers Act, is a group of diverse stakeholders representing a variety of interests in water quality. Due to its large area of CRP responsibility, NRA has recently split its steering committee into three subgroups: Upper Nueces River Basin, Lower Nueces River and Nueces Coastal Basins, and the Arroyo-Colorado. The reasoning behind the split was to focus more on each individual basin's needs and allow each basin to be better represented throughout the NRA and CRP process. Each basin subgroup has representatives from municipalities, state and federal agencies, the Texas State Soil and Water Conservation Board, industrial and agricultural interests, and educational institutes. Each year, NRA facilitates steering committee meetings, which are intended to bring the steering committee members together to discuss water quality and other related issues of each basin as well as NRA's management of CRP. NRA uses input from these meetings to help develop its CRP program.

The steering committee process is important because it provides NRA with new ideas for work plans and allows NRA to focus on the needs and interests of the stakeholders of the basins. Such ideas have included: increased education, more public outreach, additional special studies, expanded routine and systematic monitoring, and increased targeted monitoring.

WATERSHED SUMMARIES

The purpose of the technical summary, Section 3 of this report, is to provide detailed information about each segment within the Nueces River Basin, the San Antonio-Nueces and Nueces-Rio Grande Coastal Basins, and the adjacent bays and estuaries. The main emphasis of the data review are the results of the Draft 2002 305(b) Assessment Report, additional findings since the assessment report, and possible explanations for the concerns and impairments. In general, impairments refer to segments that do not meet TSWQS for a specific parameter. In general, if 25% or more of the measured parameter values exceed the TSWQS, the segment is considered to be impaired which can affect renewal or granting of discharge permits. Concerns refer to segments in which 10% to 25% of the measured parameter values exceed the TSWQS. There are some cases in which the percent of exceedances is greater than 25%, but for a number of samples less than the minimum required for an official assessment. In these cases, the segment is listed as having a concern rather than an impairment. The assessment report is generated every two years, comparing the water quality within the basins to the TSWQS.

The data review section is designed to address a number of issues: water quality conditions, explanations of the possible reason(s) for poor water quality conditions, and recommendations for addressing findings. Tables 1 and 3.2.1 summarize the impairments and concerns found throughout the basins. Maps showing the segments with concerns and impairments are in Appendix A.

Table 1. Impairments and Concerns Summary

Storet Code	Parameter	Impairment/ Concern	Use	Segments	Map #
	Bacteria	Concern	Oyster Waters	2462, 2471, 2481, 2485, 2491	A-1
	Bacteria	Impairment	Oyster Waters	2472	A-1
	Bacteria	Impairment		2107	A-2
	DDE, and other organochlorine pesticides	Impairment	Fish consumption	2202	A-3
	Mercury in king mackerel > 43''	Impairment	Fish consumption	2501	A-4
	PCBs in fish tissue	Impairment	Fish consumption	2202A	A-5
	Toxicity in Ambient Sediment	Impairment		2201	A-6
	Zinc in oyster tissue	Impairment	Oyster Waters	2482	A-7
00010	Temperature	Concern	General Use	2115	A-8
00010	Temperature	Impairment	General Use	2203	A-8
00300	DO	Concern	Aquatic Life Use	2002, 2004, 2116, 2117, 2201, 2202, 2472, 2483, 2494	A-9
00300	DO	Impairment		2104, 2107, 2113, 2201, 2485, 2491	A-9
00610	Ammonia	Concern	Nutrient Enrichment	2107, 2201, 2202, 2484, 2491	A-10
00630	Nitrogen	Concern	Nutrient Enrichment	2109, 2110, 2117, 2201, 2202, 2462, 2484, 2485A, 2491	A-11
00630	Nitrogen	Impairment	Public Water Supply	2110	A-11
00665	Total phosphorus	Concern	Nutrient Enrichment	2202, 2462, 2472, 2485A, 2491	A-12
00671	Orthophosphorus	Concern	Nutrient Enrichment	2003, 2202, 2462, 2485A, 2491	A-13
00940	Chloride	Concern	Public Water Supply	2104, 2117	A-14
00940	Chloride	Impairment	General Use	2204	A-14
00945	Sulfate	Concern	Public Water Supply	2109	A-15
00945	Sulfate	Impairment	General Use	2204	A-15

31616	Fecal coliform	Concern	Contact Recreation	2107, 2202	A-2
31616	Fecal coliform	Impairment	Contact Recreation	2202, 2485A	A-2
31648	<i>E. coli</i>	Concern	Contact Recreation	2002, 2106, 2107, 2117	A-2
31648	<i>E. coli</i>	Impairment	Contact Recreation	2117	A-2
31649	Enterococci	Concern	Contact Recreation	2001, 2002, 2003, 2462, 2473, 2485, 2485A	A-2
32211	Chlorophyll a	Concern	Excessive Algal Growth	2101, 2107, 2202, 2203, 2204, 2485, 2491, 2492	A-16
70300	TDS	Concern	Public Water Supply	2104, 2107, 2117	A-17
70300	TDS	Impairment	General Use	2116, 2204	A-17

A segment by segment review follows the summary table in Section 3 of this report. The segment reviews detail the results of the assessment report. The information is organized by basin and segment and lists the impairments and concerns of each. The data for the assessment were collected from March 1, 1996 through February 28, 2001.

TREND ANALYSIS

The trend analysis of water quality data serves to develop a greater understanding of water quality conditions and enhance the ability to make decisions regarding water quality issues. This effort is designed to accomplish several goals, including:

- define long-term water quality variability and significant relationships
- provide supplementary information for concerns and use impairments
- set priorities for water quality monitoring
- identify areas where water quality is deteriorating so that action strategies may be developed to address potential problems
- highlight areas where water quality is improving
- assess the success of water quality improvement projects and other changes in the watershed

Table 2 below summarizes the results of the trend analysis. Appendix B contains detailed information on each of the parameters including maps, statistical analysis results, and graphs. The details are grouped by tidal, non-tidal, and marine segments. For comparison purposes, the same y ranges (range of measured values) are used on the graphs where there is more than one increasing trend with the segment groups. The same x range (1/1/1993 – 1/1/2003) is used on all graphs.

Table 2. Trend Analysis Summary

Parameter Description	Storet Code	# Data Sets	# Decreasing Trends	# Increasing Trends
Summer Water Temperature (°C)*	00010	73	6	3
Winter Water Temperature (°C)*	00010	134	0	2
Water Temperature (°C)*	00010	134	23	0
Transparency (meters)	00078	36	2	2
Conductivity (UMHOS @ 25°C)	00094	42	2	7
Summer DO Deficit	00300	40	4	6
Winter DO Deficit	00300	40	2	4
DO Deficit	00300	40	4	5
pH (Standard Units)*	00400	43	13	1
Alkalinity (Mg/L)	00410	46	1	13
Salinity (ppt)	00480	127	2	30
Total Suspended Solids (Mg/L)	00530	52	9	3
Volatile Suspended Solids (Mg/L)	00535	49	11	8
Ammonia (Mg/L)	00610	52	9	0
Kjeldahl Nitrogen (Mg/L)	00625	46	1	7
Nitrate + Nitrite Nitrogen (Mg/L)	00630	27	5	0
Total Phosphorus (Mg/L)**	00665	51	0	3
Ortho-Phosphorus (Mg/L)**	00671	31	8	4
Total Organic Carbon (Mg/L)	00680	49	0	13
Log of Chloride	00940	47	1	4
Sulfate (Mg/L)*	00945	54	2	5
Dissolved Arsenic (Ug/L)	01000	1	0	0
Dissolved Barium (Ug/L)	01005	2	1	1
Dissolved Cadmium (Ug/L)	01025	1	0	0
Dissolved Chromium (Ug/L)	01030	1	0	0
Dissolved Copper (Ug/L)	01040	1	0	1
Dissolved Lead (Ug/L)	01049	1	0	0
Dissolved Nickel (Ug/L)	01065	2	0	0
Dissolved Silver (Ug/L)	01075	2	0	0
Dissolved Zinc (Ug/L)	01090	1	0	0
Dissolved Aluminum (Ug/L)	01106	1	0	0
Fecal coliform (#/100ML)*	31616	29	2	2
Chlorophyll a (Ug/L)**	32211	44	7	1
Total Dissolved Solids (Mg/L)	70300	37	3	5

* Criteria from TSWQS denoted on graphs. There is no criteria listed for sulfate nor TDS for tidal or marine sediments.

**The criteria annotated on the graphs for this parameter are the screening levels used for assessments since no official criteria exists.

CONCLUSIONS AND RECOMMENDATIONS

San Antonio – Nueces River Basin: None of the segments in this basin have any impairments. There are concerns for bacteria, DO, and orthophosphorus. There are increasing trends for DO deficit, TOC, and VSS.

24-hour DO monitoring is currently underway on segment 2002. Two monitoring events occurred by the time of this writing. The minimum recorded values were 5.41 mg/L and 6.11 mg/L, the maximum recorded values were 6.6 mg/L and 6.4 mg/L, with the average values being 6.04 mg/L and 6.24 mg/L, respectively. The criteria for DO on this segment is 5.0 mg/L. With additional monitoring, it appears likely that the concern for DO will be removed from the Draft 2002 305(b) Report for this segment.

Segment 2004 should be removed from the Draft 2002 305(b) Report. Beginning in August 1998, samples were being taken on Aransas Creek, an intermittent stream, not the Aransas River. The correct location has again been sampled since July 2002. The incorrect location was assigned a new Surface Water Quality Monitoring (SWQM) number and assigned to those sampling results. Therefore, there were only 3 samples for the Aransas River during the assessment period, which is not enough data points to determine whether or not there is an actual DO concern on this segment. None of the 3 samples exceed the criteria. Since the assessment, 2 additional samples have been taken, neither of which exceed the criteria.

Nueces River Basin: There are impairments for bacteria, DO, nitrogen, and TDS. There are concerns for ammonia, bacteria, chloride, chlorophyll a, DO, nitrogen, sulfate, temperature, and TDS. There are trends for alkalinity, dissolved barium, chloride, conductivity, dissolved copper, pH, sulfate, temperature, total Kjeldahl Nitrogen (TKN), TSS, and VSS

Segments 2104, 2107, and 2113 are included in the South Central Texas – Bacteria and DO TMDL currently underway. More information about the TMDL can be found at <http://www.tnrcc.state.tx.us/water/quality/tmdl/SouthCentralBacteria.pdf>.

Segment 2116 is listed as impaired for TDS. However, there is a direct correlation between water level and TDS in Choke Canyon Reservoir. As described in the introduction of this report, this region suffered its worst drought of record from 1993 to July 2002. Analysis of the reservoir from March 1999 to July 2002 showed that during this time period, the water level dropped 16 feet, and dropped from 51.3% of capacity to 35.6% of capacity. During this same time period, calculated TDS levels rose from 427 to 940. In August 2002, the reservoir was full, and the calculated TDS level at station 13020 was 224. This is a naturally occurring problem, compounded by the City of Corpus Christi's Reservoir System operating procedure which does not allow for the system to be flushed unless there is a flood event. A formal request has been made to TCEQ to change the criteria for TDS for this segment based on this information.

24-hour DO monitoring is also currently underway on segment 2116. DO is a concern, not an impairment in this segment. Between the two monitoring events to date, the minimum recorded values were 2.61 mg/L and 3.75 mg/L, the maximum recorded values were 4.36 mg/L and 6.24 mg/L, with the average values being 3.4 mg/L and 4.68 mg/L, respectively. The criteria for DO on this segment is 5.0 mg/L. There are no discharges directly into this segment, and the remaining 24-hour monitoring results may indicate that the segment is impaired. As with TDS discussed above, this is a naturally occurring problem. A formal request may be made to TCEQ to change the criteria for DO.

Nueces – Rio Grande Coastal Basin: There are bacteria, chloride, pesticides, DO, Polychlorinated Biphenyls (PCBs), sulfate, TDS temperature, and toxicity in sediment impairments in this basin. There are concerns for

ammonia, bacteria chlorophyll a, DO, nitrogen, orthophosphorus, and total phosphorus. There are trends for bacteria, chloride, chlorophyll a, DO deficit, orthophosphorus, TDS, TKN, TOC, total phosphorus, and transparency.

Segment 2201 is scheduled to be included in the Statewide Ambient Toxicity TMDL.

Segments 2202, and 2202A are included in the Arroyo Colorado Legacy/Donna Canal Legacy TMDL that has been completed. More information about the TMDL can be found at

http://www.tnrcc.state.tx.us/water/quality/tmdl/arroyo_legacyfact.pdf. The adopted implementation plan can be found at http://www.tnrcc.state.tx.us/water/quality/tmdl/implan_arroyo.pdf.

Segment 2204 is included in the Colorado and San Gabriel Rivers, Brushy and Petronila Creeks – TDS TMDL currently underway. More information about the TMDL can be found at <http://www.tnrcc.state.tx.us/water/quality/tmdl/colorado&sangabriel.pdf>.

Bays and Estuaries: There are bacteria, bacteria in oysters, DO, mercury in fish tissue, and zinc in oyster tissue impairments in the bays and estuaries. There are concerns for ammonia, bacteria, bacteria in oysters, chlorophyll a, DO, nitrogen, orthophosphorus, and total phosphorus. There are trends for alkalinity, bacteria, chloride, chlorophyll a, conductivity, DO deficit, orthophosphorus, salinity, sulfate, TDS, temperature, TKN, TOC, total phosphorus, transparency, TSS, and VSS.

Segments 2462, and 2472 are included in the Gulf Coastal Oyster Waters – Bacteria TMDL schedule for June 2006 through July 2007.

Segment 2482 is the only segment in the Nueces Bay Zinc TMDL scheduled for September 2005 through October 2006. More information about the TMDL can be found at <http://www.tnrcc.state.tx.us/water/quality/tmdl/nuecesbay.pdf>.

Segments 2485 and 2491 are included in the Oso Bay DO TMDL schedule for May 2004 through June 2005.

24-hour DO monitoring is currently underway in segment 2472. DO is a concern, not an impairment in this segment. Between three monitoring events, the minimum recorded values were 5.41 mg/L, 5.57 mg/L, and 5.88 mg/L, the maximum recorded values were 8.19 mg/L, 7.18 mg/L, and 8.31 mg/L, with the average values being 6.46 mg/L, 6.23 mg/L, and 6.64 mg/L, respectively. The criteria for DO on this segment is 5.0 mg/L. With additional monitoring, it appears likely that the concern for DO will be removed from the Draft 2002 305(b) Report for this segment.

24-hour DO monitoring is also currently underway in segment 2483. DO is a concern, not an impairment in this segment. Between the three monitoring events to date, the minimum recorded values were 4.94 mg/L, 5.01 mg/L, and 3.77 mg/L, the maximum recorded values were 9.52 mg/L, 8.78 mg/L, and 7.65 mg/L, with the average values being 6.7 mg/L, 6.34 mg/L, and 6.27 mg/L, respectively. The criteria for DO on this segment is 5.0 mg/L. With additional monitoring, it appears likely that the concern for DO will be removed from the Draft 2002 305(b) Report for this segment.

NRA will continue to monitor the Nueces River Basin and the adjoining coastal basins in order to broaden its understanding of, and to find solutions to, the causes of parameter impairments and concerns.

1.0 INTRODUCTION:

In 1991, the 72nd Texas Legislature enacted Senate Bill 818, the Texas Clean Rivers Act in response to growing concerns about the quality of Texas's surface waters. By applying a holistic approach, the Texas Clean Rivers Act mandates basin-wide water quality assessments for each river and coastal basin in Texas. The Texas Clean Rivers Program (CRP) was created under this act. CRP is the vehicle responsible for developing working partnerships between the Texas Commission on Environmental Quality (TCEQ), other state agencies, river authorities, local governments, industries, and concerned citizens. Within the Texas Clean Rivers Act, several goals and objectives were set for CRP and its partners to accomplish.

The primary mission of CRP: *to maintain and improve water quality within the river and coastal basins throughout the State of Texas*, comprises the following goals and objectives:

- Ensure efficient use of public funds
- Enhance public participation and outreach
- Encourage comprehensive and cooperative watershed planning
- Maintain basin-wide water quality-monitoring programs
- Develop and maintain a river basin water quality database clearinghouse
- Provide quality assured data to TCEQ for use in water quality decision making
- Focus on priority issues and address local initiatives
- Identify, analyze, and report on water quality issues and potential cause of pollution, and
- Identify and evaluate alternatives for preventing and reducing pollution.

These goals and objectives are updated every five years. The most recent goals are stated in the Long Term Action Plan 2000 - 2005.

Throughout its existence, CRP has been effective in monitoring and addressing surface water quality concerns. This is accomplished by applying an integrated and coordinated watershed management approach. A watershed is broadly defined as the geographic description of an entire river basin and the land that drains into it. Water does not stay within governmental boundaries, such as state borders, county lines, or city limits; it flows throughout its natural basin boundaries. In recent years, the dominance of non-point source pollution, the necessary participation from local stakeholders, and the need for new and innovative approaches to water quality concerns are driving the utilization of watershed management. The watershed management approach applies monitoring and management tools to what affects and happens to water quality on the watershed as a whole. For example, any human or natural activity upstream can possibly affect water quality downstream. By managing those activities, good water quality can be maintained downstream. Therefore, watershed management can account for all aspects of the entire watershed system, ecologically, economically, and demographically.

The Nueces River Authority (NRA) is delegated by CRP to be responsible for the Nueces River Basin, the San Antonio – Nueces Coastal Basin, and the Nueces – Rio Grande Coastal Basin; an area comprised of roughly 30,500 square miles, ranging from the hill country in Edwards County to San Antonio Bay in Refugio County to the Brownsville Ship Channel in Cameron County. There are 23 stream segments, 3 reservoir segments, and 16 bay and estuary segments.

NRA and TCEQ work together to apply a watershed management approach to the Nueces River Basin and the adjoining coastal basins. Both NRA and TCEQ collect quality assured data from surface water

bodies, evaluate the results, and assess each segment's condition. Subsequently, any identified water quality concerns are prioritized and targeted for future studies and remedial action under CRP or other water quality programs.

SAN ANTONIO – NUECES COASTAL BASIN

The San Antonio – Nueces Coastal Basin is approximately 3,100 square miles, covering all or part of 7 counties. The basin is bordered by the San Antonio River Basin to the north, the Lavaca-Guadalupe Coastal Basin to the northeast, bays, estuaries, and the Gulf of Mexico to the east, the Nueces-Rio Grande Coastal Basin to the south, and the Nueces River Basin to the northwest. Being a coastal area, the basin is naturally host to several recreational areas. These include Goose Island SP near Rockport, Copano Bay State Fishing Pier along State Highway 35 north of Fulton, Fulton Mansion SHP in Fulton, and the Aransas National Wildlife Refuge in Aransas County.

NUECES RIVER BASIN

The Nueces River Basin covers approximately 17,000 square miles, encompassing all or part of 23 counties in South-Central Texas. Other rivers within the basin include the Frio, Leona, Sabinal, and Atascosa Rivers. The basin is bordered by the Colorado, Guadalupe, and San Antonio River Basins to the north, the San Antonio – Nueces Coastal Basin to the southeast, the Nueces – Rio Grande Coastal Basin to the south, and the Rio Grande River basin to the south and southwest. Throughout the basin, the rivers are used for water supply and recreational purposes. The basin is home to numerous recreational areas including: Choke Canyon State Park (SP) on the south side of Choke Canyon Reservoir near Three Rivers, Lake Corpus Christi SP on the southeast bank of Lake Corpus Christi near Mathis, Garner SP north of Concan, Tips State Recreational Area on the Frio River in Three Rivers, Lipantitlan State Historic Park (SHP) near Sandia, Lost Maples State Natural Area (SNA) north of Vanderpool, and Hill Country SNA north of Hondo.

NUECES – RIO GRANDE COASTAL BASIN

The Nueces – Rio Grande Coastal Basin covers approximately 10,400 square miles, encompassing all or part of 12 counties in South Texas. The basin is bordered by the Nueces River Basin and the San Antonio – Nueces Coastal Basin to the north, bays, estuaries, and the Gulf of Mexico to the east, and the Rio Grande River Basin to the south and southwest. The inland area of the basin is dominated by large ranches, including the King Ranch. Recreational areas are primarily along the coast and include Mustang Island SP, Port Isabelle Light House SHP in Port Isabel, and the Padre Island National Seashore.

COORDINATION/COOPERATION WITH OTHER BASIN ENTITIES

Cooperation and coordination among different entities which address water quality issues are essential to the success of the CRP program and to understanding the water quality of the basins. TCEQ, NRA, other river authorities, state agencies, and federal agencies work together to provide water quality data for the statewide database, TCEQ Regulatory Activity and Compliance System (TRACS), and, subsequently, for water quality assessments. Throughout this assessment period, data and information have been shared and provided by a variety of entities so that a more complete picture can be drawn about water quality within the Nueces River Basin and the adjoining coastal basins.

Each year, in an effort to maintain a complete water quality database with no duplicative efforts or wasted resources, TCEQ and each CRP partner develop a coordinated monitoring schedule for each individual partner's area of responsibility. The schedule is designed to keep all entities involved and informed of what is being sampled, where it is being sampled, why it is being sampled, and who is

sampling it. To produce the schedule, NRA facilitates a coordinated monitoring meeting each year. The meeting is intended to organize the schedule of sampling events that are going to occur within the Nueces River Basin and the adjoining coastal basins in the following fiscal year. All entities, which are performing water quality sampling within these basins and submitting data to TCEQ for assessment purposes, are invited to this meeting. Currently, the schedule for NRA's area of CRP responsibility includes NRA, TCEQ's Surface Water Quality Monitoring (SWQM) team for Regions 13, 14, 15, and TCEQ's Total Maximum Daily Load (TMDL) team.

At the coordinated monitoring meeting, the group reviews the monitoring plans of each entity involved and each station that is listed for all 42 segments within the basins. For each segment, the group discusses whether the following criteria are being met:

- At least one station per segment
- Adequate number of stations to cover length of segment
- Adequate number of samples for assessment
- Appropriate sampling for each site

In addition to informing each entity of all sampling events to occur, the coordinated monitoring meeting also allows everyone to discuss other issues within the basins such as segments that are considered priority areas, data issues, and potential areas for special studies.

SUMMARY OF BASIN'S WATER QUALITY CHARACTERISTICS

Due to the size of the basins and the uses of the surface waters, the quality of those water bodies is an important trait for the vitality of the area. All of the water bodies are used for one or more of the major uses for which water quality standards are applied: aquatic life use, contact recreation, public water supply, and fish consumption. These uses are discussed in more detail in Section 3.2 of this report.

On whole, the water quality for the three basins is considered good. However, as expected there are areas of concern and areas of impairment where the water quality does not either partially or fully meet the established water quality standards. In general, impairments refer to segments that do not meet TSWQS for a specific parameter. In general, if 25% or more of the measured parameter values exceed the TSWQS, the segment is considered to be impaired which can affect renewal or granting of discharge permits. Concerns refer to segments in which 10% to 25% of the measured parameter values exceed the TSWQS. There are some cases in which the percent of exceedances is greater than 25%, but for a number of samples less than the minimum required for an official assessment. In these cases, the segment is listed as having a concern rather than an impairment. This can be attributed to a long history of activities and growth in the area involving agriculture, ranching, oil drilling, and industrial and municipal discharge. However, some natural causes can be held responsible for some degradation of water quality as defined by the water quality standards. For example, several of the segments that have not met standards are resulting in these concerns or impairments because of the drought that plagued all three basins during the assessment period.

To measure whether or not the quality of water bodies meet the Texas Surface Water Quality Standards (TSWQS), water samples must be collected and analyzed. A variety of parameters are collected based on each segment, its uses, and the associated standards that have been established.

Field and conventional parameters are collected to provide a baseline of information about the general quality of the water within the basins. If a concern is identified then additional, special parameters may need to be

collected on the specific water body to address that concern. Special parameters that may be collected include volatile organic compounds (VOCs), benthic samples, fish tissue, or 24-hour DO data. VOCs may be collected to determine if a petroleum spill has occurred and affected a water body. Routine benthic collection can provide some understanding about species composition and how biological systems react to changes in water quality. Fish tissue samples help determine the extent of historical pollution. The data collected from 24-hour DO events provides information about a water body's reaction to temporal and spatial effects such as a long-term drought.

The field and conventional parameters are considered routine and are therefore collected on a consistent basis. Under CRP, there are three main types of monitoring: routine, systematic, and targeted. Generally, routine monitoring occurs throughout the state by all entities contributing to TRACS. Routine monitoring involves consistent sampling for field and conventional parameters on a quarterly basis for each fixed site. This monitoring results in a historical database. Systematic monitoring may involve field and conventional parameters but it may only involve monitoring sites for a short period. This type of monitoring is utilized to detect suspected water quality concerns. Targeted monitoring affects sites that are identified by TCEQ as lacking sufficient data. Because CRP is a cooperative program, CRP partners sample much of the identified sites that need additional data collection.

NRA has performed a variety of monitoring under CRP. Generally, NRA performs routine and systematic monitoring, however, NRA has also collected benthic information and at the request of TCEQ, Region 14, NRA has collected VOCs near the Valero Refinery in Three Rivers, Texas. In addition, under the definition of targeted monitoring, NRA has assisted TCEQ with flow data associated with discharge permits.

The draft 2002 Texas 303(d) List as of October 1, 2002, contains a list of water bodies that do not meet applicable water quality standards or is threatened for one or more designated uses by one or more pollutants, and are considered top priorities for TMDLs. These listed segments are divided into three subcategories: (a) a TMDL is underway, scheduled, or will be scheduled; (b) a review of the water quality standards, for this water body will be conducted before a TMDL is scheduled; and (c) additional data and information will be collected before a TMDL is scheduled. The water bodies falling under the "a" subcategory are:

- 2110 Lower Sabinal River for nitrogen
- 2202 Arroyo Colorado Above Tidal for organic compounds in fish tissue
- 2204 Petronila Creek Above Tidal for chloride, sulfate, and TDS
- 2462 San Antonio Bay/Hynes Bay/Guadalupe Bay for bacteria in oyster waters
- 2472 Copano Bay/Port Bay/Mission Bay for bacteria in oyster waters
- 2482 Nueces Bay for zinc in oyster tissue, and
- 2501 Gulf of Mexico for mercury in king mackerel > 43 inches

A complete review of all segments and all concerns and impairments is include in section 3.2 of this report. All of the segments, which possess some sort of concern or impairment, are recommended to undergo best management practices and additional monitoring. Through the CRP process and coordinated monitoring schedule, NRA and TCEQ work together to get those recommendations implemented.

2002 IN REVIEW

During the first half of 2002, the region was still undergoing a new "drought of record" that began in 1993. However, three significant rainfall events of tropical origin led to severe flooding with the

following counties having been declared federal disaster areas: Aransas, Duval, Jim Wells, Live Oak, McMullen, Nueces, and San Patricio. An estimated 2.92 million acre-feet (AF) of inflow to the Lake Corpus Christi/Choke Canyon Reservoir System (Reservoir System) was recorded in 2002 marking the largest flood since Hurricane Beulah in 1967. The Nueces River downstream from Wesley Seale Dam on Lake Corpus Christi was at or above flood stage for 53 days between July 5th and November 11th.

Beginning in late June, heavy rain episodes caused by a slow moving tropical weather system began to occur over much of south and central Texas. Although the rainfall followed a significant dry spell in the watershed, the duration and intensity of the precipitation event quickly inundated creeks and rivers. Some portions of the watershed in Live Oak and McMullen counties received in excess of 10 inches of rain during the event. By July 2nd, all major tributaries upstream from the Reservoir System were at flood stage and rising; some segments went from no flow to flood stage in less than two days. Widespread and intense flooding ensued for weeks along the Frio and Nueces Rivers forcing the evacuation of residents in low lying areas. For the Frio River at Tilden, a record gauge height reading of 30.11 feet (ft) was set on July 10, 2002, surpassing the 29 ft recorded in June 1997. (Flood stage is 22 ft above mean sea level (msl)).

July 12th officially marked the end of this new drought of record when the Reservoir System reached full capacity (936,512 AF). Within two weeks, 511,170 AF of measured inflow attributed to the filling of the Reservoir System for the first time since July 3, 1993. Subsequent inflow could not be contained and was spilt downstream into the Lower Nueces River where it flows into Nueces Bay and Estuary. At the peak of the July event, Choke Canyon Reservoir had all of its seven floodgates opened, sending as much as 13,500 cubic feet per second (cfs) of water downstream into the Frio River. By July 16th, Wesley Seale Dam had all 27 crest gates on the South Dam spilling as much as 50,700 cfs downstream to the Lower Nueces River.

A subsequent rainfall event in early September associated with the remnants of Tropical Storm Fay sent river levels rising above flood stage for the second time during 2002. Most areas of the Nueces River Basin received between 3 and 8 inches of rain, inundating creeks and rivers that had flooded just weeks prior. Choke Canyon Reservoir, at the height of the September event, was spilling a record amount of 22,500 cfs over all its seven flood gates from September 11th – 14th. Lake Corpus Christi's maximum spill rate was 56,200 cfs on September 15th. The maximum recorded spill rate was 138,000 cfs in 1967 during Hurricane Beulah. Downstream from Wesley Seale Dam at the Calallen gauge, the river crested in excess of 13 ft msl during the September event; the maximum recorded level was approximately 16 ft msl, also during Hurricane Beulah. (Flood stage is 7.0 ft msl).

An additional rainfall event, in late October, associated with the remnants of Pacific-born Hurricane Kenna contributed to minor flooding in parts of the Nueces River Basin. Making landfall just north of Puerto Vallarta, Mexico, Hurricane Kenna crossed the Sierra Madre mountain range and ended up soaking South Texas. Though not as severe of a rainmaker as the storms associated with the July and September events, the remnants of Hurricane Kenna combined with a saturated watershed, were sufficient to raise stream levels above flood stage for the third time in 2002.

Fortunately, the floods of 2002 occurred after the completion of a \$22.1 million repair project to strengthen the Wesley Seale Dam's spillway. There were concerns about the dam's stability after a slight bulge in the spillway had been detected. It was suspected that the dam may have slid downstream slightly since its construction in 1958. Repairs, which began in 1999, were completed 10 months ahead of schedule in March 2001. During the repairs, the reservoir was limited to 91 ft msl to ensure the integrity of the dam. The lake was allowed to

return to its normal pool elevation of 94 ft msl once the repairs were complete. This 3 ft of storage is equal to 54,978 AF.

OFF-ROAD VEHICLE (ORV) ISSUE

In the Upper Nueces River Basin, use of ORVs in state-owned riverbeds has become an increasingly popular pass-time for hundreds of off-road enthusiasts. Off-roaders use the streambed as a trail and forge through fish beds, degrading sensitive riparian and aquatic habitat. In many areas, it has displaced traditional river recreation (canoeing, picnicking, swimming, snorkeling, and fishing) due to safety concerns associated with multitudes of oncoming ORVs. The vehicles of choice for these off-roaders are modified 4-wheel drive trucks. Other ORVs include motorcycles and all terrain vehicles.

One site study on the Nueces River by Texas Parks and Wildlife Biologist Dr. Gary Garrett, reported, “Their (*off-road vehicles*) impact was dramatically evident. There was little to no aquatic vegetation, virtually no riparian vegetation, and the substrate had the appearance of heavy scouring.” In addition, comparisons of fish populations at pristine locations and vehicle-traveled locations on the Nueces River reflected a sharp disparity. “Unless we do something soon, our fisheries, our wildlife and the very quality of our water will suffer irreversible damage,” said Agriculture Commissioner Susan Combs, citing organized river rallies that draw 50 to 100 vehicles.

Until recently, there have been no laws restricting ORV use in state-owned streambeds. However, in the 78th Session of the Texas Legislature, a bipartisan group of South Texas lawmakers filed legislation banning, with limited exceptions, the use of any motorized vehicle in a state-owned riverbed. Senate Bill 155 and its companion, House Bill 305, are designed to preserve the public rivers for the enjoyment of future generations and improve public safety. The bill was signed by Governor Rick Perry on June 20, 2003. The effective date is August 1, 2003 and the ban goes into effect January 1, 2004.

Support for legislation banning motorized vehicles in state-owned riverbeds came from numerous state, local, and private entities concerned with conserving Texas’ natural resources. NRA Board of Directors supported this legislation. More information concerning this issue can be found at http://www.nueces-ra.org/outreach_main.html.

VALERO REFINERY

On the Frio River, downstream from Choke Canyon Reservoir in the town of Three Rivers, Texas, Valero Energy Corporation is performing interim corrective action and monitoring in response to the discovery of hydrocarbon seeps that occurred in the vicinity of the river. The hydrocarbon, a light non-aqueous phase liquid, was observed by City of Corpus Christi personnel on March 26, 2001, seeping from the riverbank. Subsequent seeps occurred on April 3, May 29 and 31, 2001.

Remediation activities conducted to contain and/or remove hydrocarbon contamination in the river area include: (1) deployment of an absorbent boom in the river to contain and control surface-water contamination; (2) vacuum extraction along the riverbank, bluff, and near the flood control levee, (3) groundwater recovery, and (4) operation of a 32-well fence line recovery system.

Monitoring and sampling of surface-water and groundwater was initiated by Valero personnel to determine if contamination impacted the river. Visual inspections and surface-water elevations were periodically measured at locations near the hydrocarbon seeps. Surface-water samples were analyzed for benzene, toluene, ethylbenzene, total xylenes (BTEX), naphthalene and alkyl benzenes. Additional

surface-water samples were collected from locations upstream and in the immediate vicinity of the seeps and analyzed for VOCs and semi-volatile organic (SVOC) constituents (including methyl-tert-butyl-ether (MTBE)).

Groundwater samples were collected from river area monitoring wells and analyzed for benzene, toluene, ethylbenzene, BTEX, and MTBE. During one sampling event in October 2001, groundwater samples were analyzed for VOCs and SVOCs. Fluid level measurements were conducted when the remediation systems were operational to document the influence of those systems.

Monitoring results of surface-water sampling during the October – December 2001 reporting period were limited due to excessive rainfall and safety concerns. Analytical results of surface-water samples taken indicated no detectable concentrations of organic constituents during the remediation period with the exception of one sampling event on October 22, 2001 where concentrations of 3&4-methylphenol (16.1 ug/L), naphthalene (11.5 ug/L), and phenol (60.3 ug/L) were identified. Results of groundwater monitoring indicate detectable concentrations of hydrocarbon constituents in a number of monitoring wells. However, the dissolved-phase plume remains relatively stable in the remediation area.

Monitoring results of surface-water sampling during the January – June 2002 reporting period indicated no detectable concentrations of organic constituents during the remediation period. However, surface-water samples were not collected during April 2002 due to high water in the Frio River. Daily (weekdays) visual inspections of the riverbank indicated hydrocarbon sheens were not present. Results of groundwater monitoring indicated detectable concentrations of hydrocarbon constituents in a number of monitoring wells. Results indicate that the dissolved-phase plume remains relatively stable in the remediation area.

Monitoring results of surface-water and groundwater sampling during the July – December 2002 reporting period were limited due to excessive rainfall and flooding associated with the July and October 2002 floods. No riverbank sampling was performed during this time due to inaccessibility of the monitoring points. Daily (weekdays) visual inspections of the riverbank indicated hydrocarbon sheens were not present. Results of groundwater monitoring indicated either no detectable concentrations of hydrocarbon constituents or a decreasing trend. It is important to note that groundwater elevations during the July – December 2002 reporting period were elevated due to the flooding events and resulted in the reversal of the groundwater gradient, i.e. groundwater was flowing from the river area towards the refinery.

Due to the discovery of the hydrocarbon seep at the Valero Refinery, water quality monitoring efforts by NRA, through CRP, have been stepped up. An additional, quarterly monitored sampling site was added downstream from the remediation site. Analytical testing for VOCs was added to the new site and a site just upstream to monitor for hydrocarbon contamination occurring in that segment.

FRESH WATER INFLOWS INTO THE NUECES ESTUARY

The impoundment of surface waters in the Reservoir System has greatly reduced the amount of freshwater flowing downstream to the Nueces Estuary. In an effort to sustain the ecological health of the Estuary, the permit to build Choke Canyon Reservoir included a special condition that would require the release of fresh water from the Reservoir System after Choke Canyon Reservoir filled for the first time. The adoption of an Agreed Operating Order (Order) to meet the requirements was established by TCEQ, the City of Corpus Christi, NRA, and the City of Three Rivers. The Order also required the establishment of the Nueces Estuary Advisory Council (NEAC) to review and provide recommendations on the amount and timing of freshwater inflows. NEAC meets at least annually to address and consider any recommended improvements to the Order.

The City of Corpus Christi is required to allow fresh water to “pass through” the reservoir system to the Nueces Estuary each month. To paraphrase the current Order: “Inflow into the reservoir system, up to a monthly target, must be passed through to the Nueces Estuary. Inflow exceeding the monthly target can be captured for future use. No release of stored water is required to meet the target amount.” The monthly target varies, and is based on the amount of water available in the Reservoir System, seasonal requirements of estuarine organisms, inflows into the Reservoir System, and the salinity levels in Nueces Bay.

More information regarding the Order, pass through requirements, and other related issues is available on the NRA’s website at http://www.nueces-ra.org/faq_list.html.



Photo: Hynes Bay

2.0 PUBLIC INVOLVEMENT

A primary element of CRP is the involvement of the public. The Texas Clean Rivers Act states:

In order to assist in the coordination and development of assessments and reports required by this section, a river authority shall organize and lead a basin-wide steering committee that includes persons paying fees under Section 26.0291, private citizens, the State Soil and Water Conservation Board, representatives from other appropriate state agencies, political subdivisions, and other persons with an interest in water quality matters of the watershed or river basin. Based on committee and public input, each steering committee shall develop water quality objectives and priorities that are achievable considering the available technology and economic impact. The objectives and priorities shall be used to develop work plans and allocate available resources under Section 26.0291. Each committee member shall help identify significant water quality issues within the basin and shall make available to the river authority all relevant water quality data held by the represented entities. A river authority shall also develop a public input process that provides for meaningful comments and review by private citizens and organizations on each basin summary report. A steering committee established by the commission to comply with this subsection in the absence of a river authority or other qualified local government is not subject to Chapter 2110, Government Code.

NRA depends on public involvement and input from stakeholders to assist in understanding the needs of the basins and the areas of concern. Therefore, NRA works with stakeholders to address concerns within each basin and set water quality monitoring priorities. Historically, NRA has worked with a steering committee, which, as defined in the Texas Clean Rivers Act, is a group of diverse stakeholders representing a variety interests in water quality. Due to its large area of responsibility, NRA has recently split its steering committee into three subgroups: Upper Nueces River Basin, Lower Nueces River and Nueces Coastal Basins, and the Lower Nueces - Rio Grande Coastal Basin. The idea behind the split was to allow each basin to be better represented throughout the NRA and CRP process. Each basin subgroup invites representatives from municipalities, state and federal agencies, the Texas State Soil and Water Conservation Board, industrial and agricultural interests, and educational institutes. Each year, NRA facilitates steering committee meetings, which are intended to bring the steering committee members together to discuss water quality and other related issues of each basin as well as NRA's management of CRP. NRA uses input from these meetings to help develop its CRP program.

The steering committee process is important because it provides NRA with new ideas for work plans and allows NRA to focus on the needs and interests of the stakeholders of the basins. Such ideas have included: increased education, more public outreach, additional special studies, expanded routine and systematic monitoring, and increased targeted monitoring. For a list of current steering committee members see: http://www.nueces-ra.org/outreach_main.html.

In addition to the steering committee process, NRA utilizes environmental education as a component of its public outreach. This approach has been key to NRA's success in informing the public about the issues and concerns facing its basins.

Beginning in 2001, NRA created a strong public awareness campaign regarding the impacts resulting from increased public use and incidents of irresponsible behavior on the Upper Nueces River and other accessible areas in the upper basin. As a result, NRA has developed a series of presentations identifying threats to water

quality and aquatic habitats in the upper basin. These presentations focus on human activities and behaviors that contribute to nonpoint source pollution. NRA has addressed civic and professional clubs, educators, and environmental organizations to help these organizations inform citizens about the value of the river and how to protect it.

NRA outreach efforts have included classroom visits and field trips to the rivers in support of the teachers. Realtors have been informed about the importance of preserving riparian areas and hunters informed about the need to protect riverbeds from vehicle traffic. School administrators and teachers have been directed to the student education resources and opportunities available to them from TCEQ and the Texas Parks and Wildlife Department (TPWD), including the easy to use, interactive program “Do you know how to keep our water clean?” for elementary students.

NRA has also participated in a TPWD task force to address the water quality threats of off road vehicles in the upper Nueces River. NRA has worked with cities, counties, chambers of commerce, and local law enforcement agencies to publicize resource protection using the “Keep Our Rivers Clean” slogan in public service announcements at movie theaters. In November 2001, NRA participated in a TNRCC sponsored “Keep Texas Beautiful,” an all volunteer Trash Bash at the Hwy 83 crossing on the Nueces River in Zavala County.

Recently, NRA has developed a Public Education, Outreach, and Resource Protection link on its website: http://www.nueces-ra.org/outreach_main.html. This web page presents all of NRA’s education programs, which focus on educating the public about water quality and issues that affect it. It also provides links to other environmental education programs.

Other than NRA’s own environmental education programs, NRA promotes the TCEQ’s Texas Watch Volunteer Monitoring and Environmental Education Program. The Texas Watch Program is an excellent way for concerned citizens to get involved in water-quality issues in the state.

TCEQ created the Texas Watch Program to “facilitate stewardship by empowering a statewide network of concerned volunteers, partners, and institutions in a collaborative effort to promote a healthy and safe environment through environmental education, data collection, and community action.” In addition, Texas Watch creates an extended database of water quality for the state of Texas.

NRA has been active in providing its own stakeholders with information about Texas Watch as well as acting as a liaison to the Texas Watch program. NRA has also uses many of Texas Watch’s educational tools such as their interactive watershed model to show students in basin schools how nonpoint source pollution can work its way through an entire river system.

Although much of NRA’s public outreach efforts have been concentrated on the issues of the Upper Nueces River, NRA participates in other public outreach events as well as being available for providing water quality information and education throughout its basins. One such event that NRA has participated in is the Coastal Bend Bays Foundation’s Earth Day/Bay Day activities. This program takes place in April of each year. It is an all day program designed to educate the public on the importance of the environment and demonstrates how people can enjoy the outdoors without causing harm to the environment. NRA has provided information about water quality and water quality sampling at the event.

3.0 TECHNICAL SUMMARY

3.1 OVERVIEW OF TECHNICAL SUMMARY

The purpose of the technical summary section is to provide detailed information about each segment within the Nueces River Basin, the San Antonio-Nueces and Nueces-Rio Grande Coastal Basins, and the adjacent bays and estuaries. Table 3.1.1 is a list of all segments.

Table 3.1.1. Segments

San Antonio – Nueces Coastal Basin	
2001	Mission River Tidal
2002	Mission River Above Tidal
2003	Aransas River Tidal
2004	Aransas River Above Tidal
Nueces River Basin	
2101	Nueces River Tidal
2102	Nueces River Below Lake Corpus Christi
2103	Lake Corpus Christi
2104	Nueces River Above Frio River
2105	Nueces River Above Holland Dam
2106	Nueces / Lower Frio River
2107	Atascosa River
2108	San Miguel Creek
2109	Leona River
2110	Lower Sabinal River
2111	Upper Sabinal River
2112	Upper Nueces River
2113	Upper Frio River
2114	Hondo Creek
2115	Seco Creek
2116	Choke Canyon Reservoir
2117	Frio River Above Choke Canyon Reservoir
Nueces – Rio Grande Coastal Basin	
2201	Arroyo Colorado Tidal
2202	Arroyo Colorado Above Tidal
2202A	Donna Reservoir
2203	Petronila Creek Tidal
2204	Petronila Creek Above Tidal
Bays and Estuaries	
2462	San Antonio Bay / Hynes Bay / Guadalupe Bay
2463	Mesquite Bay / Carlos Bay / Ayres Bay
2471	Aransas Bay
2472	Copano Bay
2473	St. Charles Bay
2481	Corpus Christi Bay
2482	Nueces Bay
2483	Redfish Bay

Table 3.1.1 continued.

2484	Corpus Christi Inner Harbor
2485	Oso Bay
2485A	Oso Creek
2491	Laguna Madre
2492	Baffin Bay / Alazan Bay / Cayo del Grullo / Laguna Salada
2493	South Bay
2494	Brownsville Ship Channel
2501	Gulf of Mexico

The main emphasis of the data review are the results of the Draft 2002 305(b) Assessment Report, additional findings since the assessment report, and possible explanations for the concerns and impairments. The assessment report is generated every two years, comparing the water quality within the basins to the Texas Surface Water Quality Standards. The following is an excerpt from a TCEQ publication entitled “Texas Surface Water Quality – What Is It, and How Is It Measured?”

Texas Surface Water Quality Standards

The Texas Surface Water Quality Standards are rules designed to:

- establish numerical and narrative goals for water quality throughout the state; and
- provide a basis on which TCEQ regulatory programs can establish reasonable methods to implement and attain the state’s goals for water quality.

All standards are protective; that is, they signal a situation where there is some possibility that water quality may be inadequate to meet its designated uses. There are instances, for example, in which a water body fails to meet the standard for aquatic life use, yet no fish kills are observed. However, a decline in the variety or number of aquatic species and an increased probability of fish kills may be observed.

Four general categories for water use are defined in the Texas Surface Water Quality Standards: aquatic life use, contact recreation, public water supply, and fish consumption.

Aquatic Life Use

The standards associated with this use are designed to protect plant and animal species that live in and around the water. They establish optimal conditions for the support of aquatic life and define indicators used to measure whether these conditions are met. Some pollutants or conditions that may violate this standard include low levels of dissolved oxygen, or toxic substances such as metals or pesticides.

Contact Recreation

The standard associated with this use measures the level of certain bacteria in water to estimate the relative risk of swimming or other water sports involving direct contact with the water. It is possible to swim in water that does not meet this standard without becoming ill; however, the probability of becoming ill is higher than it would be if bacteria levels were lower.

Public Water Supply

Standards associated with this use indicate whether water from a lake or river is suitable for use as a source for a public water supply system. Source water is treated before it is delivered to the tap; a separate set of standards govern treated drinking water. Indicators used to measure the safety or usability of surface water bodies as a source for drinking water include the presence or absence of substances such as metals or pesticides. Concentrations of salts, such as sulfate or chloride, are also measured, since treatment to remove high levels of salts from drinking water is expensive.

Fish Consumption

The standards associated with this use are designed to protect the public from consuming fish or shellfish that may be contaminated by pollutants in the water. The standards identify levels at which there is a significant risk that certain toxic substances dissolved in water may accumulate in the tissue of aquatic species. However, because these levels do not always predict when toxic substances will accumulate in fish to unsafe concentrations, the state also conducts tests on fish and shellfish tissue to determine if there is a risk to the public from consuming fish caught in state waters. The standards also specify bacterial levels in marine waters to assure that oysters or other shellfish that may accumulate bacteria from the water are safe for commercial harvest, sale, and consumption by the public.

Indicators of Water Quality

Indicators of water quality that are not tied to specific uses—such as dissolved solids, nutrients, and toxic substances in sediment—are also described in the standards. Several different parameters are measured to determine whether a water body meets the standards for its use. Some of the most common are listed here, with an explanation of why they are important to the health of a water body.

Fecal coliform, E. coli, and Enterococci Bacteria

These bacteria are measured to determine the relative risk of swimming (contact recreation). Bacteria originate from the wastes of warm-blooded animals; their presence indicates that pathogens from these wastes may be reaching a body of water from inadequately treated sewage, improperly managed animal waste from livestock, pets in urban areas, aquatic birds and mammals, or failing septic systems.

Dissolved Oxygen

The concentration of dissolved oxygen is a single, easy-to-measure characteristic of water that correlates with the occurrence and diversity of aquatic life in a water body. A water body that can support diverse, abundant aquatic life is a good indication of high water quality. A related problem is an excess of nutrients in water. Large quantities of nutrients in water can cause excessive growth of vegetation. This excessive vegetation, in turn, can cause low dissolved oxygen.

Dissolved Solids

High levels of dissolved solids such as chloride and sulfate can cause water to be unusable, or simply too costly to treat, for drinking water uses. Changes in dissolved solids concentrations also affect the quality of habitat for aquatic life.

Metals

High concentrations of metals such as cadmium, mercury, and lead pose a threat to drinking water supplies and human health. Eating fish contaminated with metals can cause these toxic substances to accumulate in human tissue, posing a significant health threat. Metals also pose a threat to livestock and aquatic life. Potentially dangerous levels of metals and other toxic substances are identified through chemical analysis of water, sediment, and fish tissue.

Organics

Toxic substances from pesticides and industrial chemicals, called organics, pose the same concerns as metals. Polychlorinated biphenyls (PCBs), for example, are industrial chemicals that are toxic and probably carcinogenic. Although banned in the United States in 1977, PCBs remain in the environment, and they accumulate in fish and human tissues when consumed.

Fish Consumption Advisories and Closures

The Texas Department of Health (TDH) conducts chemical testing of fish tissue to determine whether there is a risk to human health from consuming fish or shellfish caught in Texas streams, lakes, and bays. Fish seldom contain levels of contaminants high enough to cause an imminent threat to human health, even to someone who eats fish regularly. Risk increases for those persons who regularly consume larger fish and predatory fish from the same area of contaminated water over a long period of time. To reduce health risks in areas of contamination, people should eat smaller fish from a variety of water bodies. When a fish consumption advisory is issued, a person may legally take fish or shellfish from the water body under the advisory, but should limit how much fish he or she eats, and how often. When a fish consumption closure is issued, it is illegal to take fish from the water body.

The entire publication can be found at http://www.tnrcc.state.tx.us/water/quality/tmdl/303_expl.pdf.

Field and conventional parameters are collected to provide a baseline of information about the general quality of the water within the basins. Field parameters include dissolved oxygen (DO), water temperature, specific conductance, and pH. These parameters are measurements that are collected on site in the field. Other field parameters measured on site include environmental characteristics such as air temperature, water color, water odor, estimated flow, wind direction and intensity, and the amount of rainfall within the past 7 days.

Conventional parameters, which are analyzed in laboratories from water samples collected on site, supply information about a segment's reaction to excessive plant growth or how pollutants are dispersed. For example, such parameters include analysis of bacteria content, specifically fecal coliform *E. coli*, and Enterococci. In particular, bacteria analyses are important because they can help determine whether a water body is supportive of contact recreation use. Water samples are also routinely analyzed for alkalinity, total suspended solids (TSS), volatile suspended solids (VSS), ammonia, nitrate+nitrite nitrogen (nitrogen), total phosphorus, orthophosphorus, total organic carbons (TOC), chloride, sulfate, total dissolved solids (TDS), turbidity, bacteria, and hardness.

The following terms are used throughout the report, some of which are discussed in more detail in the main body of text. They are included here as a reference for the reader.

Concern: designation assigned to a water body for a specific parameter where the percentage of measured values exceeding the Texas State Water Quality Standards (TSWQS) is between 10% and 25%.

Criteria: the maximum value a specific parameter can have and meet the TSWQS

Decreasing trend: statistical analysis result which indicates that measured values for a specific parameter are decreasing over time.

DO deficit: a measure of the lack of dissolved oxygen which is calculated using measured dissolved oxygen and temperature values $(500/(\text{Temp} + 35)) - \text{DO}$

Exceedance: a measured value that is greater than the TSWQS for a specific segment and parameter.

Impairment: designation assigned to a water body for a specific parameter where the percentage of measured values exceeding the TSWQS is greater than 25%.

Increasing trend: statistical analysis result which indicates that measured values for a specific parameter are increasing over time.

Nitrogen: in this report, nitrate + nitrite nitrogen.

P-value: statistical analysis result which represents the attained significance level with respect to the data. A trend is indicated if the R-squared value is greater than 0.10, the t-ratio value is greater than or equal to |1|, and the P-value is less than -0.10.

Parameter: a water quality component for which measurements are taken (e.g. water temperature) or analyzed (e.g. ammonia).

R-squared value: statistical analysis result used to determine the variability of the data. A trend is indicated if the R-squared value is greater than 0.10, the t-ratio value is greater than or equal to |1|, and the P-value is less than -0.10.

Segment: a defined water body; all or part of a river, stream, or creek, or a lake, reservoir, bay, or the Gulf of Mexico.

t-ratio value: statistical analysis result which represents the slope of a line with respect to the data. A trend is indicated if the R-squared value is greater than 0.10, the t-ratio value is greater than or equal to |1|, and the P-value is less than -0.10.

3.2 TECHNICAL PROCESS

The data review section is designed to address a number of issues: water quality conditions, explanations of the possible reason(s) for poor water quality conditions, and recommendations for addressing findings. Table 3.2.1 summarizes the impairments and concerns found throughout the basins. Maps showing the segments with concerns and impairments are in Appendix A.

Table 3.2.1. Impairments and Concerns Summary

Storet Code	Parameter	Impairment/ Concern	Use	Segments	Map #
	Bacteria	Concern	Oyster Waters	2462, 2471, 2481, 2485, 2491	A-1
	Bacteria	Impairment	Oyster Waters	2472	A-1
	Bacteria	Impairment		2107	A-2
	DDE, and other organochlorine pesticides	Impairment	Fish consumption	2202	A-3
	Mercury in king mackerel > 43"	Impairment	Fish consumption	2501	A-4
	PCBs in fish tissue	Impairment	Fish consumption	2202A	A-5
	Toxicity in Ambient Sediment	Impairment		2201	A-6
	Zinc in oyster tissue	Impairment	Oyster Waters	2482	A-7
00010	Temperature	Concern	General Use	2115	A-8
00010	Temperature	Impairment	General Use	2203	A-8
00300	DO	Concern	Aquatic Life Use	2002, 2004, 2116, 2117, 2201, 2202, 2472, 2483, 2494	A-9
00300	DO	Impairment		2104, 2107, 2113, 2201, 2485, 2491	A-9
00610	Ammonia	Concern	Nutrient Enrichment	2107, 2201, 2202, 2484, 2491	A-10
00630	Nitrogen	Concern	Nutrient Enrichment	2109, 2110, 2117, 2201, 2202, 2462, 2484, 2485A, 2491	A-11
00630	Nitrogen	Impairment	Public Water Supply	2110	A-11
00665	Total phosphorus	Concern	Nutrient Enrichment	2202, 2462, 2472, 2485A, 2491	A-12
00671	Orthophosphorus	Concern	Nutrient Enrichment	2003, 2202, 2462, 2485A, 2491	A-13
00940	Chloride	Concern	Public Water Supply	2104, 2117	A-14
00940	Chloride	Impairment	General Use	2204	A-14
00945	Sulfate	Concern	Public Water Supply	2109	A-15
00945	Sulfate	Impairment	General Use	2204	A-15

Table 3.2.1 continued.

31616	Fecal coliform	Concern	Contact Recreation	2107, 2202	A-2
31616	Fecal coliform	Impairment	Contact Recreation	2202, 2485A	A-2
31648	<i>E. coli</i>	Concern	Contact Recreation	2002, 2106, 2107, 2117	A-2
31648	<i>E. coli</i>	Impairment	Contact Recreation	2117	A-2
31649	Enterococci	Concern	Contact Recreation	2001, 2002, 2003, 2462, 2473, 2485, 2485A	A-2
32211	Chlorophyll a	Concern	Excessive Algal Growth	2101, 2107, 2202, 2203, 2204, 2485, 2491, 2492	A-16
70300	TDS	Concern	Public Water Supply	2104, 2107, 2117	A-17
70300	TDS	Impairment	General Use	2116, 2204	A-17

Since the assessment report and prior to the compilation of this report, additional data have been added to the database. Where applicable, the additional data have been evaluated to determine if the percentage of samples exceeding the criteria for each station/parameter is increasing or decreasing. This comparison is based on the available TRACS data (Note: the second data set is for a time period greater than the five years used for an official assessment). In some cases, the causes of the concerns and impairments can be explained, giving justification of removing some of the concerns and impairments from future assessment reports. Trend analysis is summarized, but only those parameters with increasing or decreasing trends are discussed. Fish kill information as reported on the Draft 2002 305(b) Assessment Report is also listed.

The following segment by segment reviews detail the results of the assessment report. The information is organized by basin and segment and lists the impairments and concerns of each. The data for the assessment were collected from March 1, 1996 through February 28, 2001.

Trend Analysis

The trend analysis of water quality data serves to develop a greater understanding of water quality conditions and enhance the ability to make decisions regarding water quality issues. This effort is designed to accomplish several goals, including:

- define long-term water quality variability and significant relationships
- provide supplementary information for concerns and use impairments
- set priorities for water quality monitoring
- identify areas where water quality is deteriorating so that action strategies may be developed to address potential problems
- highlight areas where water quality is improving
- assess the success of water quality improvement projects and other changes in the watershed

Statistically, a trend indicates an overall change in value over time. With respect to this report, an increasing trend indicates that the measured values of a specific parameter are increasing over time. This trend may serve as a warning that a possible concern or impairment could develop for this parameter. A decreasing trend, where measured values decrease over time, may indicate that the water quality at that location is improving.

TCEQ extracted data sets from TRACS for NRA that met the requirements for trend analysis, simple linear regression, as of September 30, 2002. The datasets that were selected contained the minimum required number of samples and period of record: five years with four samples per year, or greater than five years and a minimum of 20 total data points. 1,332 data sets, consisting of 32 different parameters, were analyzed. The analysis resulted in 117 negative trends for 22 parameters, and 129 positive trends for 23 parameters.

Table 3.2.2 below summarizes the results of the trend analysis. Appendix B contains detailed information on each of the parameters: number of data sets, number of decreasing and increasing trends, a map showing the station location of each data set, color coded to indicate no trend, decreasing trend, or increasing trend, tables with segment id, station id, number of data points, R-squared value, t-ratio, P-value, minimum value, and maximum value. Graphs of parameters with increasing trends are also shown (except for water transparency where negative trends are graphed). The details are grouped by tidal, non-tidal, and marine segments. For comparison purposes, the same y ranges (range of measured values) are used on the graphs where there is more than one increasing trend with the segment groups. The same x range (1/1/1993 – 1/1/2003) is used on all graphs.

Table 3.2.2. Trend Analysis Summary

Parameter Description	Storet Code	# Data Sets	# Decreasing Trends	# Increasing Trends
Summer Water Temperature (°C)*	00010	73	6	3
Winter Water Temperature (°C)*	00010	134	0	2
Water Temperature (°C)*	00010	134	23	0
Transparency (meters)	00078	36	2	2
Conductivity (UMHOS @ 25°C)	00094	42	2	7
Summer DO Deficit	00300	40	4	6
Winter DO Deficit	00300	40	2	4
DO Deficit	00300	40	4	5
pH (Standard Units)*	00400	43	13	1
Alkalinity (Mg/L)	00410	46	1	13
Salinity (ppt)	00480	127	2	30
Total Suspended Solids (Mg/L)	00530	52	9	3
Volatile Suspended Solids (Mg/L)	00535	49	11	8

Table 3.2.2 continued.

Ammonia (Mg/L)	00610	52	9	0
Kjeldahl Nitrogen (Mg/L)	00625	46	1	7
Nitrate + Nitrite Nitrogen (Mg/L)	00630	27	5	0
Total Phosphorus (Mg/L)**	00665	51	0	3
Ortho-Phosphorus (Mg/L)**	00671	31	8	4
Total Organic Carbon (Mg/L)	00680	49	0	13
Log of Chloride	00940	47	1	4
Sulfate (Mg/L)*	00945	54	2	5
Dissolved Arsenic (Ug/L)	01000	1	0	0
Dissolved Barium (Ug/L)	01005	2	1	1
Dissolved Cadmium (Ug/L)	01025	1	0	0
Dissolved Chromium (Ug/L)	01030	1	0	0
Dissolved Copper (Ug/L)	01040	1	0	1
Dissolved Lead (Ug/L)	01049	1	0	0
Dissolved Nickel (Ug/L)	01065	2	0	0
Dissolved Silver (Ug/L)	01075	2	0	0
Dissolved Zinc (Ug/L)	01090	1	0	0
Dissolved Aluminum (Ug/L)	01106	1	0	0
Fecal coliform (#/100ML)*	31616	29	2	2
Chlorophyll a (Ug/L)**	32211	44	7	1
Total Dissolved Solids (Mg/L)	70300	37	3	5

* Criteria from TSWQS denoted on graphs. There is no criteria listed for sulfate nor TDS for tidal or marine sediments.

**The criteria annotated on the graphs for this parameter are the screening levels used for assessments since no official criteria exists.

3.3 WATERSHED SUMMARIES, OVERVIEWS, AND DATA REVIEW

CRP utilizes the watershed management approach when analyzing water quality. A descriptive narrative of each basin in the Nueces River Authority's area of responsibility for CRP is provided as in the introduction of this report. This section also provides watershed overviews with more technical data as an introduction into the data review portion of this section. Each segment within the respective basin is then discussed in detail. Drainage Area:

San Antonio-Nueces Coastal Basin

Approximately 3,100 square miles

Counties – Partial:

Bee, Goliad, Karnes, Nueces, Refugio, San Patricio

Counties – Entire

Aransas

Region:

The San Antonio-Nueces Basin is bordered by the San Antonio River Basin to the north, the Lavaca-Guadalupe River Basin to the northeast, and the Nueces River Basin to the south and west. Runoff drains into Copano Bay.

Principal Cities (Including Population Range):

10,000 - 50,000: Beeville, Portland
 5,000 – 10,000: Aransas Pass, Ingleside, Rockport, Sinton
 Less than 5,000: Gregory, Port Aransas, Refugio, Rockport

Regional Economy:

Agriculture, Commercial Fishing, Offshore Equipment Manufacturing, Petroleum Refining, Military, Mineral Production, Shipbuilding, Tourism

Principal Tributaries:

Aransas River, Mission River, Chiltipin Creek, Medio Creek, Blanco Creek

Principal Aquifers:

Gulf Coast

Major Ecoregions:

Gulf Coast

Average Annual Rainfall:

Regional average annual rainfall is approximately 33 inches. Most precipitation occurs in early fall and coincides with tropical storm activity or in late spring due to the passage of frontal systems.

Figure 3.3.1 is a map of the San Antonio-Nueces Coastal Basin and adjoining bays and estuaries, showing the cities, counties, rivers and creeks, bays, and wastewater outfall locations (depicted as +). Figure 3.3.2 is a map of the basin showing all of the monitoring sites within the area that are referenced in the segment by segment analysis below. The stations with a concern, impairment and/or trend are denoted in red, along with the station number.

Segment 2001 – Mission River Tidal – Station 12943

Impairments: None

Concerns:

There is a bacteria (Enterococci) concern for contact recreation, but there was not enough data to make a full assessment. Additional data indicates a possible impairment.

Parameter	Station	Assessment Period			Assessment Period through 10/15/2002		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
Enterococci	12943	6	2	33%	13	8	62%

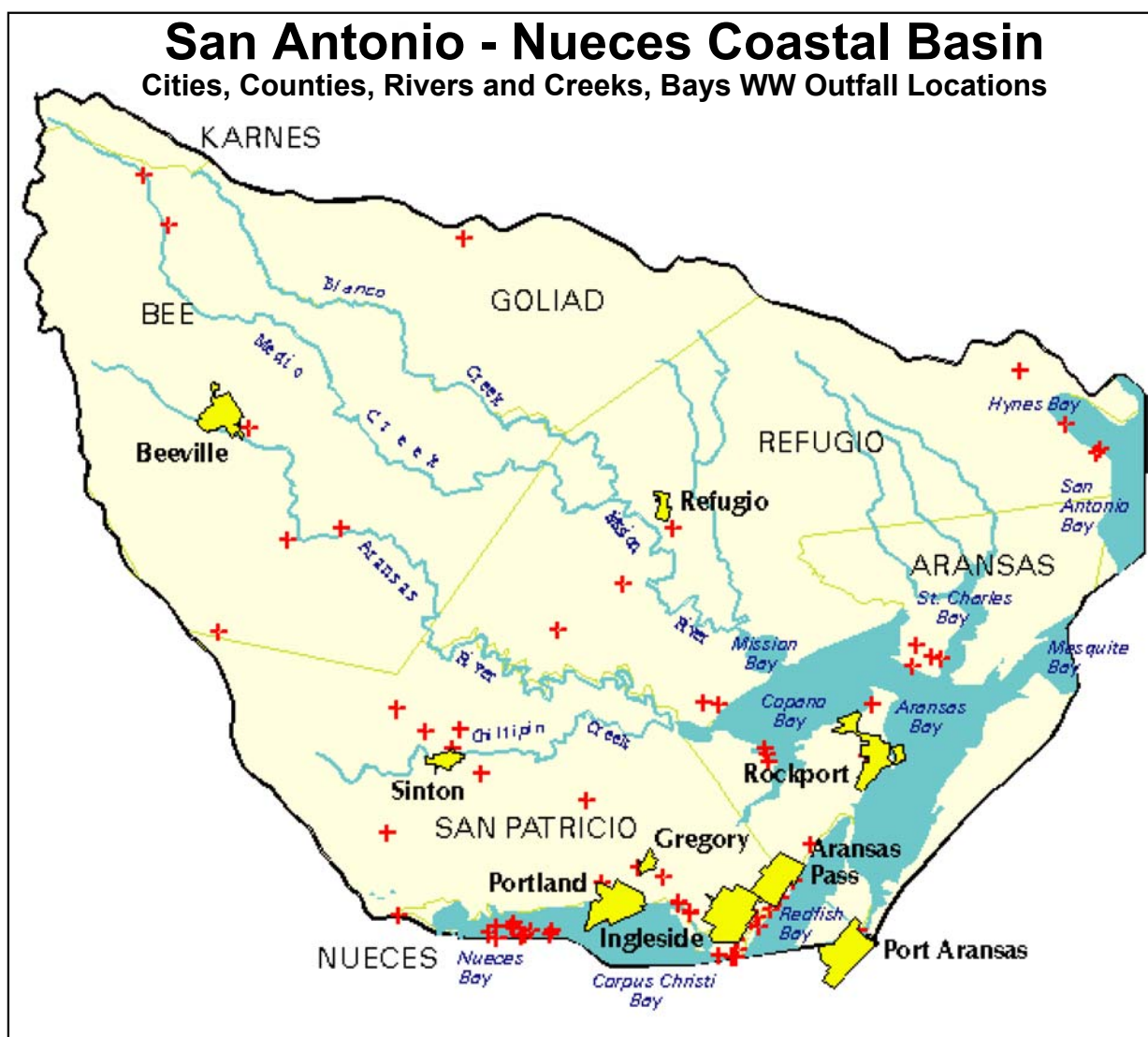


Figure 3.3.1. Map of the San Antonio-Nueces Coastal Basin.

General Information:

The aquatic life, contact recreation, and general uses were fully supported. The fish consumption use was not assessed.

Trends:

VSS was not assessed in this segment, however, trend analysis for this parameter at station 12943 shows an increasing trend. (Appendix B, Storet 00535)

There is no concern for ammonia in this segment, and trend analysis for this parameter at station 12943 shows a decreasing trend. (Appendix B, Storet 00610)

Fish Kills: None

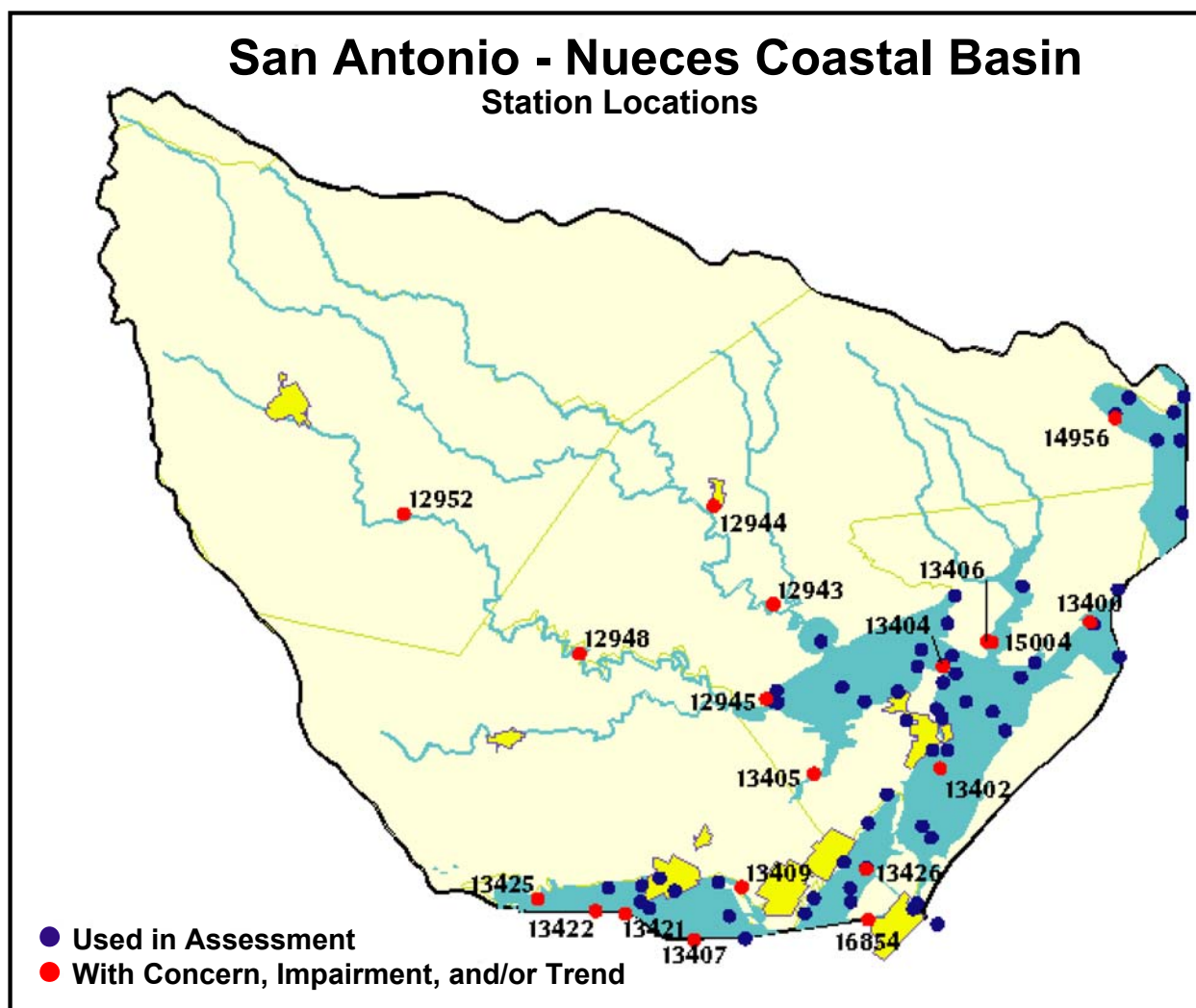


Figure 3.3.2. Map of the San Antonio-Nueces Coastal Basin monitoring site locations.



Photo: Mission Rivier

Segment 2002 – Mission River Above Tidal – Station 12944

Impairments: None

Concerns:

There is a depressed DO concern for aquatic life use.

There is a bacteria (*E. coli*) concern for contact recreation, but there was not enough data to make a full assessment.

General Information:

The aquatic life and general uses were fully supported. The contact recreation and fish consumption uses were not assessed.

Parameter	Station	Assessment Period			Assessment Period through 10/15/2002		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
DO	12944	18	3	17%	25	3	12%
<i>E. coli</i>	12944	5	2	40%	13	6	46%

Studies:

24-hour DO monitoring events are being taken at station 12944 to determine the extent of the DO problem. The station was monitored in August and October 2002, and two additional monitoring events are scheduled for July and August 2003.

Trends:

A trend analysis for DO deficit at station 12944 shows an increase overall. (Appendix B, Storet 00300)

The segment is fully supporting for pH, and trend analysis for this parameter at station 12944 shows a decreasing trend. (Appendix B, Storet 00400)

VSS was not assessed in this segment, however, trend analysis for this parameter at station 12944 shows an increasing trend. (Appendix B, Storet 00535)

TOC was not assessed in this segment, however, trend analysis for this parameter at station 12944 shows an increasing trend. (Appendix B, Storet 00680)

Fish Kills: None

Segment 2003 – Aransas River Tidal – Station 12948

Impairments: None

Concerns:

There is a bacteria (Enterococci) concern for contact recreation, but there was not enough data to make a full assessment.

There is an orthophosphorus concern for nutrient enrichment.

Parameter	Station	Assessment Period			Assessment Period through 10/15/2002		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
Enterococci	12948	4	2	50%	8	6	75%
Orthophosphorus	12948	12	5	42%	16	6	38%

General Information:

The aquatic life and general uses were fully supported. The contact recreation and fish consumption uses were not assessed.

Trends:

Conductivity was not assessed in this segment, however, trend analysis for this parameter at station 12948 shows a decreasing trend. (Appendix B, Storet 00094)

VSS was not assessed in this segment, however, trend analysis for this parameter at station 12948 shows an increasing trend. (Appendix B, Storet 00535)

Fish Kills: None

Segment 2004 – Aransas River Above Tidal – Station 12952

Impairments: None

Concerns:

There is a depressed DO concern for aquatic life use. The assessment reported that 6 of 13 readings exceeded the criteria. Since the assessment, 2 additional samples have been taken, neither of which exceed the criteria.

Explanations and Recommendations:

After the assessment, it was discovered that beginning in August 1998, samples were being taken on Aransas Creek, an intermittent stream, not the Aransas River. The correct location has again been sampled since July 2002. The incorrect location was assigned a new SWQM number and assigned to those sampling results. Therefore, there were only 3 samples for the Aransas River during the assessment period, which is not enough data points to determine whether or not there is an actual DO concern on this segment.

General Information:

The aquatic life and general uses were fully supported. The contact recreation and fish consumption uses were not assessed.

Trends: None

Fish Kills: None

Nueces River Basin

Drainage Area:

Approximately 17,000 square miles

Firm Annual Yield:

Approximately 252,000 acre-feet

Counties – Partial:

Atascosa, Bandera, Bexar, Dimmit, Duval, Edwards, Jim Wells, Karnes, Kerr, Kinney, Maverick, Medina, Nueces, Real, San Patricio, Webb, Wilson

Counties – Entire:

Frio, La Salle, Live Oak, McMullen, Uvalde, Zavala

Region:

The Nueces River originates in the Hill Country of Edwards County and flows southeast to Corpus Christi Bay through Nueces Bay, collecting runoff from the Frio and Atascosa River watersheds.

Principal Cities (Including Population Range):

10,000 - 50,000: Uvalde

5,000 – 10,000: Carrizo Springs, Crystal City, Hondo, Mathis, Pearsall, Pleasanton

Regional Economy:

Agriculture, Oil and Gas, Mineral Production

Major Rivers:

Nueces River, Frio River, Atascosa River

Principal Tributaries:

Leona River, Sabinal River, San Miguel Creek, Hondo Creek, Seco Creek

Major Lakes & Reservoirs (Including Impoundment):

Lake Corpus Christi: 241,241 AF

Choke Canyon Reservoir: 695,271 AF

Aquifers:

Carrizo-Wilcox, Edwards-Trinity, Gulf Coast, Queen City, Sparta, Yegua-Jackson

Major Ecoregions:

Hill Country, South Texas Plains, Gulf Coast

Average Annual Rainfall:

Precipitation in the Nueces River Watershed ranges from 24-29 inches annually. Most precipitation occurs in early fall and coincides with tropical storm activity or in late spring due to the passage of frontal systems.

Nueces River Basin

Cities, Counties, Rivers and Creeks, Bays WW Outfall Locations

This map illustrates the Nueces River Basin, showing the following counties: KERR, EDWARDS, REAL, BANDERA, UVALDE, MEDINA, KINNEY, BEXAR, WILSON, KARNES, MAVERICK, ZAVALA, FRIO, ATASCOSA, BEE, DIMMIT, LIVE OAK, SAN PATRICIO, LA SALLE, WEBB, JIM WELLS, and NUECES. Major cities and towns marked include Uvalde, Pearsall, Crystal City, Carrizo Springs, Pleasanton, and Mathis. The map also shows the Nueces River, Leon River, San Antonio River, and various creeks like Hondo Creek and San Marcos Creek. Key features include the Choke Canyon Reservoir and Lake Corpus Christi. Red crosses indicate WW outfall locations, and yellow stars mark specific cities. The map is overlaid with a yellow grid.

Figure 3.3.3. Map of the Nueces River Basin.

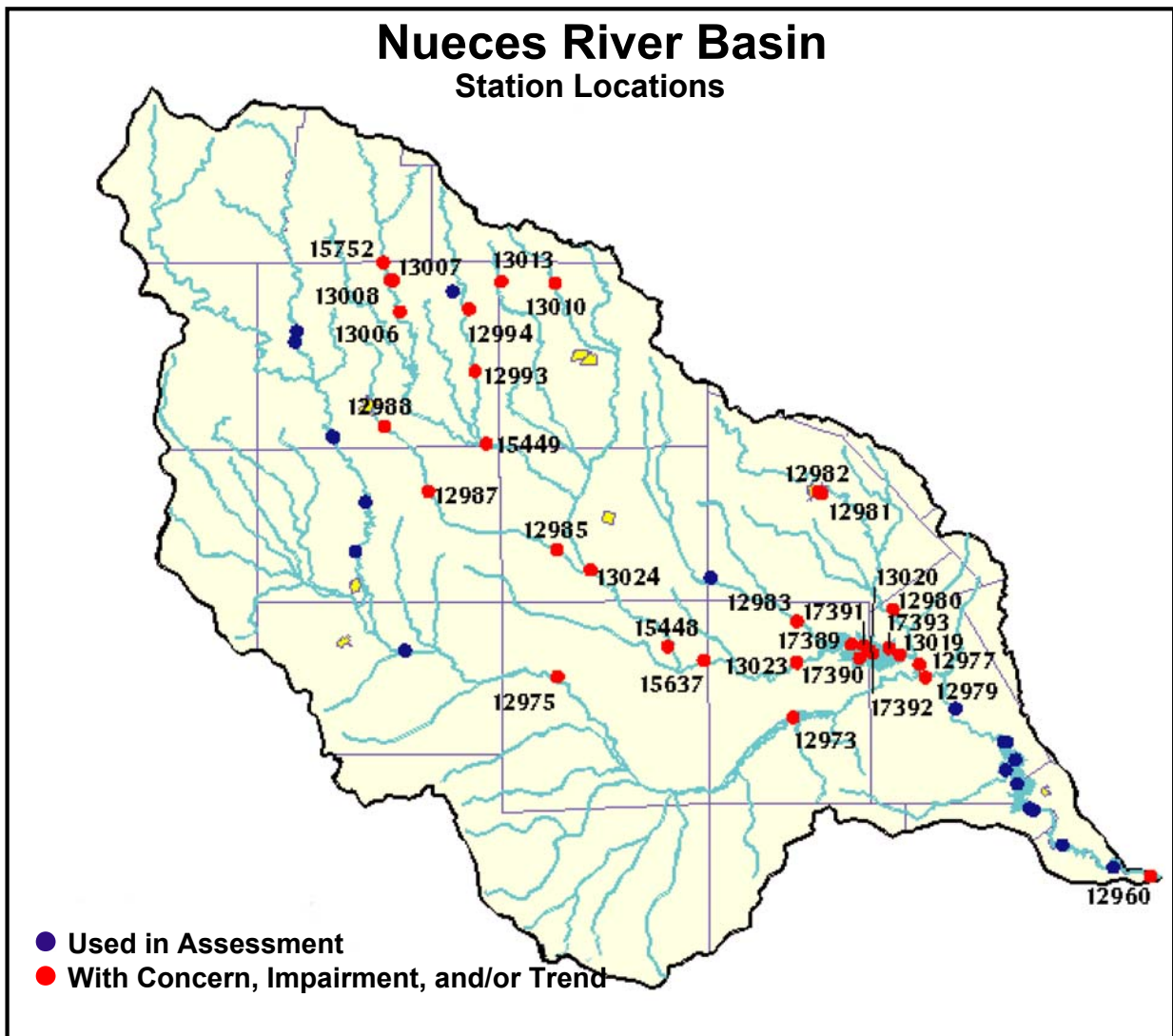


Figure 3.3.4. Map of the Nueces River Basin monitoring site locations.



Photo: Lower Nueces River

Segment 2101 - Nueces River Tidal - Station 12960

Impairments: None

Concerns:

There is a chlorophyll a concern for excessive algal growth.

Parameter	Station	Assessment Period			Assessment Period through 8/22/2002		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
Chlorophyll a	12960	19	7	37%	25	9	36%

General Information:

The aquatic life, contact recreation, and general uses were fully supported. The fish consumption was use was not assessed.

Trends:

Total TKN was not assessed in this segment, however, trend analysis for this parameter at station 12960 shows an increasing trend. (Appendix B, Storet 00625)

Chloride was not assessed in this segment, however, trend analysis for this parameter at station 12960 shows an increasing trend. (Appendix B, Storet 00940)

Sulfate was not assessed in this segment, however, trend analysis for this parameter at station 12960 shows an increasing trend. (Appendix B, Storet 00945)

Fish Kills:

08/01/1998: From the Violet Road boat ramp to the railroad trestle downstream, low DO killed 85 fish.

Segment 2102 – Nueces River Below Lake Corpus Christi – Stations 12962, 12964, and 12965

Impairments and Concerns: None

General Information:

The aquatic life, public water supply, and general uses were fully supported. The contact recreation and fish consumption uses were not assessed.

Trends: None

Fish Kills: None

Segment 2103 – Lake Corpus Christi – Stations 12967, 12971, 17383, 17384, 17385, and 17386

Impairments and Concerns: None

General Information:

The aquatic life, public water supply, and general uses were fully supported. The contact recreation and fish consumption uses were not assessed.

Trends: None

Fish Kills: None

Segment 2104 – Nueces River Above Frio River – Station 12973

Impairments:

This segment was on the 2000 303(d) List as an impairment due to depressed DO in the lower 25 miles. Because an insufficient number of 24-hour DO values were available in 2002 to determine if the criterion is supported, this segment will be identified as not meeting the standard for DO until sufficient 24-hour measurements are available to demonstrate support of the criterion. Individual DO readings do not support an impairment or concern.

Parameter	Station	Assessment Period			Assessment Period through 10/22/2002		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
DO	12973	Not reported			32	3	9%

Concerns:

There is a chloride concern for public water supply.

There is a TDS concern for public water supply.

Parameter	Station	Assessment Period			Assessment Period through 10/22/2002		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
Chloride	12973	30	1	3%	38	1	3%
TDS	12973	35	1	3%	19	1	5%

Explanations and Recommendations:

The assessment report shows that the 30 chloride samples had a mean of 473.3. One value, collected on June 2, 1998 had a chloride value of 12,000; all other values are <= 329. The mean of the values without that one sample is 75.9. The assessment report also shows that the 35 TDS samples had a mean of 1120.28. One value, also collected on June 2, 1998 had a TDS value of 25,100; all other values are <= 1050. The mean of the values in the TRACS database without that one sample is 444.2. Considering these facts, there appears to be no reason why either of these parameters should be listed as concerns.

General Information:

The aquatic life, contact recreation, and public water supply uses were fully supported. The fish consumption use was not assessed.

Studies:

A TMDL is currently underway on this segment for bacteria and DO. Information about the study can be found at <http://www.tnrcc.state.tx.us/water/quality/tmdl/SouthCentralBacteria.pdf>.

Trends:

The segment is fully supporting for temperature, and trend analysis for this parameter at station 12973 shows a decreasing trend in the summer months. (Appendix B, Storet 00010)

The segment is fully supporting for pH, and trend analysis for this parameter at station 12973 shows a decreasing trend. (Appendix B, Storet 00400)

Fish Kills: None

Segment 2105 – Nueces River Above Holland Dam – Stations 12975, 12976

Impairments and Concerns: None

General Information:

The public water supply and general uses were fully supported. The contact recreation and fish consumption uses were not assessed.

Trends:

TSS was not assessed in this segment, however, trend analysis for this parameter at station 12975 shows an increasing trend. (Appendix B, Storet 00530)

VSS was not assessed in this segment, however, trend analysis for this parameter at station 12975 shows an increasing trend. (Appendix B, Storet 00535)

Fish Kills: None

Segment 2106 – Nueces / Lower Frio River – Stations 12977, 12978, 12979

Impairments: None

Concerns:

There is a bacteria (*E. coli*) concern for contact recreation in the upper 10 miles of the segment (station 12977), but there was not enough data to make a full assessment. Additional data indicates a possible impairment.

Parameter	Station	Assessment Period			Assessment Period through 10/24/2002		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
<i>E. coli</i>	12977	6	1	16%	13	4	31%

General Information:

The aquatic life, public water supply, fish consumption and general uses were fully supported. The contact recreation use was not assessed.

Trends:

Conductivity was not assessed in this segment, however, trend analysis for this parameter at station 12977 shows an increasing trend. (Appendix B, Storet 00094)

The segment was fully supporting for pH, however, trend analysis for this parameter at station 12977 shows an increasing trend. (Appendix B, Storet 00400))

The segment was fully supporting for sulfate, and trend analysis for this parameter at station 12979 shows a decreasing trend. (Appendix B, Storet 00945)

Dissolved barium was not assessed in this segment, however, trend analysis for this parameter at station 12979 shows an increasing trend. (Appendix B, Storet 01005)

Dissolved copper was not assessed in this segment, however, trend analysis for this parameter at station 12979 shows an increasing trend. (Appendix B, Storet 01040)

Fish Kills: None

Segment 2107 – Atascosa River – Stations 12980, 12981, 12982

Impairments:

This segment was on the 2000 303(d) List as and impairment due to bacteria in the 25 miles downstream of SH 16. Because there were insufficient data to evaluate changes in water quality, this segment is included on the 2002 303(d) List for bacteria. The assessment report does not list any stations that represent this portion of the segment.

This segment was also on the 2000 303(d) List as an impairment due to depressed DO in the 25 miles downstream of SH 16. Because an insufficient number of 24-hour DO values were available in 2002 to determine if the criterion is supported, this segment will be identified as not meeting the standard for DO until sufficient 24-hour measurements are available to demonstrate support of the criterion. The assessment report does not list any stations that represent this portion of the segment.

Concerns:

There is a bacteria (*E. coli* and fecal coliform) concern for contact recreation in the 25 miles surrounding U.S 281 (stations 12981 and 12982) and the lower 25 miles of the segment (station 12980), but there was not enough data to make a full assessment.

There is an ammonia concern for nutrient enrichment recreation in the 25 miles surrounding U.S 281 (stations 12981 and 12982).

There is a chlorophyll a concern for excessive algae growth in the 25 miles surrounding U.S 281 (stations 12981 and 12982).

There is a TDS concern for public water supply in the entire segment.

Parameter	Station	Assessment Period			Assessment Period through 10/22/2002		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
<i>E. coli</i>	12980	4	3	75%	13	12	92%
Fecal coliform	12980	6	3	50%	14	11	79%
	12981	7	2	29%	13	9	69%
	12982				7	6	86%
Ammonia	12981	13	4	31%	5	2	40%
	12982				12	2	17%
Chlorophyll a	12981	13	8	62%	5	4	80%
	12982				12	8	66%
TDS	12980	36	1*	3%	11	2	18%
	12981				2	0	0%
	12982				11	0	0%

General Information:

The aquatic life, public water supply and general uses were fully supported. The contact recreation and fish consumption uses were not assessed.

Studies:

A TMDL is currently underway on this segment for bacteria and DO. Information about the study can be found at <http://www.tnrcc.state.tx.us/water/quality/tmdl/SouthCentralBacteria.pdf>.

Trends: None

Fish Kills: None

Segment 2108 – San Miguel Creek – Stations 12983, 12984

Impairments and Concerns: None

General Information:

The aquatic life, public water supply and general uses were fully supported. The contact recreation and fish consumption uses were not assessed.

Trends:

The segment was fully supporting for temperature, and trend analysis for this parameter at station 12983 shows a decreasing trend overall and in the summer months. (Appendix B, Storet 00010)

The segment was fully supporting for pH, and trend analysis for this parameter at station 12983 shows a decreasing trend. (Appendix B, Storet 00400)

Fish Kills: None

Segment 2109 – Leona River – Stations 12985, 12987, 12988

Impairments: None

Concerns:

There is a nitrate+nitrite nitrogen (nitrogen) concern for nutrient enrichment. However, there are no nitrogen values in TRACS for these stations during the assessment period.

There is a sulfate concern for public water supply. There are no sulfate values in TRACS for stations 12988 during the assessment period.

Parameter	Station	Assessment Period			Assessment Period through 11/21/2002		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
Nitrogen	12985	12	12	100%			
	12987						
	12988						
Sulfate	12985	13	2	15%	17	2	11%
	12987				8	0	0%

General Information:

The public water supply and general uses were fully supported. The aquatic life, contact recreation and fish consumption uses were not assessed.

Trends: No analysis performed on any stations in this segment.

Fish Kills: None

Segment 2110 – Lower Sabinal River – Station 12993

Impairments:

The segment is not supporting for nitrogen for public water supply use.

Parameter	Station	Assessment Period		
		# of Samples	# of Exceedances	% of Exceedances
Nitrogen	12993	26	2	8%

Concerns:

There is a concern for nitrogen for nutrient enrichment. Since the assessment, there have been no additional samples for nitrogen.

Parameter	Station	Assessment Period		
		# of Samples	# of Exceedances	% of Exceedances
Nitrogen	12993	9	5	56%

General Information:

The aquatic life, contact recreation, and general uses were fully supported. The fish consumption use was not assessed.

Trends:

The segment was fully supporting for chloride, and trend analysis for this parameter at station 12993 shows a decreasing trend. (Appendix B, Storet 00940)

The segment was fully supporting for sulfate, and trend analysis for this parameter at station 12993 shows a decreasing trend. (Appendix B, Storet 00945)

The segment was fully supporting for TDS, and trend analysis for this parameter at station 12993 shows a decreasing trend. (Appendix B, Storet 70300)

Fish Kills: None

Segment 2111 – Upper Sabinal River – Stations 12994, 14939

Impairments and Concerns: None

General Information:

The aquatic life, contact recreation, public water supply and general uses were fully supported. The fish consumption use was not assessed.

Trends:

The segment was fully supporting for DO, and trend analysis for this parameter at station 12994 shows a decreasing trend for DO deficit, overall and in the summer months. (Appendix B, Storet 00300)

There was no concern for ammonia in the segment, and trend analysis for this parameter at station 12994 shows a decreasing trend. (Appendix B, Storet 00610)

Fish Kills: None

Segment 2112 – Upper Nueces River – Stations 12996, 12998, 12999, 14253, 16704, 17143

Impairments and Concerns: None

General Information:

The aquatic life, contact recreation, public water supply and general uses were fully supported. The fish consumption use was not assessed.

Trends: No analysis performed on any stations in this segment.

Fish Kills: None

Segment 2113 – Upper Frio River – Stations 13006, 13007, 13008, 15752

Impairments:

This segment is listed as partially supporting the aquatic life use due to depressed DO. Because an insufficient number of 24-hour DO values were available in 2002 to determine if the criterion is supported, this segment will be identified as not meeting the standard for DO until sufficient 24-hour measurements are available to demonstrate support of the criterion. No additional samples have been taken at stations 13008 or 15752.

Parameter	Station	Assessment Period			Assessment Period through 02/13/2002		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
DO	13006	36	0	0%	44	0	0%
	13007				10	4	40%
	13008						
	15752						

Concerns: None

General Information:

The aquatic life, public water supply and general uses were fully supported. The fish consumption use was not assessed.

Studies:

A TMDL is currently underway on this segment for bacteria and DO. Information about the study can be found at <http://www.tnrc.state.tx.us/water/quality/tmdl/SouthCentralBacteria.pdf>.

Trends:

There was no concern for ammonia in the segment, and trend analysis for this parameter at station 13006 shows a decreasing trend. (Appendix B, Storet 00610)

There was no concern for chlorophyll a in the segment, and trend analysis for this parameter at station 13006 shows a decreasing trend. (Appendix B, Storet 32211)

Fish Kills: None

Segment 2114 – Hondo Creek – Station 13010

Impairments and Concerns: None

General Information:

The aquatic life, contact recreation, public water supply and general uses were fully supported. The fish consumption use was not assessed.

Trends:

Alkalinity was not assessed in this segment, however, trend analysis for this parameter at station 13010 shows an increasing trend. (Appendix B, Storet 00410)

VSS was not assessed in this segment, and trend analysis for this parameter at station 13010 shows a decreasing trend. (Appendix B, Storet 00535)

Fish Kills: None

Segment 2115 – Seco Creek – Station 13013

Impairments: None

Concerns:

There is a temperature concern for general use in the upper 25 miles of the segment.

Parameter	Station	Assessment Period			Assessment Period through 07/24/2002		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
Temperature	13013	31	4	13%	52	8	15%

General Information:

The aquatic life, contact recreation, fish consumption, and general uses were fully supported.

Trends:

A trend analysis for temperature at station 13013 shows an increasing trend in the winter months. (Appendix B, Storet 00010)

There was no concern for ammonia in this segment, and trend analysis for this parameter at station 13013 shows a decreasing trend. (Appendix B, Storet 00610)

TKN was not assessed in this segment, however, trend analysis for this parameter at station 13013 shows an increasing trend. (Appendix B, Storet 00625)

Fish Kills: None

Segment 2116 – Choke Canyon Reservoir – Stations 13019, 13020, 17389, 17390, 17391, 17392, 17393

Impairments:

The segment is not supporting for TDS, calculated from conductivity readings. There were 36 readings that had a mean of 528.46, and the criteria is 500. Since the assessment, only station 13020 has had additional samples taken.

Parameter	Station	Assessment Period			Assessment Period through 10/23/2002		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
TDS	13019	36	21	58%			
	13020				9	7	77%
	17389						
	17390						
	17391						
	17392						
	17393						

Concerns:

There is depressed DO concern for aquatic life use at the western end of the lake to RR 99 bridge (station 17389). There have been no additional samples taken since the assessment report.

Explanations and Recommendations:

There is a direct connection between water level and TDS in Choke Canyon. As described in the introduction of this report, this region suffered its worst drought of record from 1993 to July 2002. Analysis of the reservoir from March 1999 to July 2002 showed that during this time period, the water level dropped 16 feet, and dropped from 51.3% of capacity to 35.6% of capacity. During this same time period, calculated TDS levels rose from 427 to 940. In August 2002, the reservoir was full, and the calculated TDS level at station 13020 was 224.

This is a naturally occurring problem, compounded by the City of Corpus Christi's Reservoir System operating procedure which doesn't allow for the system to be flushed unless there is a flood event.

A formal request has been made to TCEQ to change the criteria for TDS for this segment based on this information.

General Information:

The public water supply is fully supported. The aquatic life, contact recreation, fish consumption and general uses were not assessed.

Studies:

24-hour DO monitoring events are being taken at station 17389 to determine the extent of the DO problem. The station was monitored in August and October 2002, and two additional monitoring events are scheduled for July and August 2003.

Trends: No trend analysis was performed on any stations in this segment.

Fish Kills:

09/20/1998: North Shore boat ramp, physical damage/trauma killed 60 fish.

Segment 2117 – Frio River Above Choke Canyon Reservoir – Stations 13023, 13024, 15448, 15449, 15637

Impairments:

The lower 25 miles of the segment are not supported for bacteria (*E. coli*).

Parameter	Station	Assessment Period			Assessment Period through 10/22/2002		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
<i>E. coli</i>	13023	10	4	40%	21	18	86%

Concerns:

There is chloride concern on the entire segment for public water supply.

There is TDS concern on the entire segment for public water supply. No additional chloride samples have been taken at stations 15488 and 15637.

There is a bacteria (*E. coli*) concern from 2 miles downstream of SH 97 to 14 miles upstream of SH 97 for contact recreation use. Fecal coliform is also a concern with limited data. No additional *E. coli* nor fecal coliform samples have been taken at station 15637.

There is a depressed DO concern in the 25 miles surrounding IH 35 for aquatic life use.

There is a nitrogen concern in the 25 miles surrounding IH 35 and in the lower 25 miles of the segment for nutrient enrichment. No additional nitrogen samples have been taken at station 13024.

There is a chlorophyll a concern in the lower 25 miles of the segment for algal growth.

Parameter	Station	Assessment Period			Assessment Period through 12/12/2002		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
Chloride	13023	38	3	8%	31	4	13%
	13024				15	0	0%
	15448						
	15449				1	0	0%
	15637						
TDS	13023	89	4	4%	15	2	13%
	13024				29	1	4%
	15448						
	15449						
	15637						
<i>E. coli</i>	15637	7	2	29%			
Fecal coliform	15637	7	4	57%			
DO	13024	14	4	29%	21	6	29%
Nitrogen	13023	31	10	32%	15	5	33%
	13024	22	8	36%			
Chlorophyll a	13023	14	5	36%	17	6	35%

General Information:

The aquatic life, public water supply, fish consumption and general uses are fully supported.

Trends:

The segment was fully supporting for temperature in the lower 25 miles of the segment. Trend analysis for this parameter at station 13023 shows an increasing trend in the winter months, and a decreasing trend in the summer months. (Appendix B, Storet 00010)

There was no concern for ammonia in the lower 25 miles of this segment, and trend analysis for this parameter at station 13023 shows a decreasing trend. (Appendix B, Storet 00610)

There was no concern for orthophosphorus in the lower 25 miles of this segment, and trend analysis for this parameter at station 13023 shows a decreasing trend. (Appendix B, Storet 00671)

Fish Kills:

05/06/1997: From 20 miles downstream of HWY 85 to Tilden, low DO killed 23,200 fish.

Nueces-Rio Grande Coastal Basin

Drainage Area:

Approximately 10,400 square miles

Counties - Partial:

Cameron, Duval, Hidalgo, Jim Hogg, Jim Wells, Nueces, Starr, Webb

Counties - Entire:

Brooks, Kenedy, Kleberg, Willacy

Region:

The Nueces-Rio Grande Basin is bordered on the north and west by the Nueces River Basin, and on the west and south by the Rio Grande Basin. Runoff drains into the Laguna Madre, Baffin Bay and Oso Bay.

Principal Cities (Including Population Range):

100,000-500,000: Brownsville, Corpus Christi, McAllen

50,000-100,000: Harlingen

10,000 - 50,000: Alice, Donna, Edinburg, Kingsville, Mercedes, Mission, Pharr, Robstown, San Benito, San Juan, Weslaco

5,000 – 10,000: Alamo, Falfurrias, La Feria, Raymondville, Rio Hondo

Regional Economy:

Agriculture, Commercial Fishing, Chemical Production, Ecotourism, Manufacturing, Military, Oil and Gas Production, Tourism

Principal Tributaries:

Petronila Creek, San Fernando Creek, Los Olmos Creek

Principal Aquifers:

Gulf Coast

Major Ecoregions:

Gulf Coast

Average Annual Rainfall:

Regional average annual rainfall is approximately 26 inches of rain annually. Most precipitation occurs in early fall and coincides with tropical storm activity or in late spring due to the passage of frontal systems.

Figure 3.3.5 is a map of the Nueces-Rio Grande Coastal Basin and adjoining bays and estuaries, showing the cities, counties, rivers and creeks, bays, and wastewater outfall locations (depicted as +). Figure 3.3.6 is a map of the basin showing all of the monitoring sites within the area that are referenced in the segment by segment analysis below. The stations with a concern, impairment and/or trend are denoted in red, along with the station number.

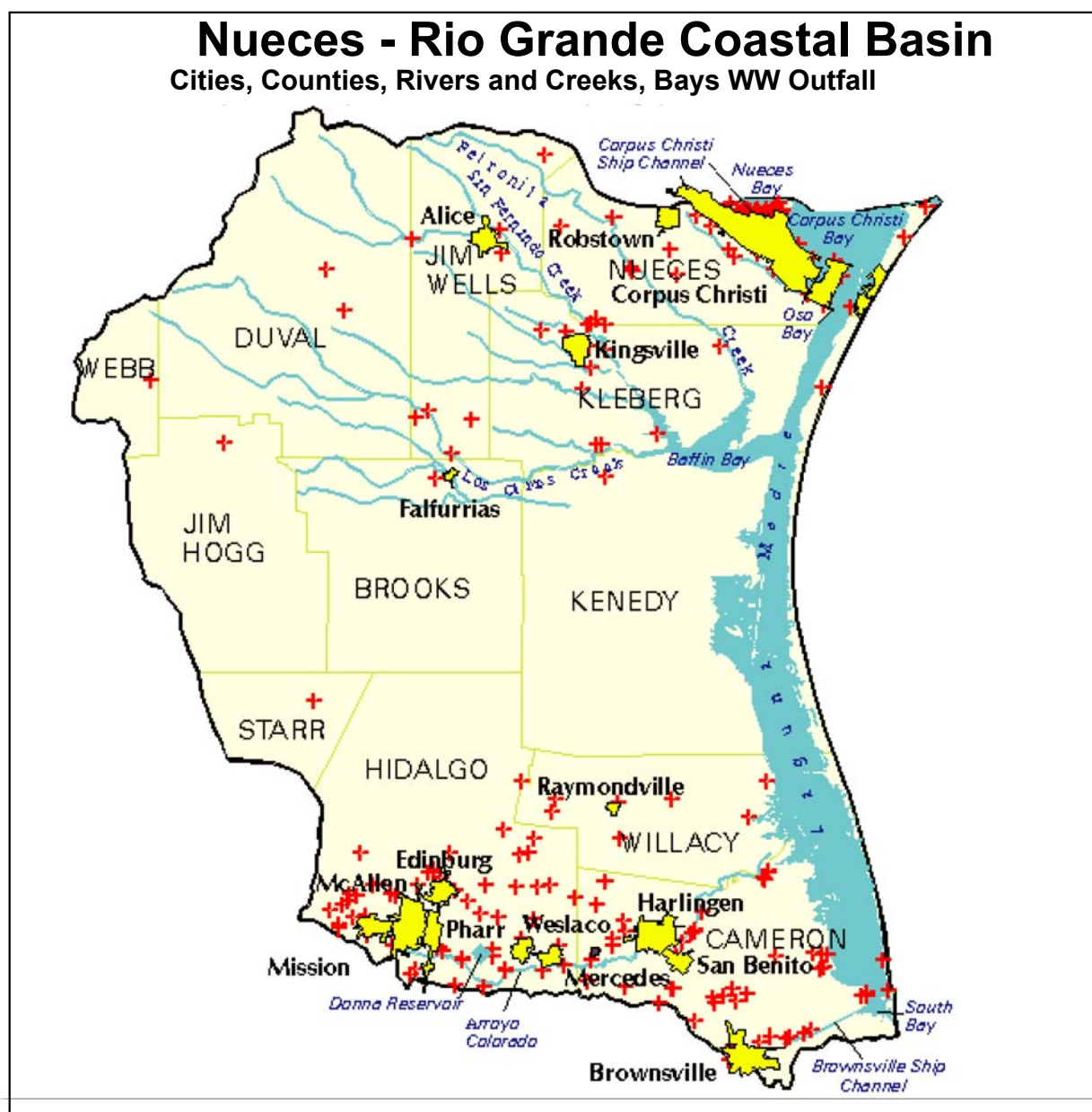


Figure 3.3.5. Map of the Nueces-Rio Grande Coastal Basin

Segment 2201 – Arroyo Colorado Tidal – Stations 13071, 13072, 13073, 13559, 13782

Impairments:

The upper 7.1 miles of this segment was on the 2000 303(d) List as an impairment due to depressed DO. Because an insufficient number of 24-hour DO values were available in 2002 to determine if the criterion is supported, this segment will be identified as not meeting the standard for DO until sufficient 24-hour measurements are available to demonstrate support of the criterion. There are no stations listed as representing the upper 7.1 miles of the segment.

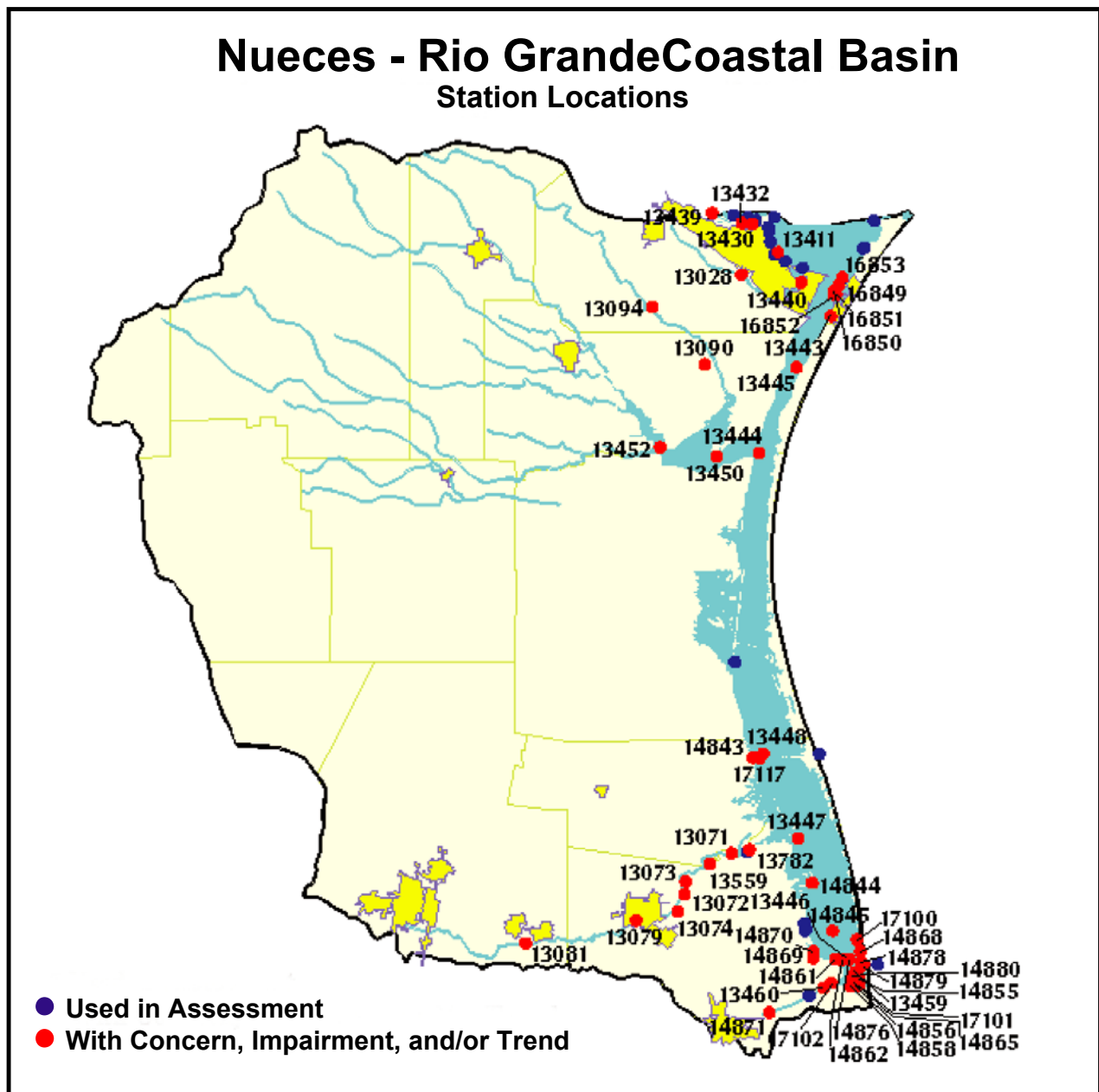


Figure 3.3.6. Map of the Nueces-Rio Grande Coastal Basin monitoring site locations.



Photo: Laguna Atascosa

This segment was on the 2000 303(d) List as an impairment due to toxicity in ambient sediment. Because there were insufficient data to evaluate changes in water quality, this segment will be included on the 2002 303(d) List for toxicity in ambient sediment. There are four storet codes for toxicity in sediment in the TCEQ database, none of which are in TRACS.

Concerns:

There is a nitrogen concern for nutrient enrichment in the segment from approximately 1 mile upstream to 3 miles downstream of Camp Perry, from approximately 3 miles upstream to 2 miles downstream of Marker 27, and in the upper 4 miles. No additional samples have been taken at station 13559.

There is a depressed DO concern for aquatic life in the upper 4 miles of the segment. Additional samples indicate a water quality impairment with respect to DO.

There is an ammonia concern for nutrient enrichment in the segment in the upper 4 miles of the segment.

Parameter	Station	Assessment Period			Assessment Period through 9/11/2002		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
Nitrogen	13072	16	13	81%	24	19	79%
	13073	18	12	67%	24	17	71%
	13559	12	6	50%			
DO	13072	16	2	13%	36	3	8%
Ammonia	13072	18	8	44%	41	18	44%

General Information:

The aquatic life, contact recreation and general uses were fully supported. The fish consumption use was not assessed.

Studies:

A Statewide Ambient Toxicity TMDL has been completed. Summaries and final reports can be found at <http://www.tnrc.state.tx/water/quality/tmdl/toxicity-project.html>.

Trends:

TSS was not assessed in this segment, and trend analysis for this parameter at station 13071 shows a decreasing trend. (Appendix B, Storet 00530)

VSS was not assessed in this segment, and trend analysis for this parameter at station 13071 shows a decreasing trend. (Appendix B, Storet 00535)

TOC was not assessed in this segment, however, trend analysis for this parameter at stations 13071, 13073, and 13782 show increasing trends. (Appendix B, Storet 00680)

Chloride was not assessed in this segment, however, trend analysis for this parameter at station 13071 shows an increasing trend. (Appendix B, Storet 00940)

TDS was not assessed in this segment, however, trend analysis for this parameter at station 13071 and 13782 show increasing trends. (Appendix B, Storet 70300)

There was no concern for DO in the lower 9 miles of the segment, and trend analysis for DO deficit in the summer months.

Conductivity was not assessed on this segment, however, trend analysis at station 13071 shows an increasing trend. (Appendix B, Storet 00094)

Fish Kills:

11/04/1996: From water tower in Arroyo City upstream to Circle X, disease killed 1,000 fish.

06/18/1997: From Port Harlingen to Camp Perry, low DO killed 1,000,000 fish.

08/04/1997: At Rio Hondo near Port of Harlingen, low DO killed 1,000,000 fish.

07/13/1998: On the west bank from the Port of Harlingen to north of the Rio Hondo swing bridge, low DO killed 100,000 fish.

07/30/1998: At the Rio Hondo bridge, low DO killed 100,000 fish.

08/17/1998: Approximately 0.5 miles north of the Rio Hondo bridge, low DO killed 2,000,000 fish.

07/26/1999: At the Port of Brownsville, low DO killed 16,804 fish.

08/03/1999: At the low water bridge to Port of Harlingen, low DO killed 4,160 fish.

08/06/1999: Low DO killed 19,840,000 fish.

09/08/1999: At Port of Brownsville downstream 1 mile, low DO killed 20,000 fish.

Segment 2202 – Arroyo Colorado Above Tidal – Stations 13074, 13079, 13081

Impairments:

The segment is not supporting for bacteria (fecal coliform) for contact recreation use from approximately 14 miles upstream to approximately 11 miles downstream of FM 1015 and in the lower 4 miles of the segment.

The segment is partially supporting for DDE and other organochlorine pesticides in fish tissue for fish consumption, from approximately 14 upstream to approximately 11 miles downstream of FM 1015, approximately 11 miles upstream to 4 miles downstream of US 77, the lower 4 miles of the segment, and the upper 19 miles of the segment. Neither the number of samples nor the number of exceedances for these parameters are listed in the assessment report, neither grouped nor individually.

There is a Texas Department of Health advisory for smallmouth buffalo fish due to organochlorine pesticides. For more information visit http://www.tdh.state.tx.us/bfds/ssd/map/palf/arroyo_colorado.pdf.

Parameter	Station	Assessment Period			Assessment Period through 9/11/2002		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
Fecal coliform	13074	31	19	61%	49	43	88%
	13081	25	13	52%	49	34	79%

Concerns:

There is an ammonia concern for nutrient enrichment from approximately 14 upstream to approximately 11 miles downstream of FM 1015 and in the lower 4 miles of the segment.

There is a nitrogen concern for nutrient enrichment from approximately 14 upstream to approximately 11 miles downstream of FM 1015, from approximately 11 miles upstream to 4 miles downstream of US 77, and in the lower 4 miles of the segment.

There is an orthophosphorus concern for nutrient enrichment from approximately 14 upstream to approximately 11 miles downstream of FM 1015 and in the lower 4 miles of the segment.

There is a total phosphorus concern for nutrient enrichment from approximately 14 upstream to approximately 11 miles downstream of FM 1015 and in the lower 4 miles of the segment.

There is a chlorophyll a concern for excessive algal growth from approximately 14 upstream to approximately 11 miles downstream of FM 1015 and in the lower 4 miles of the segment.

There is a bacteria (fecal coliform) concern for contact recreation use from approximately 11 miles upstream to 4 miles downstream of US 77.

There is a depressed DO concern for aquatic life use in the lower 4 miles of the segment.

Parameter	Station	Assessment Period			Assessment Period through 2/06/2003		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
Ammonia	13074	49	37	76%	54	52	96%
	13081	27	23	85%	51	42	82%
Nitrogen	13074	47	16	34%	35	20	57%
	13079	43	39	91%	21	17	81%
	13084	27	27	100%	33	31	94%
Orthophosphorus	13074	47	20	43%	35	28	80%
	13081	27	13	48%	33	18	55%
Total Phosphorous	13074	45	19	42%	53	28	53%
	13081	24	12	50%	51	30	59%
Chlorophyll a	13074	49	39	80%	54	42	78%
	13081	27	14	52%	51	37	73%
Fecal coliform	13079	4	2	50%	17	13	76%
DO	13074	35	6	17%	62	6	10%

General Information:

The aquatic life and general uses are fully supported.

Studies:

A TMDL has been completed on this segment for legacy pollutants. Information about the study can be found at http://www.tnrcc.state.tx.us/water/quality/tmdl/arroyo_legacyfact.pdf. The adopted implementation plan can be found at http://www.tnrcc.state.tx.us/water/quality/tmdl/implan_arroyo.pdf.

Trends:

The segment was fully supporting for DO in the lower 4 miles of the segment, however, trend analysis for DO deficit at station 13074 shows an increasing trend in the winter months. (Appendix B, Storet 00300)

A trend analysis for orthophosphorus at station 13074 shows an increasing trend. (Appendix B, Storet 00671)

TOC was not assessed in this segment, however, trend analysis for this parameter at stations 13074 and 13081 show increasing trends. (Appendix B, Storet 00680)

The segment was fully supporting for TDS, and trend analysis for this parameter at stations 13074 and 13079 show decreasing trends. (Appendix B, Storet 70300)

The segment was fully supporting for pH, and trend analysis for this parameter at stations 13079 and 13081 show decreasing trends. (Appendix B, Storet 00400)

TKN was not assessed in this segment, however, trend analysis for this parameter at stations 13079 and 13081 show increasing trends. (Appendix B, Storet 00625)

There was no concern for total phosphorus from approximately 11 miles upstream to approximately 4 miles downstream on US 77, however, trend analysis for this parameter at station 13079 shows an increasing trend. (Appendix B, Storet 00665)

There was no concern for orthophosphorus from approximately 11 miles upstream to approximately 4 miles downstream on US 77, however, trend analysis for this parameter at station 13079 shows an increasing trend. (Appendix B, Storet 00671)

Dissolved barium was not assessed in this segment, and trend analysis for this parameter at station 13079 shows a decreasing trend. (Appendix B, Storet 1005)

A trend analysis for transparency at station 13081 shows a decreasing trend. (Appendix B, Storet 00078)

A trend analysis for total phosphorus at station 13081 shows an increasing trend. (Appendix B, Storet 00665)

A trend analysis for fecal coliform at station 13081 shows an increasing trend. (Appendix B, Storet 31616)

Fish Kills:

09/04/1999: West of FM 88 south of Weslaco, low DO killed 110 fish.

Segment 2202A – Donna Reservoir (unclassified water body)

Impairments:

The segment is not supporting for fish consumption use due to PCBs in fish tissue. There are no monitoring stations associated with this segment.

Concerns: None

General Information:

The public water supply use is fully supported. The aquatic life and contact recreation uses were not assessed.

Studies:

A TMDL has been completed on this segment for legacy pollutants. Information about the study can be found at http://www.tnrc.state.tx.us/water/quality/tmdl/arroyo_legacyfact.pdf. The adopted implementation plan can be found at http://www.tnrc.state.tx.us/water/quality/tmdl/implan_arroyo.pdf.

Trends: There are no monitoring stations associated with this segment.

Fish Kills: None

Segment 2203 – Petronila Creek Tidal – Station 13090

Impairments:

The segment is partially supporting for general use due to thermal modifications.

Parameter	Station	Assessment Period			Assessment Period through 10/30/2001		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
Temperature	13090	13	3	23%	15	4	27%

Concerns:

There is a chlorophyll a concern for excessive algal growth.

Parameter	Station	Assessment Period			Assessment Period through 10/30/2001		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
Chlorophyll a	13090	18	9	50%	23	11	48%

General Information:

The aquatic life and contact recreation uses are fully supported. The fish consumption use was not assessed.

Trends:

Alkalinity was not assessed in this segment, and trend analysis for this parameter at station 13090 shows a decreasing trend. (Appendix B, Storet 00410)

TSS was not assessed in this segment, and trend analysis for this parameter at station 13090 shows a decreasing trend. (Appendix B, Storet 00530)

VSS was not assessed in this segment, and trend analysis for this parameter at station 13090 shows a decreasing trend. (Appendix B, Storet 00535)

Fish Kills: None

Segment 2204 – Petronila Creek Above Tidal – Station 13094

Impairments:

The segment is not supporting in either section of the segment for general use for chloride, sulfate, nor TDS.

Parameter	Station	Assessment Period			Assessment Period through 12/18/2002		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
Chloride	13094	20	16*	80%	27	21	78%
Sulfate	13094	20	13*	65%	27	18	67%
TDS	13094	26	16*	62%	27	21	78%

Concerns:

There is a chlorophyll a concern for excessive algal growth.

Parameter	Station	Assessment Period			Assessment Period through 12/18/2002		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
Chlorophyll a	13094	20	12	60%	27	17	85%

Explanations and Recommendations:

This segment is was at one time the brine discharge location for oil and gas wells in the area, which accounts for the chloride, sulfate, and TDS impairments. These discharges have been stopped, but it will take many years before nature is able to repair the damage that was done.

General Information:

The aquatic life and contact recreation uses are fully supported. The fish consumption use was not assessed. Although there is only one station listed for the segment, the assessment report divides the segment into the lower 25 miles of the segment and the upper 19 miles of the segment.

Studies:

A TMDL is currently underway for dissolved solids. A description of the project can be found at <http://www.tnrcc.state.tx.us/water/quality/tmdl/colorado&sangabriel.pdf>.

Trends:

A trend analysis for transparency at station 13094 shows an increasing trend. (Appendix B, Storet 00078)

The segment was fully supporting for pH, and trend analysis for this parameter at station 13094 shows a decreasing trend. (Appendix B, Storet 00400)

TSS was not assessed in this segment, and trend analysis for this parameter at station 13094 shows a decreasing trend. (Appendix B, Storet 00530)

VSS was not assessed in this segment, and trend analysis for this parameter at station 13094 shows a decreasing trend. (Appendix B, Storet 00535)

Fish Kills:

02/03/1997: At FM 70, temperature killed 30 fish.

06/01/1999: Downstream from FM 2826, low DO killed 200 fish.

Bays and Estuaries

Segment 2462 – San Antonio Bay/Hynes Bay/Guadalupe Bay – Stations 13397, 14737, 14738, 14739, 14740, 14741, 14742, 14747, 14749, 14751, 14752, 14753, 14754, 14755, 14882, 14891, 14950, 14956

Impairments:

The segment is not supporting for oyster water use due to bacteria in Guadalupe Bay and San Antonio Bay near Seadrift and ICWW. This assessment is based on Texas Department of Health (TDH) maps. This portion of the segment is actually within the Lavaca-Guadalupe River Basin.

Concerns:

There is a concern for bacteria for oyster water use in 18.0 square miles in Hynes Bay and upper San Antonio Bay. This assessment is based on TDH maps.

There is a concern for bacteria (Enterococci), with limited data for contact recreation use in San Antonio Bay near Austwell.

There is a nitrogen concern for nutrient enrichment in San Antonio Bay near Austwell.

There is a orthophosphorus concern for nutrient enrichment in San Antonio Bay near Austwell.

There is a total phosphorus concern for nutrient enrichment in San Antonio Bay near Austwell.

Parameter	Station	Assessment Period			Assessment Period through 10/17/2001		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
Enterococci	14956	6	2	33%	13	8	62%
Nitrogen	14956	17	5	29%	13	6	46%
Orthophosphorus	14956	18	10	80%	23	10	43%
Total phosphorus	14956	19	13	68%	26	16	62%

General Information:

The aquatic life, contact recreation and general uses were fully supported. The fish consumption use was not assessed.

Studies:

A Gulf Coastal Oyster Waters – Bacteria TMDL is scheduled for July 2006 – June 2007.

Trends: No trend analysis was performed on any stations in this segment.

Fish Kills:

05/17/1996: At Swan Point, low DO killed 4,000 fish.

05/28/1996: Along the City of Austwell shoreline, disease killed 10,000 fish.

Segment 2463 – Mesquite Bay/Carlos Bay/Ayres Bay – Stations 13400, 14756, 14757

Impairments and Concerns: None

General Information:

The aquatic life, contact recreation, oyster waters, and general uses are fully supported. The fish consumption use was not assessed.

Trends:

Alkalinity was not assessed in this segment, however, trend analysis for this parameter at station 13400 shows an increasing trend. (Appendix B, Storet 00410)

There was no concern for ammonia in this segment, and trend analysis for this parameter at station 13400 shows a decreasing trend.

Fish Kills:

07/16/1996: At Vincent Slough, temperature killed 2,200 fish.

Segment 2471 – Aransas Bay – Stations 13402, 14758, 14760, 14761, 14762, 14763, 14764, 14765, 14767, 14768, 14771, 14773, 14777, 16492, 16848

Impairments: None

Concerns:

There is a concern for bacteria for oyster water use in the 6.8 square miles along the northern edge of the bay and near Rockport. This assessment is based on TDH maps.

General Information:

The aquatic life, contact recreation, oyster waters, and general uses are fully supported. The fish consumption use was not assessed.

Trends:

There was no concern for DO in the middle of the bay near Shell Ridge, and trend analysis for DO deficit at station 13402 shows a decreasing trend. (Appendix B, Storet 00300)

Alkalinity was not assessed in this segment, however, trend analysis for this parameter at station 13402 shows an increasing trend. (Appendix B, Storet 00410)

There was no concern for chlorophyll a in the middle of the bay near Shell Ridge, however, trend analysis for this parameter at station 13402 shows an increasing trend. (Appendix B, Storet 32211)

Fish Kills:

05/29/1997: From Goose Island south to Cove Harbor, and from the mouth of Mission Bay east to Aransas Bay, disease killed 1,000 fish.

Segment 2472 – Copano Bay/Port Bay/Mission Bay – Stations 12945, 13404, 13405, 14779, 14780, 14781, 14782, 14783, 14784, 14785, 14786, 14787, 14788, 14790, 14792, 14793, 14797

Impairments:

The segment is not supporting for oyster water use due to bacteria along the southern shore including Port Bay, area near Bayside. This assessment is based on TDH maps.

Concerns:

There is a total phosphorus concern for nutrient enrichment in the area near FM 136 south of Bayside.

There is a depressed DO concern for aquatic life use in the area near FM 188 west of Rockport.

Parameter	Station	Assessment Period			Assessment Period through 10/17/2001		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
Total Phosphorus	12945	17	6	35%	24	8	33%
DO	13405	17	3	18%	24	3	13%

General Information:

The aquatic life, contact recreation, oyster waters, and general uses are fully supported. The fish consumption use was not assessed.

Studies:

24-hour DO monitoring events are being taken at station 13405 to determine the extent of the DO problem. The station was monitored in July, September, and October 2002, and one additional monitoring event is scheduled for July or August 2003.

A Gulf Coastal Oyster Waters – Bacteria TMDL is scheduled for July 2006 – June 2007.

Trends:

TKN was not assessed in this segment, and trend analysis for this parameter at station 12945 shows a decreasing trend. (Appendix B, Storet 00625)

There was no concern for orthophosphorus in the segment, and trend analysis for this parameter at station 12945 shows a decreasing trend. (Appendix B, Storet 00671)

There was no concern for chlorophyll a in the segment, and trend analysis for this parameter at station 12945 shows a decreasing trend. (Appendix B, Storet 32211)

There was no concern for DO in the area near SH 35, however, trend analysis for DO deficit at station 13404 shows an increasing trend, both overall and in the summer months. (Appendix B, Storet 00300)

VSS was not assessed in this segment, however, trend analysis for this parameter at station 13404 shows an increasing trend. (Appendix B, Storet 00535)

There was no concern for nitrogen in the area near SH 35 and trend analysis for this parameter at station 13404 shows a decreasing trend. (Appendix B, Storet 00630)

Fish Kills:

06/04/1996: In the Holiday Beach Canals, 195 Sailfish Lane, low DO killed 10,000 fish.

06/12/1996: In the Holiday Beach Canals: low DO killed 6,003,000 fish.

05/29/1997: From Goose Island south to Cove Harbor, and from the mouth of Mission Bay east to Aransas Bay, disease killed 1,000 fish.

Segment 2473 – St. Charles Bay – Stations 13406, 14776, 15004

Impairments: None

Concerns:

There is a bacteria (Enterococci) concern, with limited data, for contact recreation use in the bay, northeast of Goose Island State Park.

Parameter	Station	Assessment Period			Assessment Period through 10/17/2001		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
Enterococci	13406	6	2	33%	13	8	62%

General Information:

The aquatic life, contact recreation, oyster waters, general, and oyster water uses were fully supported. The fish consumption use was not assessed.

Trends:

The segment was fully supporting for temperature, and trend analysis for this parameter at stations 13406 and 15004 show decreasing trends in the summer months. (Appendix B, Storet 00010)

The segment was fully supporting for DO, and trend analysis for DO deficit at station 13406 shows an increasing trend, both overall and in the winter months. (Appendix B, Storet 00300)

Alkalinity was not assessed in this segment, however, trend analysis for this parameter at station 13406 shows an increasing trend. (Appendix B, Storet 00410)

TSS was not assessed in this segment, however, trend analysis for this parameter at station 13406 shows an increasing trend. ((Appendix B, Storet 00530)

VSS was not assessed in this segment, however, trend analysis for this parameter at station 13406 shows an increasing trend. (Appendix B, Storet 00535)

The segment was fully supporting for fecal coliform, however, trend analysis for this parameter at station 13406 shows an increasing trend. (Appendix B, Storet 31616)

Salinity was not assessed in this segment and trend analysis for this parameter at station 15004 shows a decreasing trend. (Appendix B, Storet 00480)

Fish Kills: None

Segment 2481 – Corpus Christi Bay – Stations 13407, 13409, 13410, 13411, 14355, 14469, 14818, 14819, 14820, 14821, 14822, 14823, 14824, 14825, 14826, 14827, 14828, 14829, 14830, 14955, 16849, 16850, 16851, 16852, 16853, 16854, 17099

Impairments: None

Concerns:

There is a bacteria concern for oyster waters use in 16.0 square miles along shoreline near Corpus Christi and Portland. This assessment is based on TDH maps.

General Information:

The aquatic life, contact recreation, fish consumption, general and oyster waters uses were fully supported.

Trends:

Alkalinity was not assessed in this segment, however, trend analysis for this parameter at station 13407 shows an increasing trend. (Appendix B, Storet 00410)

There was no concern for chlorophyll a in this segment, and trend analysis for this parameter at station 13407 shows a decreasing trend. (Appendix B, Storet 32211)

There was no concern for ammonia in this segment, and trend analysis for this parameter at station 13409 shows a decreasing trend. (Appendix B, Storet 00610)

There was no concern for total phosphorus in this segment, however, trend analysis for this parameter at station 13409 shows an increasing trend. (Appendix B, Storet 00665)

There was no concern for orthophosphorus in this segment, and trend analysis for this parameter at station 13409 shows a decreasing trend, but trend analysis for this parameter at station 13411 shows an increasing trend. (Appendix B, Storet 00671)

Salinity was not assessed in this segment, however, trend analysis for this parameter at stations 13411, 16849, 16850, 16851, 16852, 16853 and 16854 show increasing trends. (Appendix B, Storet 00480)

VSS was not assessed in this segment, and trend analysis for this parameter at station 13411 shows a decreasing trend. (Appendix B, Storet 00535)

TKN was not assessed in this segment, however, trend analysis for this parameter at station 13411 shows an increasing trend. (Appendix B, Storet 00625)

TOC was not assessed in this segment, however, trend analysis for this parameter at station 13411 shows an increasing trend. (Appendix B, Storet 00680)

Chloride was not assessed in this segment, however, trend analysis for this parameter at station 13411 shows an increasing trend. (Appendix B, Storet 00940)

TDS was not assessed in this segment, however, trend analysis for this parameter at station 13411 shows an increasing trend. (Appendix B, Storet 70300)

Fish Kills:

06/11/1997: At North Beach near the lifeguard stand, physical damage/trauma killed 37 fish.

09/01/1998: At Oso Bay bridge, physical damage/trauma killed 1,585 fish.

04/25/1999: In the eastern section of Upper Laguna Madre and southeastern section of Corpus Christi Bay, physical damage/trauma killed 27,847 fish.

Segment 2482 – Nueces Bay – Stations 13420, 13421, 13422, 13425, 14831, 14832, 14833, 14834, 14835, 14836

Impairments:

The segment is not supporting for zinc in oyster tissue in the entire bay. This assessment is based on TDH maps.

Concerns: None

General Information:

The aquatic life, contact recreation, and general uses were fully supported. The fish consumption use was not assessed.

Studies:

A TMDL is scheduled for zinc in oyster tissue. A description of the project can be found at <http://www.tnrcc.state.tx.us/water/quality/tmdl/nuecesbay.pdf>.

Trends:

The segment was fully supporting for DO, and trend analysis for DO deficit at stations 13421 and 13422 show decreasing trends in the winter months. (Appendix B, Storet 00300)

TSS was not assessed in this segment, and trend analysis for this parameter at stations 13421, 13422, and 13425 show decreasing trends. (Appendix B, Storet 00530)

There was no concern for ammonia in this segment, and trend analysis for this parameter at station 13421 shows a decreasing trend. (Appendix B, Storet 00610)

There was no concern for nitrogen in this segment, and trend analysis for this parameter at station 13421 shows a decreasing trend. (Appendix B, Storet 00630)

Alkalinity was not assessed in this segment, however, trend analysis for this parameter at station 13422 shows an increasing trend. (Appendix B, Storet 00410)

VSS was not assessed in this segment, and trend analysis for this parameter at stations 13422 and 13425 show decreasing trends. (Appendix B, Storet 00535)

The segment was fully supporting for pH, and trend analysis for this parameter at station 13425 shows a decreasing trend. (Appendix B, Storet 00400)

Fish Kills:

04/08/1996: East of Whites Point and all across Nueces Bay, physical damage/trauma killed 184,177 fish.

09/23/1997: At the western end of Sunset Lake, low DO killed 22,254 fish.

Segment 2483 – Redfish Bay – Stations 13426, 14803, 14805, 14806, 14808, 14810, 14812, 14813, 14816, 14817, 16855

Impairments: None

Concerns:

There is a depressed DO concern for aquatic life use in the area near SH 361.

Parameter	Station	Assessment Period			Assessment Period through 10/17/2001		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
DO	13426	15	2	13%	22	2	9%

General Information:

The aquatic life, contact recreation, and general uses were fully supported. The fish consumption and oyster water uses were not assessed.

Studies:

24-hour DO monitoring events are being taken at station 13426 to determine the extent of the DO problem. The station was monitored in July, September, and October 2002, and one additional monitoring event is scheduled for July or August 2003.

Trends:

A trend analysis for transparency at station 13426 shows a decreasing trend. (Appendix B, Storet 00078)

A trend analysis for DO deficit at station 13426 shows an increasing trend in the summer months. (Appendix B, Storet 00300)

TSS was not assessed in this segment, however, trend analysis for this parameter at station 13426 shows an increasing trend. (Appendix B, Storet 00530)

VSS was not assessed in this segment, however, trend analysis for this parameter at station 13426 shows an increasing trend. (Appendix B, Storet 00535)

There was no concern for orthophosphorus in this segment, and trend analysis for this parameter at station 13426 shows a decreasing trend. (Appendix B, Storet 00671)

Fish Kills:

11/09/1998: In the western section, physical damage/trauma killed 42,968 fish.

Segment 2484 – Corpus Christi Inner Harbor – Stations 13430, 13432, 13439

Impairments: None

Concerns:

There is an ammonia concern for nutrient enrichment in the area near Avery Turning Basin, the area near Navigation Blvd., and the area near Viola Turning Basin.

There is a nitrogen concern for nutrient enrichment in the area near Navigation Blvd. and the area near Viola Turning Basin. No additional samples have been taken for nitrogen.

Parameter	Station	Assessment Period			Assessment Period through 12/10/2001		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
Ammonia	13430	19	8	42%	25	10	40%
	13432	19	9	47%	26	10	38%
	13439	19	10	53%	26	12	46%
Nitrogen	13432	19	6	32%			
	13439	17	7	41%			

General Information:

The aquatic life, contact recreation, fish consumption, and general uses were fully supported.

Trends:

The segment was fully supporting for pH, and trend analysis for this parameter at station 13430 shows a decreasing trend. (Appendix B, Storet 00400)

Alkalinity was not assessed in this segment, however, trend analysis for this parameter at stations 13430, 13432, and 13439 show increasing trends. (Appendix B, Storet 00410)

VSS was not assessed in this segment, and trend analysis for this parameter at stations 13430 and 13432 show decreasing trends. (Appendix B, Storet 00535)

There was no concern for orthophosphorus in this segment, and trend analysis for this parameter at stations 13430, 13432, and 13439 show decreasing trends. (Appendix B, Storet 00671)

TOC was not assessed in this segment, however, trend analysis for this parameter at stations 13430 and 13439 show increasing trends. (Appendix B, Storet 00680)

Sulfate was not assessed in this segment, however, trend analysis for this parameter at station 13430 shows an increasing trend. (Appendix B, Storet 00945)

Fish Kills:

05/10/1996: From Broadway to Corpus Christi Inner Harbor, low DO killed 2,000 fish.

Segment 2485 – Oso Bay – Station 13440

Impairments:

The segment is partially supporting for aquatic life use due to depressed dissolved oxygen.

Parameter	Station	Assessment Period			Assessment Period through 10/16/2002		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
DO	13440	17	5	29%	42	15	36%

Concerns:

There is a bacteria (Enterococci) concern for contact recreation use.

There is also a bacteria concern for oyster waters use. This assessment is based on TDH maps.

There is a chlorophyll a concern for excessive algal growth. Additional data indicates a possible water quality improvement with respect to chlorophyll a.

Parameter	Station	Assessment Period			Assessment Period through 10/16/2002		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
Enterococci	13440	6	3	50%	31	26	84%
Chlorophyll a	13440	16	5	31%	31	8	24%

General Information:

The contact recreation, general, and oyster water uses were fully supported. The fish consumption use was not assessed.

Studies:

A TMDL is currently underway for DO. A description of the project can be found at <http://www.tnrcc.state.tx.us/water/quality/tmdl/osobay.pdf>.

Trends:

The segment was fully supporting for temperature, and trend analysis for this parameter at station 13440 shows a decreasing trend in the summer months. (Appendix B, Storet 00010)

Trend analysis for DO deficit at station 13440 shows increasing trend in both the winter and summer months and overall. (Appendix B, Storet 00300)

There was no concern for orthophosphorus in this segment, and trend analysis for this parameter at stations 13440 shows a decreasing trend. (Appendix B, Storet 00671)

Sulfate was not assessed in this segment, however, trend analysis for this parameter at station 13440 shows an increasing trend. (Appendix B, Storet 00945)

Fish Kills: None

Segment 2485A – Oso Creek (unclassified water body) – Station 13028

Impairments:

The segment is not supporting for bacteria (fecal coliform) for contact recreation use in the lower 25 miles of the water body.

Parameter	Station	Assessment Period			Assessment Period through 10/16/2002		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
Fecal coliform	13428	12	5	42%	37	23	62%

Concerns:

There is a bacteria (Enterococci) concern for contact recreation use in the lower 25 miles of the water body.

There is a nitrogen concern for nutrient enrichment in the lower 25 miles of the water body.

There is an orthophosphorus concern for nutrient enrichment in the lower 25 miles of the water body.

There is a total phosphorus concern for nutrient enrichment in the lower 25 miles of the water body.

Parameter	Station	Assessment Period			Assessment Period through 10/16/2002		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
Enterococci	13028	5	4	80%	30	30	100%
Nitrogen	13028	18	14	78%	13	12	92%
Orthophosphorus	13028	19	13	68%	25	20	80%
Total phosphorus	13028	18	12	67%	40	30	75%

General Information:

The aquatic life use is fully supported. The fish consumption use was not assessed.

Trends:

Conductivity was not assessed in this segment, and trend analysis for this parameter at station 13028 shows a decreasing trend. (Appendix B, Storet 00094)

pH was not assessed in this segment, and trend analysis for this parameter at station 13028 shows a decreasing trend. (Appendix B, Storet 00400)

Salinity was not assessed in this segment, and trend analysis for this parameter at station 13028 shows a decreasing trend. (Appendix B, Storet 00480)

There as no concern for ammonia in this segment, and trend analysis for this parameter at station 13028 shows a decreasing trend. (Appendix B, Storet 00610)

Fish Kills:

08/11/2000: At Oso Creek Parkway off Yorktown Road in The Lakes Subdivision, low DO killed 42 fish.

Segment 2491 – Laguna Madre – Stations 13443, 13444, 13445, 13446, 13447, 13448, 13449, 14843, 14844, 14845, 14861, 14862, 14868, 14869, 14870, 14876, 14878, 14879, 15596, 15597, 15598, 15599, 15600, 15601, 15602, 15604, 15605, 17100, 17117

Impairments:

The segment was on the 2000 303(d) List as an impairment due to depressed DO. Because in insufficient number of 24-hour DO values were available to determine if the criterion was supported, this segment will be included on the 2002 303(d) List for DO.

Concerns:

There is a bacteria concern for oyster waters use in the 18.1 square miles near the Arroyo Colorado and along the ICWW. This assessment is based on TDH maps.

There is a chlorophyll a concern for excessive algal growth in the area around the mouth of Baffin Bay.

There is an ammonia concern for nutrient enrichment in the area around the mouth of Arroyo Colorado. Additional data indicates a possible water quality improvement with respect to ammonia.

There is a nitrogen concern for nutrient enrichment in the area around the mouth of Arroyo Colorado. There have been no additional nitrogen samples taken.

There is an orthophosphorus concern for nutrient enrichment in the area around the mouth of Arroyo Colorado. There have been no additional orthophosphorus samples taken.

Parameter	Station	Assessment Period			Assessment Period through 11/21/2002		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
Chlorophyll a	13444	10	5	50%	17	8	47%
Ammonia	13447	21	6	29%	28	6	21%
Nitrogen	13447	17	9	53%			
Orthophosphorus	13447	16	5	31%			
Total phosphorus	13447	21	7	33%	28	7	25%

General Information:

The aquatic life, contact recreation, general, and oyster water uses are fully supported. The fish consumption use was not assessed.

Trends:

There is no concern for DO in this segment, and trend analysis for DO deficit at stations 13443 and 13445 show decreasing trends overall and in the summer months. Trend analysis for DO deficit at station 13444 shows an increasing trend. (Appendix B, Storet 00300)

There is no concern for nitrogen in this segment, and trend analysis for this parameter at stations 13443, 13445, and 13447 show decreasing trends. (Appendix B, Storet 00630)

There is no concern for fecal coliform in this segment, and trend analysis for this parameter at stations 13443 and 13448 show decreasing trends. (Appendix B, Storet 31616)

Trend analysis for chlorophyll a at station 13444 shows a decreasing trend. (Appendix B, Storet 32211)

There is no concern for chlorophyll a in the rest of the segment, and trend analysis for this parameter at stations 13443 and 13448 show decreasing trends. (Appendix B, Storet 32211)

Conductivity was not assessed in this segment, however, trend analysis for this parameter at stations 13444, 13446, and 13448 show increasing trends. (Appendix B, Storet 00094)

Salinity was not assessed in this segment, however, trend analysis for this parameter at stations 13444, 13446, 13447, 13448, 14843, 14844, 14845, 14861, 14862, 14863, 14868, 14869, 14870, 14876, 14877, 14878, 14879, 17100, and 17117 show increasing trends. (Appendix B, Storet 00480)

VSS was not assessed in this segment, and trend analysis for this parameter at stations 13444, 13447, and 13448 show decreasing trends. (Appendix B, Storet 00535)

TOC was not assessed in this segment, however, trend analysis for this parameter at stations 13444 and 13447 show increasing trends. (Appendix B, Storet 00680)

There is no concern for temperature in this segment, however, trend analysis for this parameter at stations 13445, 13446, and 13448 show increasing trends in the summer months. Trend analysis for this parameter at stations 14843, 14844, 14845, 14861, 14862, 14863, 14868, 14869, 14870, 14876, 14877, 14878, 14879, 17100, and 17117 show decreasing trends overall. (Appendix B, Storet 00010)

A trend analysis for transparency at station 13445 shows an increasing trend. (Appendix B, Storet 00078)

Alkalinity was not assessed in this segment, however, trend analysis for this parameter at stations 13445 and 13446 show increasing trends. (Appendix B, Storet 00410)

TKN was not assessed in this segment, however, trend analysis for this parameter at station 13445 shows an increasing trend. (Appendix B, Storet 00625)

TSS was not assessed in this segment, and trend analysis for this parameter at stations 13446, 13447, and 13448 show decreasing trends. (Appendix B, Storet 00530)

TDS was not assessed in this segment, however, trend analysis for this parameter at stations 13446 and 13447 show increasing trends. (Appendix B, Storet 70300)

Sulfate was not assessed in this segment, however, trend analysis for this parameter at station 13447 shows an increasing trend. (Appendix B, Storet 00945)

There is no concern for pH in this segment, and trend analysis for this parameter at station 13448 shows a decreasing trend. (Appendix B, Storet 00400)

Fish Kills:

05/20/1996: In the irrigation ditch near La Sara, Raymondville, and FM 186, low DO killed 400 fish.

05/31/1996: In the Tropic Isles Subdivision in Flour Bluff, low DO killed 10,000 fish.

09/29/1996: At Punta Bonair off of Sea Pines in the Padre Isles Canals, low DO killed 20 fish.

08/23/1997: In the Tropic Isles Canal, off Caribbean and Azores, low DO killed 1,000 fish.

12/25/1998: In the Port Isabel finger channels, freezing temperatures killed 5,045 fish.

12/29/1998: In the canal adjacent to Cobo de Bara Circle on Padre Island, freezing temperatures killed 200 fish.

01/04/1999: In the western section of the Upper Laguna Madre Bay from shore out to the intracoastal canal, physical damage/trauma killed 47,917 fish.

07/10/2000: In the Commodore Cove Subdivision on Padre Island, low DO killed 22 fish.

Segment 2492 – Baffin Bay/Alazan Bay/Cayo del Grullo/Laguna Salada – Stations 13450, 13452

Impairments: None

Concerns:

There is a chlorophyll a concern for excessive algal growth in Upper Baffin Bay near Los Olmos and San Fernando Creek arms.

Parameter	Station	Assessment Period			Assessment Period through 10/08/2002		
		# of Samples	# of Exceedances	% of Exceedances	# of Samples	# of Exceedances	% of Exceedances
Chlorophyll a	13452	18	7	39%	25	10	40%

General Information:

The aquatic life, contact recreation, and general uses were fully supported. The fish consumption and oyster water uses were not assessed.

Trends:

There is no concern for DO in this segment, however, trend analysis for DO deficit at station 13450 shows an increasing trend, both overall and in the summer months. (Appendix B, Storet 00300)

TOC was not assessed in this segment, however, trend analysis for this parameter at stations 13450 and 13452 show increasing trends. (Appendix B, Storet 00680)

The segment is fully supporting for pH, and trend analysis for this parameter at stations 13033, 13450, and 13452 show decreasing trends. (Appendix B, Storet 00400)

There is no concern for chlorophyll a in Lower Baffin Bay near Salvation Point and Black Bluff, and trend analysis for this parameter at station 13450 shows a decreasing trend. (Appendix B, Storet 32211)

There is no concern for orthophosphorus in this segment, however, trend analysis for this parameter at station 13452 shows an increasing trend. (Appendix B, Storet 00671)

Chloride was not assessed in this segment, however, trend analysis for this parameter at station 13452 shows an increasing trend. (Appendix B, Storet 00940)

Sulfate was not assessed in this segment, however, trend analysis for this parameter at station 13452 shows an increasing trend. (Appendix B, Storet 00945)

Fish Kills:

10/20/1998: Near Drum Point in Cayo Dell Grullo, physical damage/trauma killed 1,527 fish.

Segment 2493 – South Bay – Stations 13459, 14855, 14856, 14858, 14865, 14880, 17101

Impairments and Concerns: None

General Information:

The aquatic life, contact recreation, oyster waters, and general uses were fully supported. The fish consumption use was not assessed.

Trends:

Conductivity was not assessed in this segment, however, trend analysis for this parameter at station 13459 shows an increasing trend. (Appendix B, Storet 00094)

Alkalinity was not assessed in this segment, however, trend analysis for this parameter at station 13459 shows an increasing trend. (Appendix B, Storet 00410)

Salinity was not assessed in this segment, however, trend analysis for this parameter at stations 13459, 14855 and 14880 show increasing trends. (Appendix B, Storet 00480)

The segment is fully supporting for temperature, and trend analysis for this parameter at stations 14855, 14856, 14858, 14865, 14880, and 17101 show decreasing trends overall. (Appendix B, Storet 00010)

Fish Kills:

04/30/1996: In the south flats behind Koepernik Shores Development: low DO killed 123 fish.

Segment 2494 – Brownsville Ship Channel – Stations 13460, 14871, 14875, 17102

Impairments: None

Concerns:

There is a DO concern for aquatic life use in the Brownsville Ship Channel Turning Basin. Since the assessment, no additional samples have been taken for DO.

Parameter	Station	Assessment Period		
		# of Samples	# of Exceedances	% of Exceedances
DO	14871	4	2	50%

General Information:

The aquatic life, contact recreation, and general uses are fully supported. The fish consumption use was not assessed.

Trends:

TKN was not assessed in this segment, however, trend analysis for this parameter at station 13460 shows an increasing trend. (Appendix B, Storet 00625)

There is no concern for temperature in this segment, and trend analysis for this parameter at station 17102 shows a decreasing trend. (Appendix B, Storet 00010)

Alkalinity was not assessed in this segment, however, trend analysis for this parameter at station 13460 shows an increasing trend. (Appendix B, Storet 00410)

Salinity was not assessed in this segment, however, trend analysis for this parameter at station 13460 shows an increasing trend.

Fish Kills:

03/05/1996: Temperature killed 40 fish.

10/28/1999: At the San Martin State Boat Ramp on Hwy 48 south to the Brownsville Ship Channel, biotoxin killed 5,280 fish.

Segment 2501 – Gulf of Mexico (partial) – Stations 13468, 13469, 13470

Impairments:

The segment is not supporting for mercury in king mackerel > 43 inches for fish consumption in the Port Aransas, Port Isabel, and Port Mansfield areas. The assessment was based on Advisories and Closures.

Concerns: None

General Information:

The aquatic life, contact recreation, and general uses were fully supported. The oyster waters use was not assessed.

Trends: No trend analysis was performed on any stations in this segment.

Fish Kills:

10/31/1997: From Port Mansfield Pass south to Access Road 5, Andy Bowie Park, disease killed 16,400 fish.

11/05/1997: At Padre Island National Seashore from mile marker 40 to mile marker 63, disease killed 120,000 fish.

Explanations and Recommendations

The 305(b) assessment covered a time period that was towards the end of a new drought of record. The drought ended in July 2002, and there have been several periods of flooding and abundant rainfall since. The Palmer Drought Index for the area has changed from a severe and extreme drought to a very moist and extremely moist spell. Therefore, all parameters should continue to be monitored so that the cause of the concerns and impairments can be contributed to natural causes relating to the drought, or to other conditions that can be rectified.



Photo: Frio River at Tilden

4.0 CONCLUSIONS AND RECOMMENDATIONS

The following summarizes the findings in the Nueces River Basin and the adjoining coastal basins.

SAN ANTONIO – NUECES COASTAL BASIN:

None of the segments in this basin have any impairments. There are concerns for bacteria, DO, and orthophosphorus. There are increasing trends for DO deficit, TOC, and VSS (Table 4.0.1).

Table 4.0.1. Concerns and Trends in the San Antonio - Nueces Coastal Basin

		2001	2002	2003	2004
Concerns	Bacteria	x	x	x	
	DO		x		x
	O-Phos			x	
Trends	DO		x		
	TOC		x		
	VSS	x	x	x	

All segments are in generally good shape, and routine monitoring should be continued. Emphasis will be placed on scrutinizing the sampling results for the parameters listed as concerns and / or with increasing trends.

24-hour DO monitoring is currently underway on segment 2002. Between the two monitoring events to date, the minimum recorded values were 5.41 mg/L and 6.11 mg/L, the maximum recorded values were 6.6 mg/L and 6.4 mg/L, with the average values being 6.04 mg/L and 6.24 mg/L, respectively. The criteria for DO on this segment is 5.0 mg/L. With additional monitoring, it appears likely that the concern for DO will be removed from the Draft 2002 305(b) Report for this segment.

Segment 2004 should be removed from the Draft 2002 305(b) Report. Beginning in August 1998, samples were being taken on Aransas Creek, an intermittent stream, not the Aransas River. The correct location has again been sampled since July 2002. The incorrect location was assigned a new SWQM number and assigned to those sampling results. Therefore, there were only 3 samples for the Aransas River during the assessment period, which is not enough data points to determine whether or not there is an actual DO concern on this segment. None of the 3 samples exceeded the criteria. Since the assessment, 2 additional samples have been taken, neither of which exceed the criteria.

NUECES RIVER BASIN:

There are impairments for bacteria, DO, nitrogen, and TDS. There are concerns for ammonia, bacteria, chloride, chlorophyll a, DO, nitrogen, sulfate, temperature, and TDS. There are trends for alkalinity, dissolved barium, chloride, conductivity, dissolved copper, pH, sulfate, temperature, TKN, TSS, and VSS (Table 4.0.2).

6 of the 17 segments in this basin are listed for impairments: 2104, 2107, 2110, 2113, 2116, and 2117. Segments 2104, 2107, and 2113 are included in the South Central Texas – Bacteria and DO TMDL currently underway. More information about the TMDL can be found at <http://www.tnrcc.state.tx.us/water/quality/tmdl/SouthCentralBacteria.pdf>.

Table 4.0.2. Impairments, Concerns and Trends in the Nueces River Basin.

		2101	2102	2103	2104	2105	2106	2107	2108	2109
Impairments	Bacteria							x		
	DO				x			x		
	Nitrogen									
	TDS									
Concerns	Ammonia							x		
	Bacteria						x	x		
	Chloride				x					
	Chlorophyll a	x						x		
	DO									
	Nitrogen									x
	Sulfate									x
	Temperature									
	TDS				x			x		
Trends	Alkalinity									
	Barium						x			
	Chloride	x								
	Conductivity						x			
	Copper						x			
	pH						x			
	Sulfate	x								
	Temperature									
	TKN	x								
	TSS					x				
	VSS					x				

Segment 2116 is listed as impaired for TDS. However, there is a direct correlation between water level and TDS in Choke Canyon Reservoir. As described in the introduction of this report, this region suffered its worst drought of record from 1993 to July 2002. Analysis of the reservoir from March 1999 to July 2002 showed that during this time period, the water level dropped 16 feet, and dropped from 51.3% of capacity to 35.6% of capacity. During this same time period, calculated TDS levels rose from 427 to 940. In August 2002, the reservoir was full, and the calculated TDS level at station 13020 was 224. This is a naturally occurring problem, compounded by the City of Corpus Christi's Reservoir System operating procedure which doesn't allow for the system to be flushed unless there is a flood event. A formal request has been made to TCEQ to change the criteria for TDS for this segment based on this information.

24-hour DO monitoring is also currently underway on segment 2116. DO is a concern, not an impairment in this segment. Between the two monitoring events to date, the minimum recorded values were 2.61 mg/L and 3.75 mg/L, the maximum recorded values were 4.36 mg/L and 6.24 mg/L, with the average values being 3.4 mg/L and 4.68 mg/L, respectively. The criteria for DO on this segment is 5.0 mg/L.

Table 4.0.2 continued.

		2110	2111	2112	2113	2114	2115	2116	2117
Impairments	Bacteria								x
	DO				x				
	Nitrogen	x							
	TDS							x	
Concerns	Ammonia								
	Bacteria								x
	Chloride								x
	Chlorophyll a								x
	DO							x	x
	Nitrogen	x							x
	Sulfate								
	Temperature						x		
	TDS								x
Trends	Alkalinity					x			
	Barium								
	Chloride								
	Conductivity								
	Copper								
	pH								
	Sulfate								
	Temperature						x		x
	TKN						x		
	TSS								
	VSS								

There are no direct discharges to this segment, and the remaining 24-hour monitoring results may indicate that the segment is impaired. As with TDS discussed above, this is a naturally occurring problem. A formal request may be made to TCEQ to change the criteria for DO.

Routine monitoring should be continued, with emphasis being placed on scrutinizing the sampling results for the parameters listed as impairments, concerns and / or with increasing trends on segments/parameters not currently under study.

NUECES – RIO GRANDE COASTAL BASIN:

There are bacteria, chloride, pesticides, DO, PCBs, sulfate, TDS temperature, and toxicity in sediment impairments in this basin. There are concerns for ammonia, bacteria chlorophyll a, DO, nitrogen, orthophosphorus, and total phosphorus. There are trends for bacteria, chloride, chlorophyll a, DO deficit, orthophosphorus, TDS, TKN, TOC, total phosphorus, and transparency (Table 4.0.3).

All segments in the basin are listed for at least one impairment. Segment 2201 is scheduled to be included in the Statewide Ambient Toxicity TMDL.

Table 4.0.3. Impairments, Concerns, and Trends in the Nueces-Rio Grande Coastal Basin.

		2201	2202	2202A	2203	2204
Impairments	Bacteria		x			
	Chloride					x
	DDE, et al		x			
	DO	x				
	PCB			x		
	Sulfate					x
	TDS					x
	Temperature				x	
	Toxicity in Sediment	x				
Concerns	Ammonia	x	x			
	Bacteria		x			
	Chlorophyll a		x		x	x
	DO	x	x			
	Nitrogen	x	x			
	O-Phos		x			
	Total Phos		x			
Trends	Bacteria		x			
	Chloride	x				
	Chlorophyll a	x				
	DO Deficit		x			
	O-Phos		x			
	TDS	x				
	TKN		x			
	TOC	x	x			
	Total Phos		x			
	Transparency		x			

Segments 2202, and 2202A are included in the Arroyo Colorado Legacy/Donna Canal Legacy TMDL that has been completed. More information about the TMDL can be found at http://www.tnrcc.state.tx.us/water/quality/tmdl/arroyo_legacyfact.pdf. The adopted implementation plan can be found at http://www.tnrcc.state.tx.us/water/quality/tmdl/implan_arroyo.pdf. The following table, (Table 2, page 11, of the plan), summarizes the implementation schedule:

Segment 2204 is included in the Colorado and San Gabriel Rivers, Brushy and Petronila Creeks – TDS TMDL currently underway. More information about the TMDL can be found at <http://www.tnrcc.state.tx.us/water/quality/tmdl/colorado&sangabriel.pdf>.

Routine monitoring should be continued, with emphasis being placed on scrutinizing the sampling results for the parameters listed as impairments, concerns and / or with increasing trends on segments/parameters not currently under study.

BAYS AND ESTUARIES:

There are bacteria, bacteria in oysters, DO, mercury in fish tissue, and zinc in oyster tissue impairments in the bays and estuaries. There are concerns for ammonia, bacteria, bacteria in oysters, chlorophyll a, DO, nitrogen, orthophosphorus, and total phosphorus. There are trends for alkalinity, bacteria, chloride, chlorophyll a, conductivity, DO deficit, orthophosphorus, salinity, sulfate, TDS, temperature, TKN, TOC, total phosphorus, transparency, TSS, and VSS (Table 4.0.4).

Table 4.0.4. Impairments, Concerns, and Trends in the Bays, Estuaries, and Gulf of Mexico.

		2462	2463	2471	2472	2473	2481	2482	2483
Impairments	Bacteria								
	Bacteria/Oysters	x			x				
	DO								
	Mercury								
	Zinc/Oysters							x	
Concerns	Ammonia								
	Bacteria	x				x			
	Bacteria/Oysters	x		x			x		
	Chlorophyll a								
	DO				x				x
	Nitrogen	x							
	O-Phos	x							
	Total Phos	x			x				
Trends	Alkalinity		x			x	x		
	Bacteria					x			
	Chloride						x		
	Chlorophyll a								
	Conductivity								
	DO Deficit				x				x
	O-Phos						x		
	Salinity						x		
	Sulfate								
	TDS						x		
	Temperature								
	TKN						x		
	TOC						x		
	Total Phos						x		
	Transparency								x
	TSS					x			
	VSS				x	x			x

Table 4.0.4 continued.

		2484	2485	2485A	2491	2492	2493	2494	2501
Impairments	Bacteria			x					
	Bacteria/Oysters								
	DO		x		x				
	Mercury								x
	Zinc/Oysters								
Concerns	Ammonia				x				
	Bacteria	x	x	x					
	Bacteria/Oysters	x	x						
	Chlorophyll a	x	x			x			
	DO							x	
	Nitrogen			x	x				
	O-Phos			x	x				
	Total Phos			x					
Trends	Alkalinity				x		x		
	Bacteria								
	Chloride					x			
	Chlorophyll a								
	Conductivity				x		x		
	DO Deficit	x	x			x			
	O-Phos					x			
	Salinity				x		x		
	Sulfate	x	x		x	x			
	TDS								
	Temperature				x				
	TKN				x	x			
	TOC				x				
	Total Phos								
	Transparency								
	TSS				x				
	VSS								

7 of the 16 bay and estuary segments are listed for impairments: 2462, 2472, 2482, 2485, 2485A, 2491 and 2501. Segments 2462, and 2472 are included in the Gulf Coastal Oyster Waters – Bacteria TMDL scheduled for completion in June 2008.

Segment 2482 is the only segment in the Nueces Bay Zinc TMDL scheduled for completion in December 2003. More information about the TMDL can be found at <http://www.tnrcc.state.tx.us/water/quality/tmdl/nuecesbay.pdf>.

Segments 2485 and 2491 are included in the Oso Bay DO TMDL schedule for completion by December 2006.

24-hour DO monitoring is currently underway in segment 2472. DO is a concern, not an impairment in this segment. Between the three monitoring events to date, the minimum recorded values were 5.41 mg/L, 5.57 mg/L, and 5.88 mg/L, the maximum recorded values were 8.19 mg/L, 7.18 mg/L, and 8.31 mg/L, with the average values being 6.46 mg/L, 6.23 mg/L, and 6.64 mg/L, respectively. The criteria for DO on this segment is 5.0 mg/L. With additional monitoring, it appears likely that the concern for DO will be removed from the Draft 2002 305(b) Report for this segment.

24-hour DO monitoring is also currently underway in segment 2483. DO is a concern, not an impairment in this segment. Between the three monitoring events to date, the minimum recorded values were 4.94 mg/L, 5.01 mg/L, and 3.77 mg/L, the maximum recorded values were 9.52 mg/L, 8.78 mg/L, and 7.65 mg/L, with the average values being 6.7 mg/L, 6.34 mg/L, and 6.27 mg/L, respectively. The criteria for DO on this segment is 5.0 mg/L. With additional monitoring, it appears likely that the concern for DO will be removed from the Draft 2002 305(b) Report for this segment.

Routine monitoring should be continued, with emphasis being placed on scrutinizing the sampling results for the parameters listed as impairments, concerns and / or with increasing trends on segments/ parameters not currently under study.

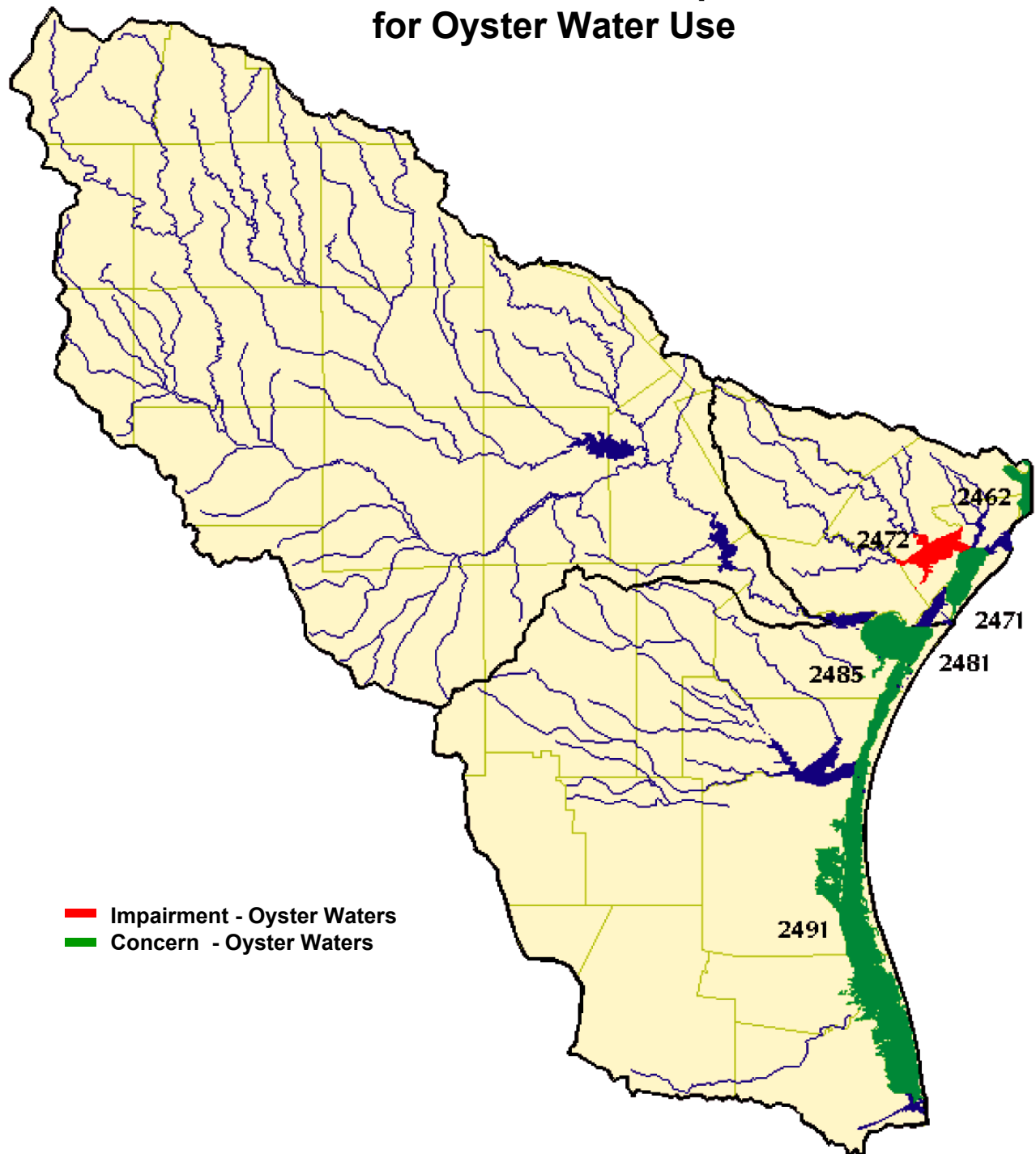


Photo: Aransas River

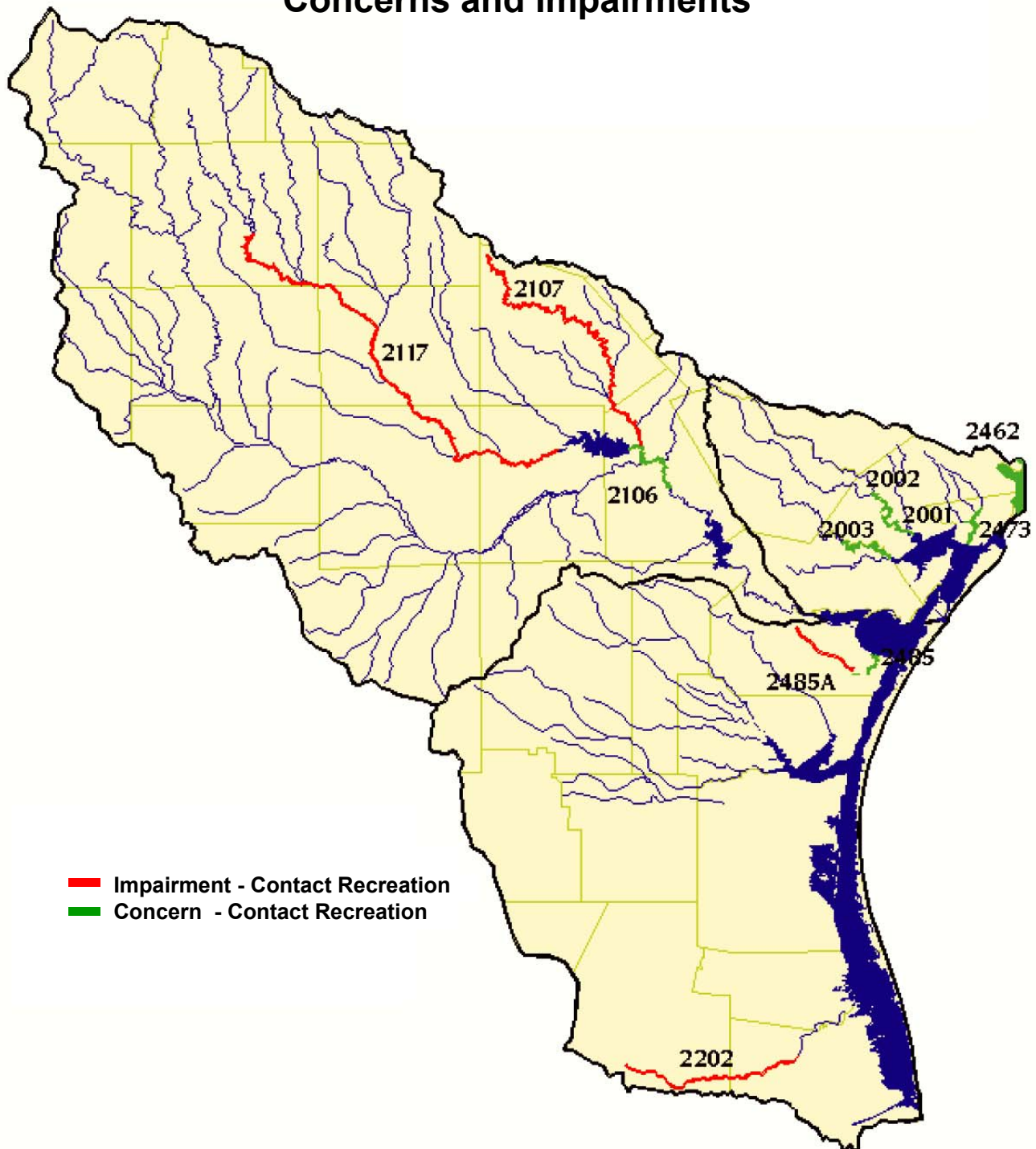
Appendix A.

Concerns and Impairments

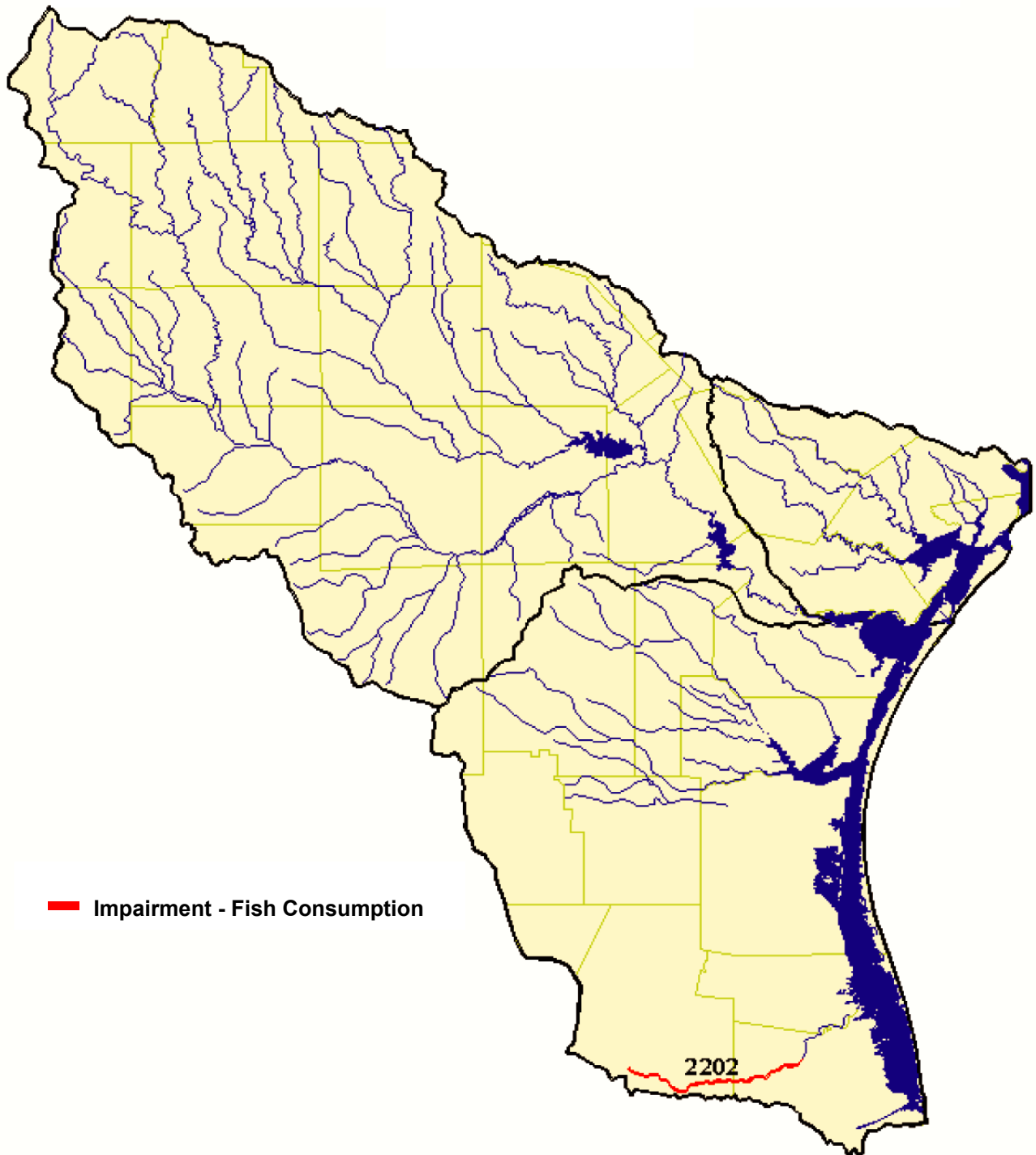
Bacteria Concerns and Impairments for Oyster Water Use



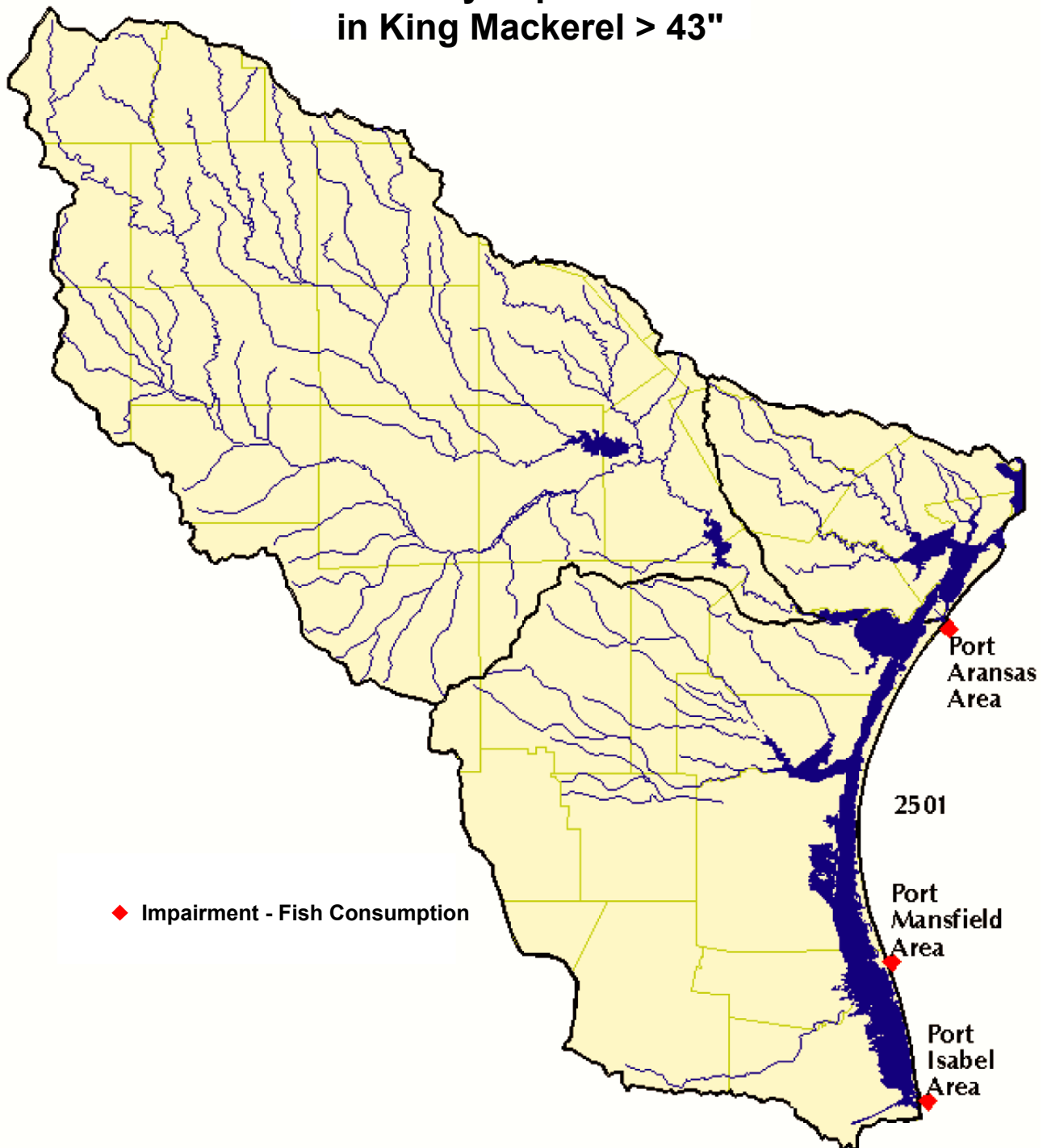
Bacteria - Fecal coliform, E. coli, and/or Enterococci Concerns and Impairments



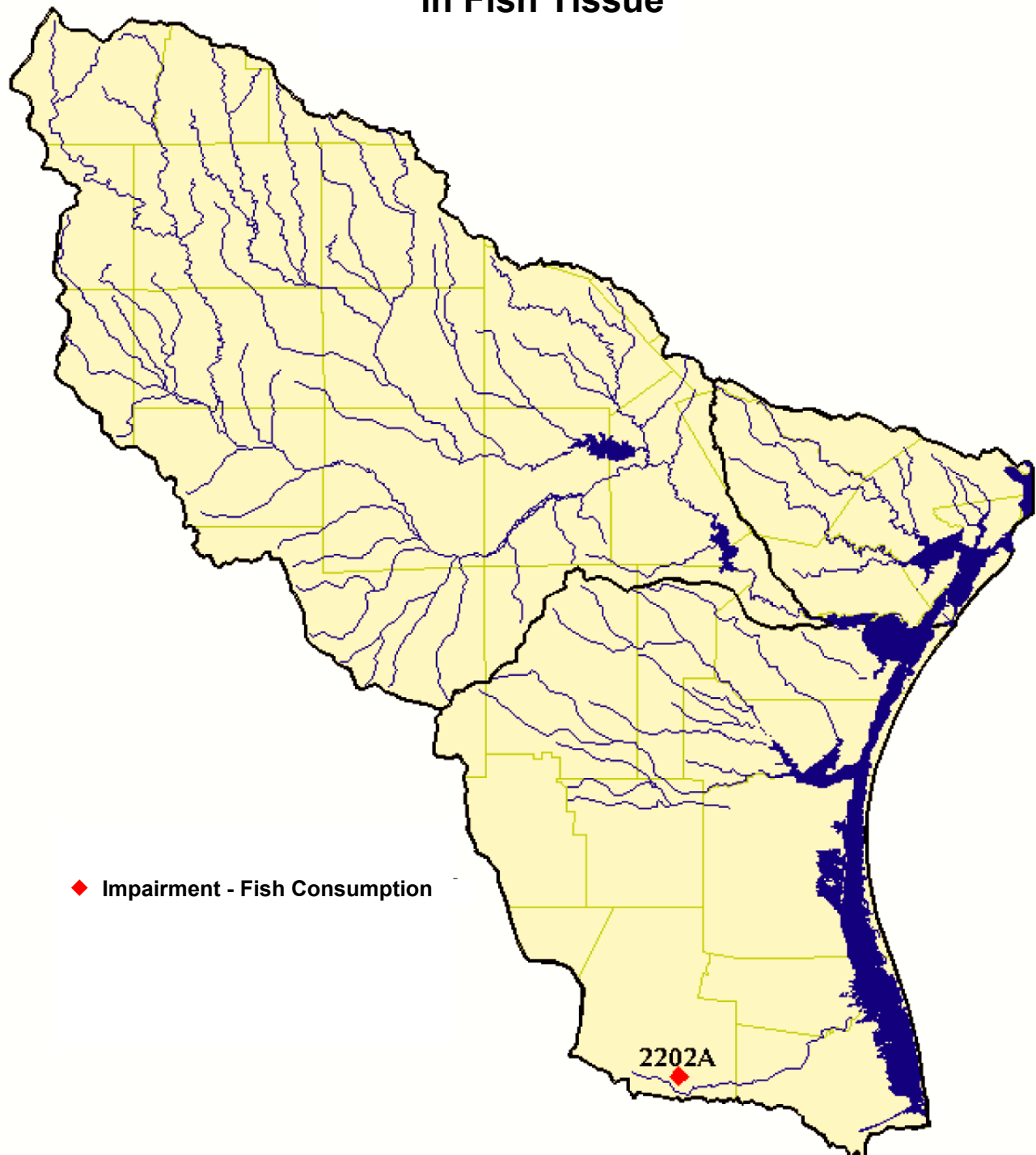
DDE and Other Organochlorine Pesticides



Mercury Impairments in King Mackerel > 43"



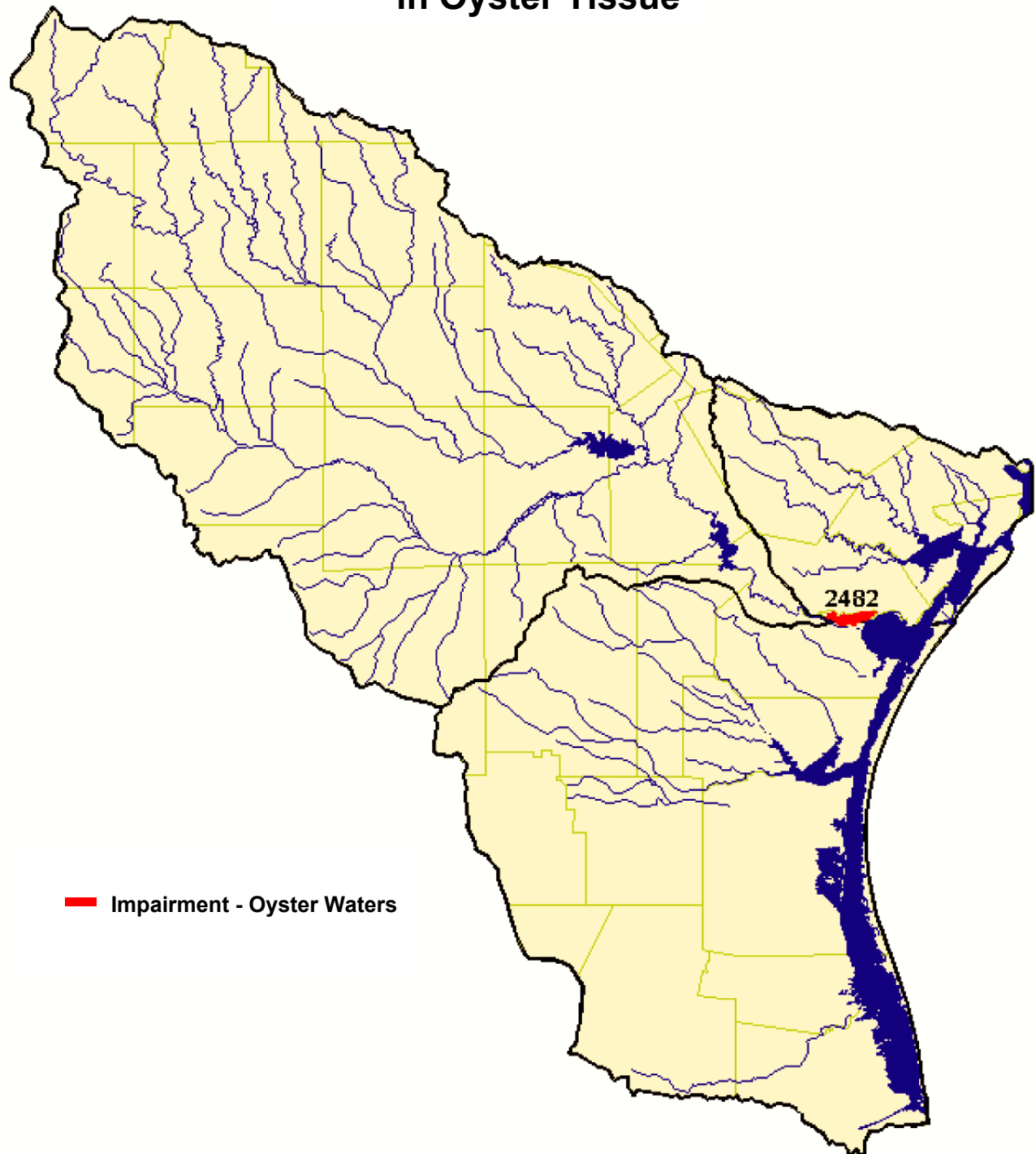
PCB Impairments in Fish Tissue



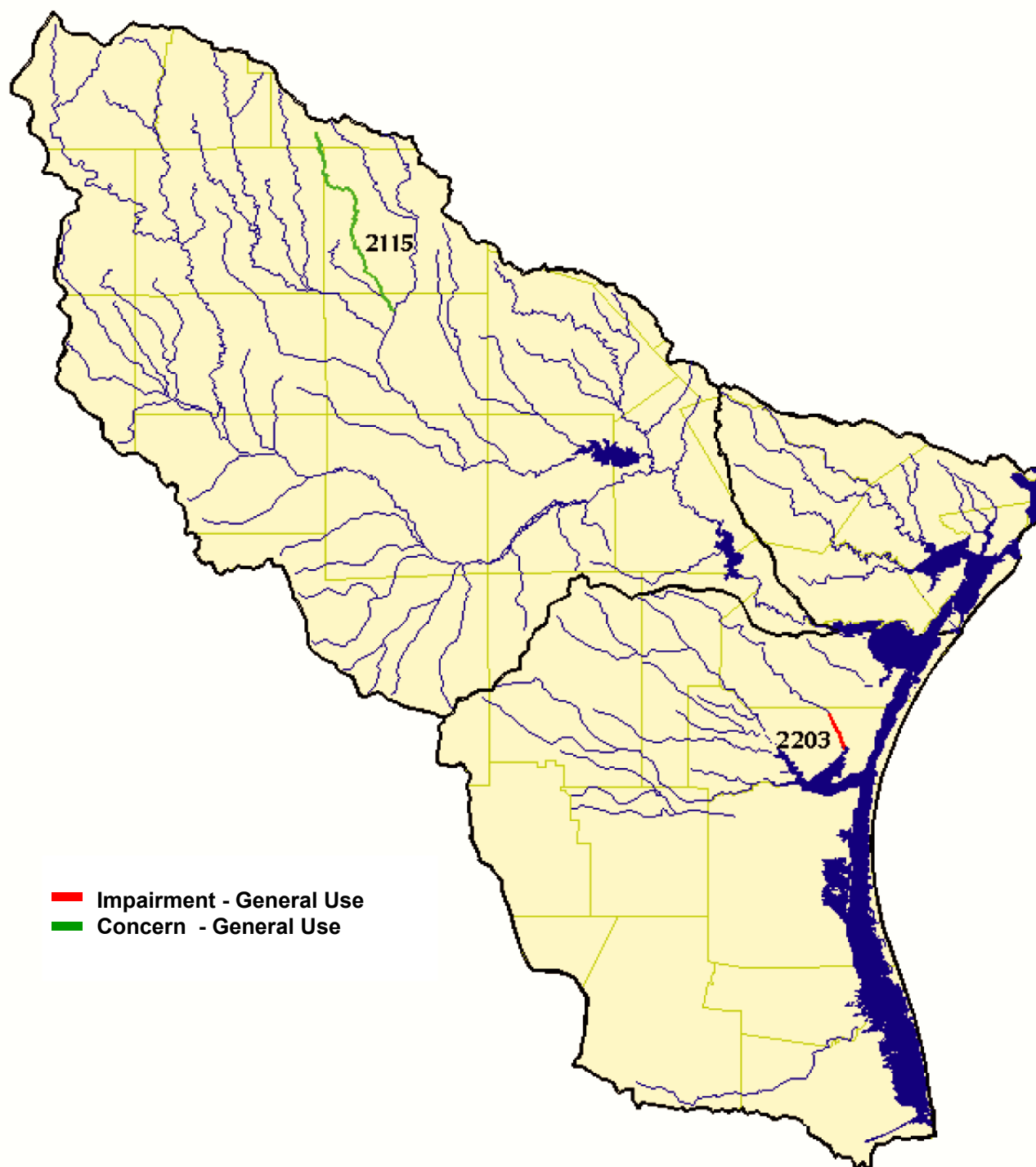
Toxicity Impairments in Ambient Sediment



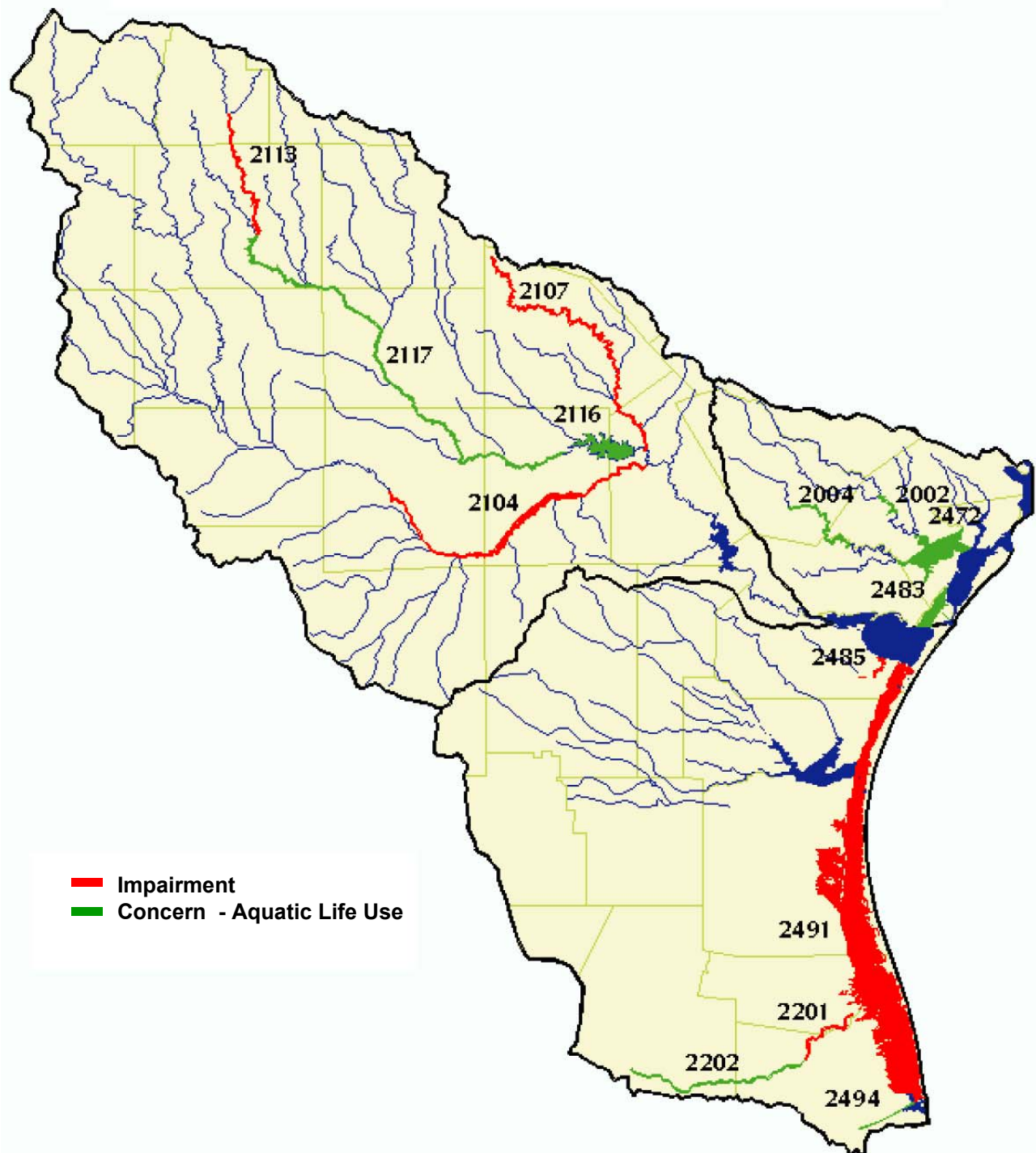
Zinc Impairments in Oyster Tissue



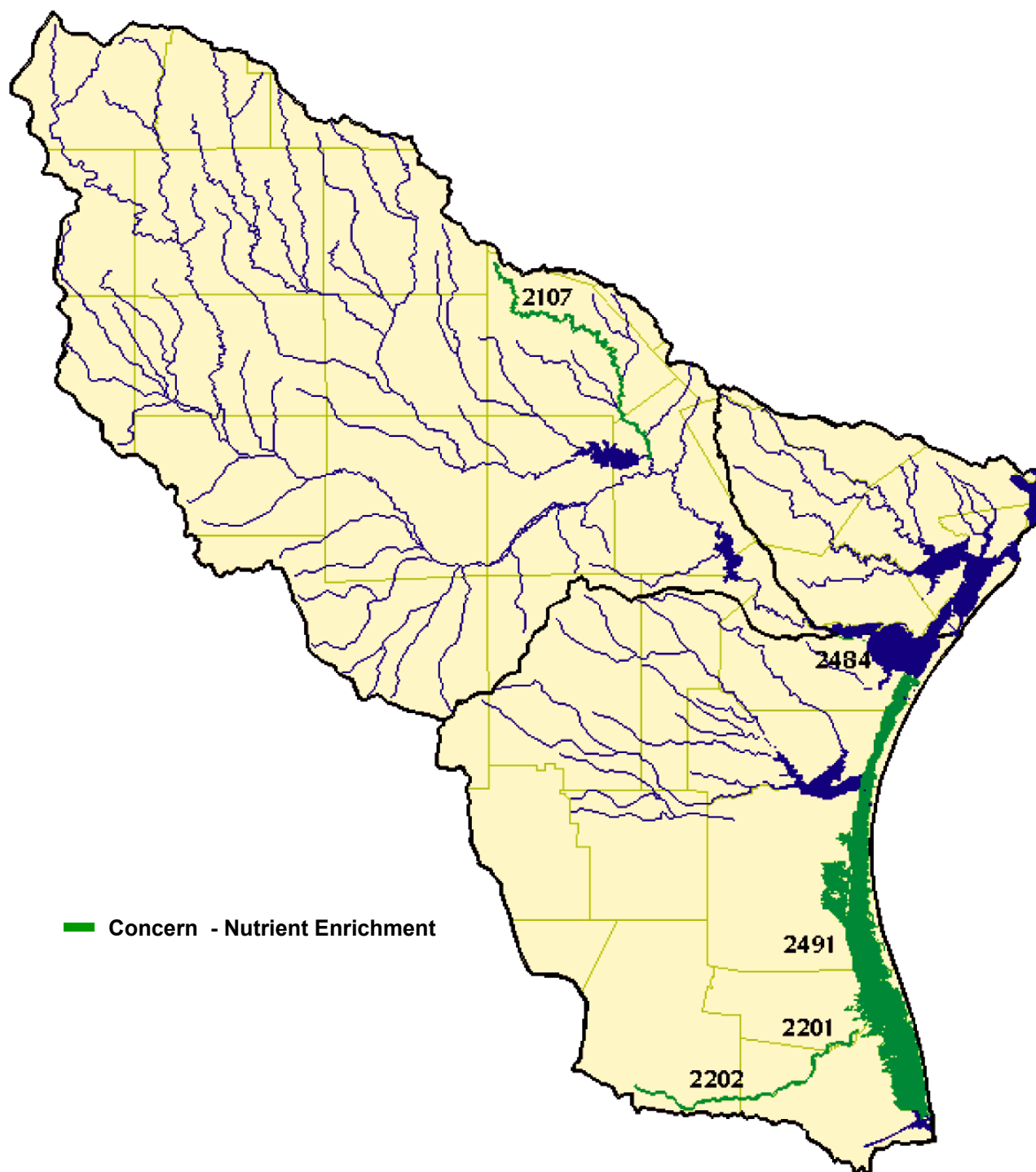
Temperature Concerns and Impairments



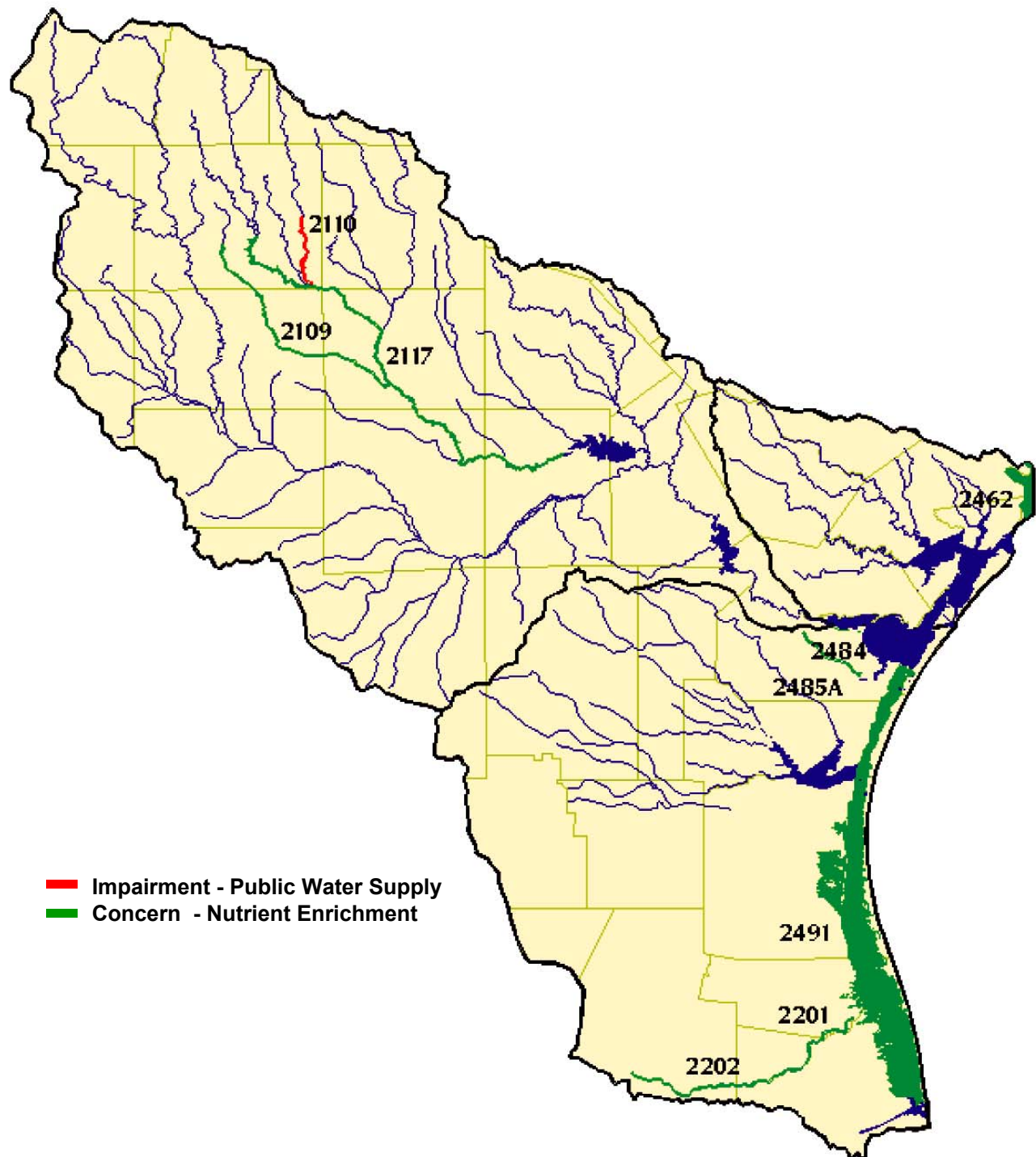
Dissolved Oxygen Concerns and Impairments



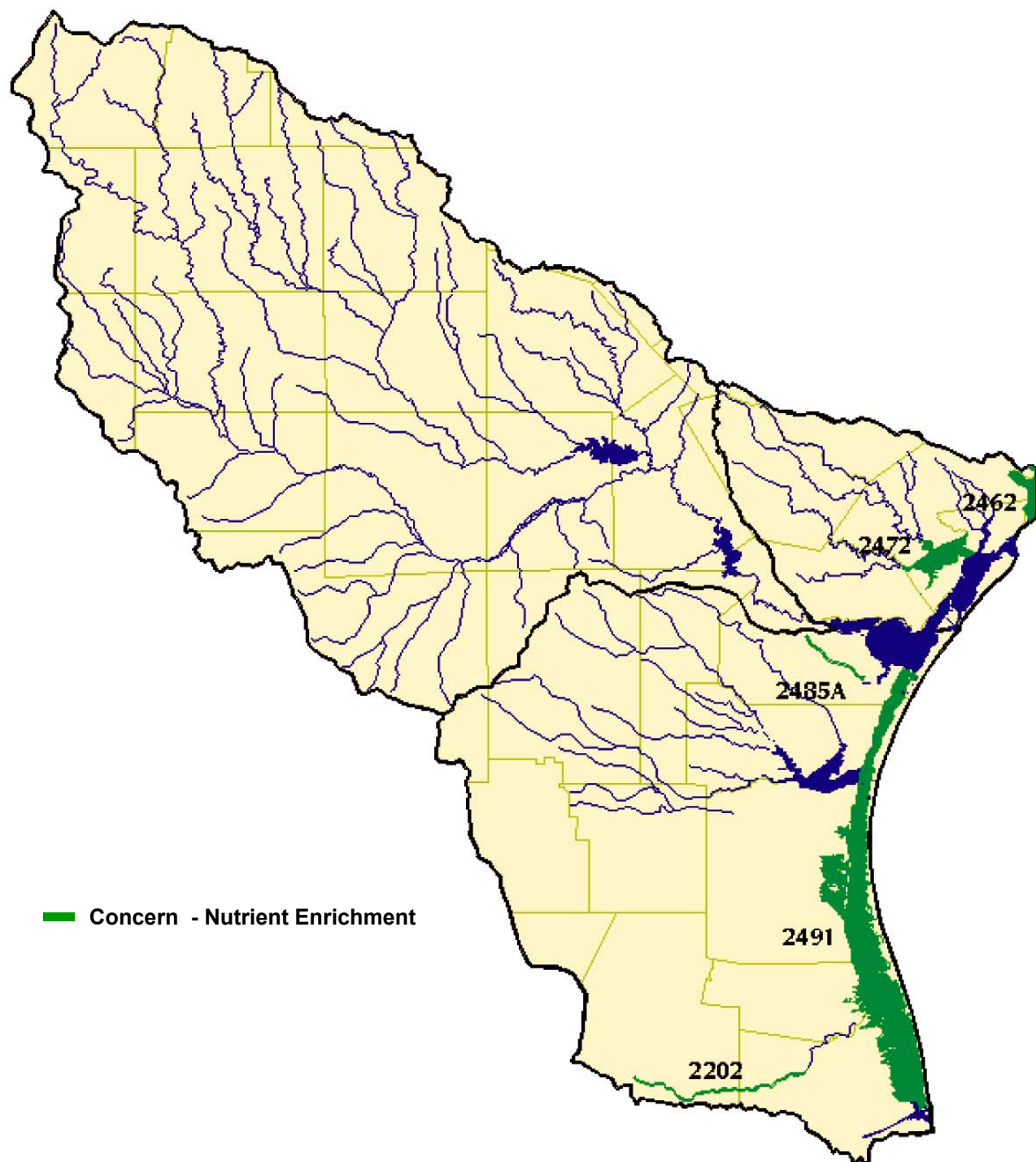
Ammonia Concerns



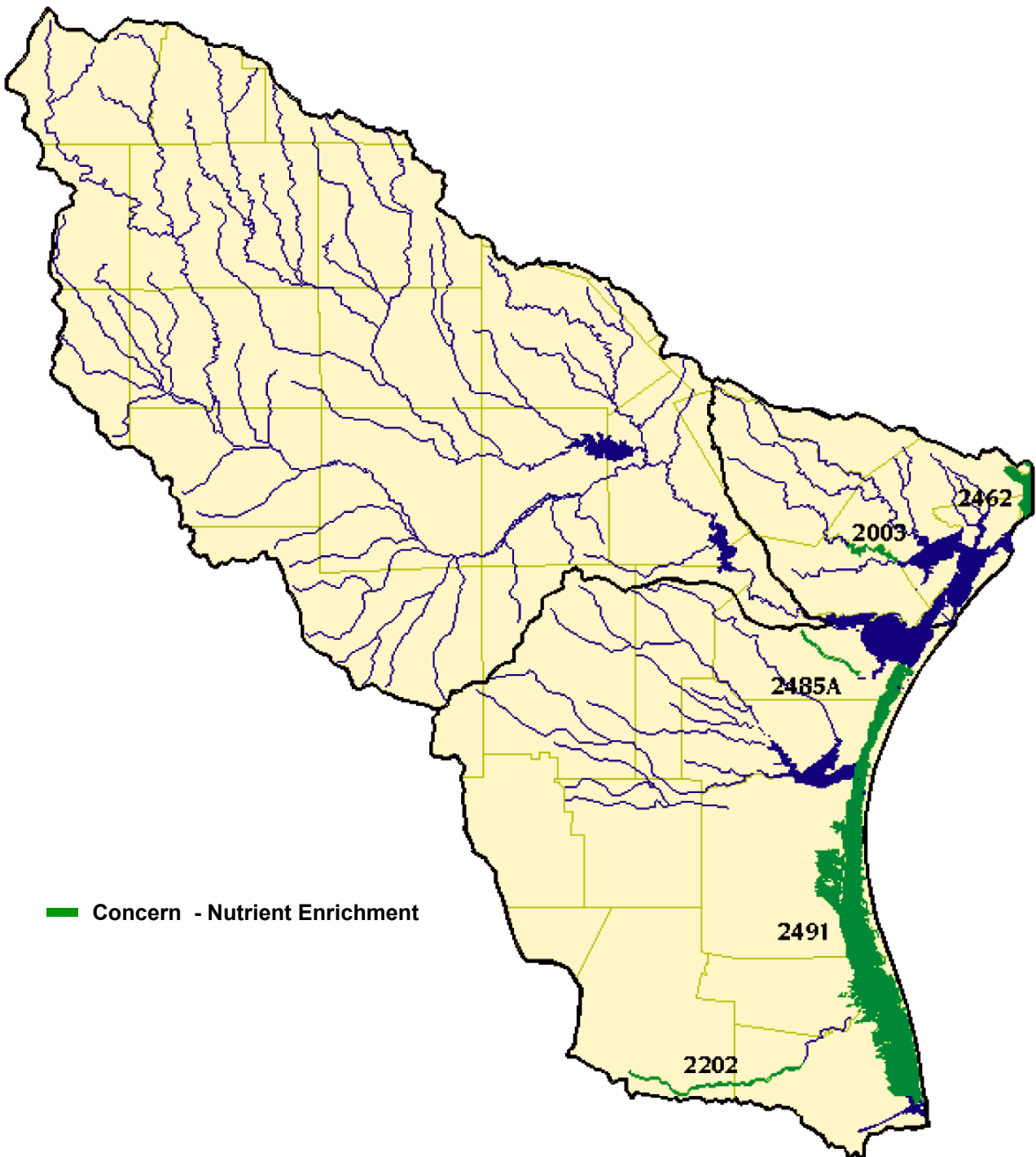
Nitrogen Concerns and Impairments



Total Phosphorus Concerns



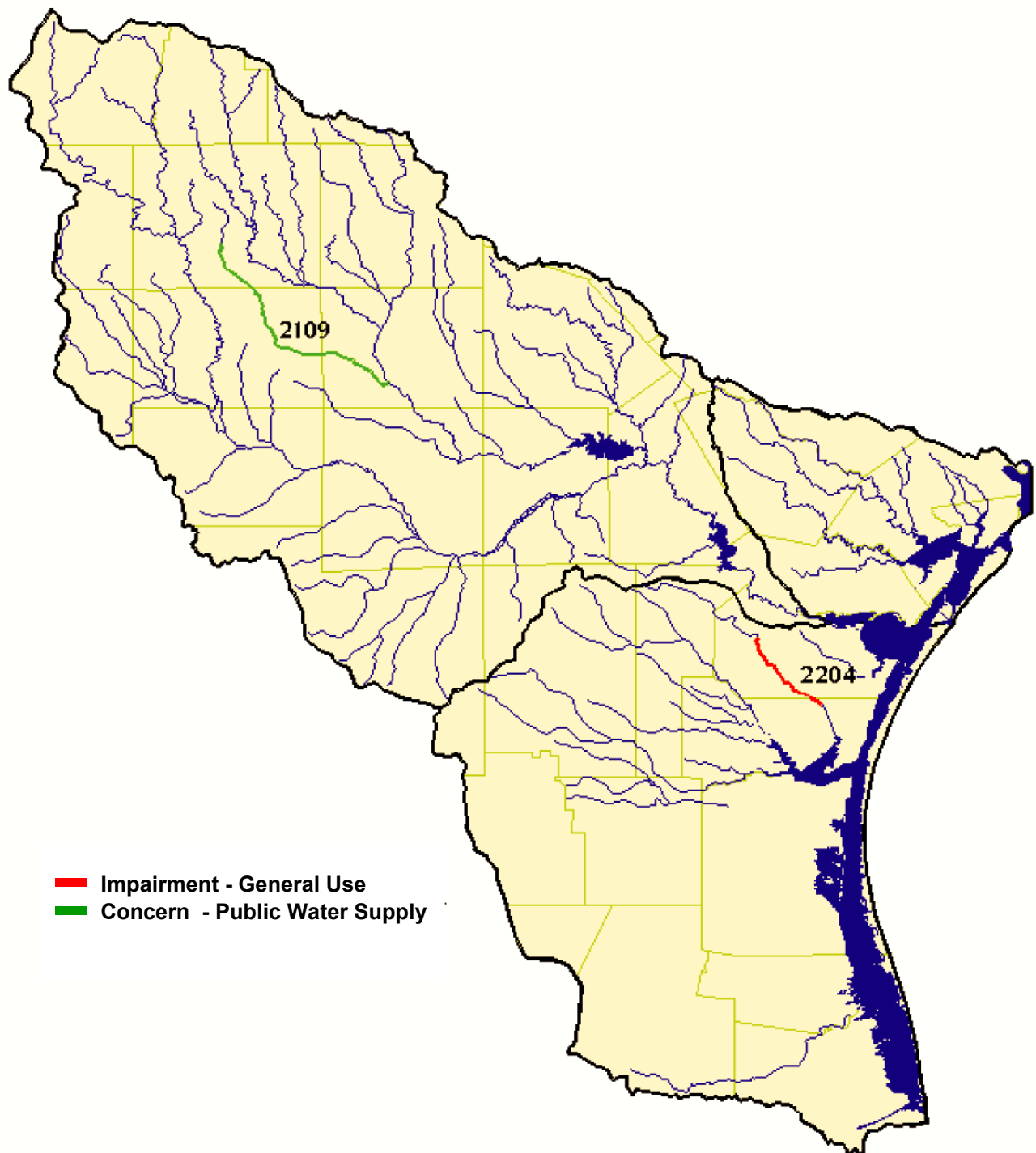
Orthophosphorus Concerns



Chloride Concerns and Impairments



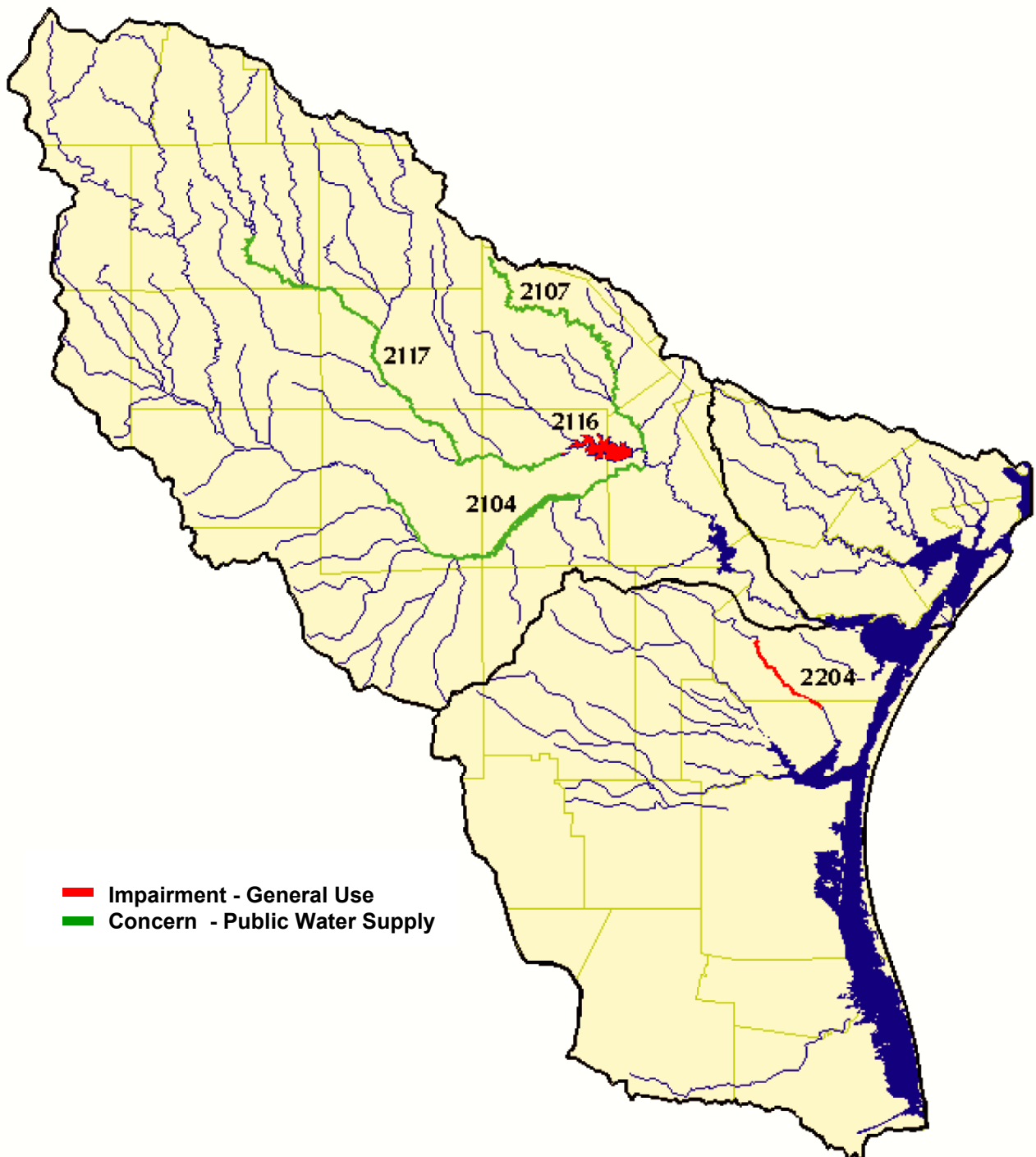
Sulfate Concerns and Impairments



Chlorophyll a Concerns



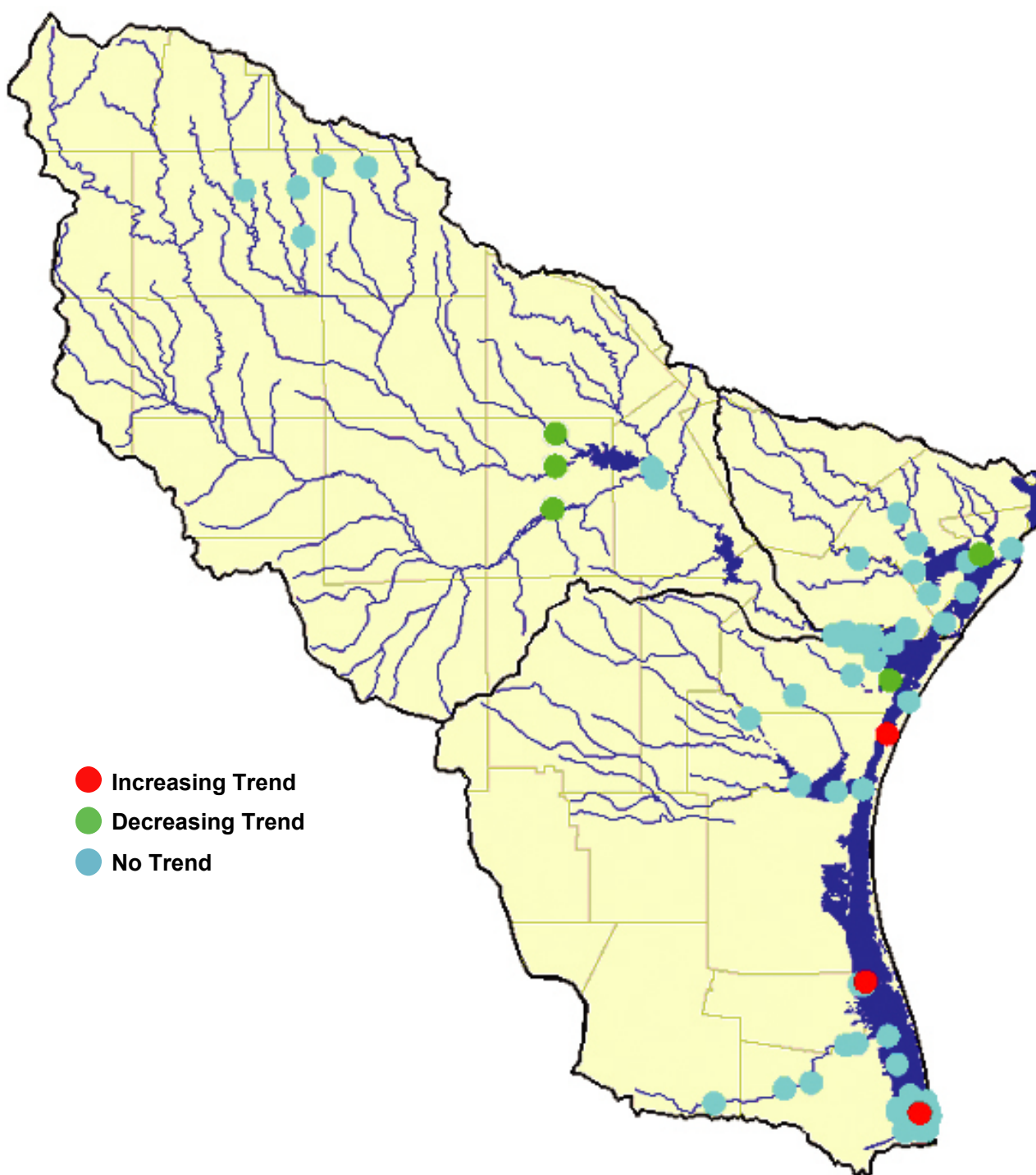
Total Dissolved Solids Concerns and Impairments



Appendix B.

**Trends for various parameters at each study site location.
(locations in storet sequence).**

Water Temperature - 00010 (Summer)



Total Number of Data Sets Analyzed: 73

Decreasing Trends: 6

Increasing Trends: 3

Decreasing Trends
Water Temperature – 00010 (Summer)
Non-Tidal

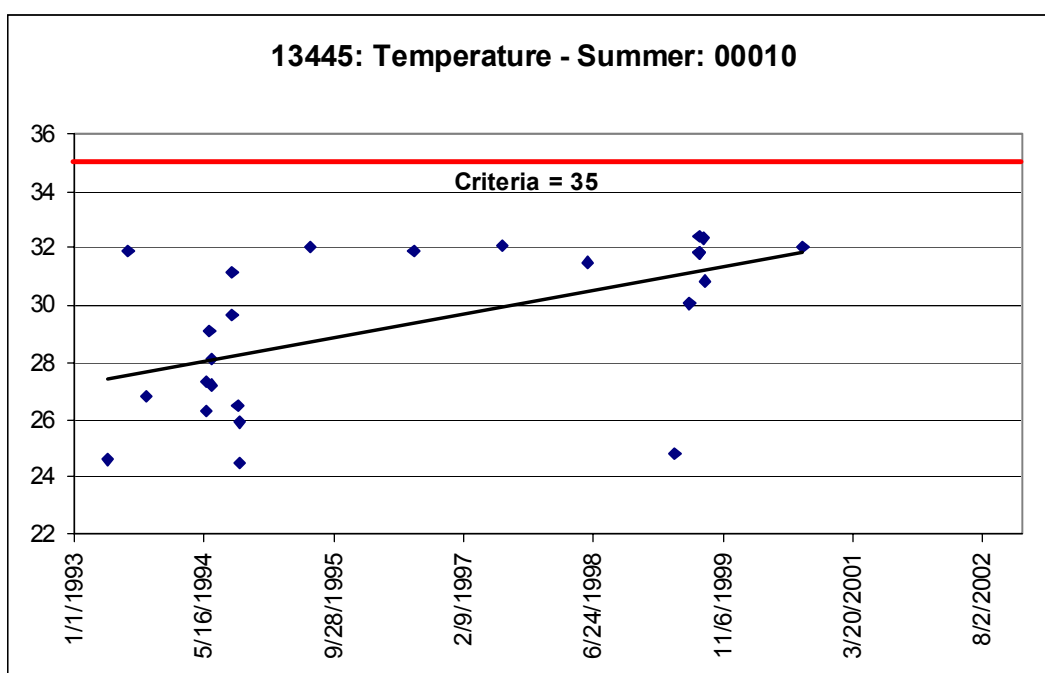
Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2104	12973	16	0.220998	-1.99292	0.066136	21.9	32.4
2108	12983	10	0.352835	-2.08845	0.070187	21.48	30.17
2117	13023	17	0.248778	-2.22878	0.041545	21.45	31.5

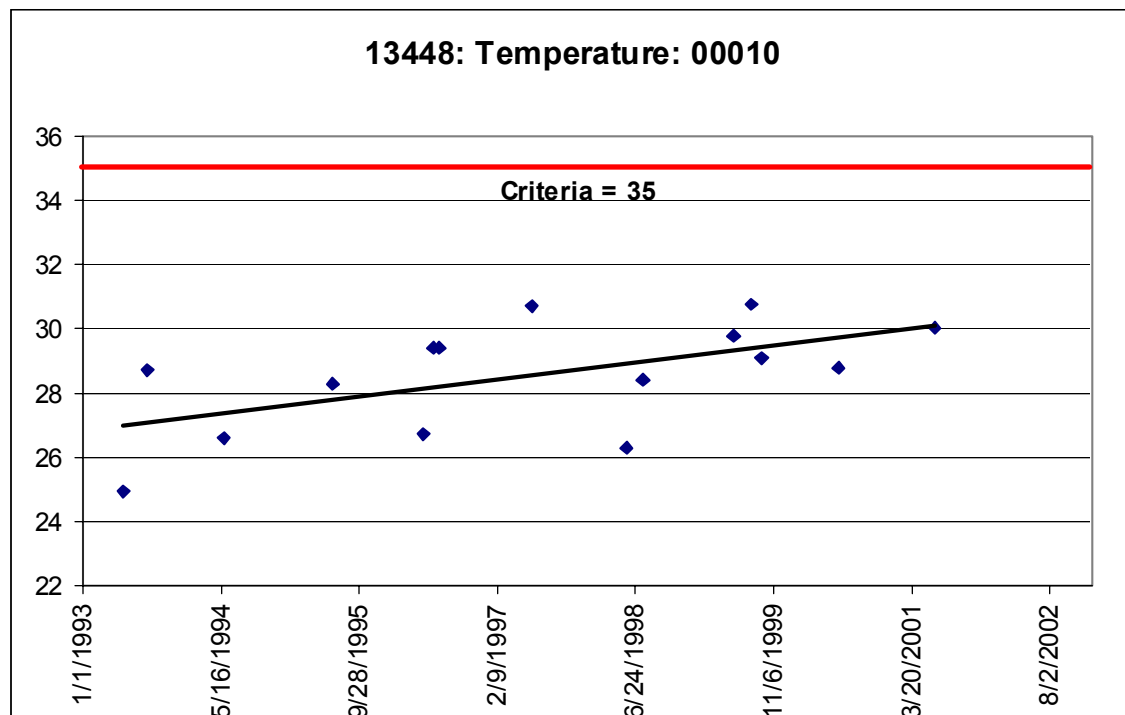
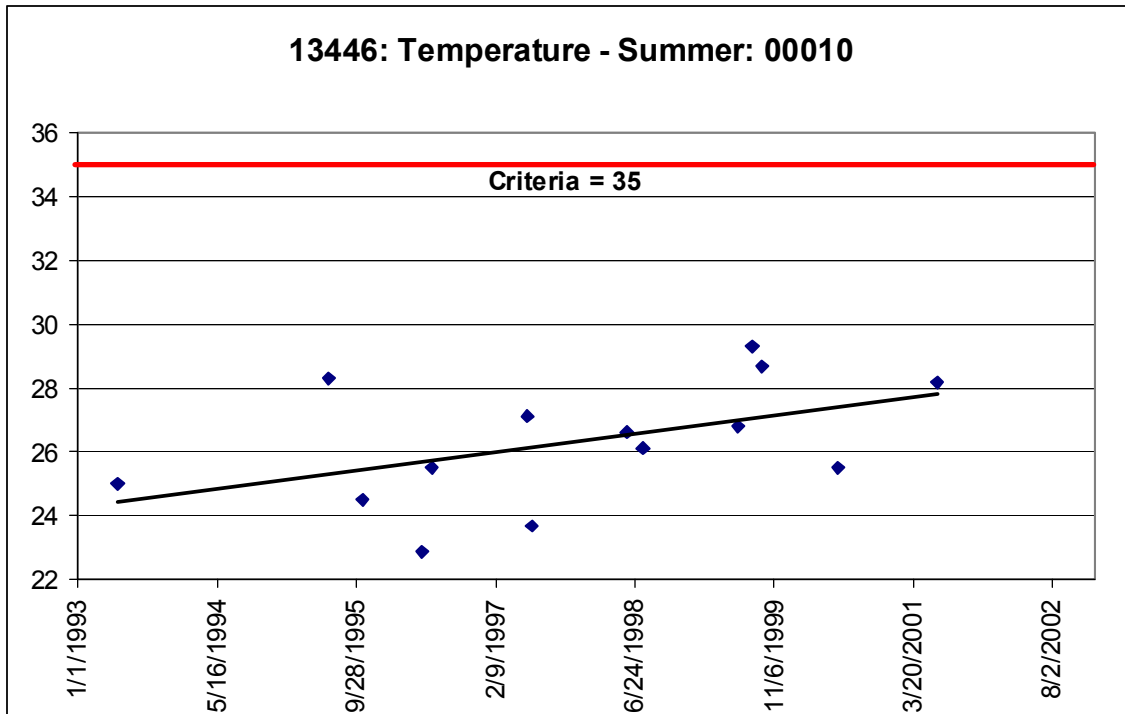
Decreasing Trends
Water Temperature – 00010 (Summer)
Marine

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2473	13406	29	0.19672	-2.57142	0.015954	11.34	32.66
	15004	16	0.498736	-3.73221	0.00223	22.22	31.16
2485	13440	25	0.136792	-1.90913	0.068799	12.64	33.78

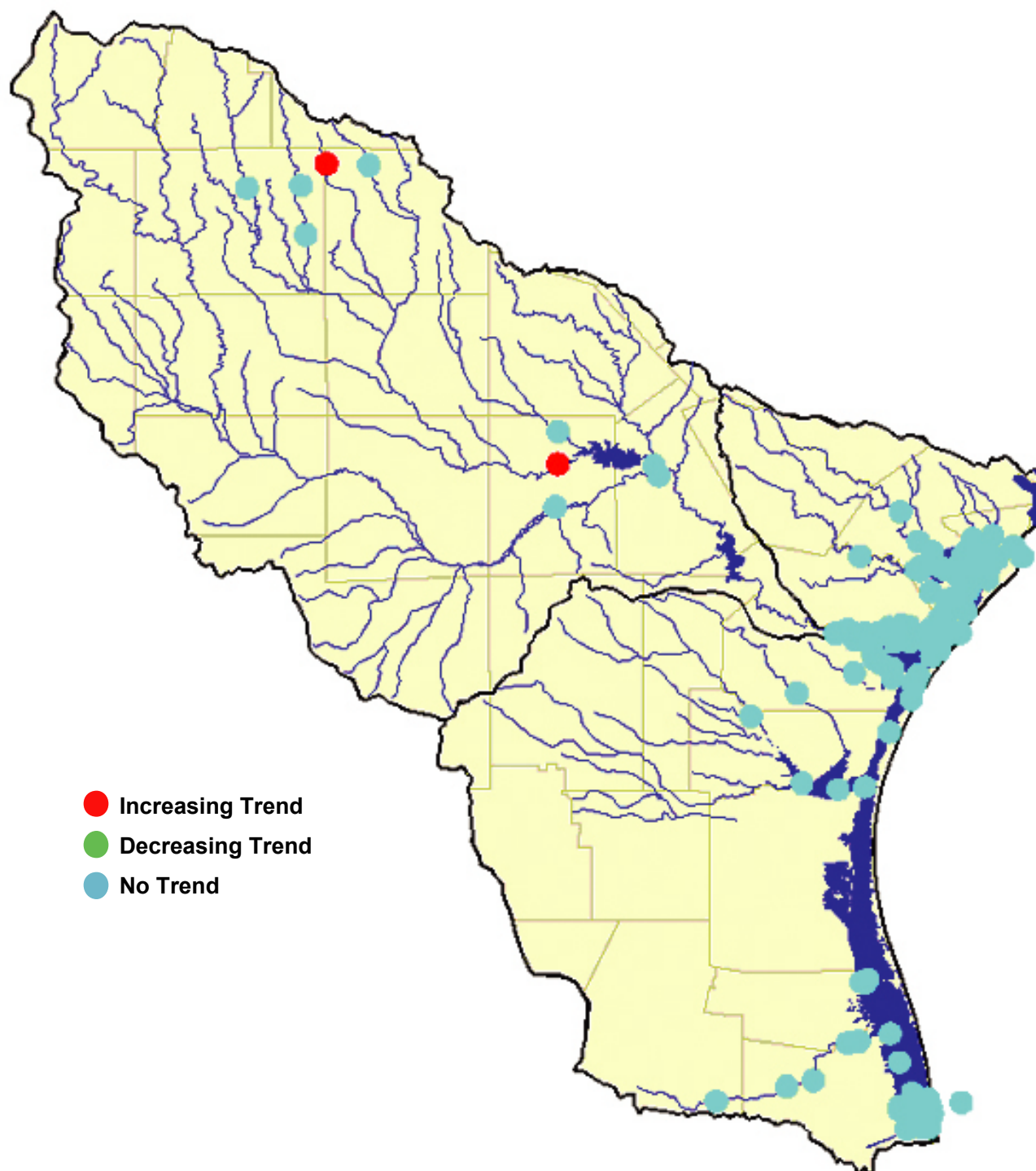
Increasing Trends
Water Temperature – 00010 (Summer)
Marine

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2491	13445	23	0.293049	3.087732	0.005196	24.49	32.41
	13446	14	0.235534	1.922817	0.078556	22.9	29.3
	13448	15	0.320394	2.475626	0.027838	24.9	30.8





Water Temperature - 00010 (Winter)



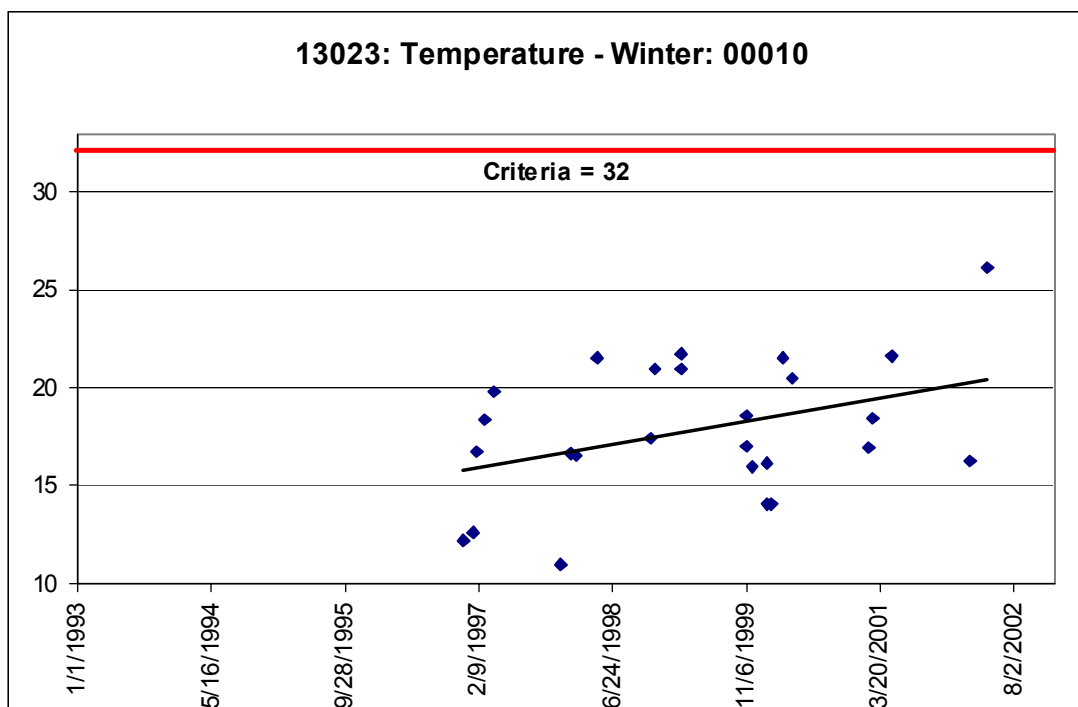
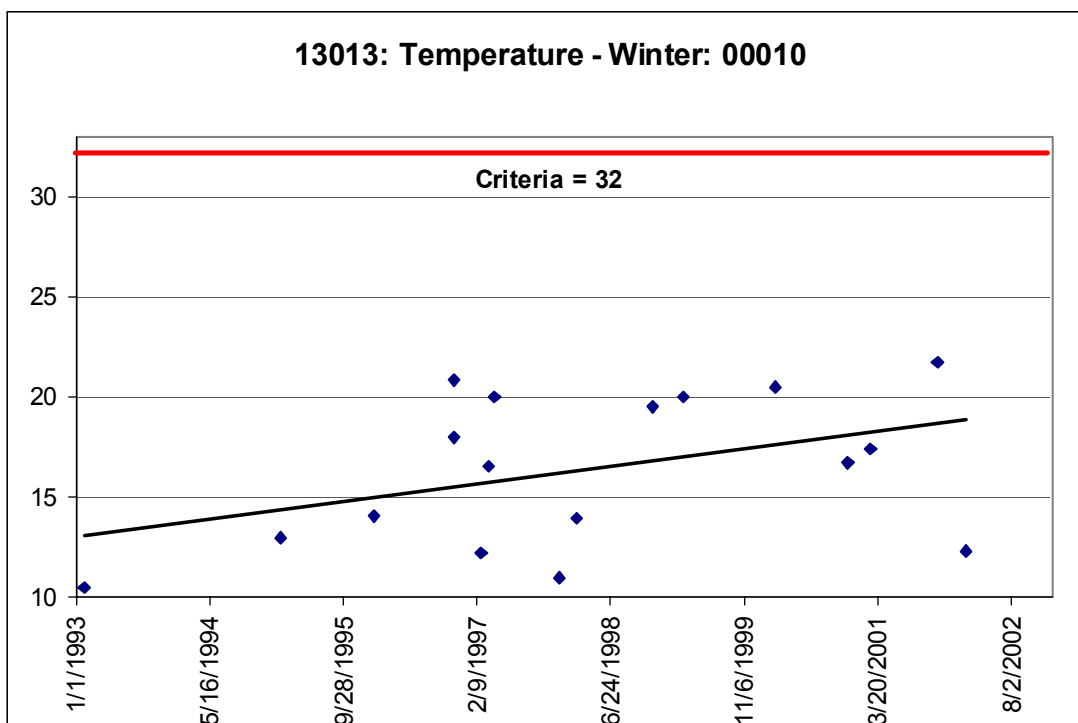
Total Number of Data Sets Analyzed: 134

Decreasing Trends: 0

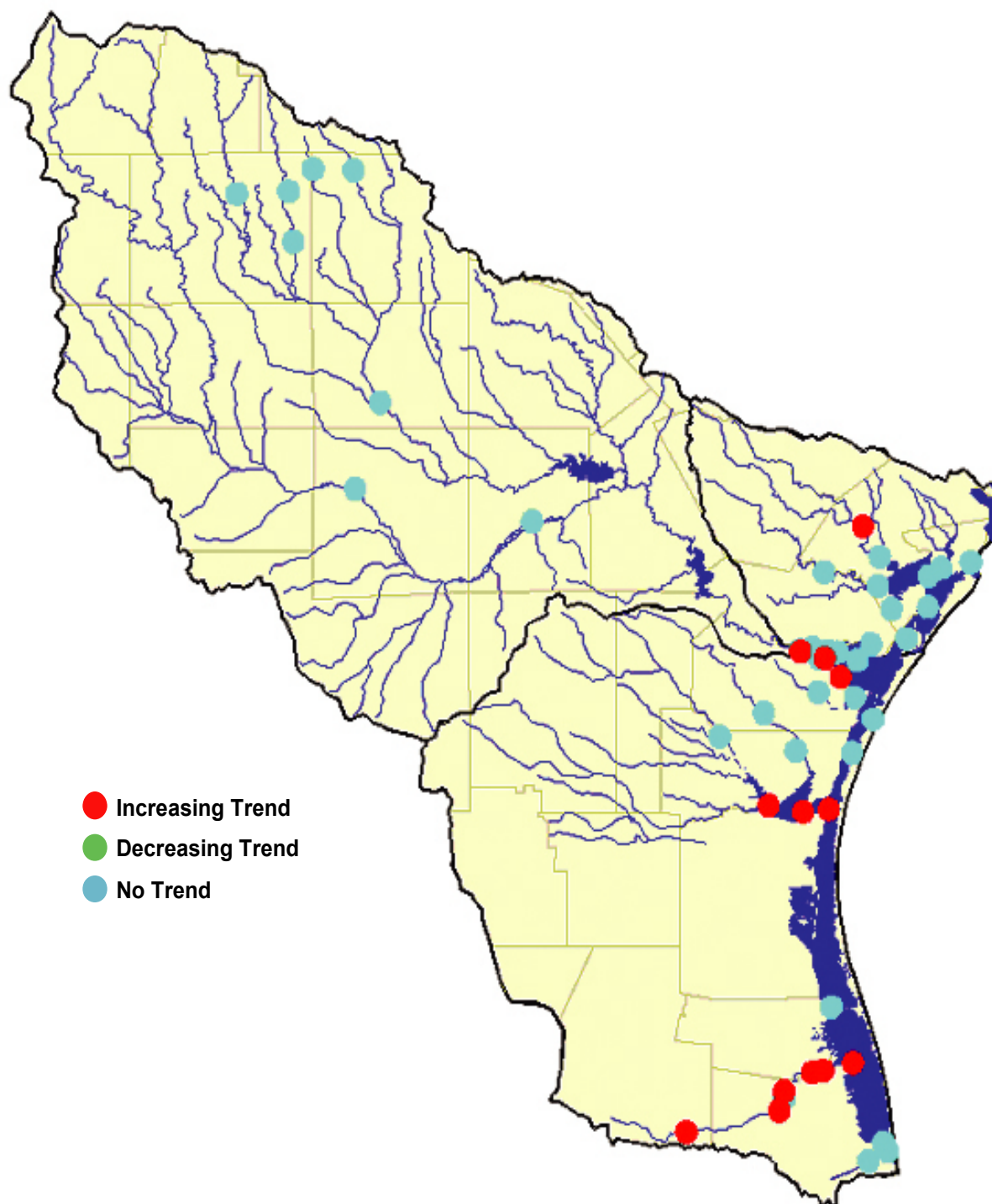
Increasing Trends: 2

Increasing Trends
Water Temperature – 00010 (Winter)
Non-Tidal

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2115	13013	17	0.171164	1.760022	0.098775	10.5	21.7
2117	13023	26	0.153834	2.088834	0.47503	11	26.21



Water Temperature - 00010 (All)



Total Number of Data Sets Analyzed: 134

Decreasing Trends: 23

Increasing Trends: 0

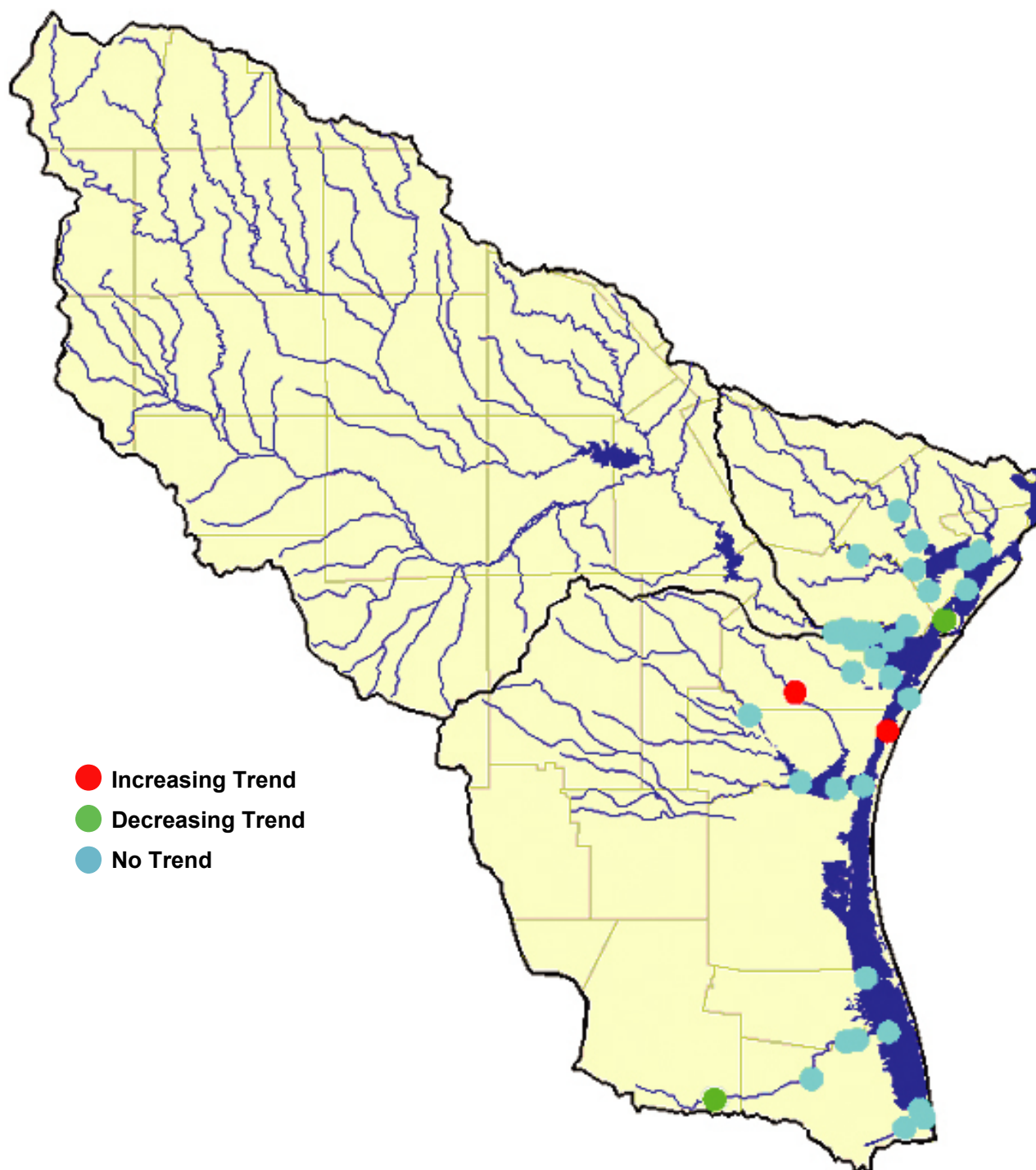
Decreasing Trends
Water Temperature – 00010 (All)
Non-Tidal

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2108	12983	22	0.212221	-2.32117	0.030956	13.77	30.17

Decreasing Trends
Water Temperature – 00010 (All)
Marine

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2491	14843	24	0.147673	-1.95235	0.063737	18.33	31.11
	14844	26	0.237589	-2.73479	0.011546	12.78	31.67
	14845	27	0.203761	-2.52935	0.018107	12.78	31.11
	14861	30	0.196797	-2.61924	0.014068	12.78	31.11
	14862	30	0.196797	-2.61924	0.014068	12.78	31.11
	14863	30	0.195126	-2.60539	0.014532	12.78	31.11
	14868	30	0.185878	-2.52841	0.017377	12.78	31.11
	14869	30	0.177643	-2.45936	0.020358	12.78	31.11
	14870	30	0.177643	-2.45936	0.020358	12.78	31.11
	14876	30	0.191393	-2.57438	0.015621	12.78	31.11
	14877	29	0.23466	-2.87723	0.007746	12.78	31.11
	14878	30	0.198724	-2.6352	0.013551	12.78	31.11
	14879	30	0.20469	-2.68447	0.012065	12.78	31.11
	17100	30	0.176264	-2.44775	0.020903	12.78	31.11
	17117	25	0.180988	-2.25447	0.033993	16.67	31.11
2493	14855	29	0.115195	-1.87488	0.071665	16.11	31.11
	14856	29	0.119782	-1.91682	0.065901	16.11	31.11
	14858	29	0.1238	-1.95317	0.061235	16.11	31.11
	14865	30	0.182781	-2.5025	0.018445	12.78	31.11
	14880	30	0.182781	-2.5025	0.018445	12.78	31.11
	17101	29	0.1238	-1.95317	0.061235	16.11	31.11
2494	17102	30	0.183489	-2.50843	0.018195	12.78	31.11

Transparency - 00078



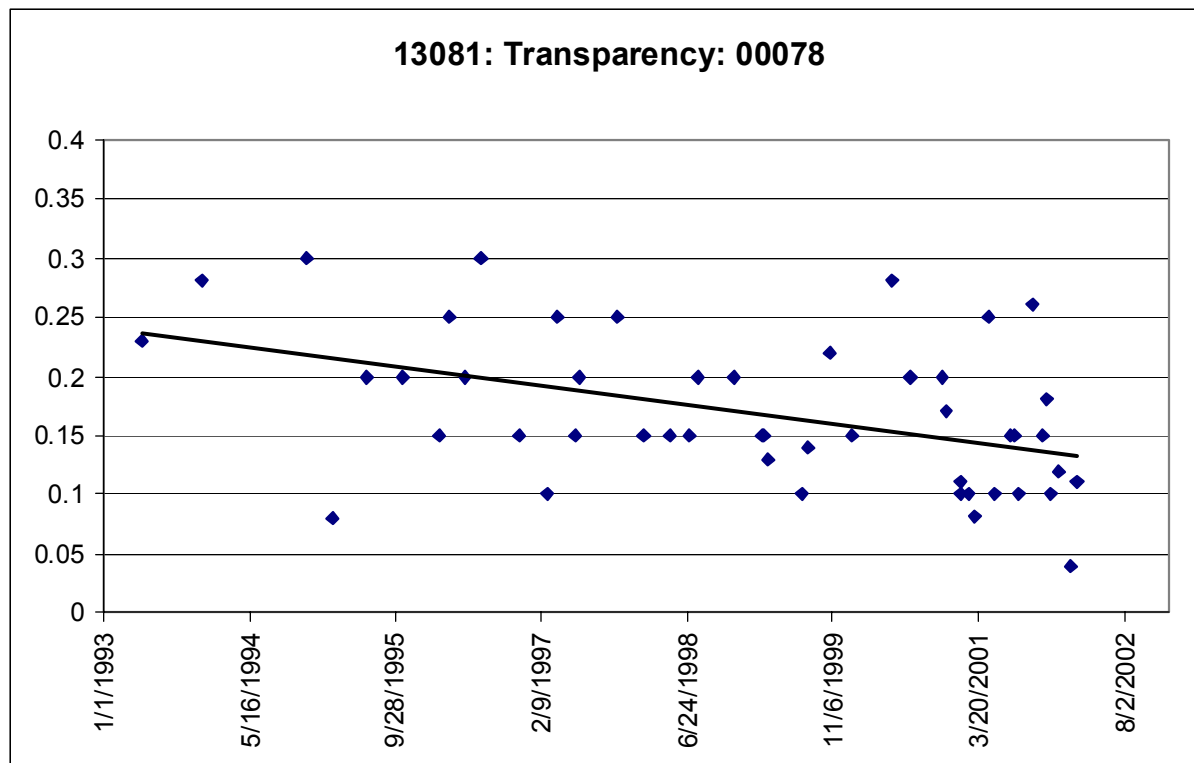
Total Number of Data Sets Analyzed: 36

Decreasing Trends: 2

Increasing Trends: 2

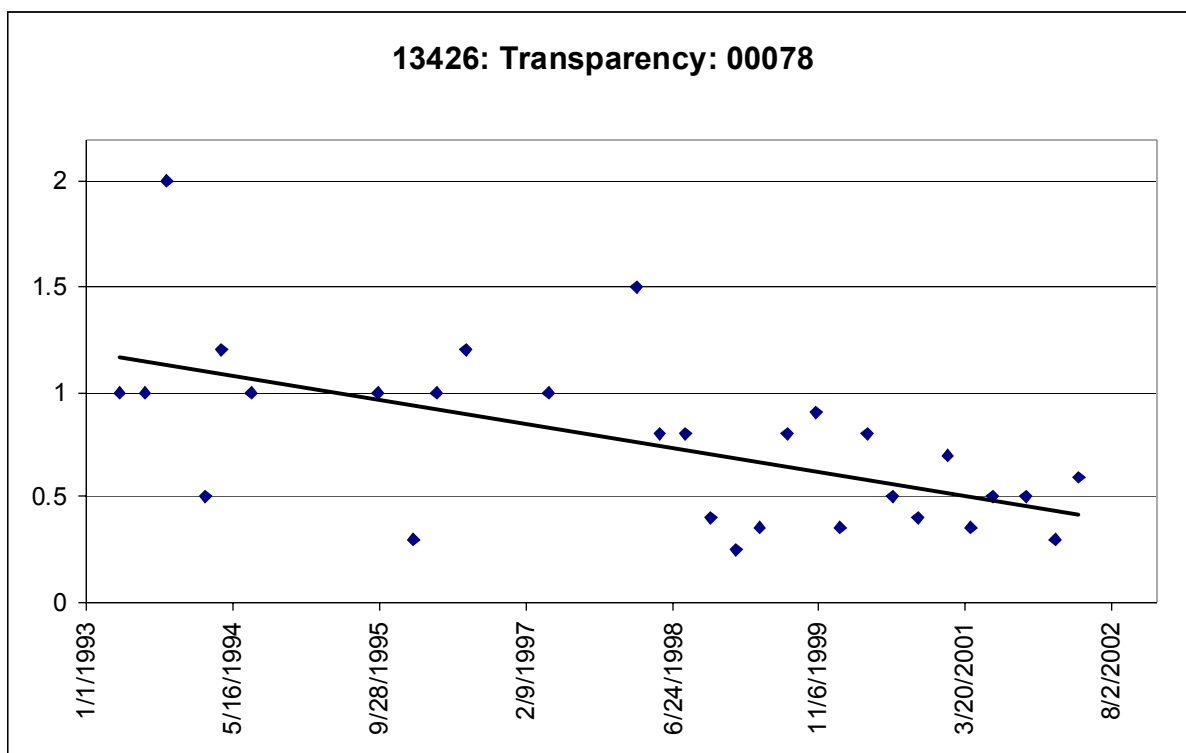
**Decreasing Trends
Transparency – 00078
Non-Tidal**

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2202	13081	48	0.202365	-3.41621	0.001337	0.04	0.3



**Decreasing Trends
Transparency – 00078
Marine**

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2483	13426	29	0.347783	-3.79437	0.000761	0.25	2



**Increasing Trends
Transparency – 00078
Non-Tidal**

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2204	13094	28	0.108784	1.781471	0.086522	0.01	1

**Increasing Trends
Transparency – 00078
Marine**

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2491	13445	46	0.120508	2.455383	0.018095	0.1	2

Conductivity - 00094



Total Number of Data Sets Analyzed: 41

Decreasing Trends: 2

Increasing Trends: 7

**Decreasing Trends
Conductivity – 00094
Non-Tidal**

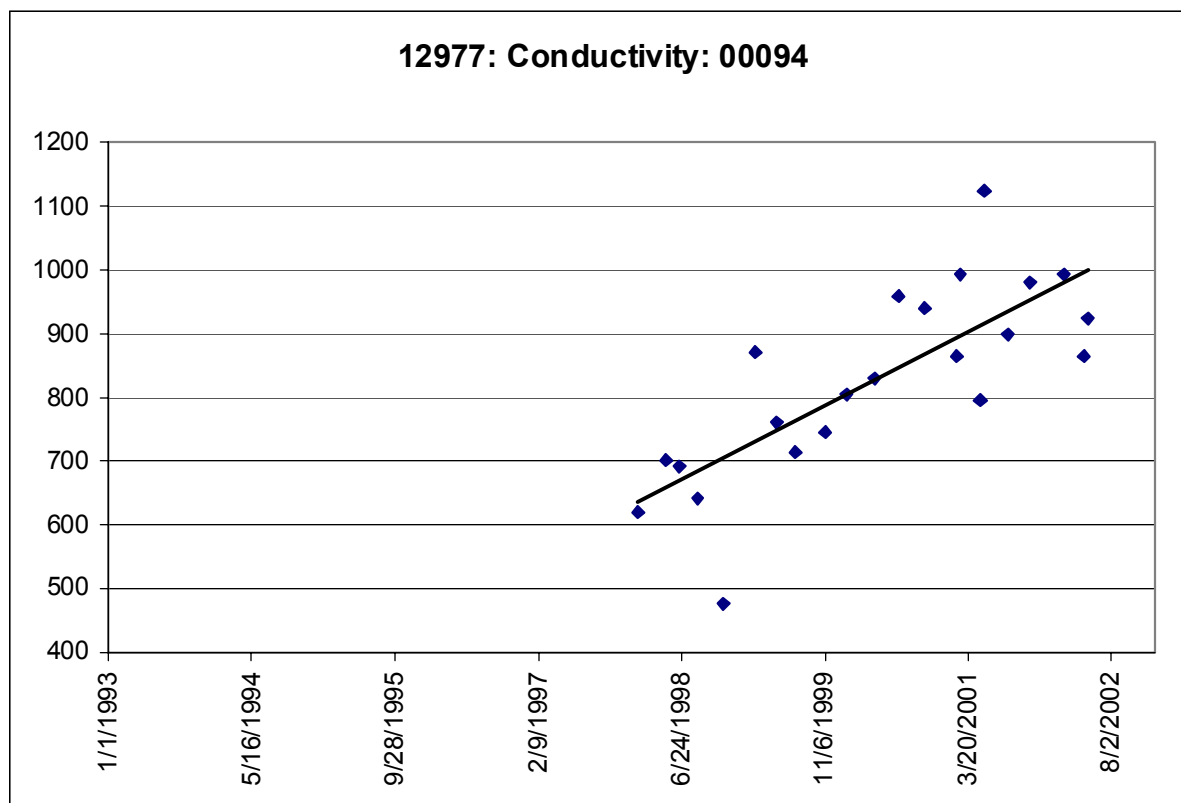
Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2003	12948	24	0.169457	-2.11866	0.045648	451	13340

**Decreasing Trends
Conductivity – 00094
Marine**

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2485	13028	34	0.25095	-3.27426	0.002547	147	7910

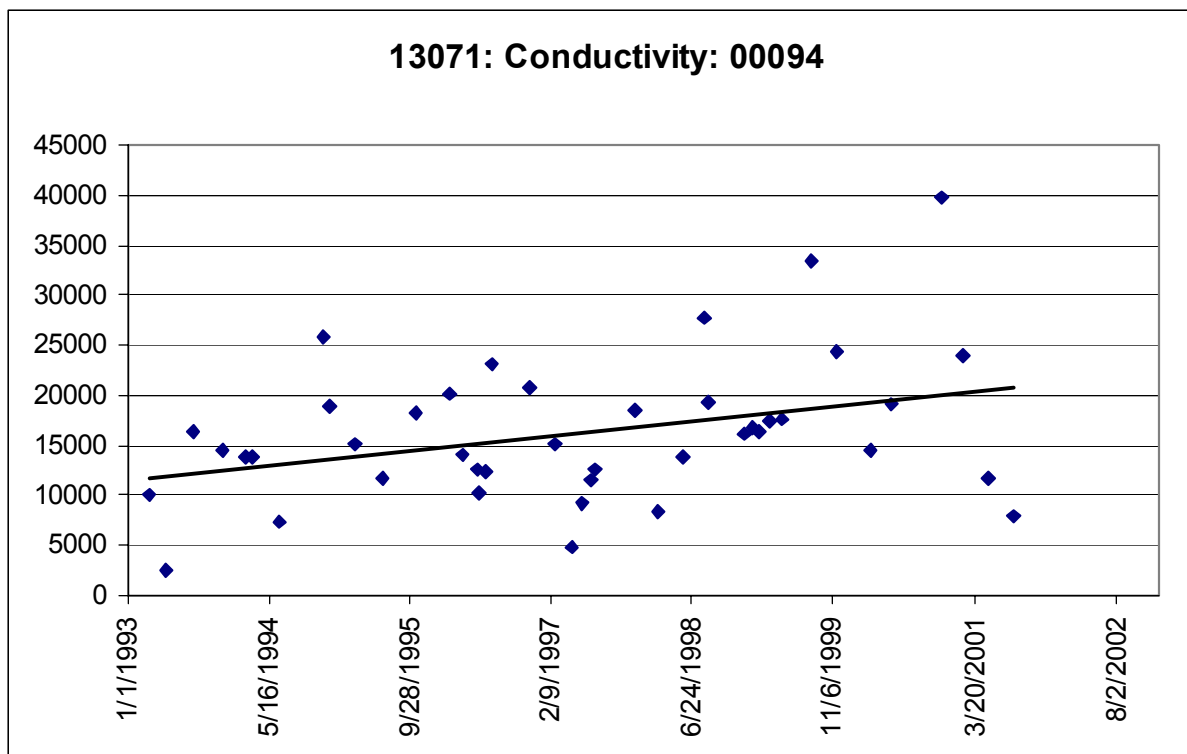
**Increasing Trends
Conductivity – 00094
Non-Tidal**

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2106	12977	22	0.599789	5.474817	2.33E-05	475	1124



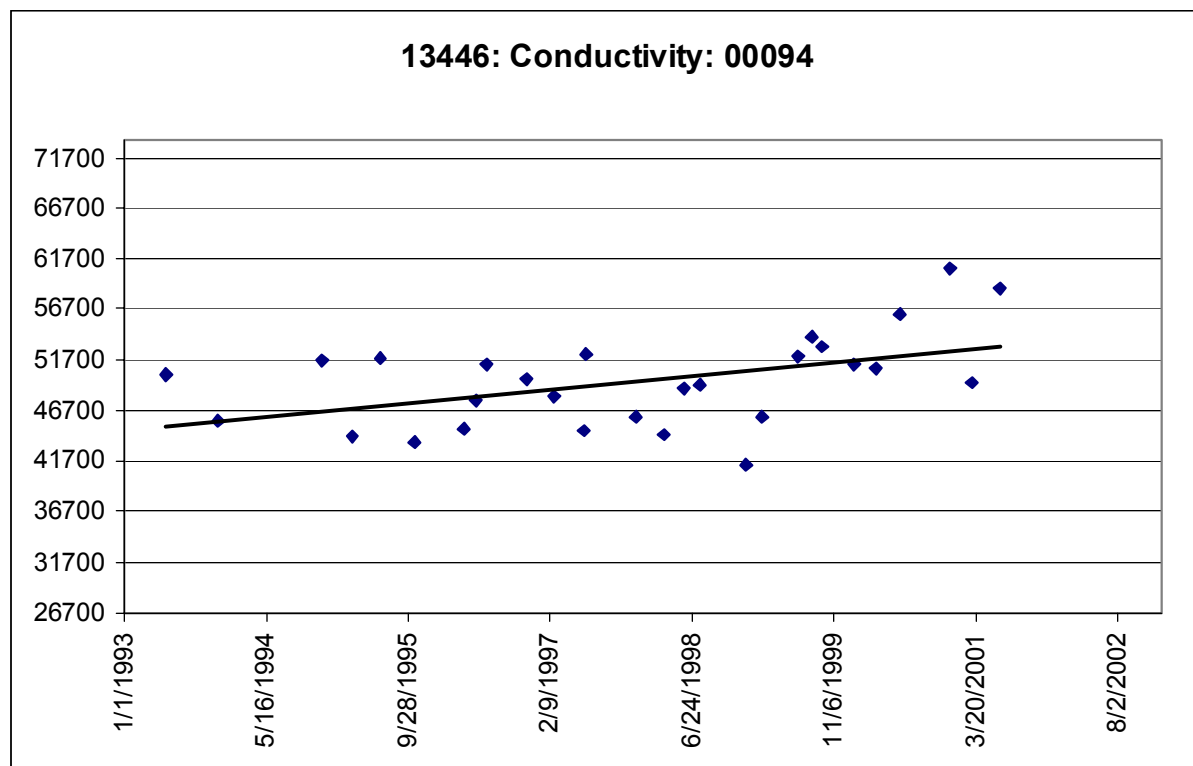
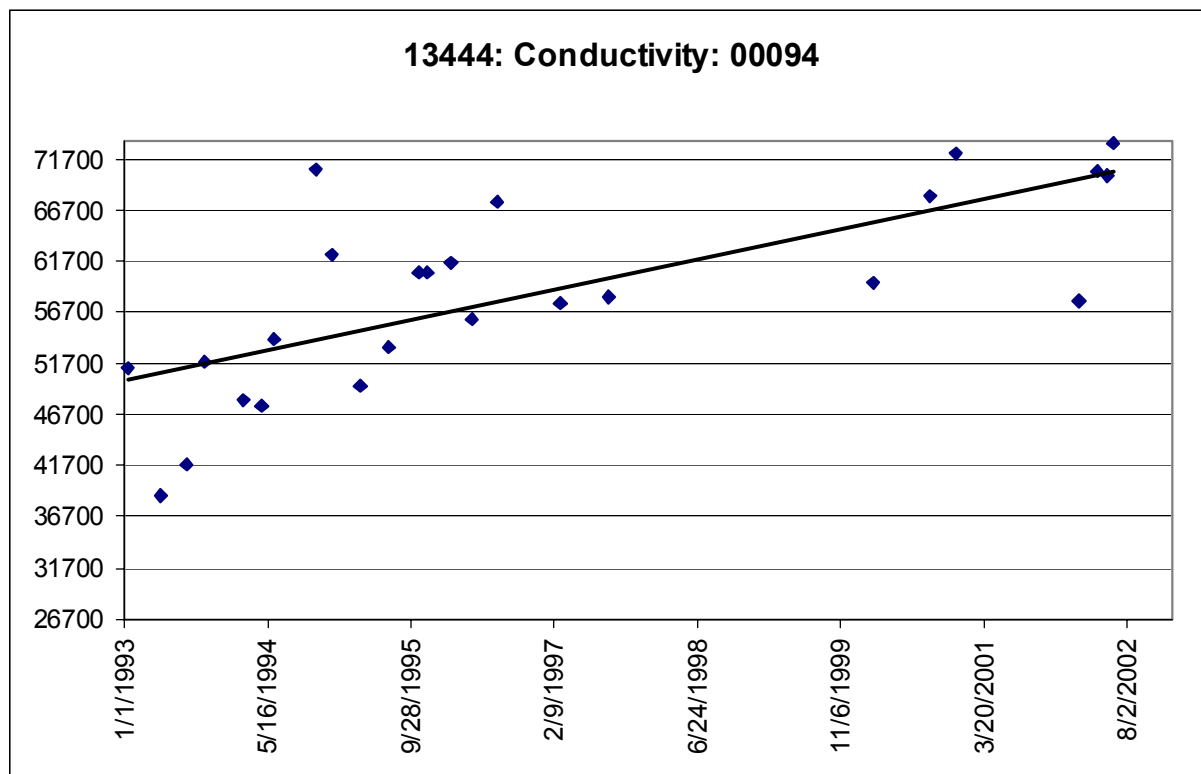
**Increasing Trends
Conductivity – 00094
Tidal**

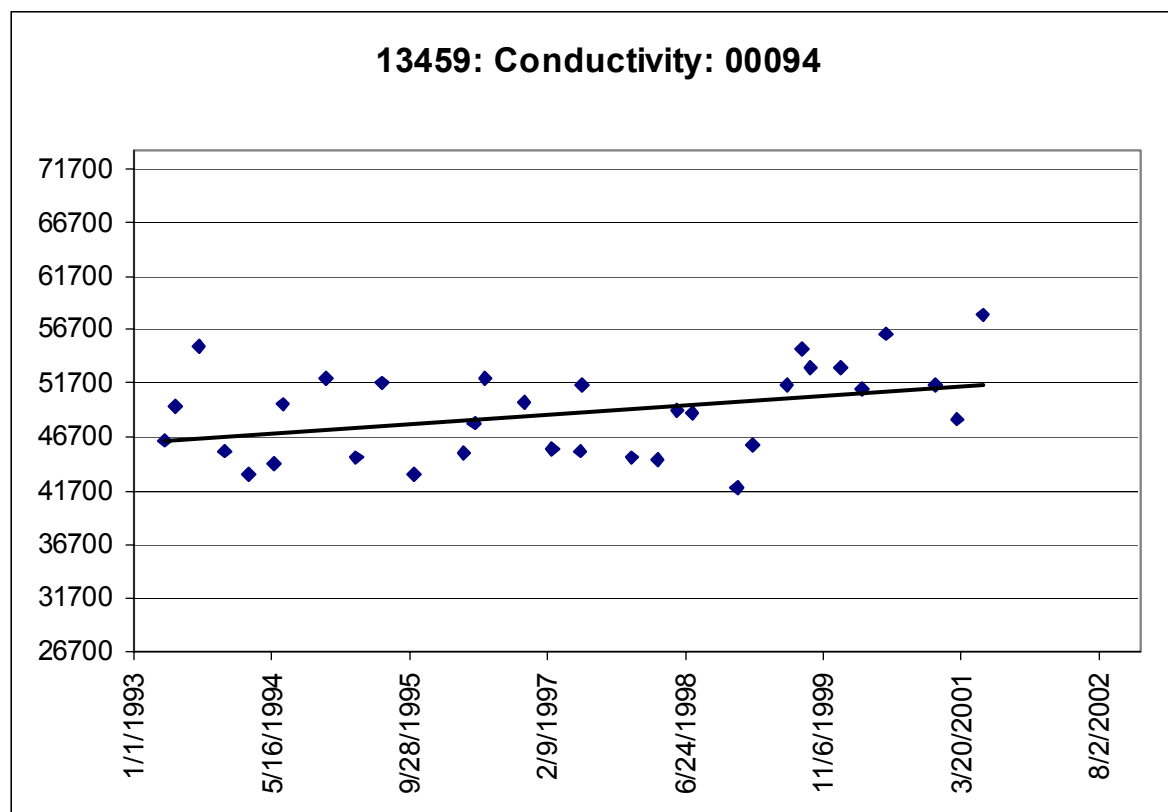
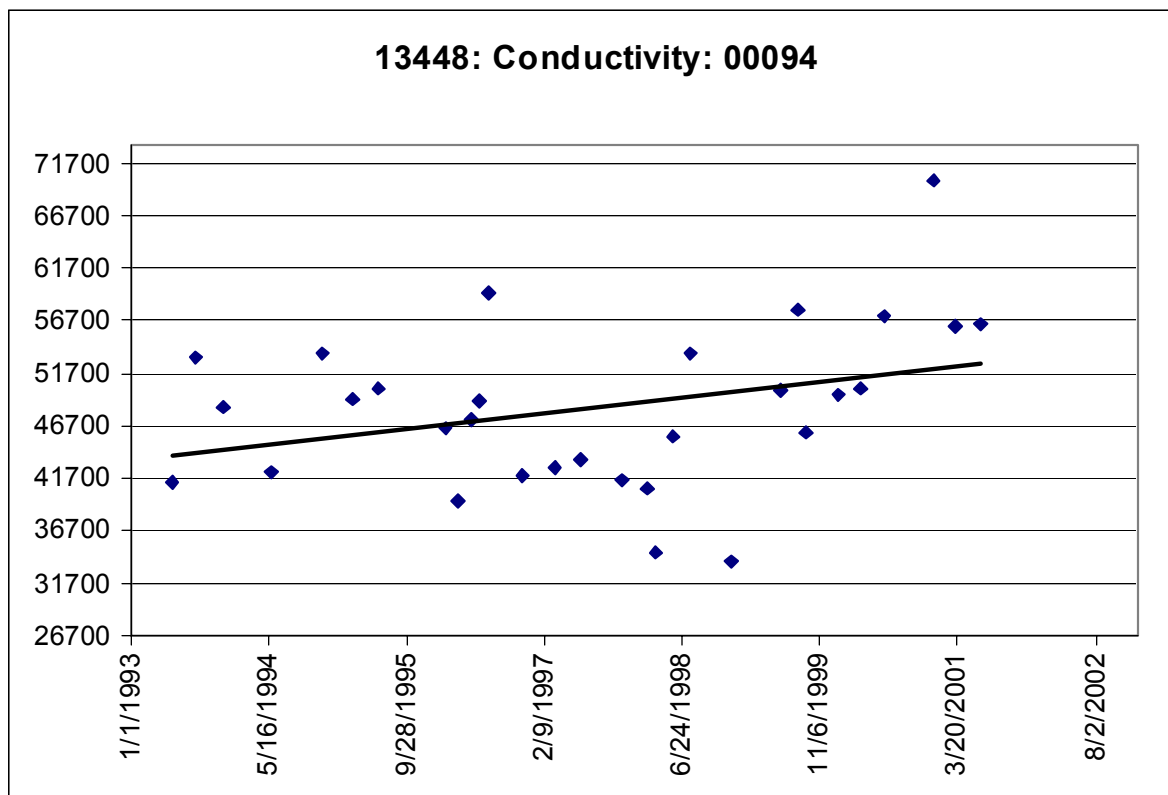
Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2201	13071	42	0.125695	2.398047	0.021239	2560	39805

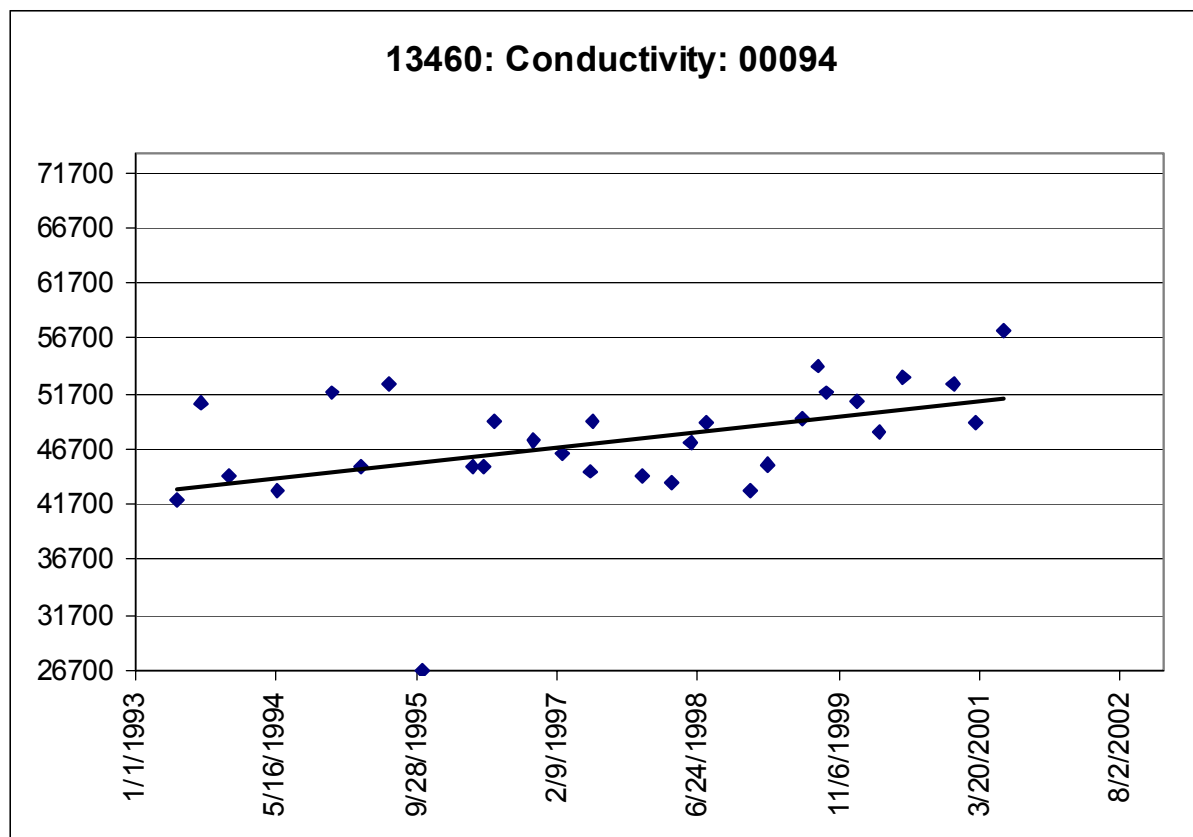


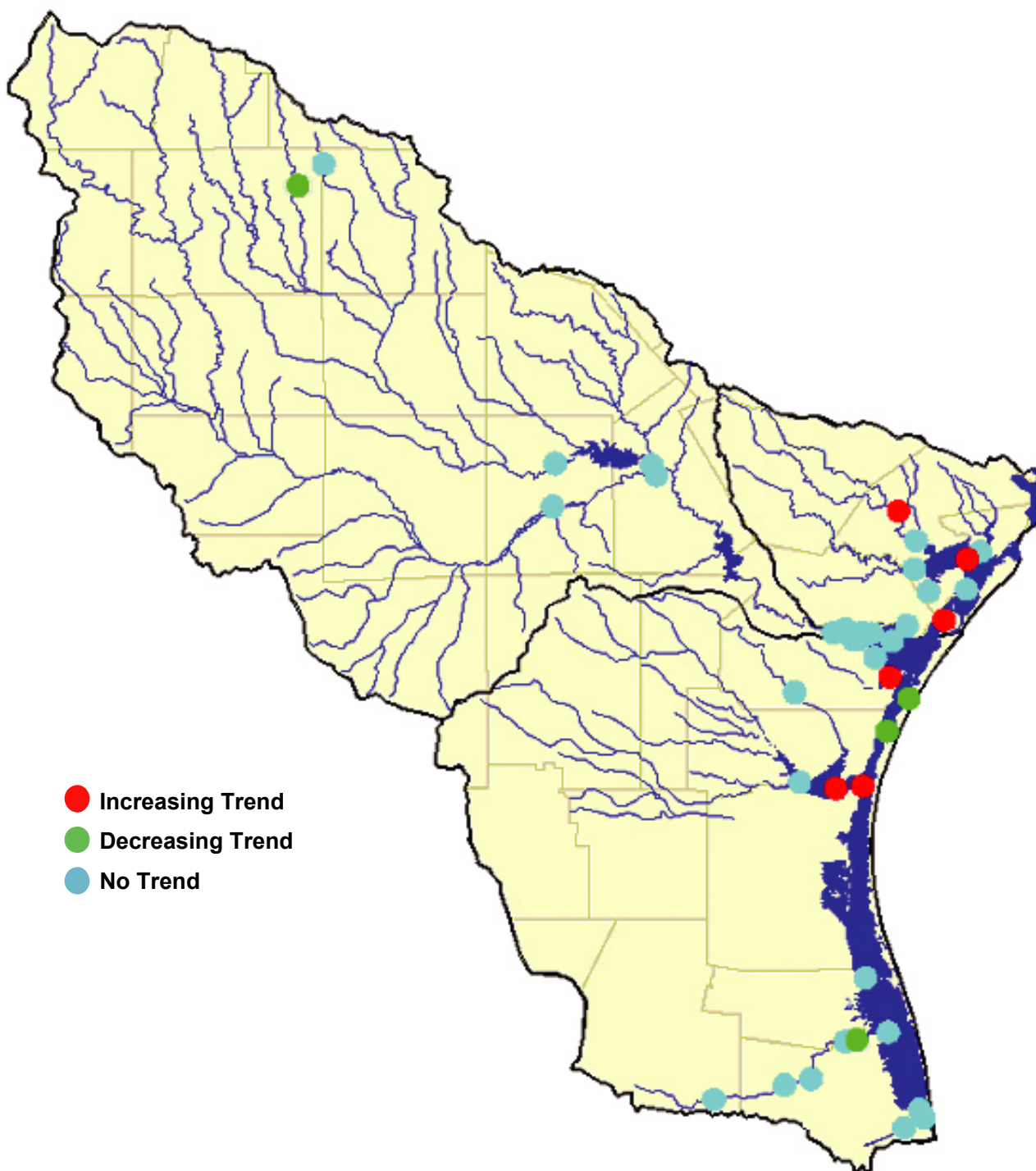
**Increasing Trends
Conductivity – 00094
Marine**

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2491	13444	25	0.522527	5.017001	4.47E-05	38700	73300
	13446	28	0.224872	2.746427	0.01079	41260	60658
	13448	30	0.10398	1.802587	0.082228	33800	70000
2493	13459	33	0.143696	2.280814	0.029587	42070	58104
2494	13460	30	0.187235	2.539748	0.016928	26760	57373







DO deficit - 00300 (Summer)

Total Number of Data Sets Analyzed: 40

Decreasing Trends: 4

Increasing Trends: 6

Decreasing Trends
DO Deficit – 00300 (Summer)
Non-Tidal

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2111	12994	26	0.320961	-3.3681	0.00255	-5.35	3.76

Decreasing Trends
DO Deficit – 00300 (Summer)
Tidal

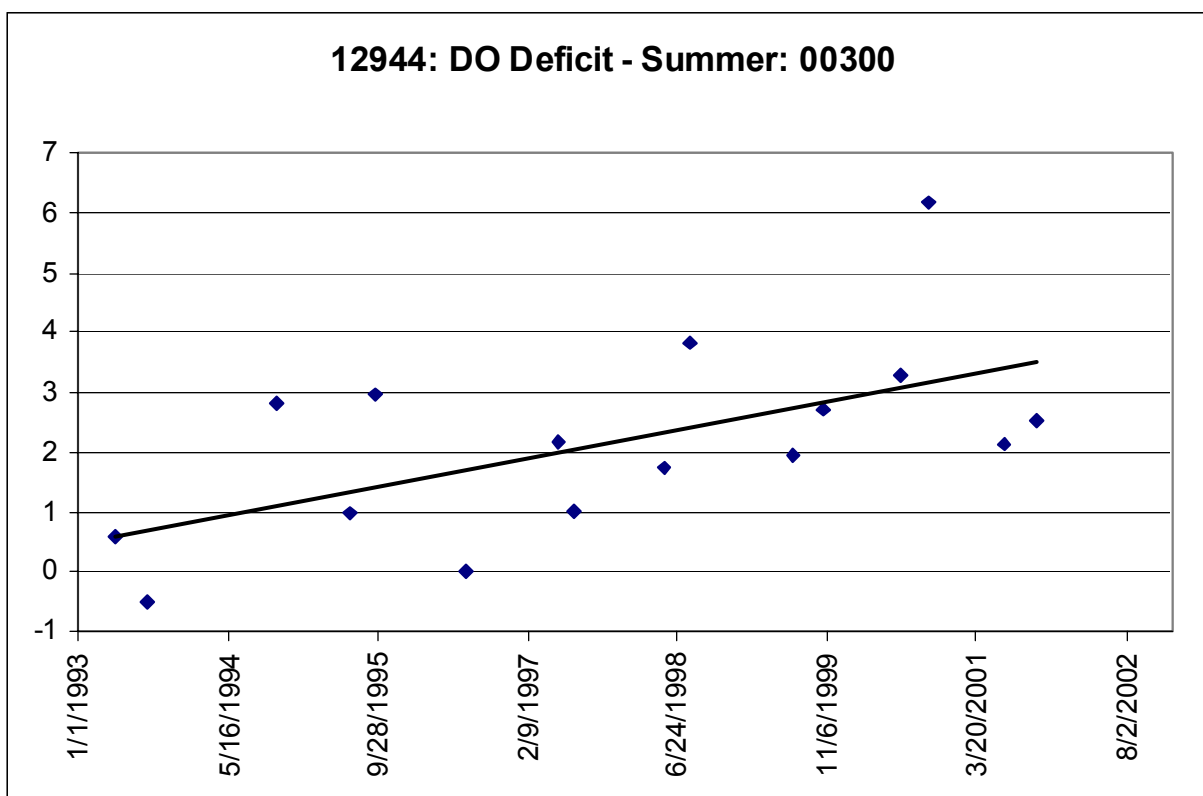
Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2201	13782	20	0.345139	-3.08005	0.006455	-7.76	2.06

Decreasing Trends
DO Deficit – 00300 (Summer)
Marine

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2491	13443	16	0.295133	-2.42114	0.029643	-0.96	3.52
	13445	25	0.203357	-2.42305	0.023668	-0.15	3.29

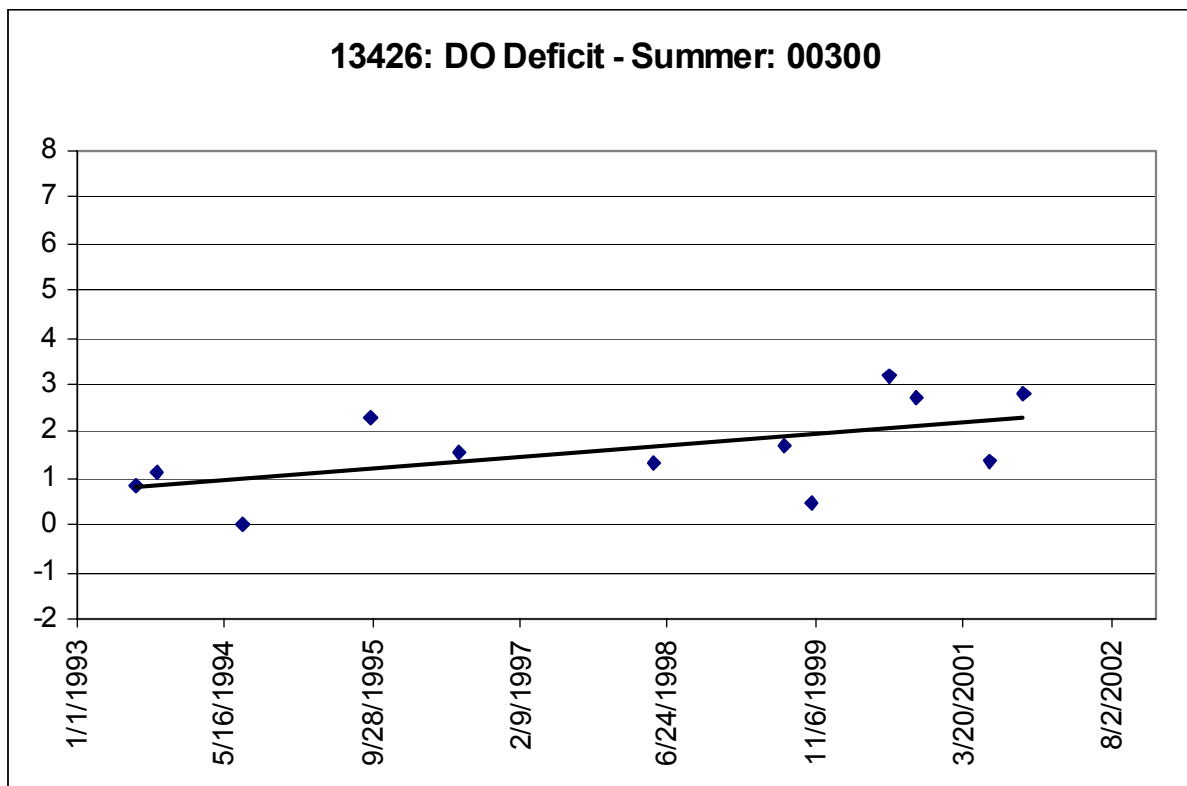
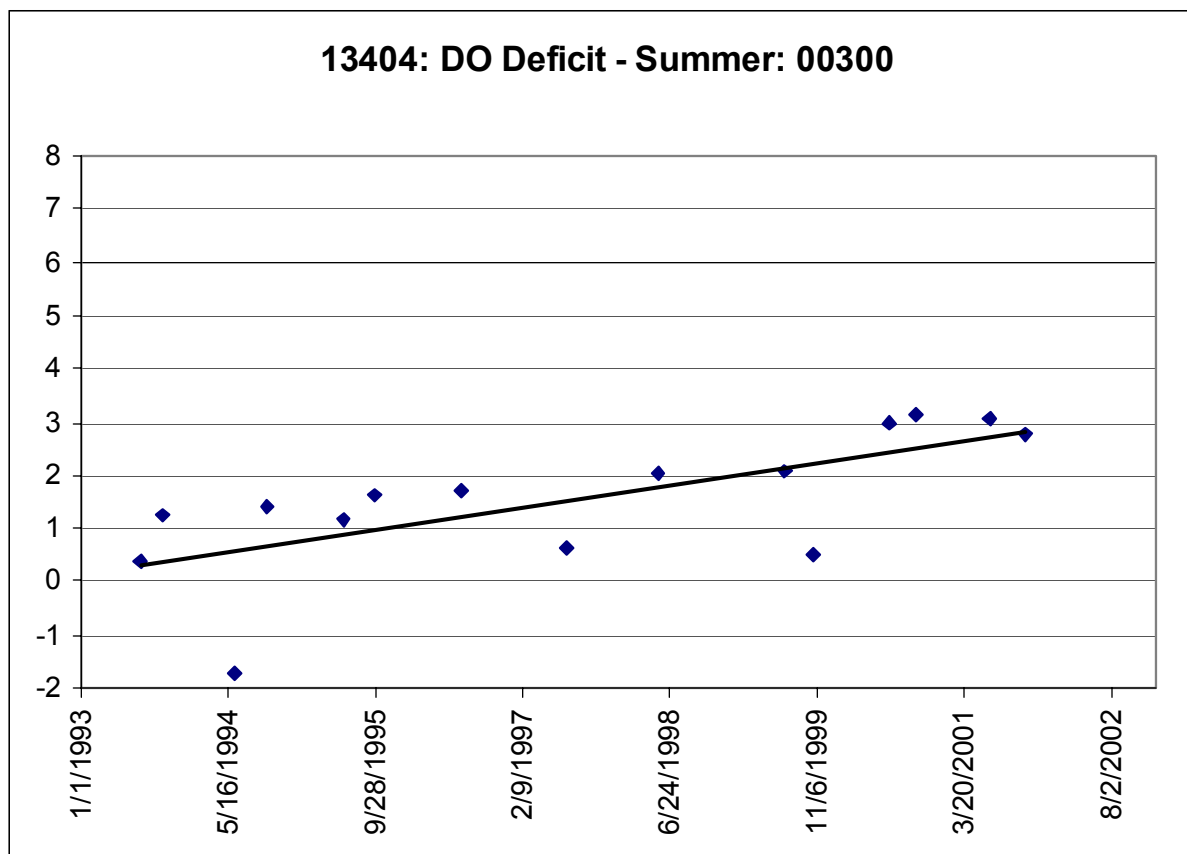
Increasing Trends
DO Deficit – 00300 (Summer)
Non-Tidal

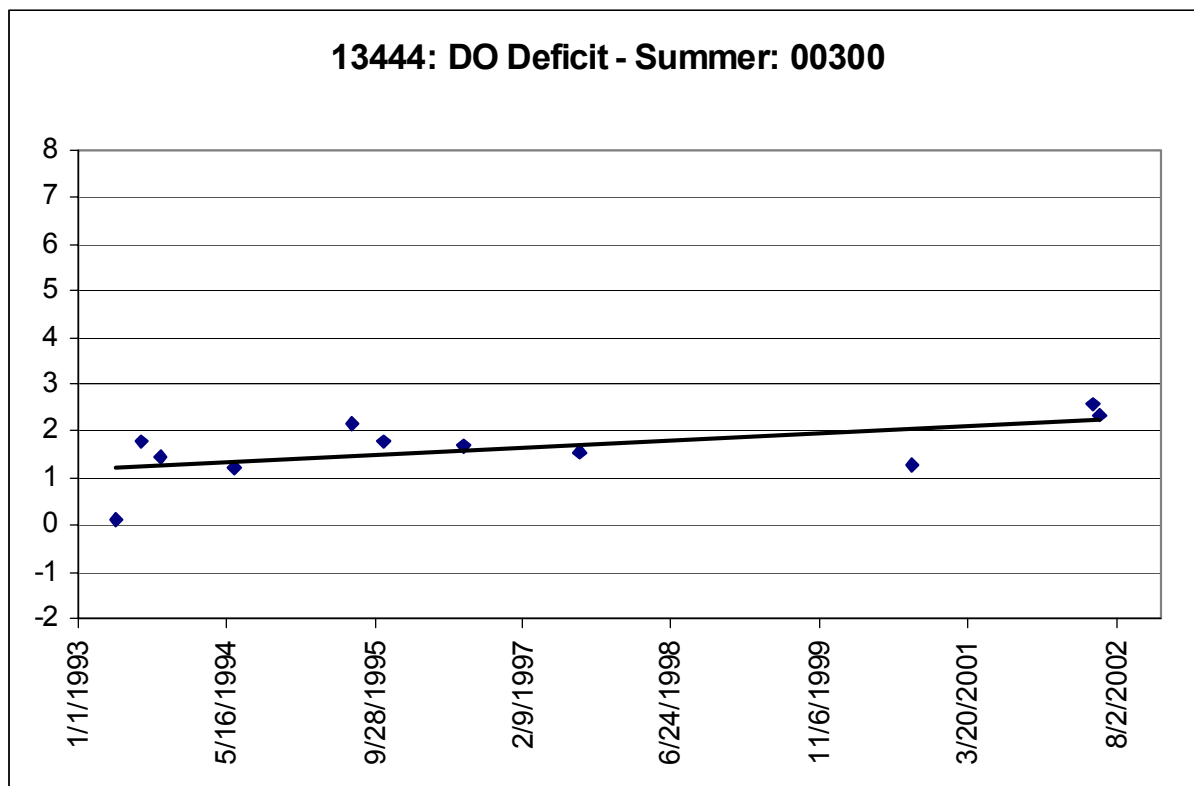
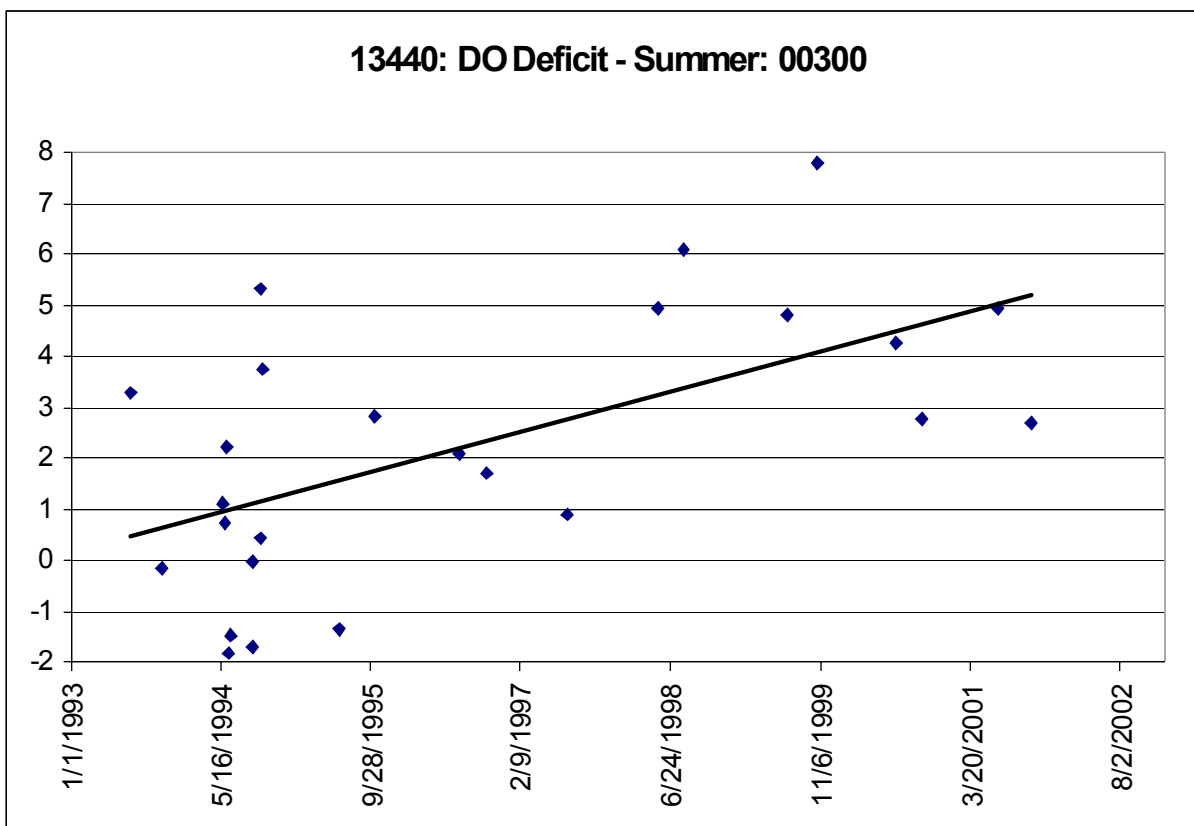
Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2002	12944	16	0.343828	2.708481	0.016972	-0.51	6.16

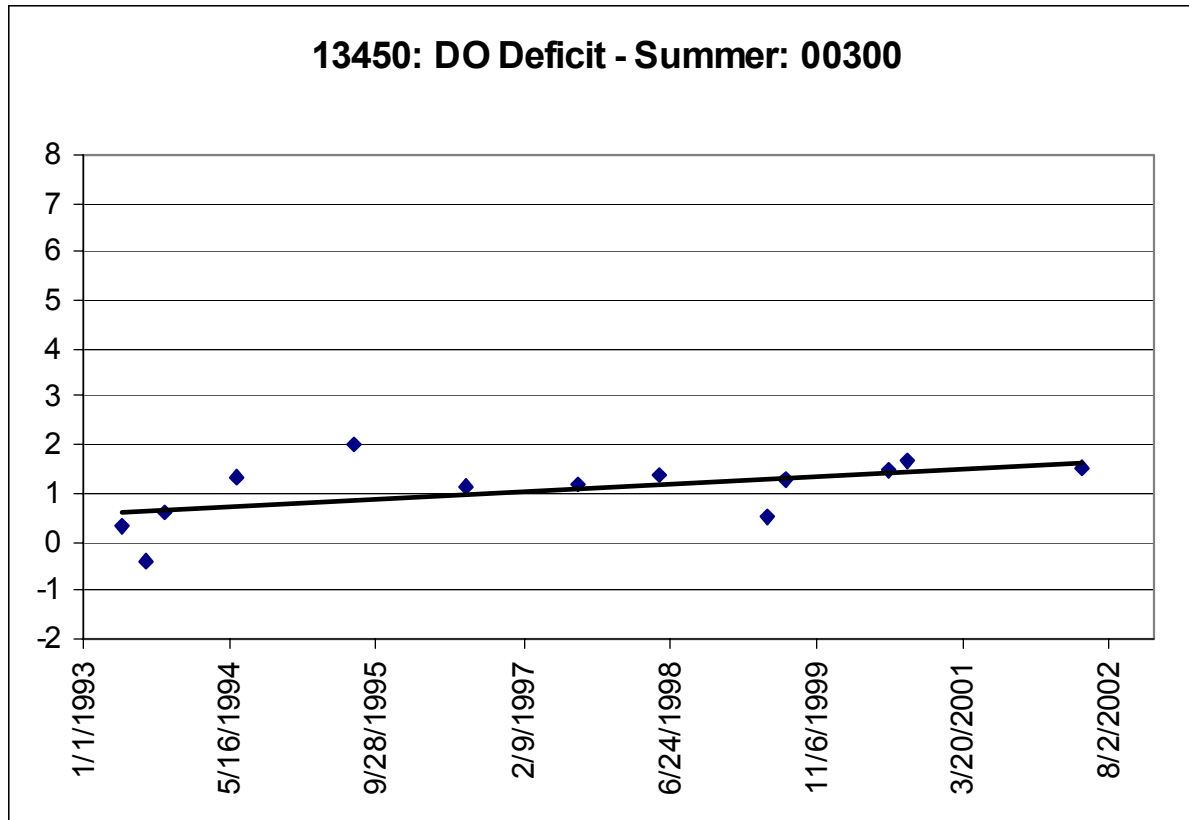


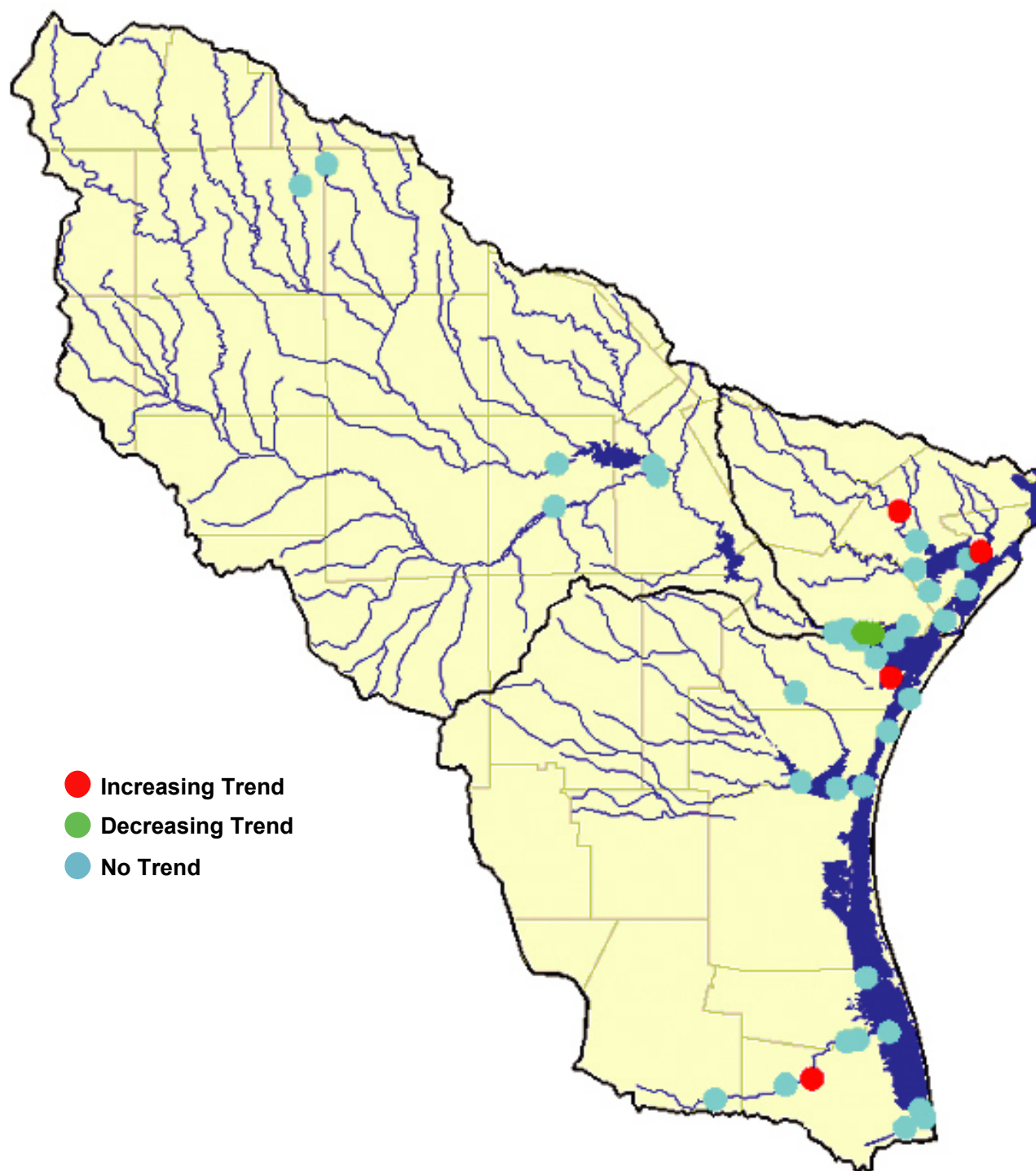
**Increasing Trends
DO Deficit – 00300 (Summer)
Marine**

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2472	13404	15	0.484183	3.493639	0.003965	-1.71	3.14
2483	13426	12	0.30875	2.113419	0.060692	-0.01	3.20
2485	13440	25	0.348546	3.50794	0.001891	-1.82	7.80
2491	13444	11	0.339771	2.15124	0.05983	0.12	2.56
2492	13450	13	0.283789	2.087726	0.06088	-0.42	2.02







DO deficit - 00300 (Winter)

Total Number of Data Sets Analyzed: 40

Decreasing Trends: 2

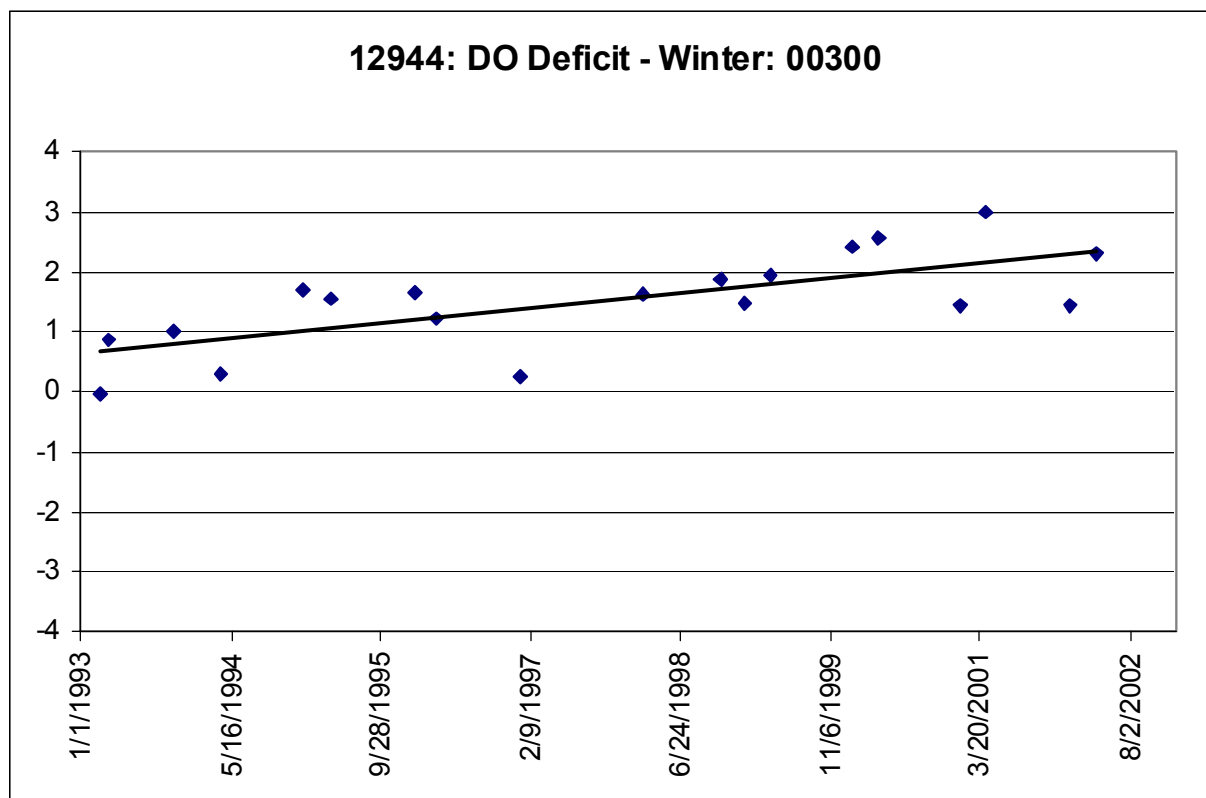
Increasing Trends: 4

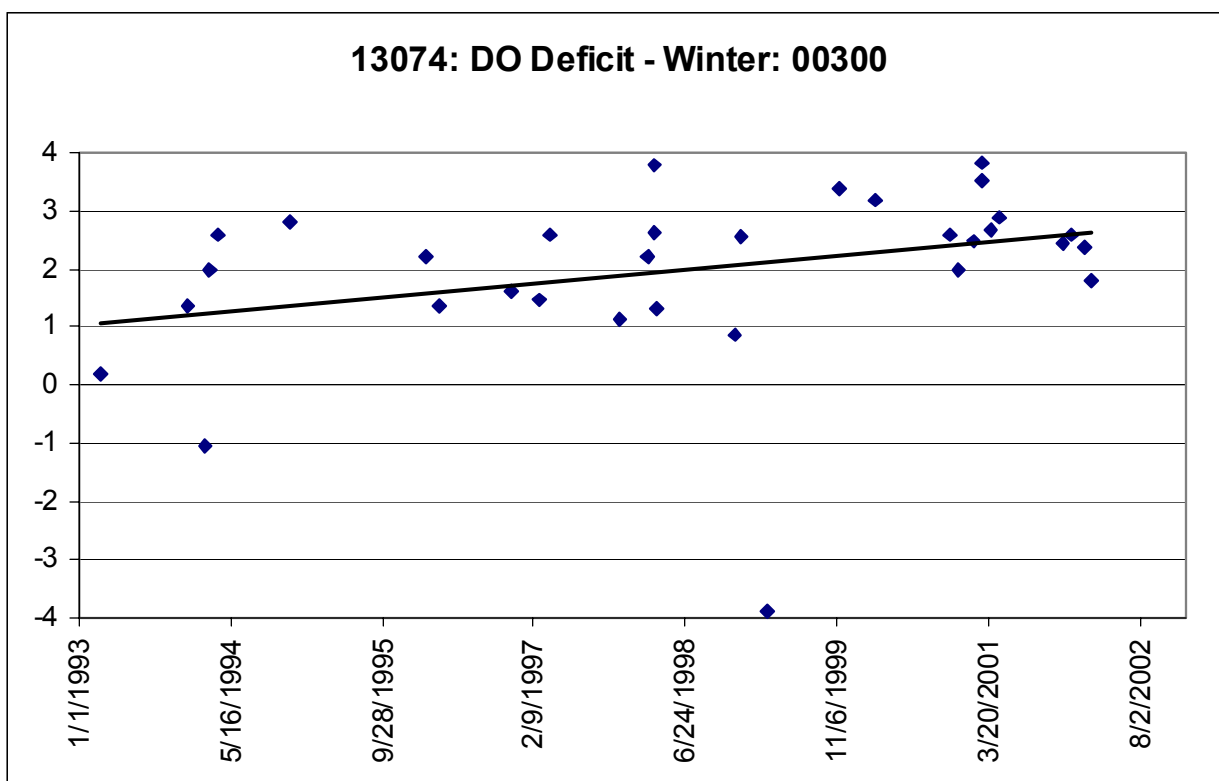
Decreasing Trends
DO Deficit – 00300 (Winter)
Marine

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2482	13421	16	0.246239	-2.13858	0.050581	0.22	4.31
	13422	15	0.223447	-1.93408	0.075172	0.19	4.04

Increasing Trends
DO Deficit – 00300 (Winter)
Non-Tidal

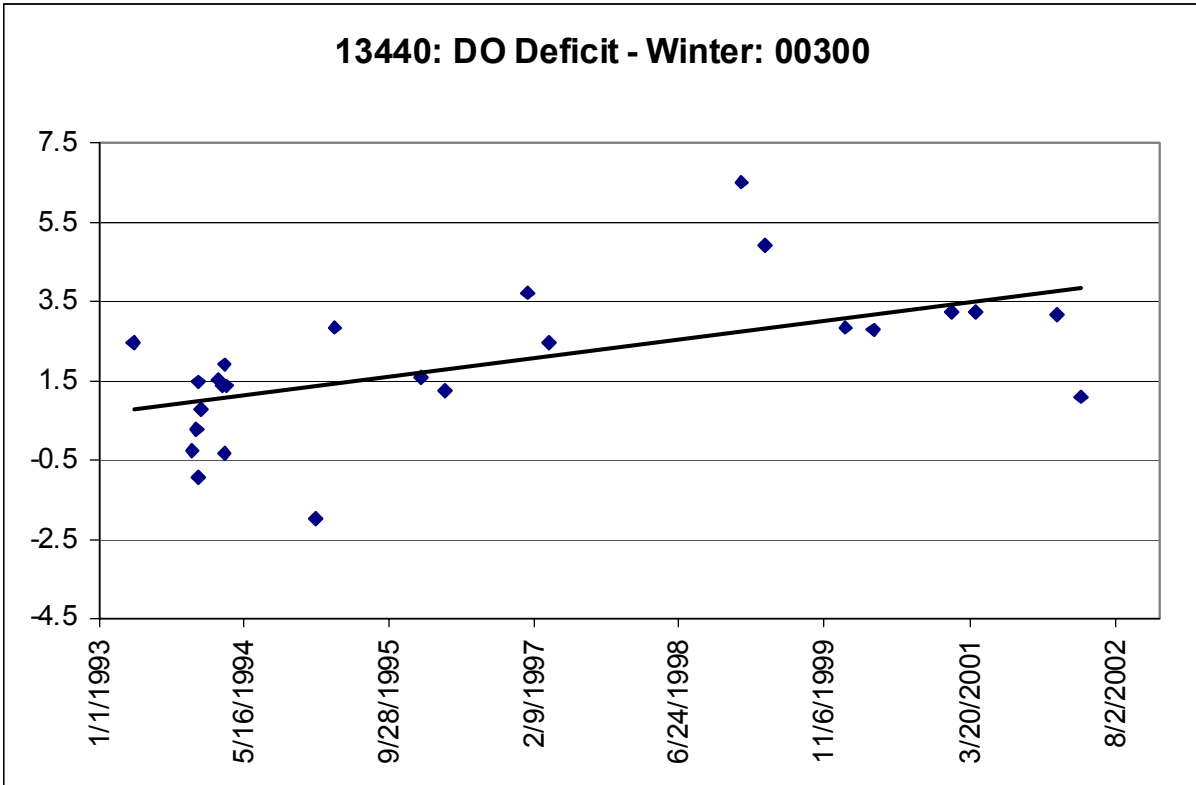
Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2002	12944	19	0.494725	4.079835	0.00078	-0.05	2.98
2202	13074	32	0.104736	1.873412	0.070783	-3.81	3.81

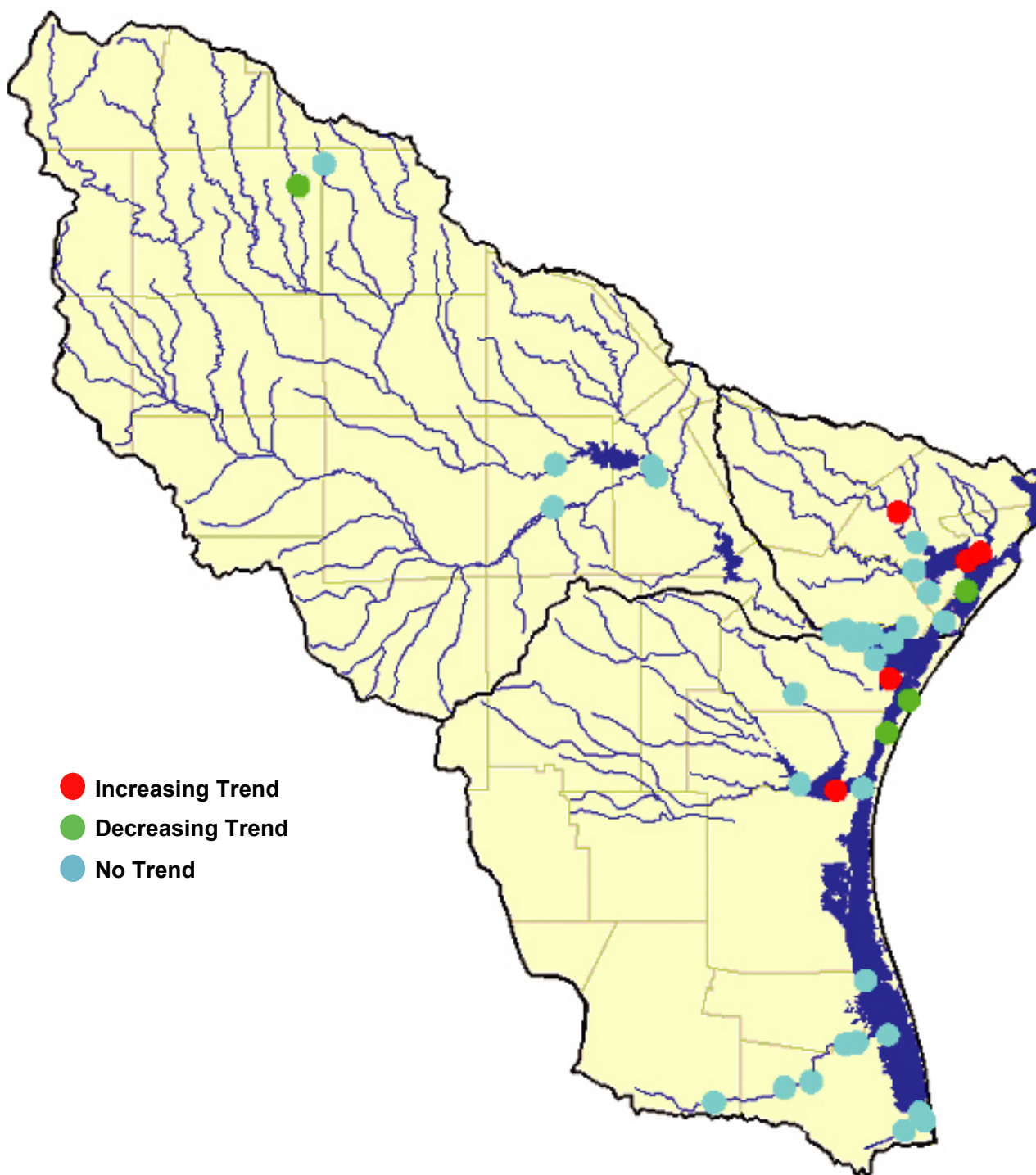




**Increasing Trends
DO Deficit – 00300 (Winter)
Marine**

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2473	13406	28	0.14569	2.105688	0.045042	-4.16	5.46
2485	13440	25	0.3198676	3.288913	0.003215	-1.97	6.53



DO deficit - 00300 (All)

Total Number of Data Sets Analyzed: 40

Decreasing Trends: 4

Increasing Trends: 5

**Decreasing Trends
DO Deficit – 00300 (All)
Non-Tidal**

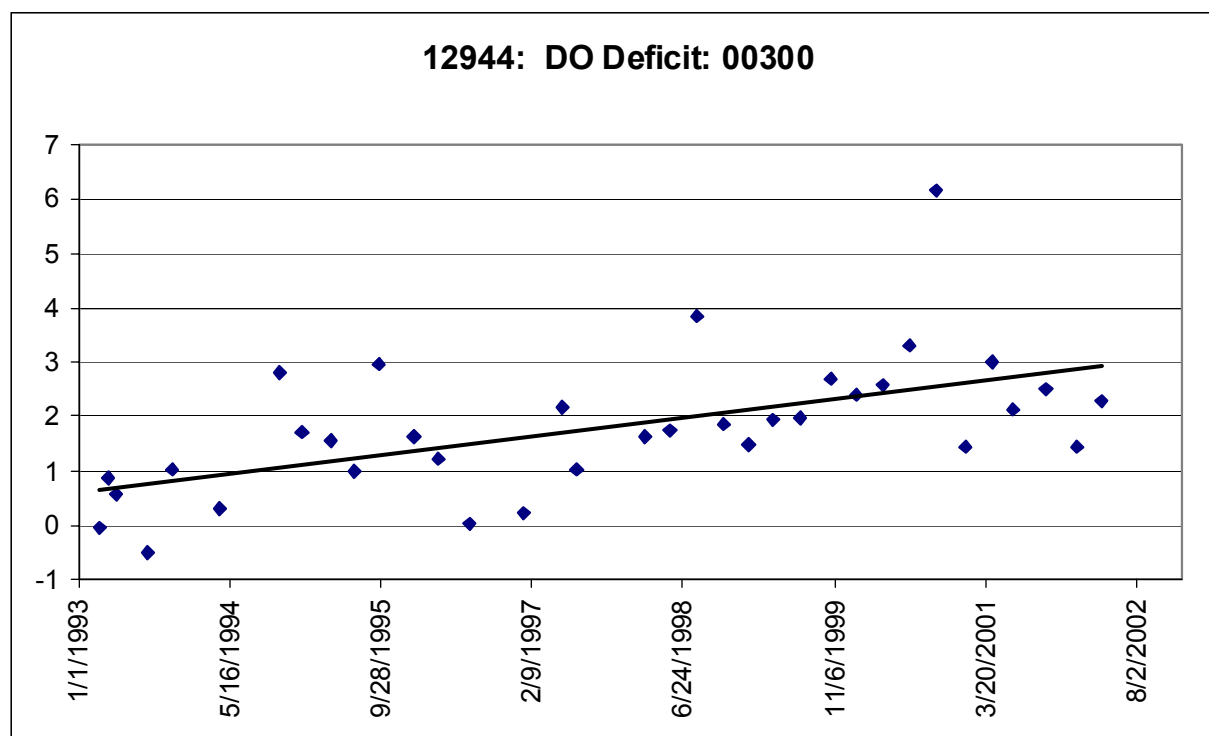
Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2111	12994	49	0.188043	-3.29922	0.001854	-5.35	3.76

**Decreasing Trends
DO Deficit – 00300 (All)
Marine**

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2471	13402	29	0.108088	-1.80888	0.08162	-0.59	2.29
2491	13443	31	0.210663	-2.78203	0.009399	-0.96	4.35
	13445	51	0.109322	-2.45241	0.017799	-7.29	4.18

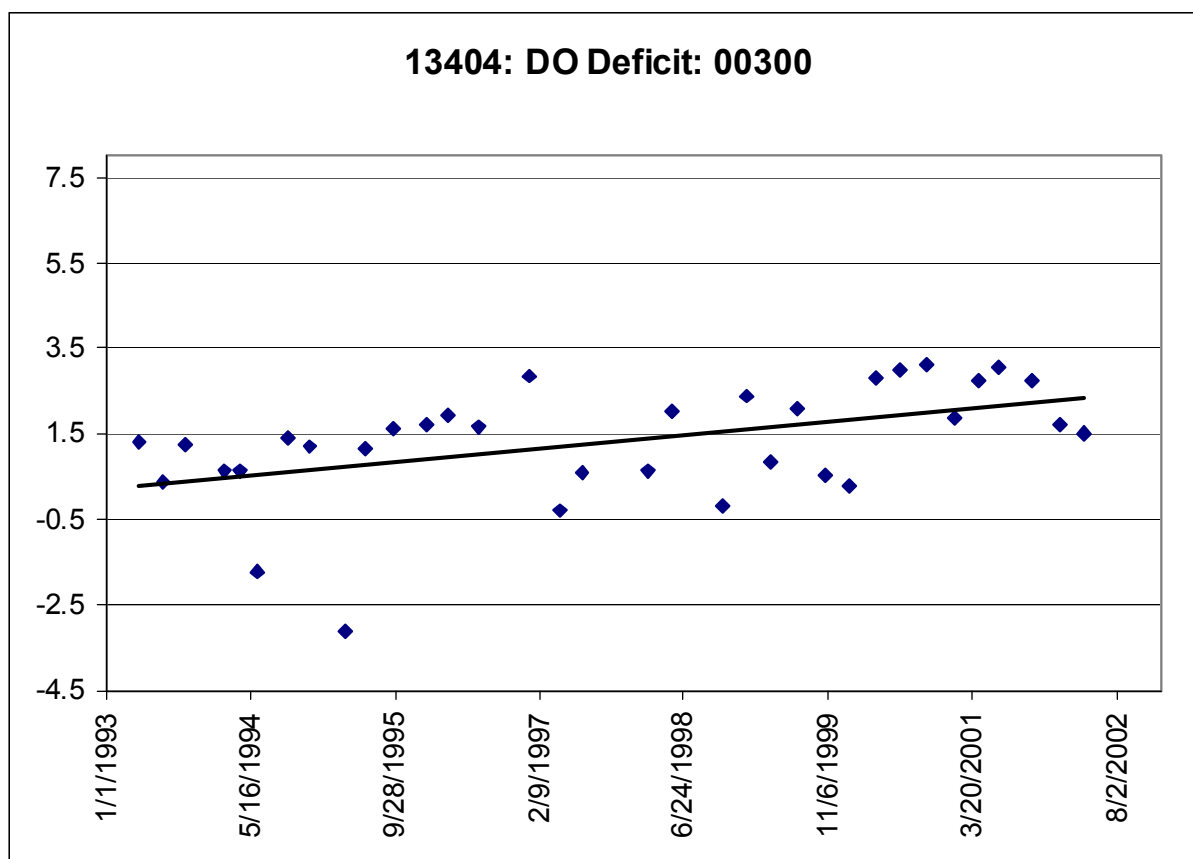
**Increasing Trends
DO Deficit – 00300 (All)
Non-Tidal**

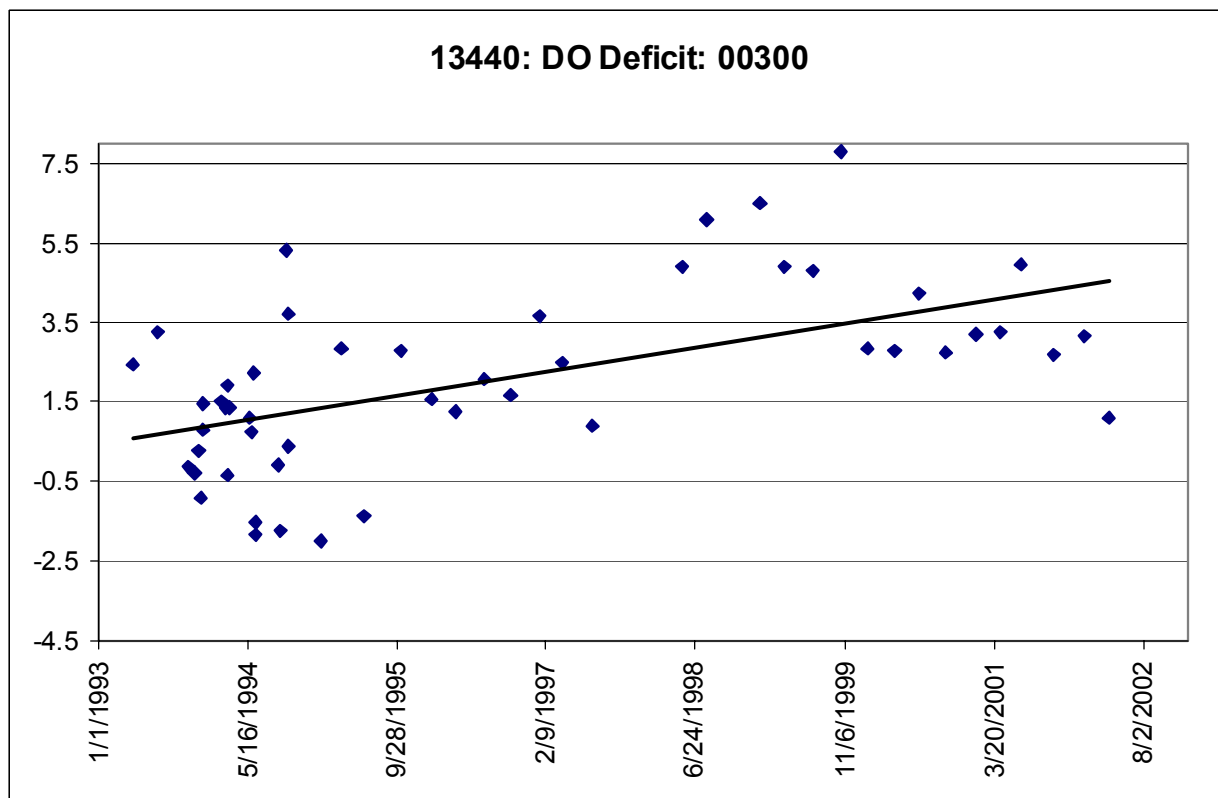
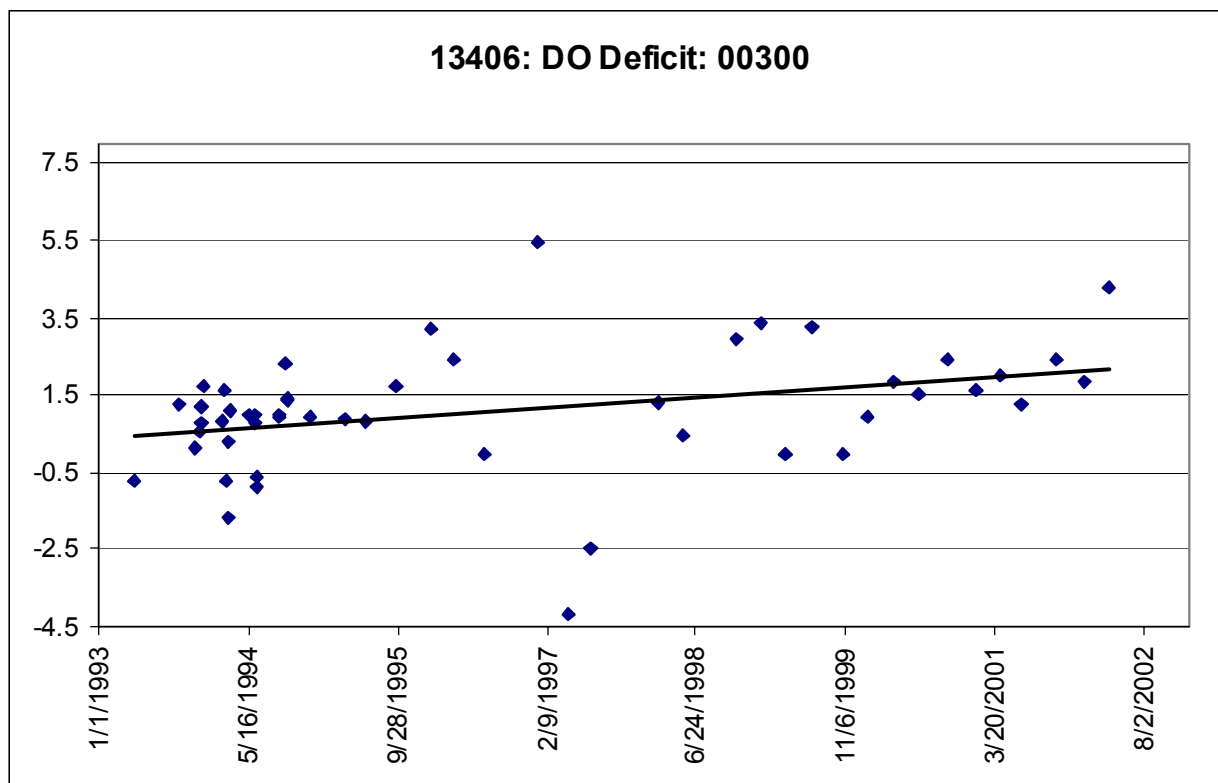
Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2002	12944	35	0.325843	3.99375	0.000342	-0.51	6.16

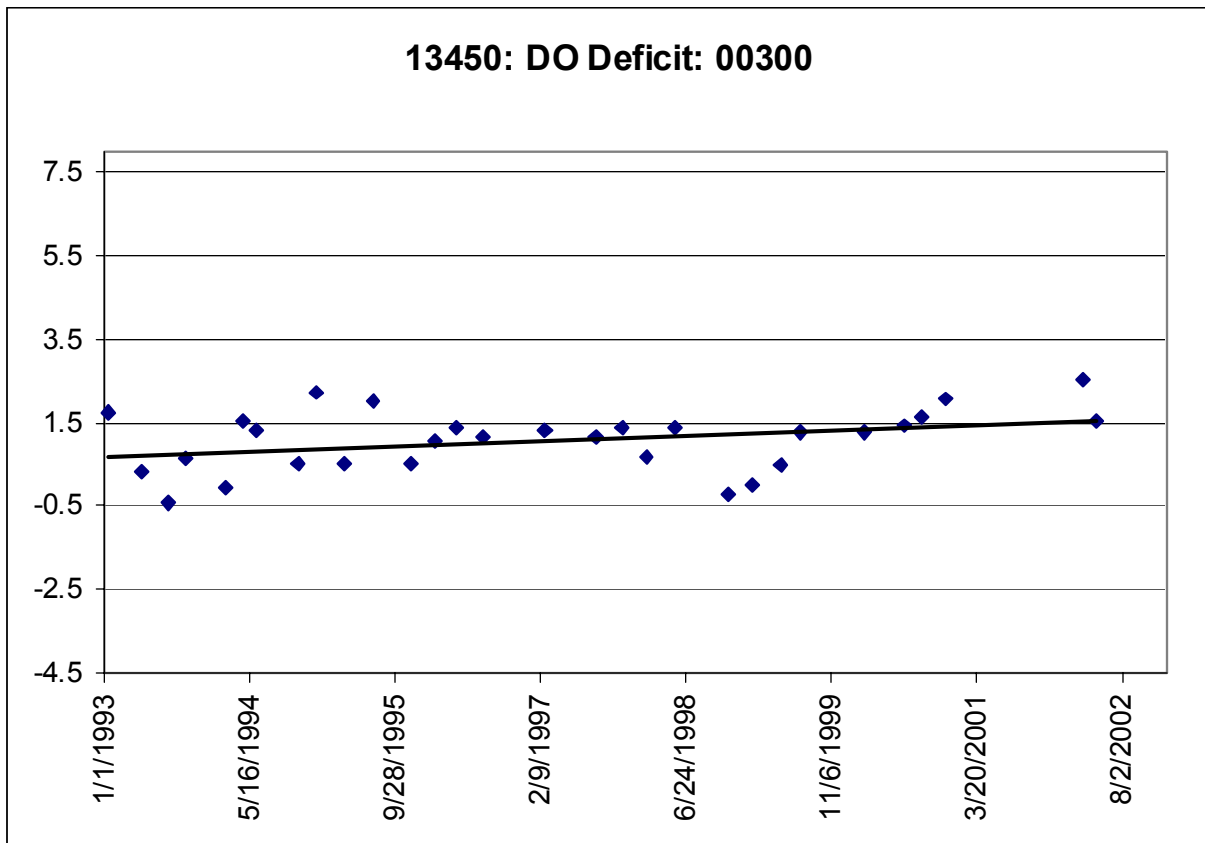


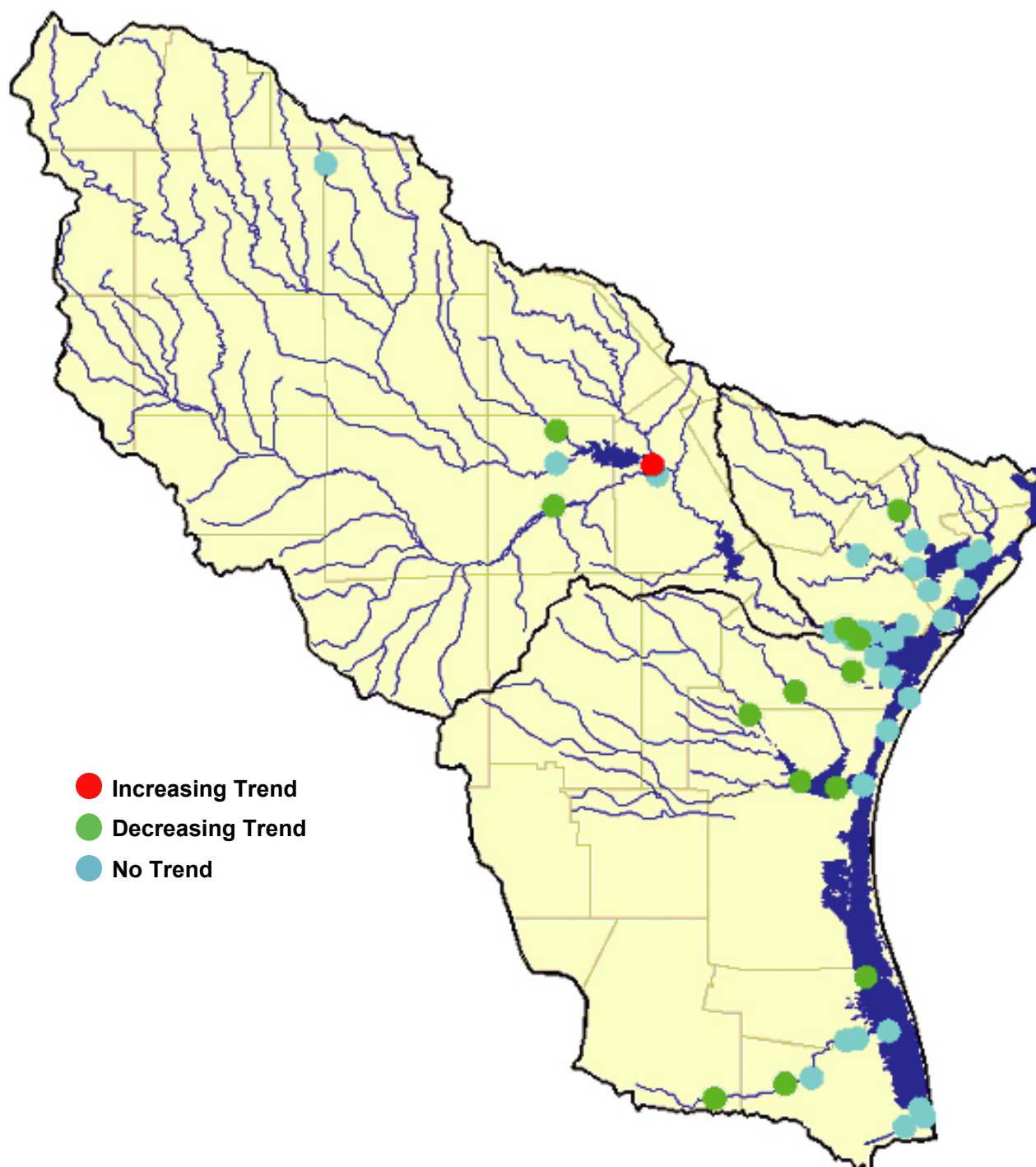
Increasing Trends
DO Deficit – 00300 (All)
Marine

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2472	13404	34	0.22676	3.063382	0.004416	-3.13	3.13
2473	13406	50	0.114959	2.496948	0.016011	-4.16	5.46
2485	13440	50	0.3147017	4.694943	2.26E-05	-1.97	7.80
2492	13450	30	0.110656	1.866516	0.072475	-0.42	2.57







pH - 00400

Total Number of Data Sets Analyzed: 43

Decreasing Trends: 13

Increasing Trends: 1

**Decreasing Trends
pH 00400
Non-Tidal**

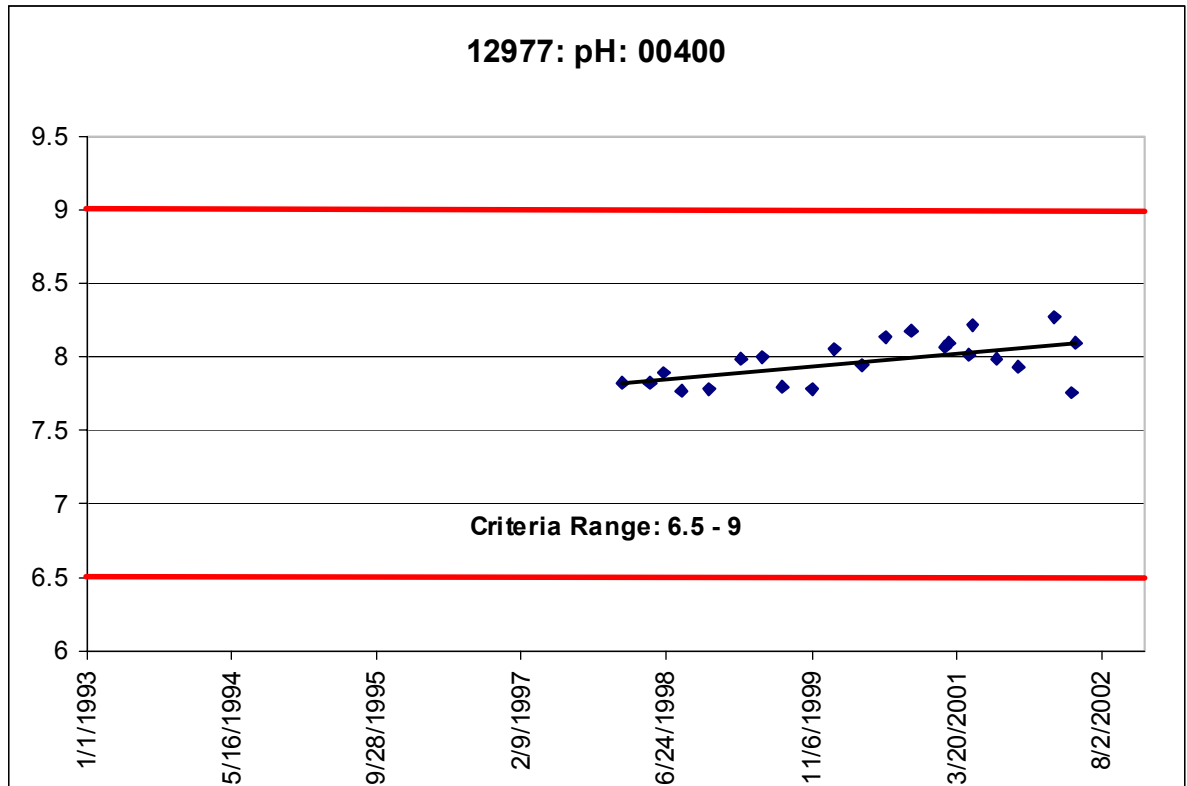
Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2002	12944	35	0.10518	-1.9695	0.057338	7.22	8.62
2104	12973	40	0.346005	-4.48379	6.56E-05	7.63	9.12
2108	12983	22	0.365391	-3.39344	0.002885	6.78	9.7
2202	13079	69	0.237803	-4.57207	2.14E-05	7.42	8.3
	13081	48	0.109698	-2.3072	0.021476	7	8.6
2204	13094	28	0.191387	-2.48069	0.019907	7.21	8.43

**Decreasing Trends
pH 00400
Marine**

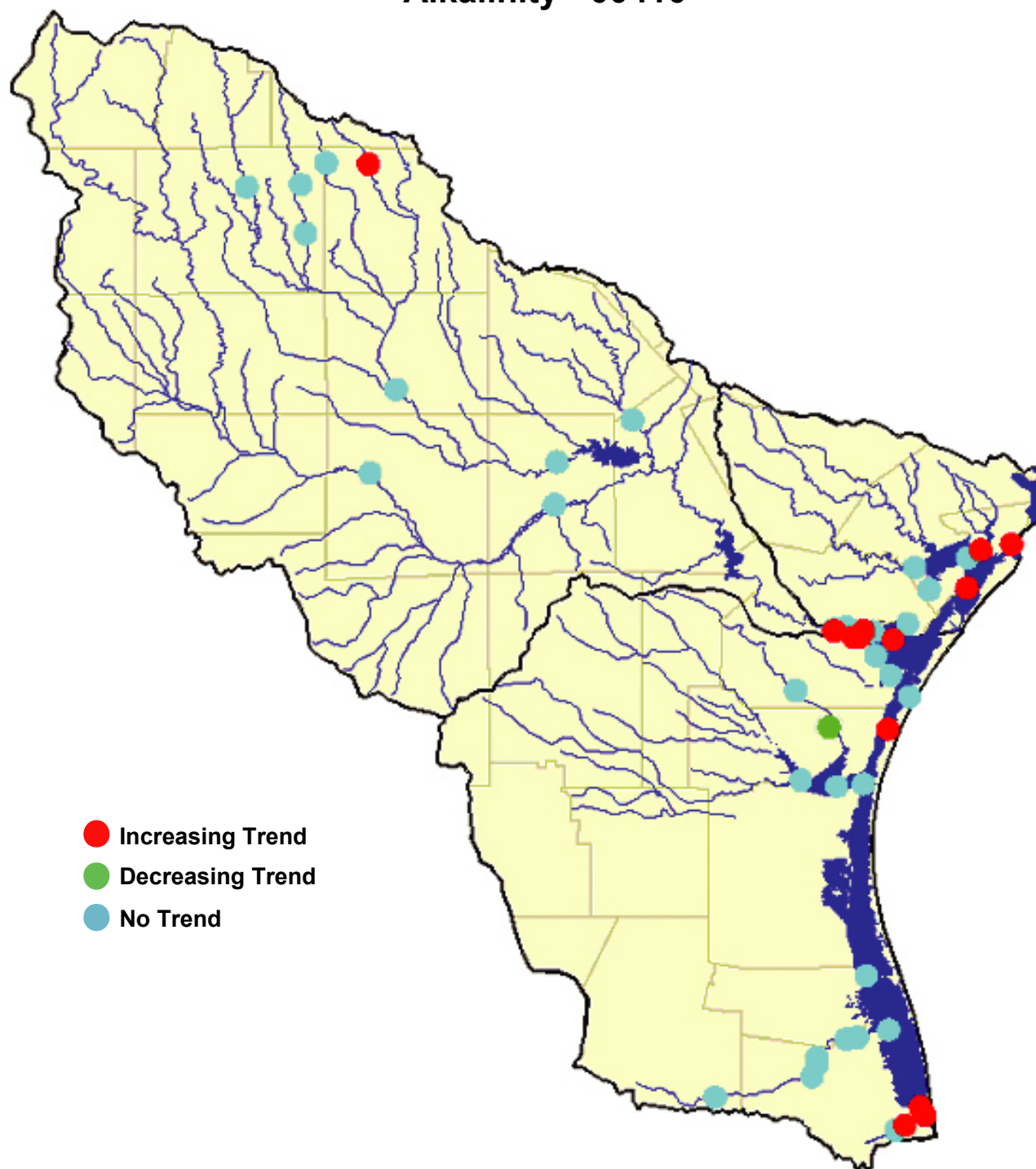
Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2482	13425	29	0.128135	-1.99201	0.056572	7.6	8.9
2484	13430	31	0.136787	-2.1437	0.040574	7.53	8.7
2485	13028	34	0.176322	-2.61727	0.013423	7.26	8.89
2491	13448	29	0.505148	-5.24993	1.56E-05	7.73	8.7
2492	13450	30	0.133501	-2.077	0.047092	7.63	8.82
	13452	31	0.249156	-3.10213	0.004255	7.2	8.74
	13033	28	0.258137	-3.00781	0.005775	7.76	8.77

**Increasing Trends
pH 00400
Non-Tidal**

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2106	12977	22	0.309762	2.995915	0.007141	7.76	8.27



Alkalinity - 00410



Total Number of Data Sets Analyzed: 46

Decreasing Trends: 1

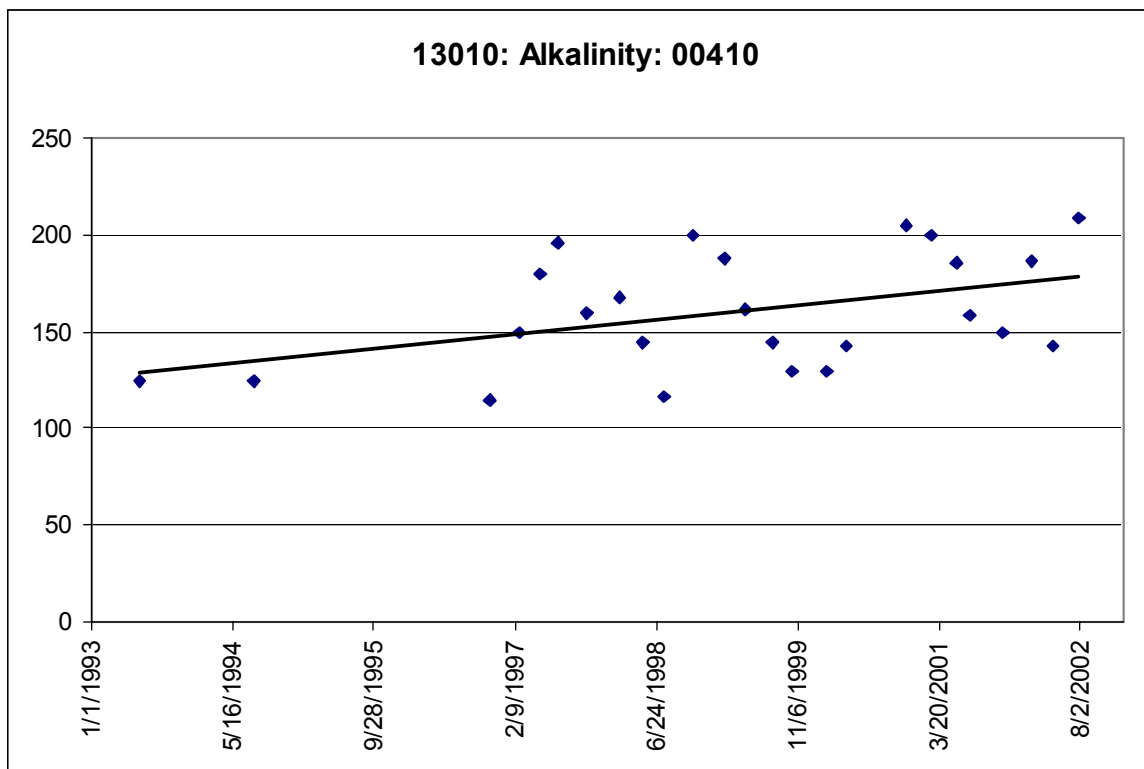
Increasing Trends: 13

Decreasing Trends
Alkalinity – 00410
Tidal

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2203	13090	28	0.307957	-3.40146	0.002177	42	200

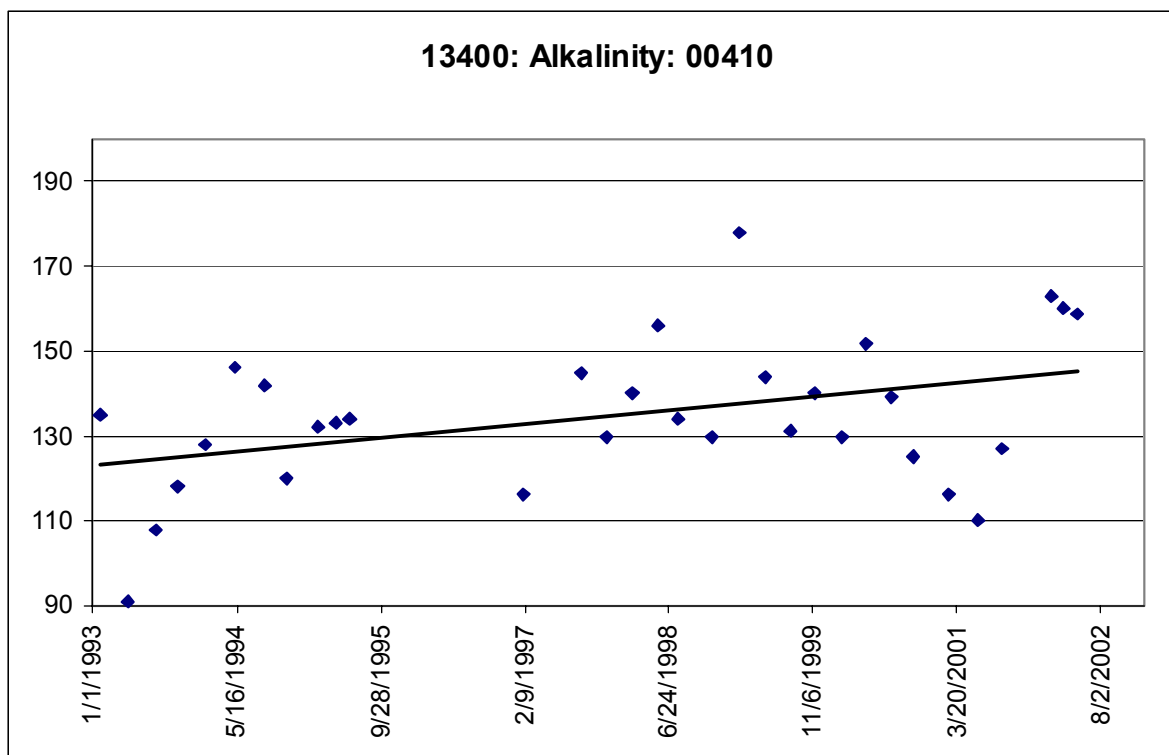
Increasing Trends
Alkalinity – 00410
Non-Tidal

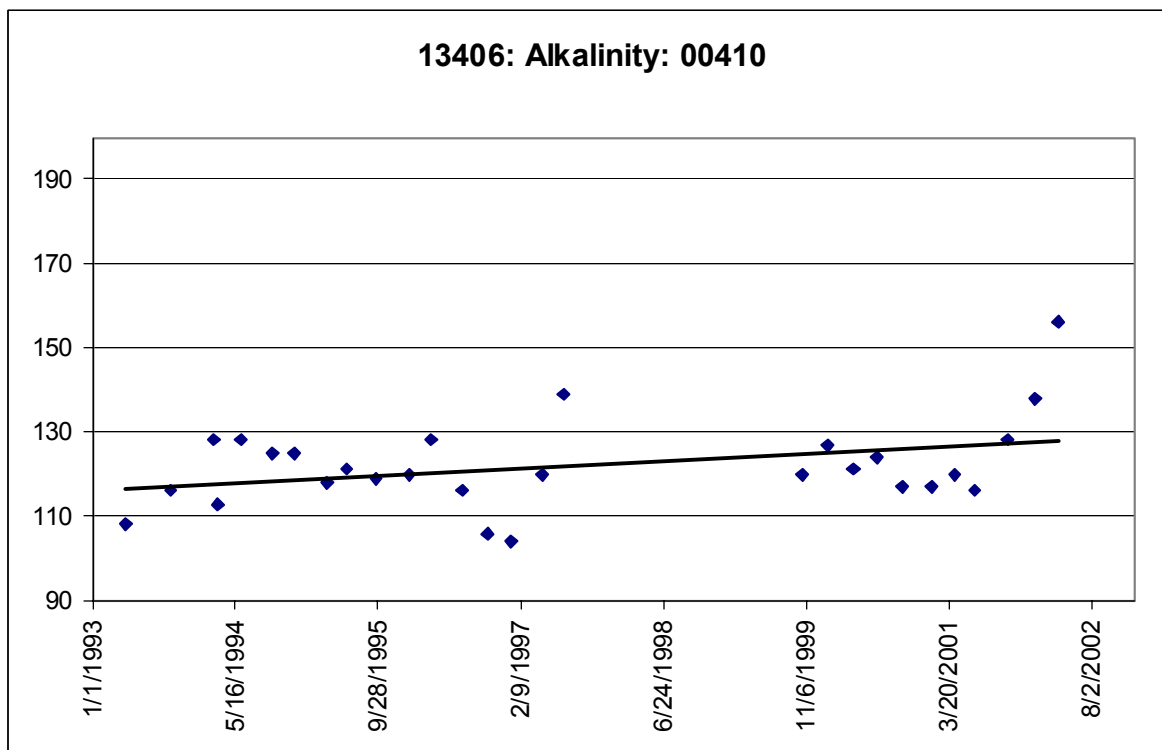
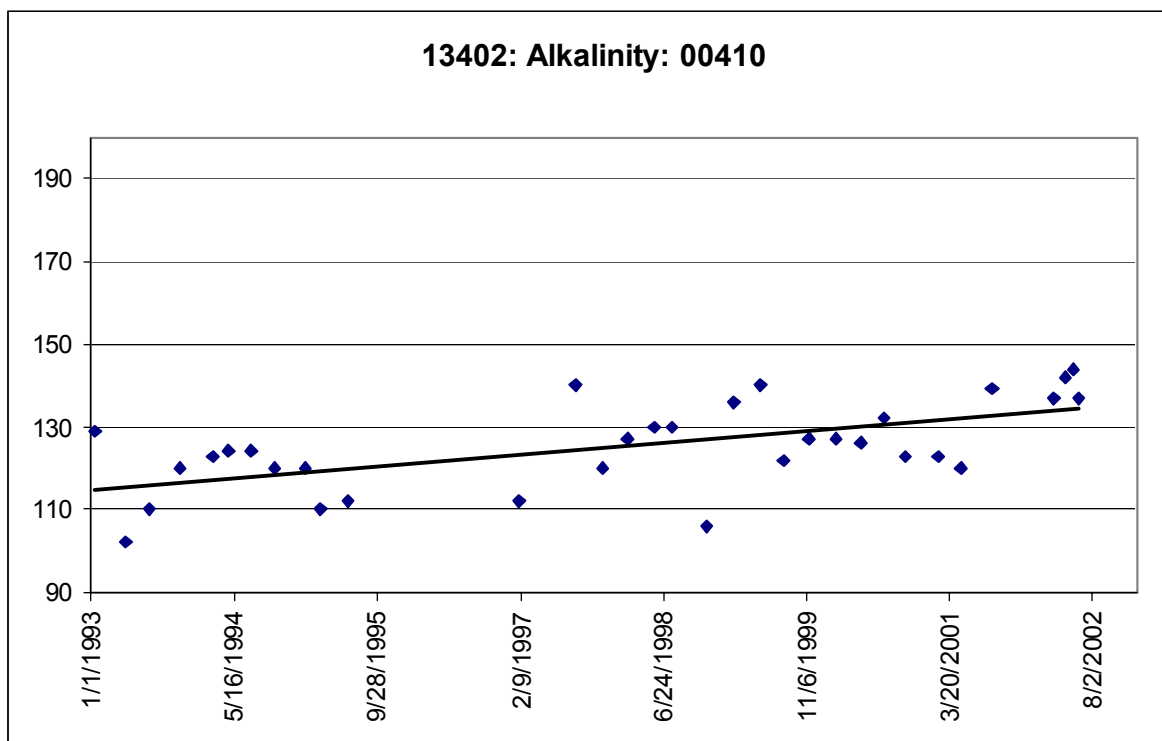
Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2114	13010	25	0.187855	2.306523	0.030433	114	209

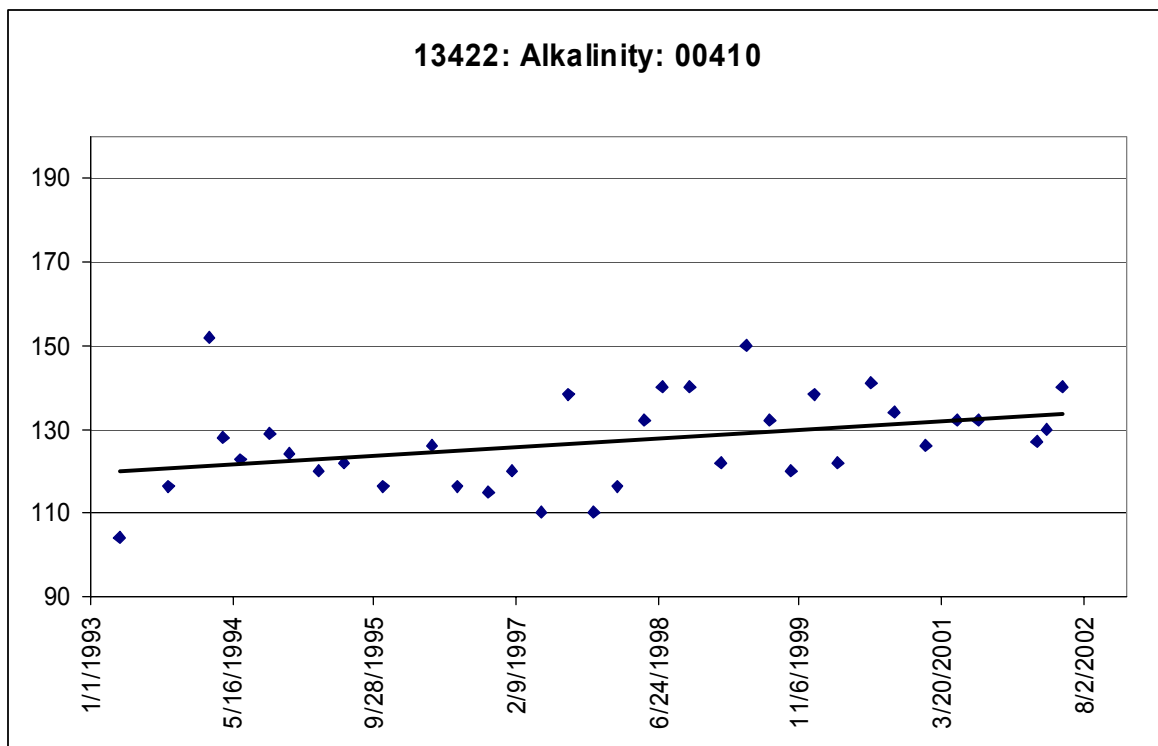
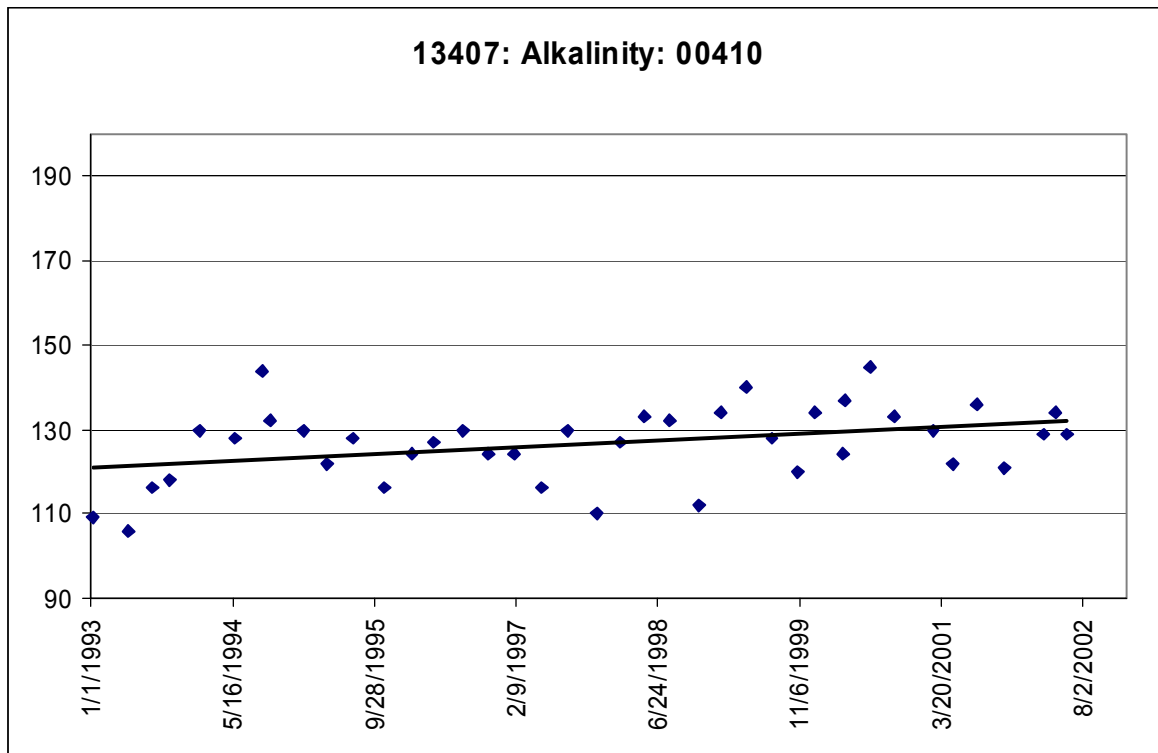


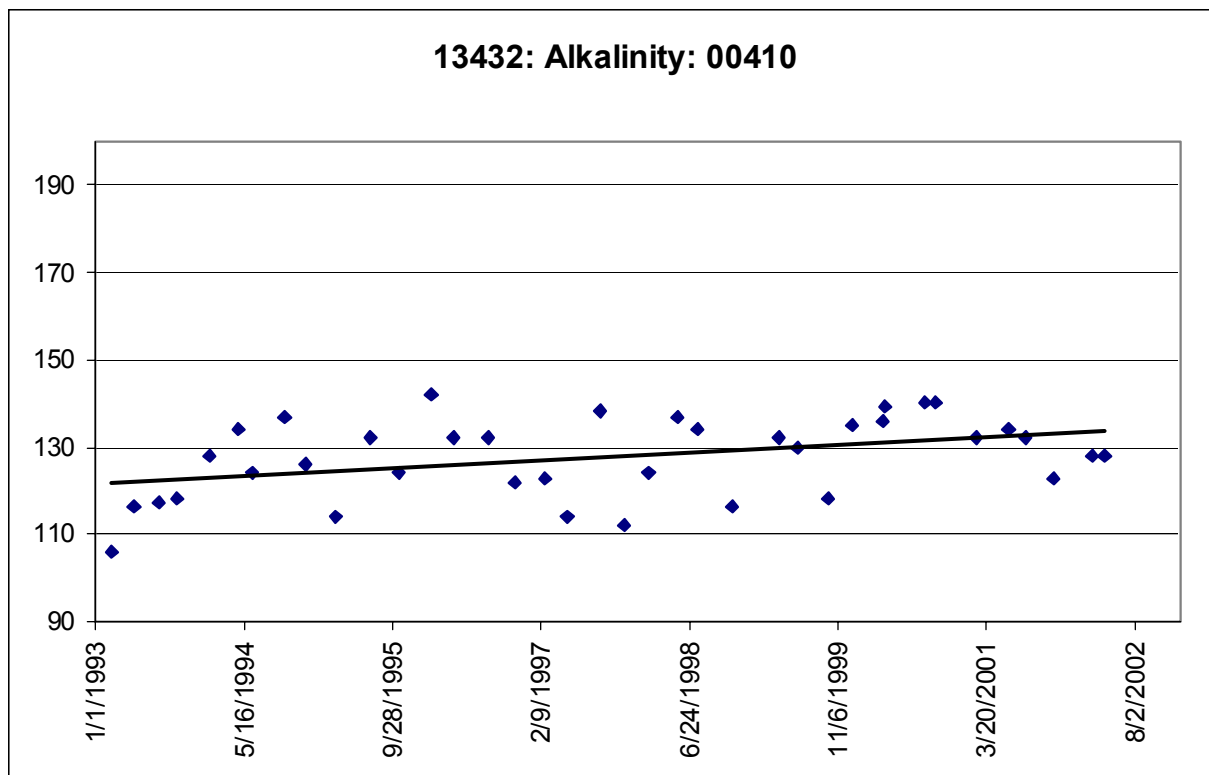
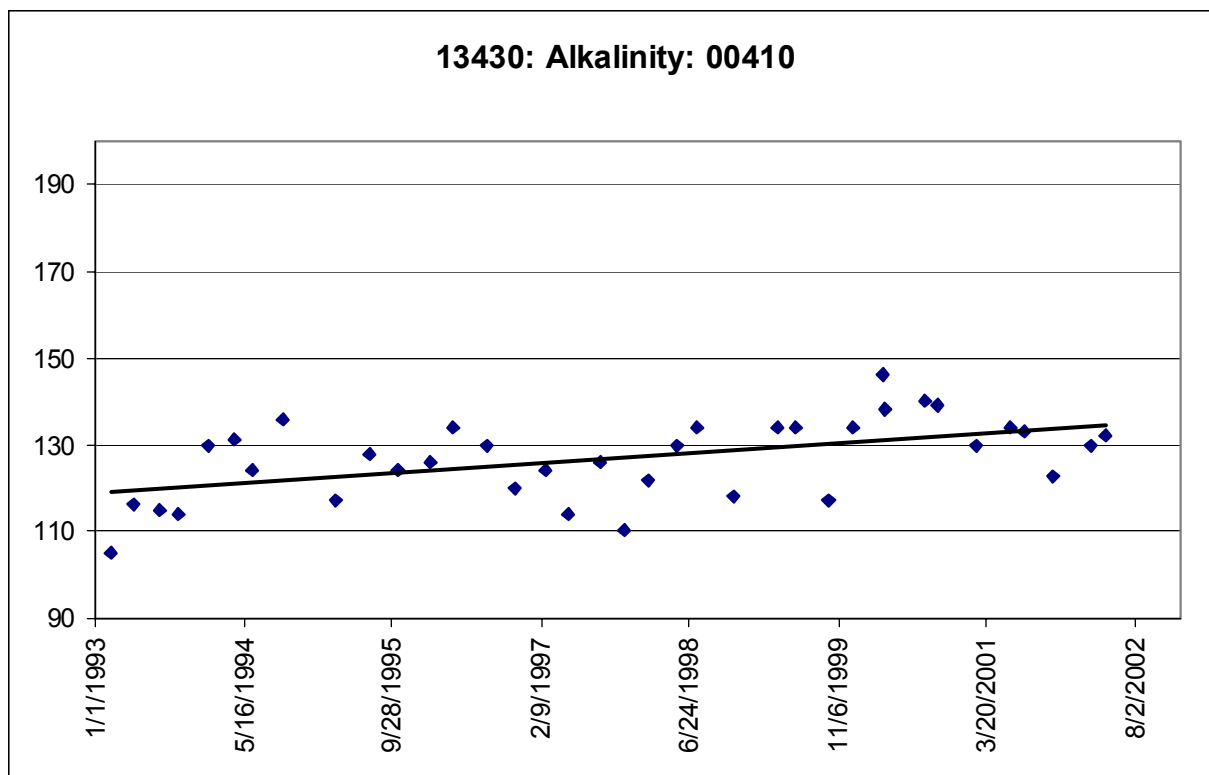
**Increasing Trends
Alkalinity – 00410
Marine**

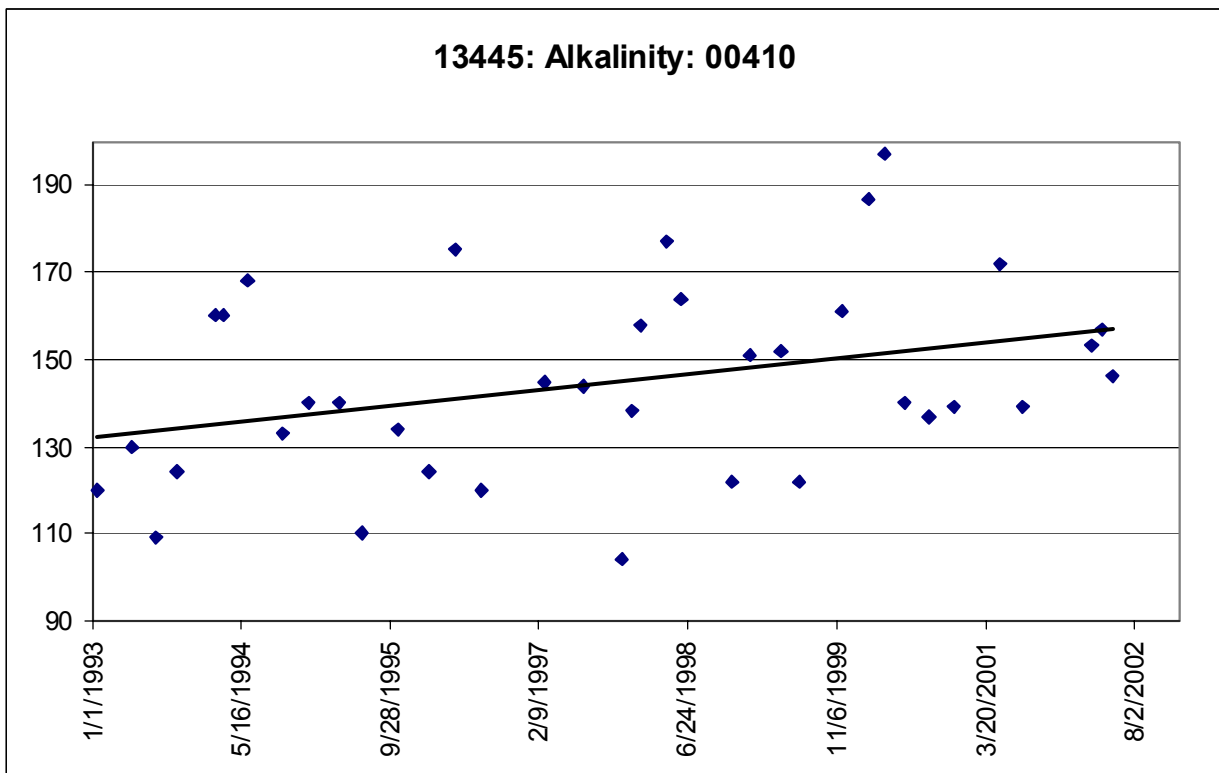
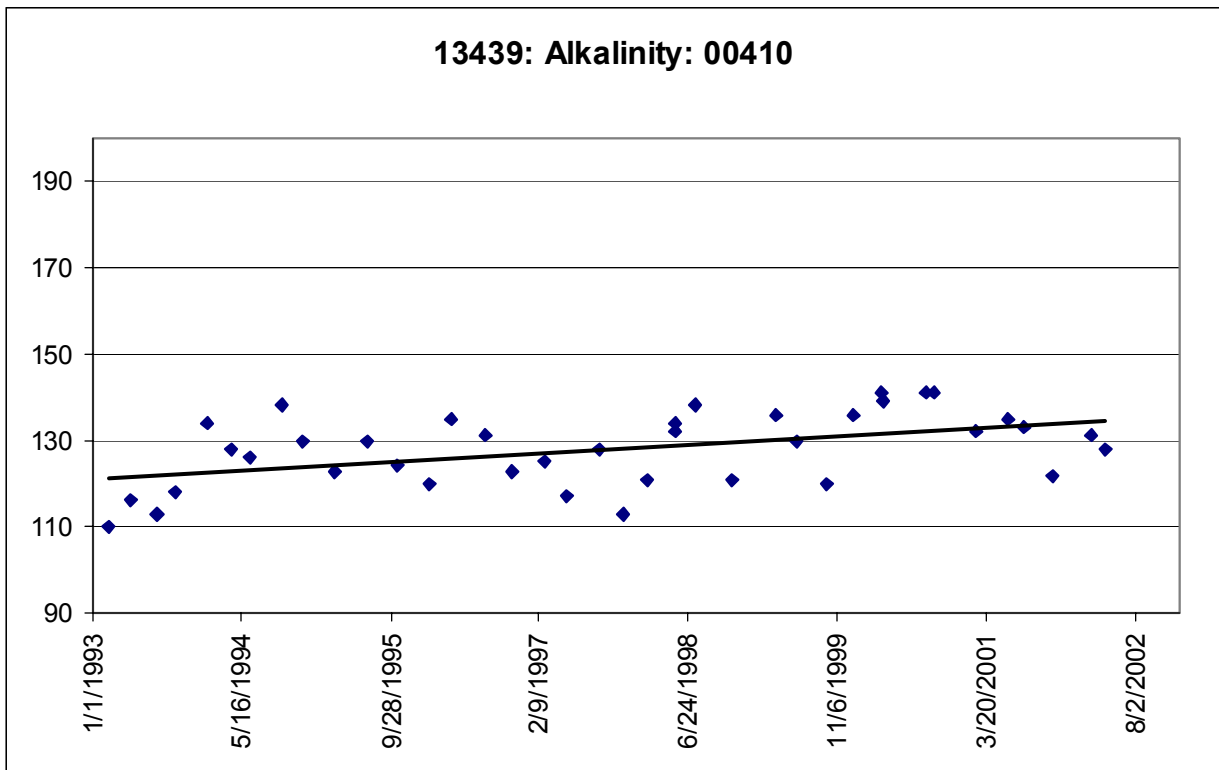
Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2463	13400	32	0.162752	2.414886	0.022044	91	178
2471	13402	33	0.358678	4.163847	0.000231	102	144
2473	13406	28	0.128793	1.960524	0.060731	104	156
2481	13407	40	0.138841	2.475189	0.017891	106	145
2482	13422	35	0.136797	2.286859	0.028752	104	152
2484	13430	37	0.262669	3.531076	0.001182	105	146
	13432	38	0.154198	2.56187	0.014743	106	142
	13439	39	0.2193	3.223871	0.002642	110	141
2491	13445	37	0.119893	2.183546	0.035788	104	197
	13446	31	0.183668	2.554361	0.016152	109	148
2493	13459	35	0.178599	2.67867	0.011434	108	136
2494	13460	32	0.199959	2.738266	0.010288	108	139

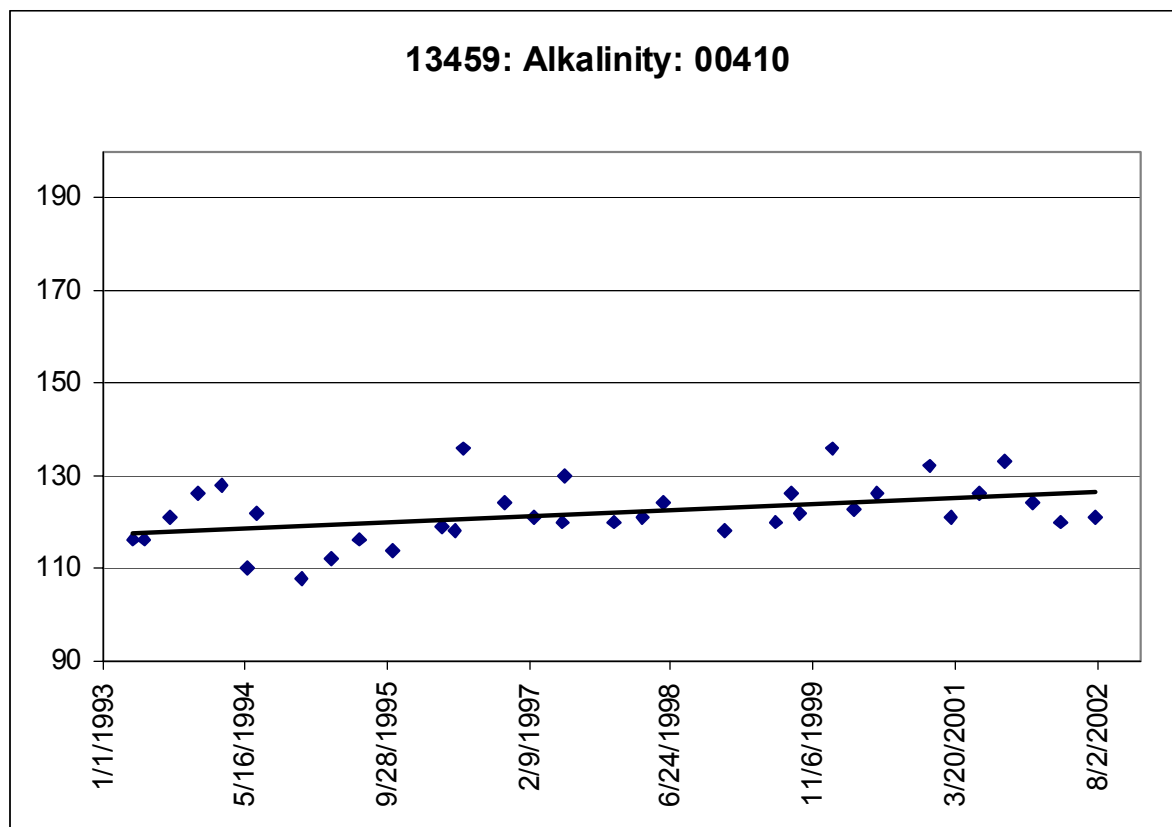
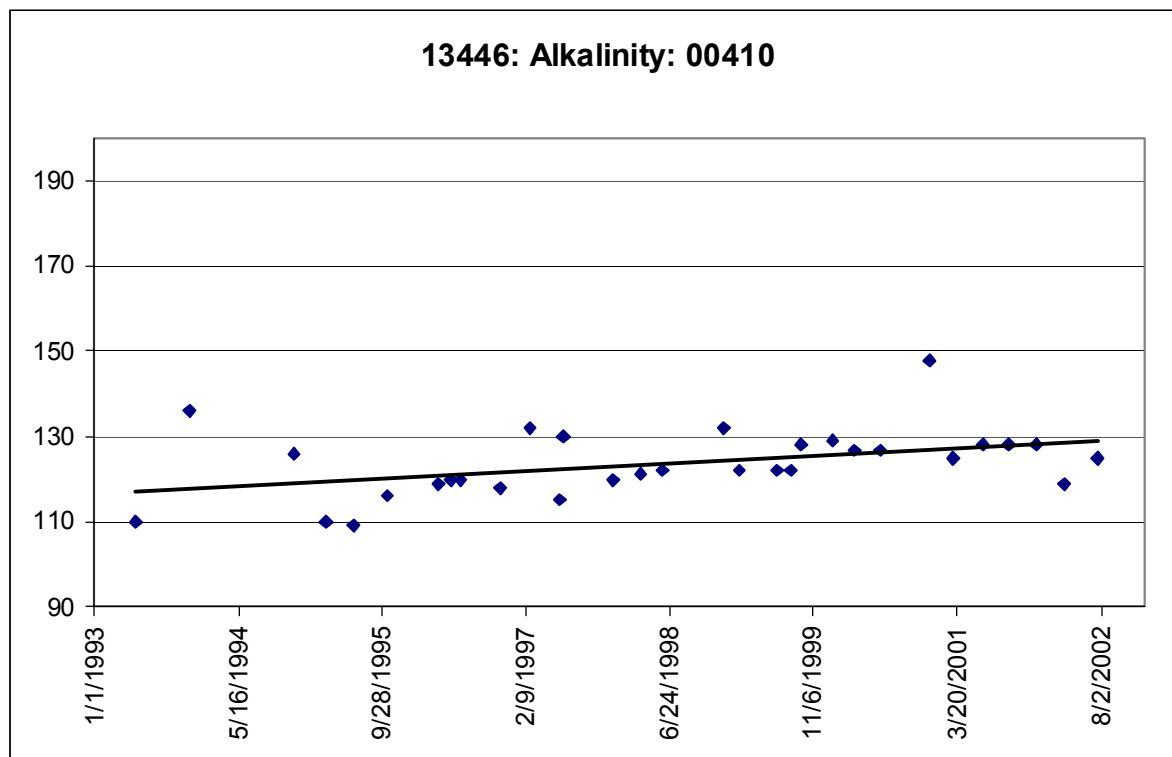


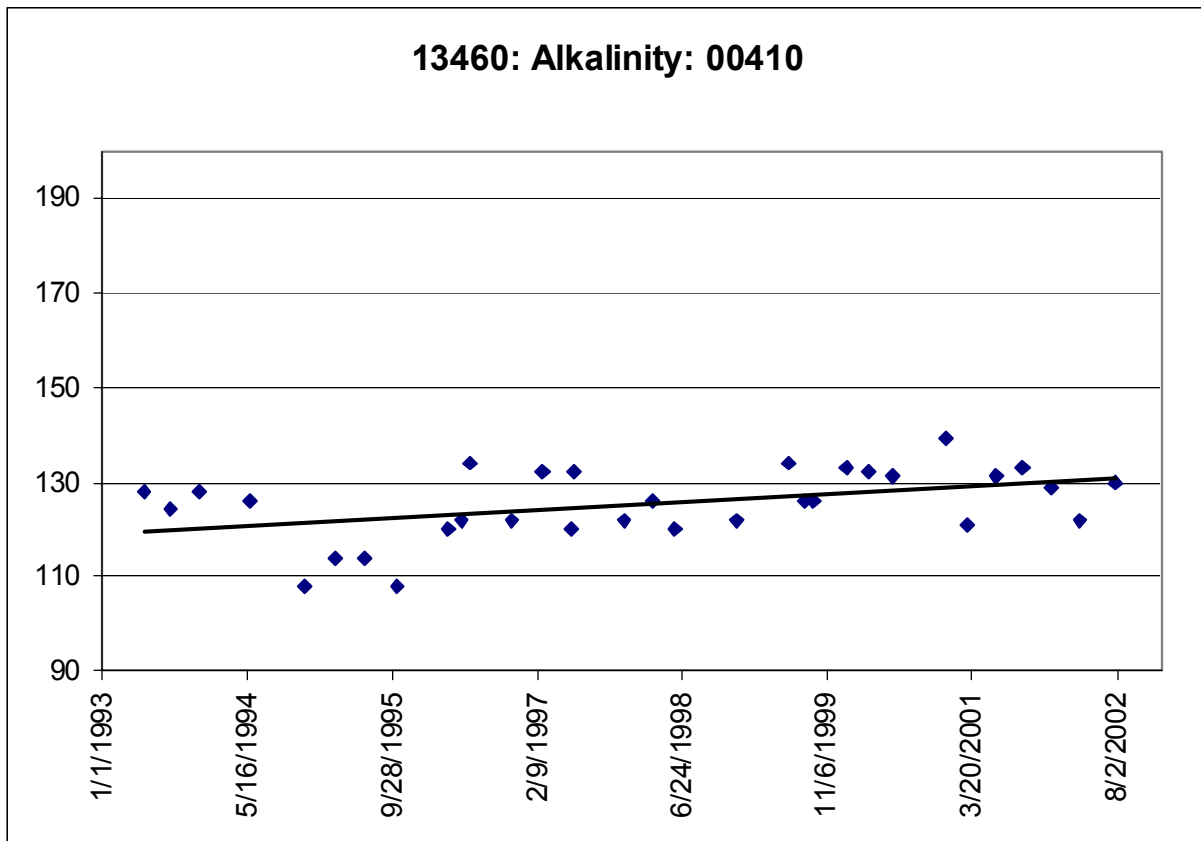




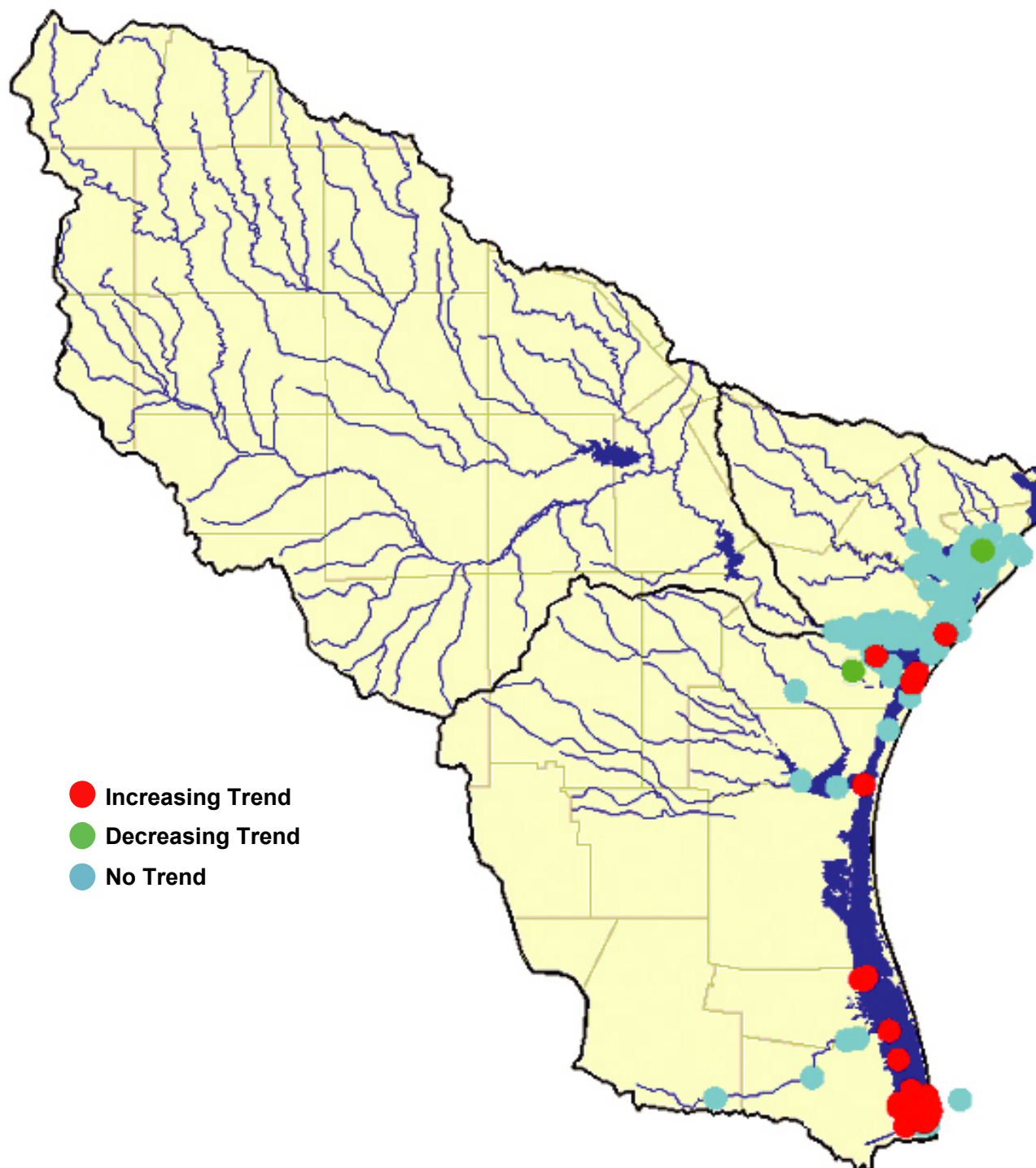








Salinity - 00480



Total Number of Data Sets Analyzed: 127

Decreasing Trends: 2

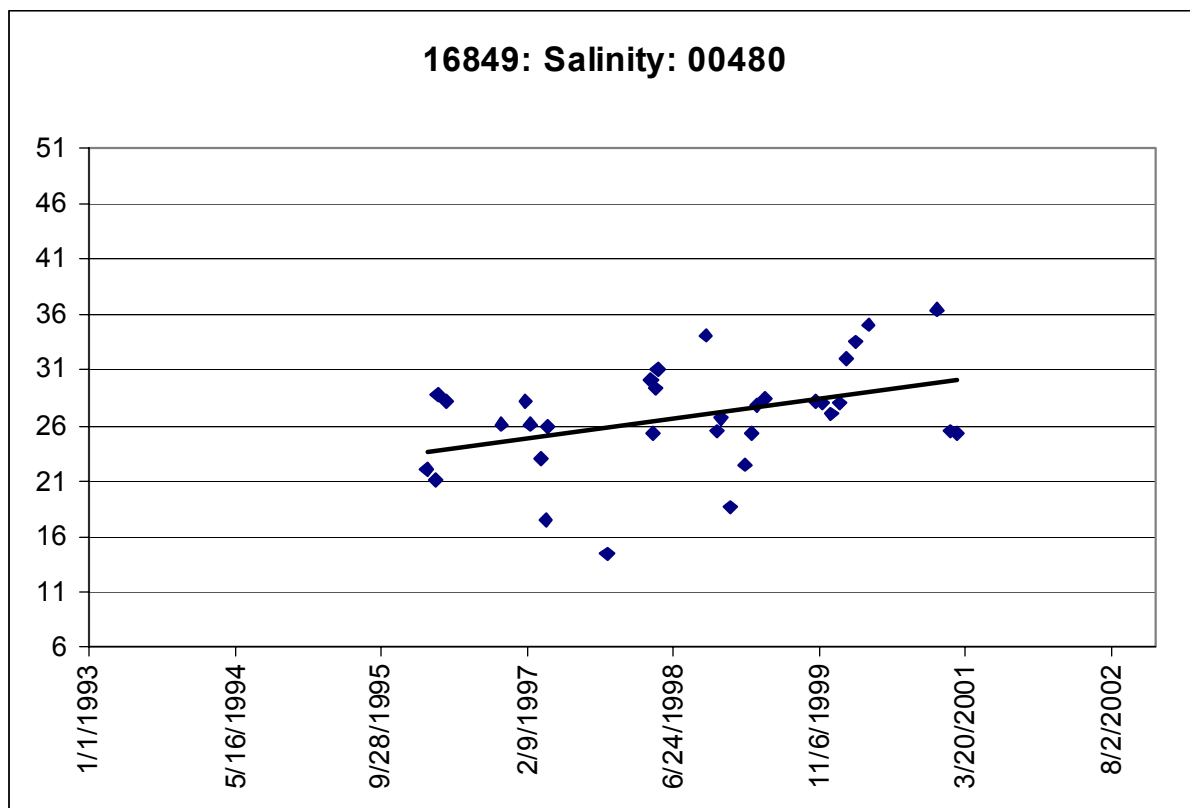
Increasing Trends: 30

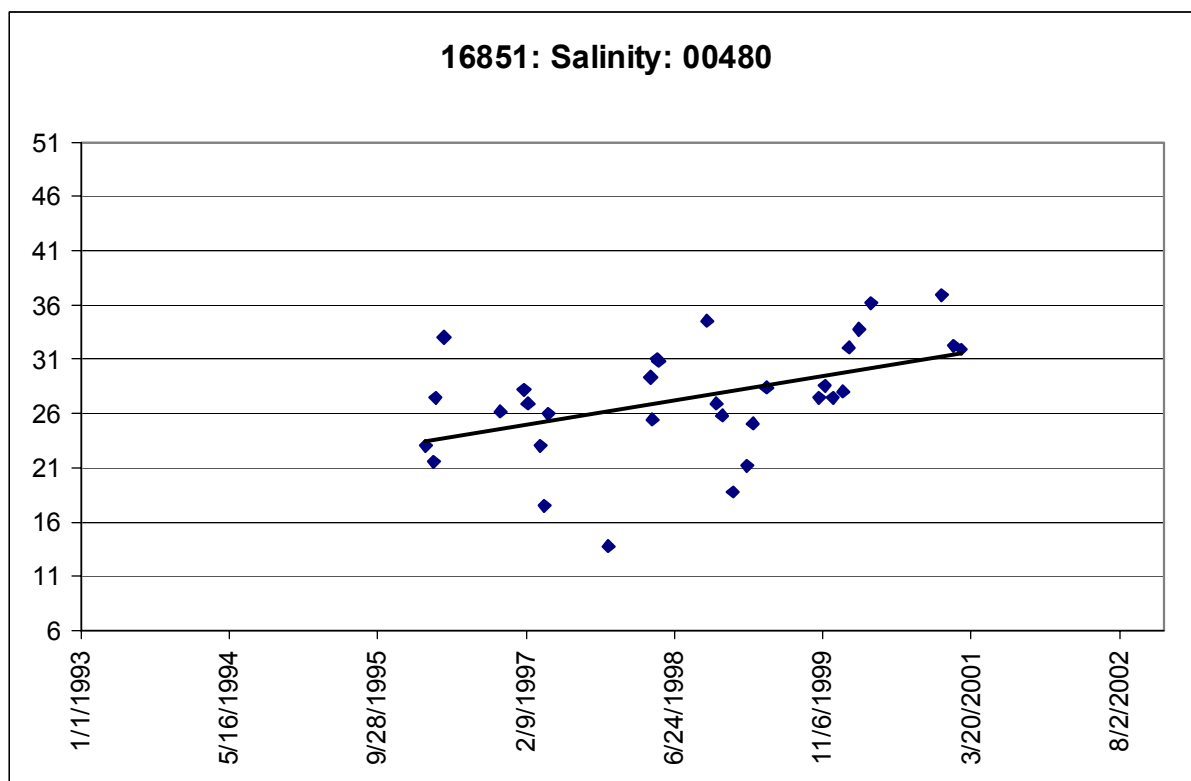
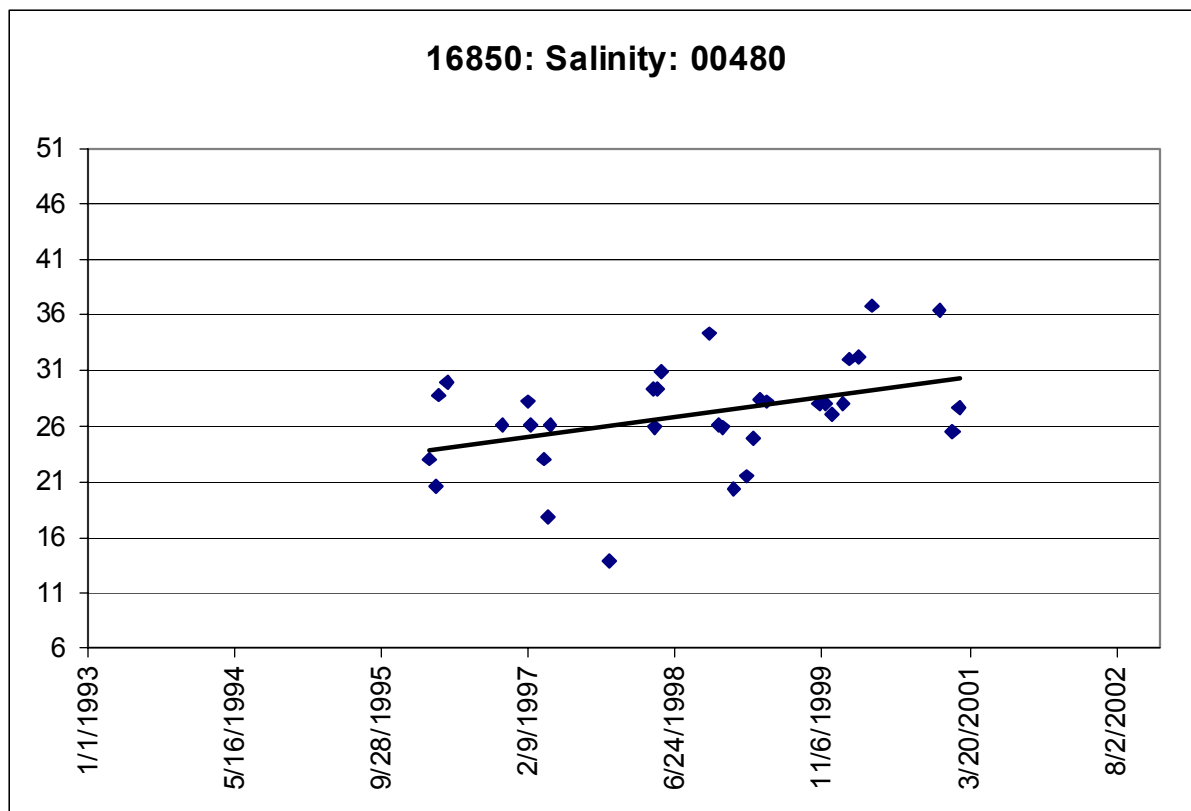
**Decreasing Trends
Salinity – 00480
Marine**

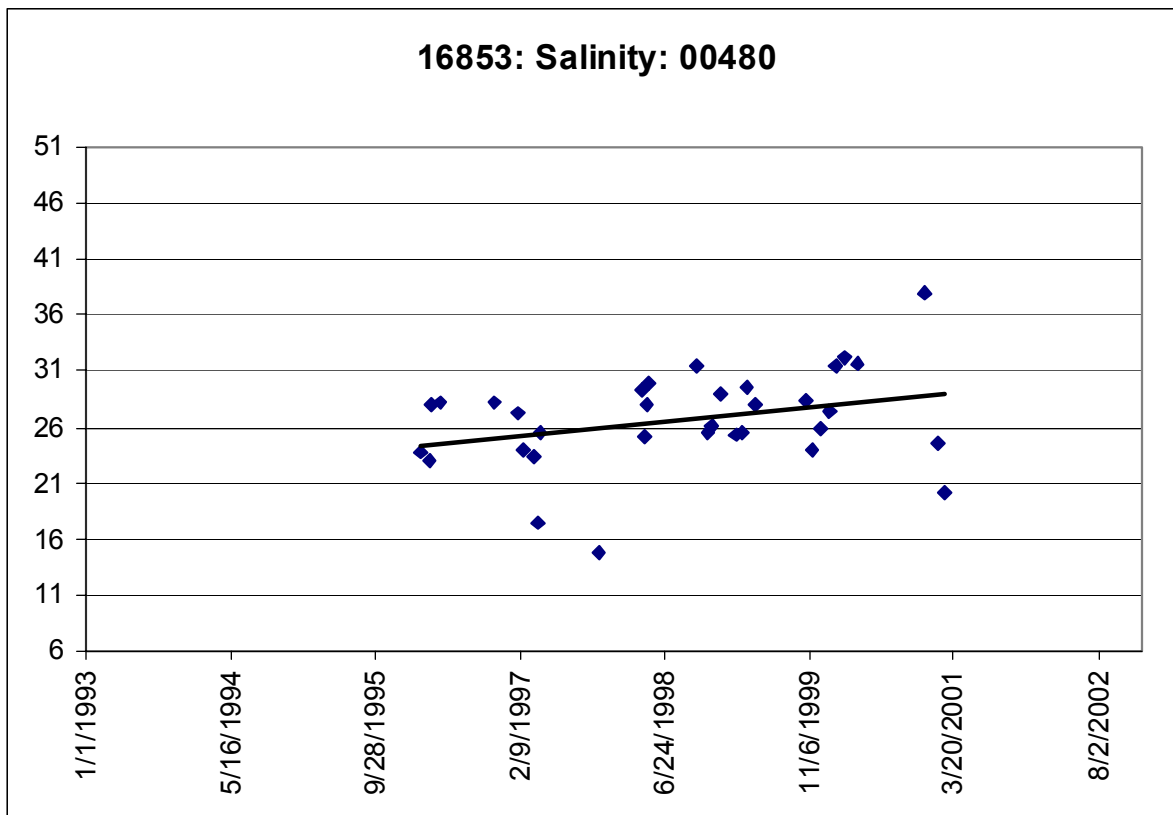
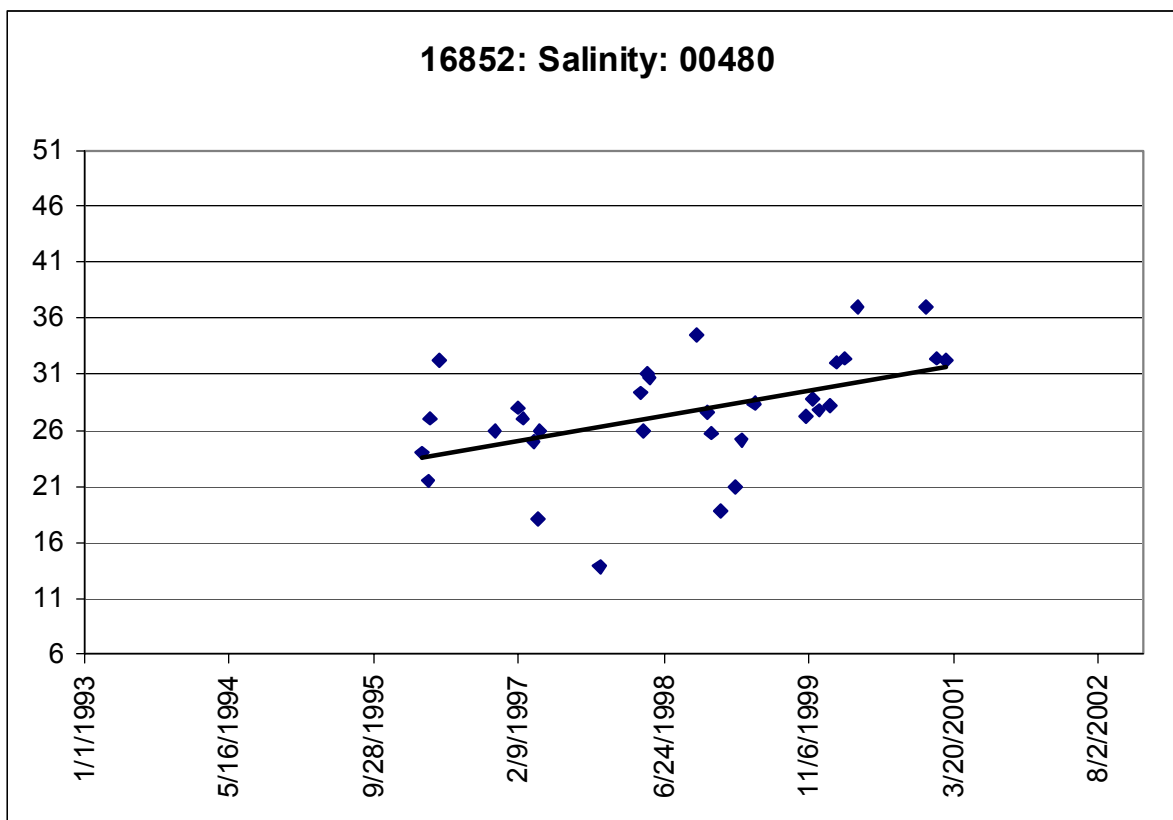
Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2473	15004	53	0.159636	-3.11256	0.003038	0.3	28.2
2485	13028	32	0.274078	-3.36553	0.002106	0.5	4.4

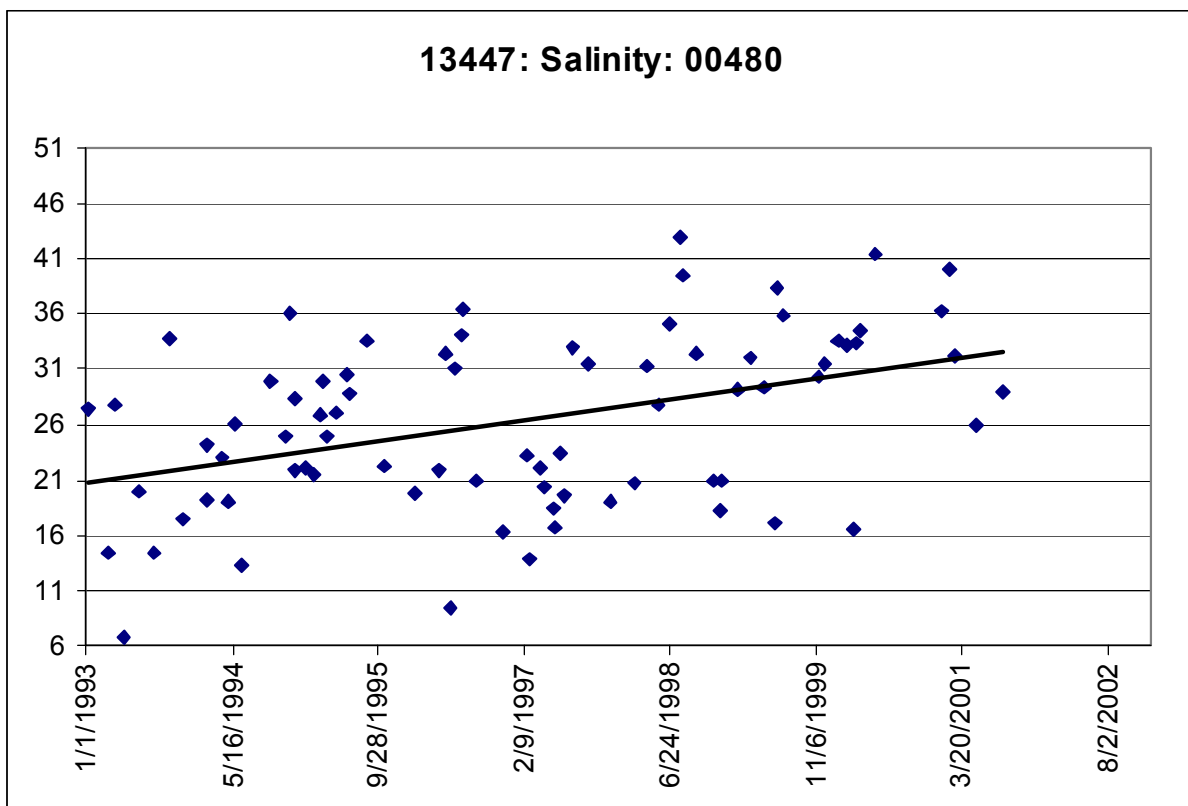
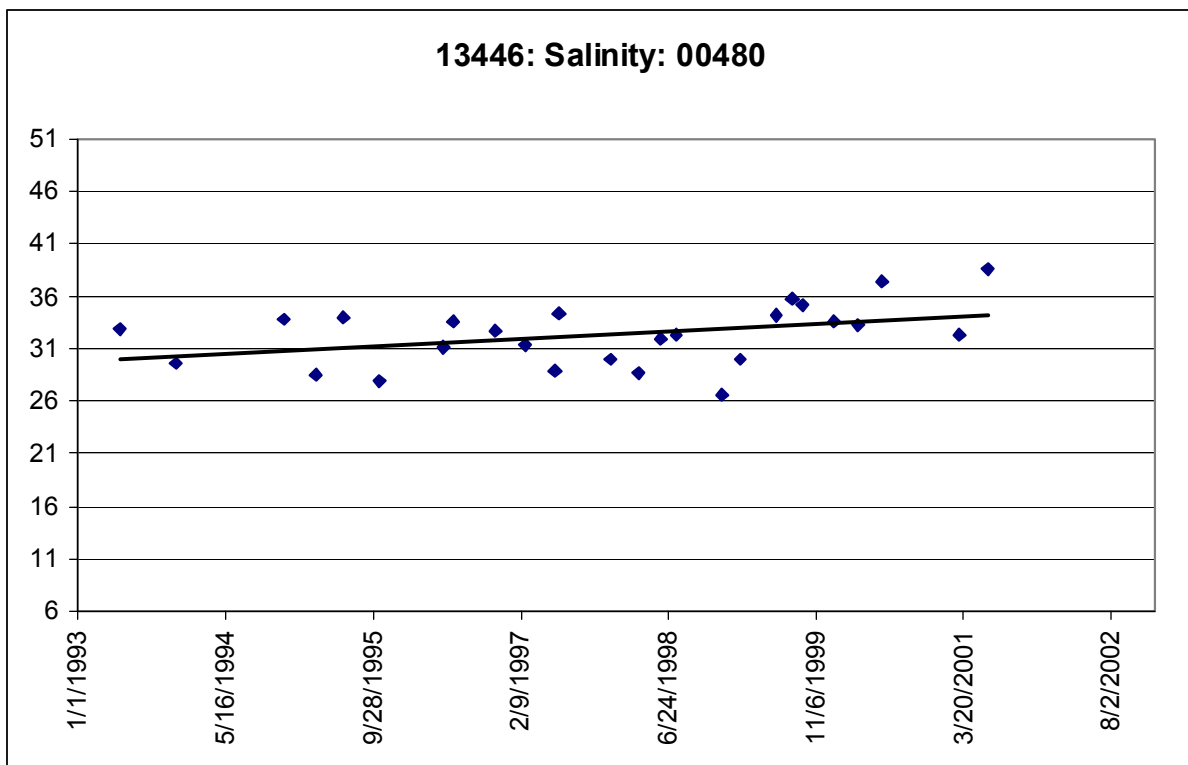
**Increasing Trends
Salinity – 00480
Marine**

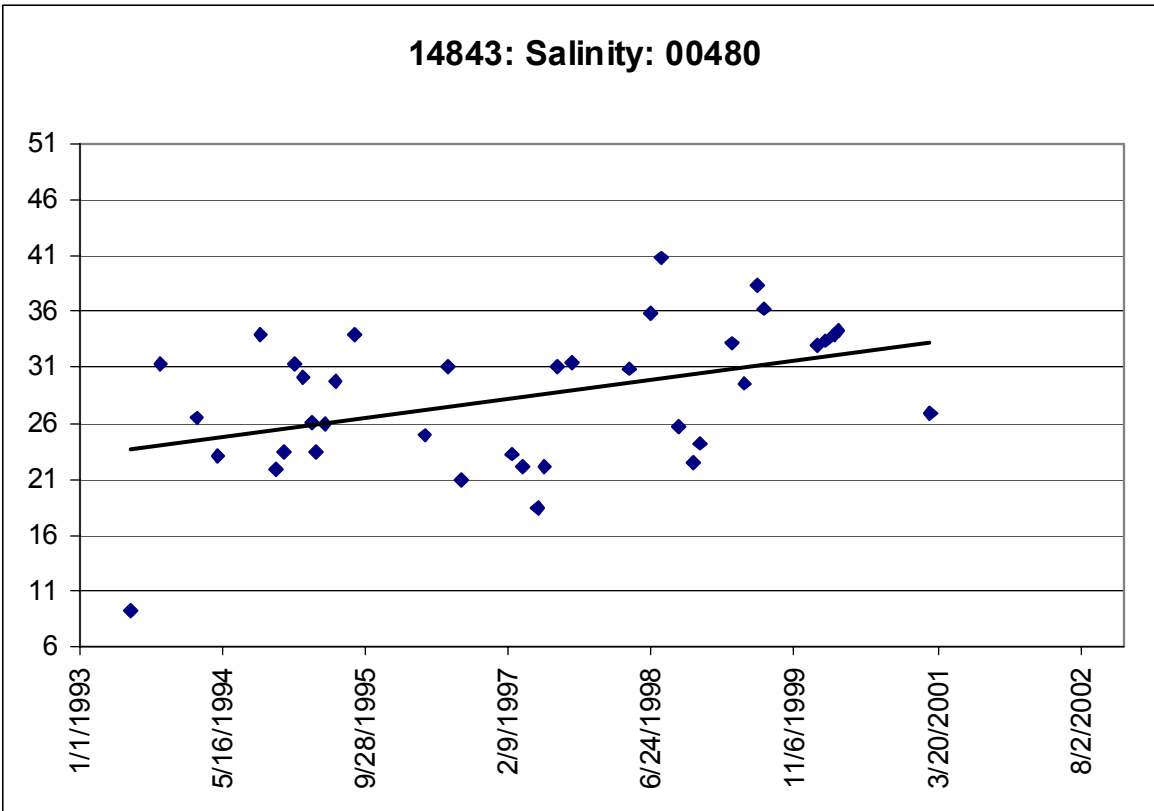
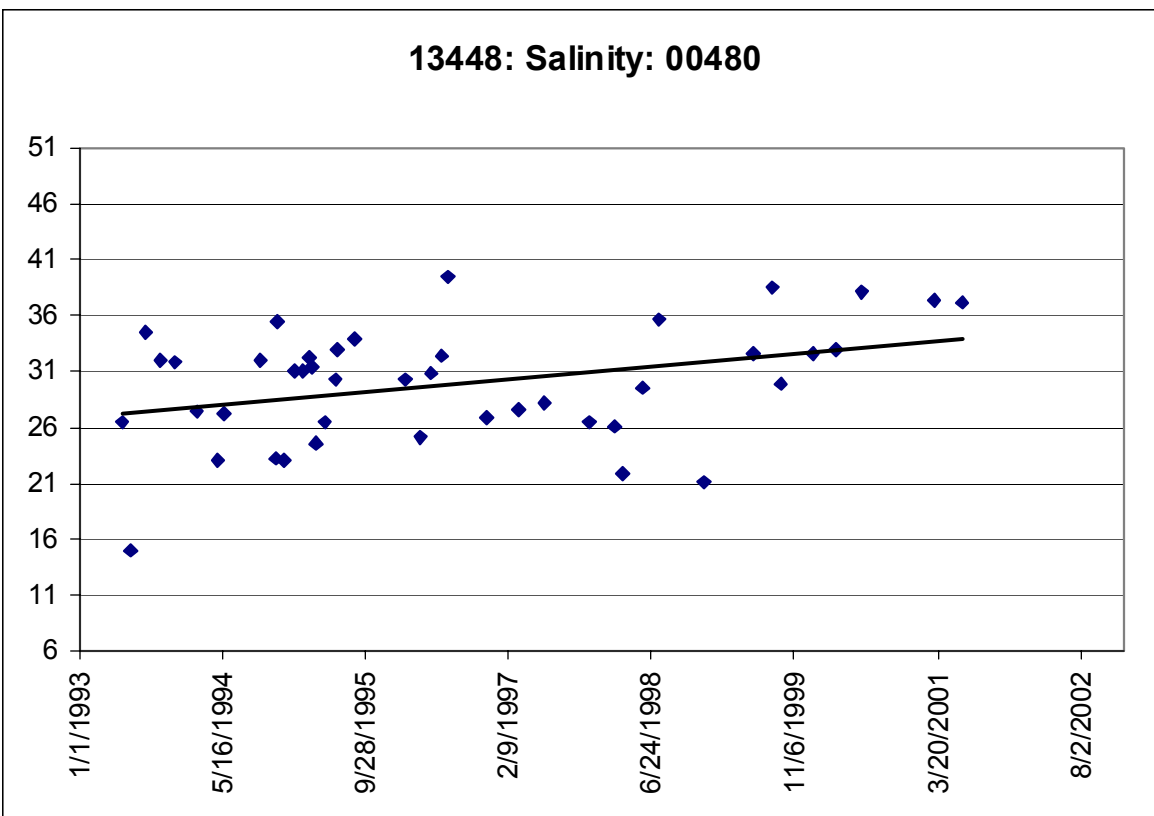
Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2481	13411	53	0.152	3.023487	0.003905	17.5	41.8
	16849	33	0.16264	2.4538	0.019955	14.5	36.5
	16850	33	0.163523	2.461749	0.01959	13.8	36.9
	16851	32	0.218458	2.895802	0.006992	13.8	37
	16852	32	0.223712	2.940315	0.006259	13.8	37.1
	16853	33	0.10078	1.863952	0.071824	14.9	38
	16854	23	0.115262	1.654039	0.112991	15	31.5
2491	13444	25	0.525289	5.044849	4.17E-05	24.7	50.4
	13446	26	0.154093	2.090908	0.0473	26.5	38.7
	13447	78	0.174164	4.003497	0.000144	6.7	43
	13448	43	0.134724	2.526606	0.015472	15	39.5
	14843	38	0.186519	2.873025	0.006778	9.2	40.8
	14844	43	0.216801	3.368888	0.001653	18.9	44.4
	14845	43	0.263358	3.828574	0.000433	18.5	37.5
	14861	50	0.198281	3.445488	0.001194	18.5	36.7
	14862	50	0.193827	3.397144	0.001377	19	36.5
	14863	51	0.210382	3.613211	0.000712	16.5	36.7
	14868	50	0.227801	3.762998	0.000457	17.7	36.7
	14869	50	0.216125	3.63789	0.00067	18.5	37.1
	14870	50	0.22205	3.701438	0.000552	18.5	37.1
	14876	50	0.331866	4.882818	1.2E-05	17.7	36.4
	14877	49	0.227305	3.718345	0.000534	18.5	36.6
	14878	50	0.171394	3.150966	0.002801	19	36.6
	14879	51	0.217158	3.686799	0.000568	16.2	36.3
	17100	30	0.16002	2.309574	0.028502	18	40
	17117	25	0.138641	1.924053	0.066809	19	42.8
2493	13459	51	0.236365	3.89446	0.000298	21.2	38.7
	14855	49	0.10618	2.362901	0.022322	18	38.8
	14880	49	0.21026	3.537405	0.000921	18.5	36.6
2494	13460	77	0.194004	4.248831	6.1E-05	16.3	38.1

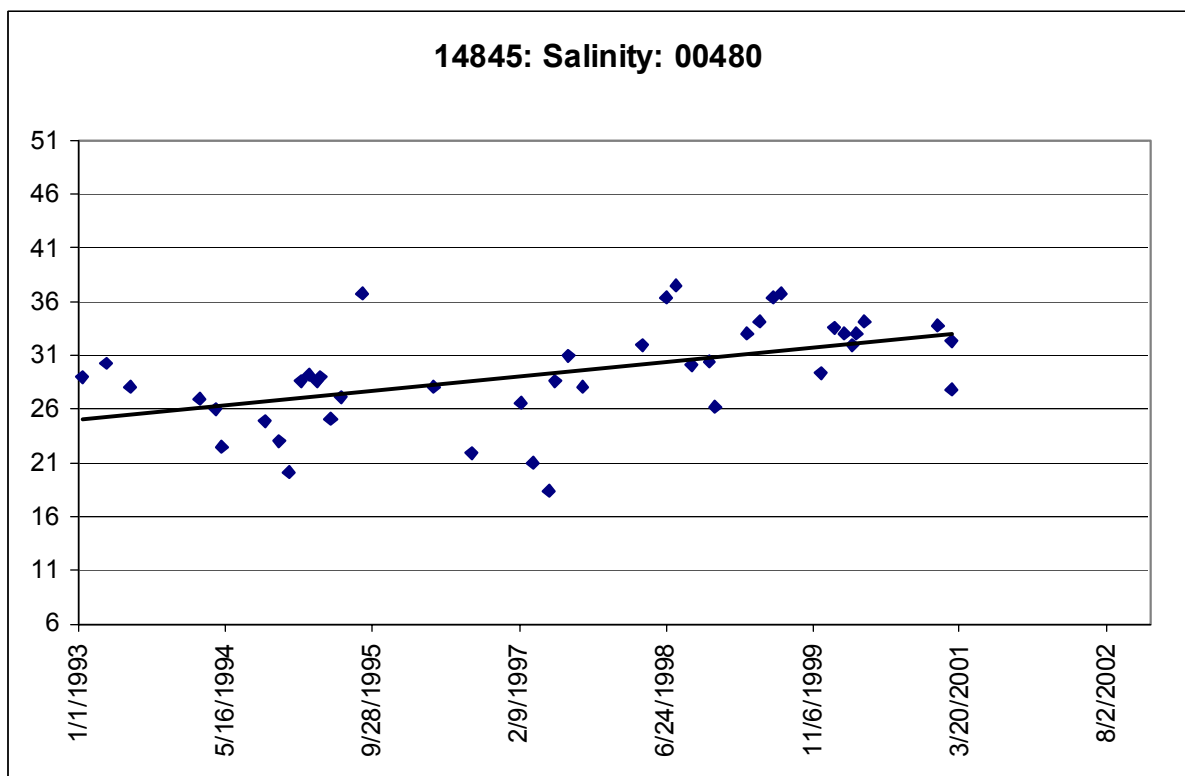
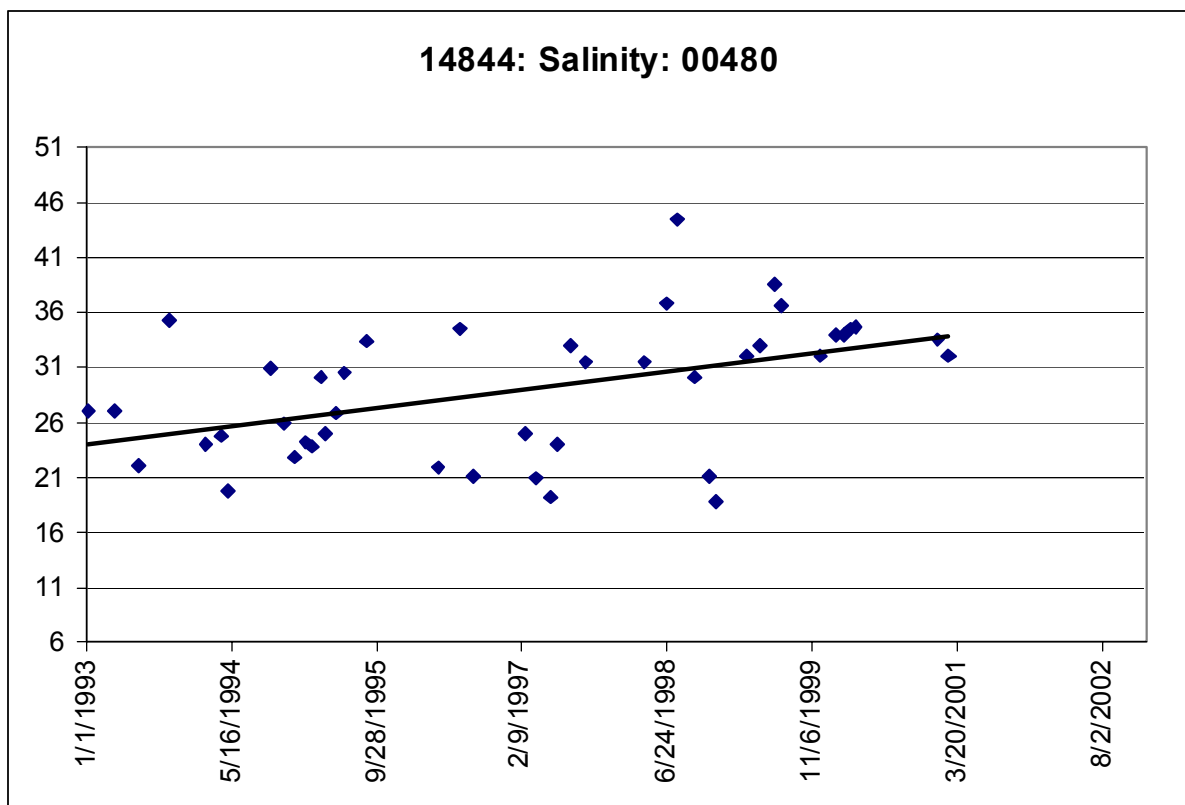


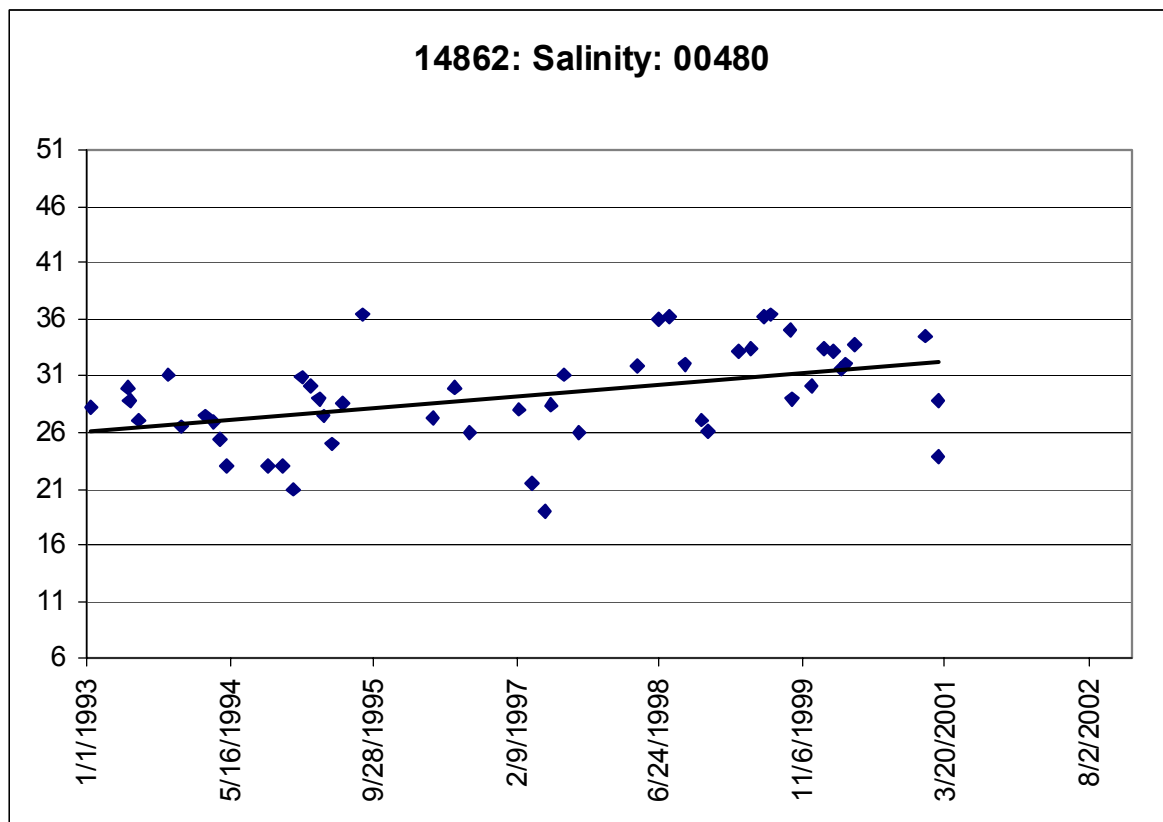
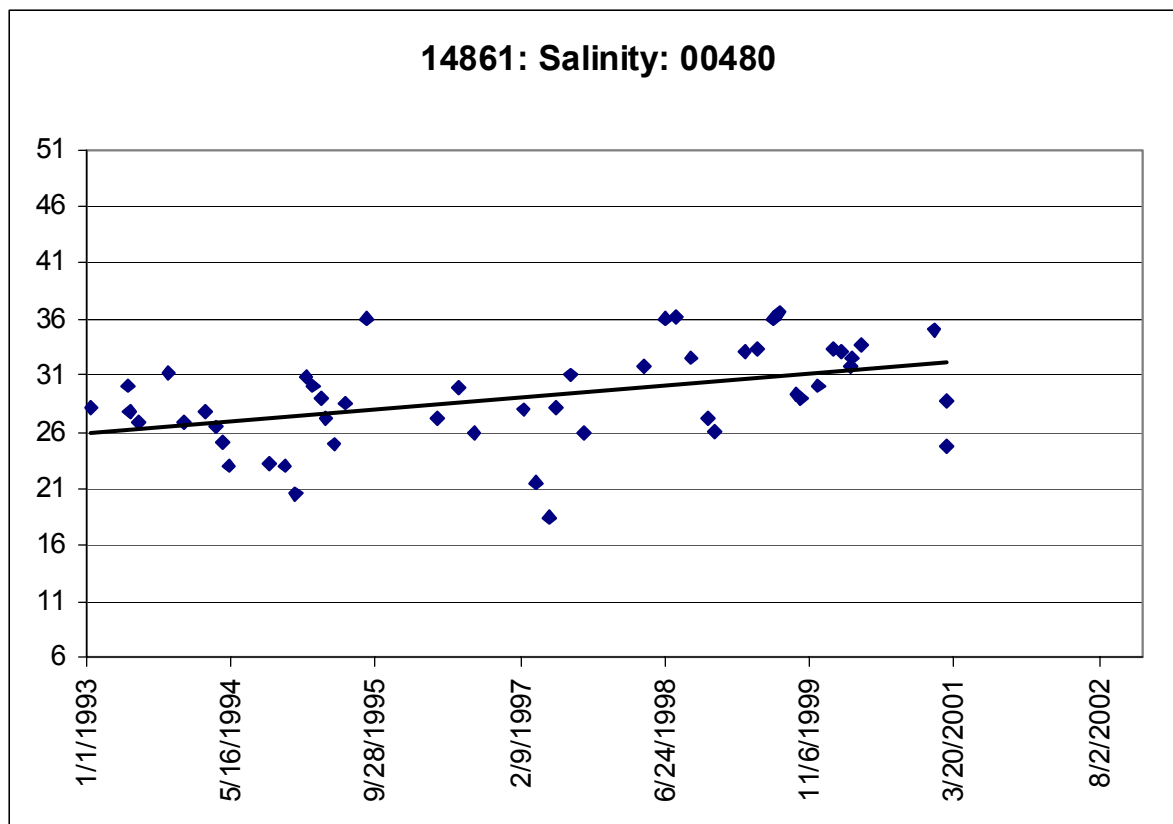


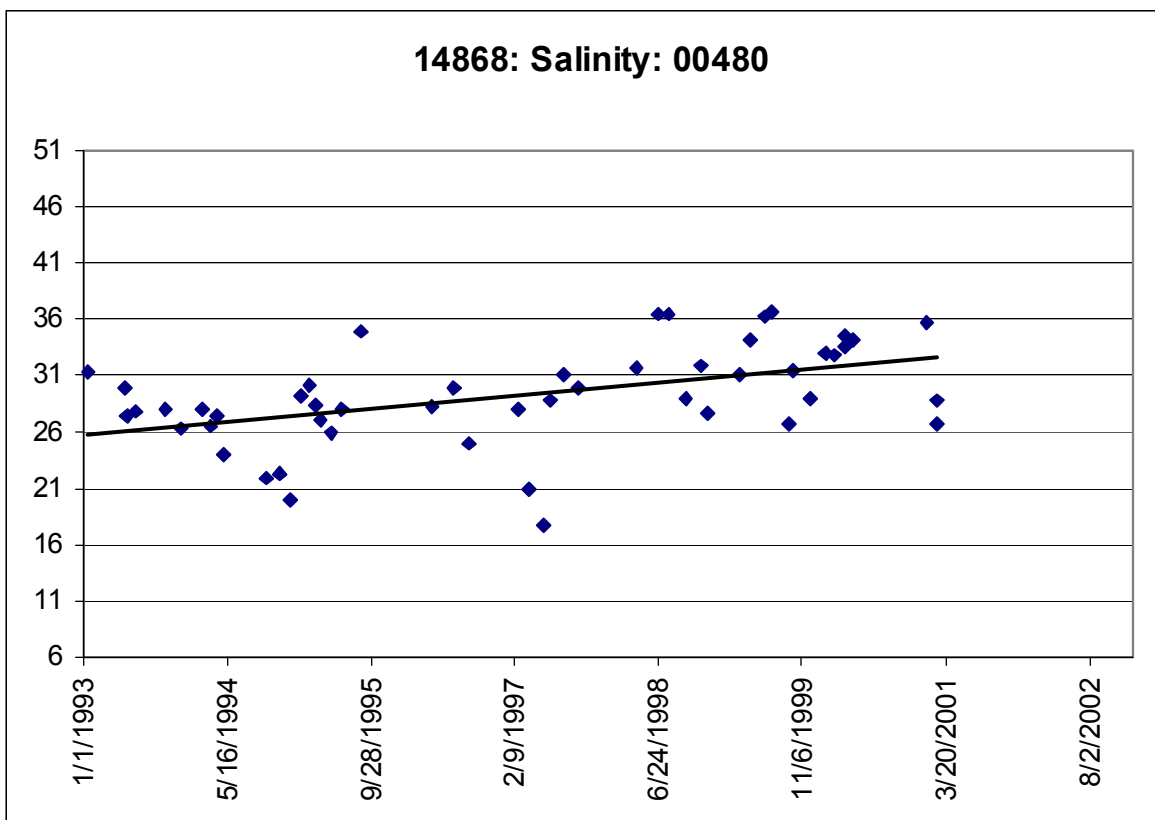
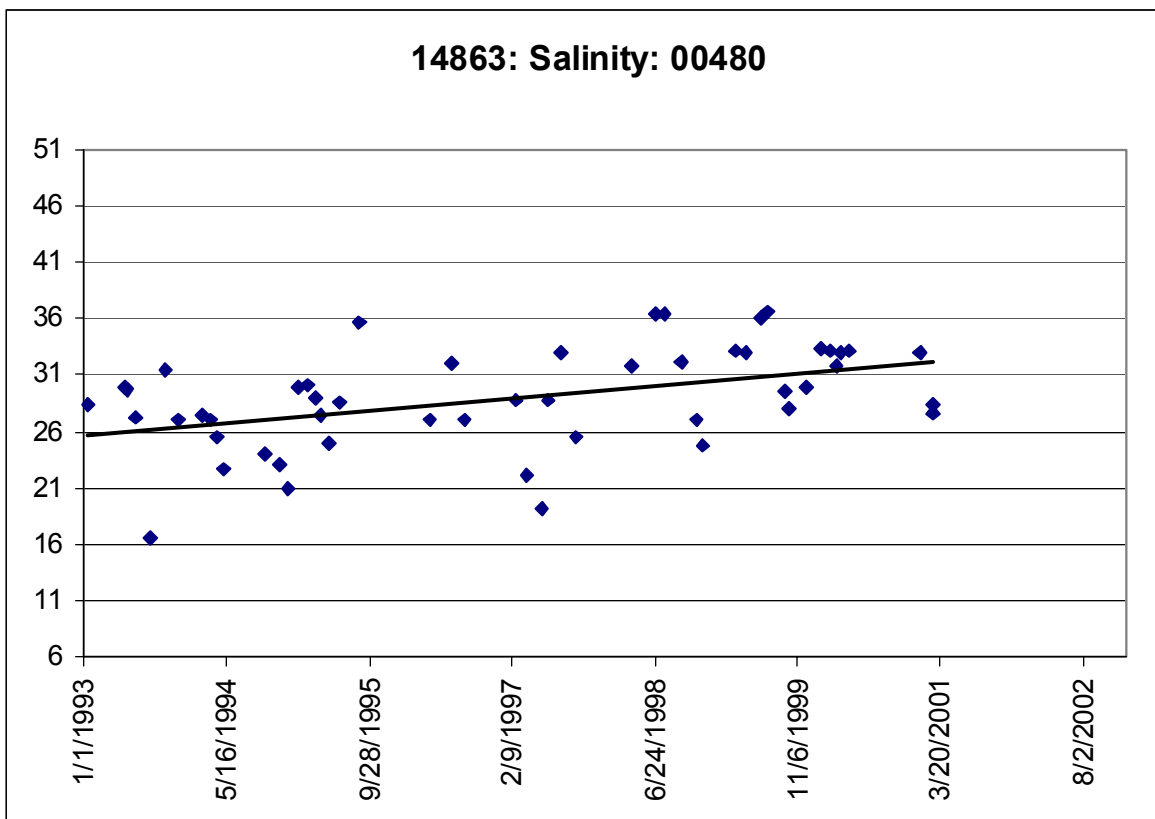


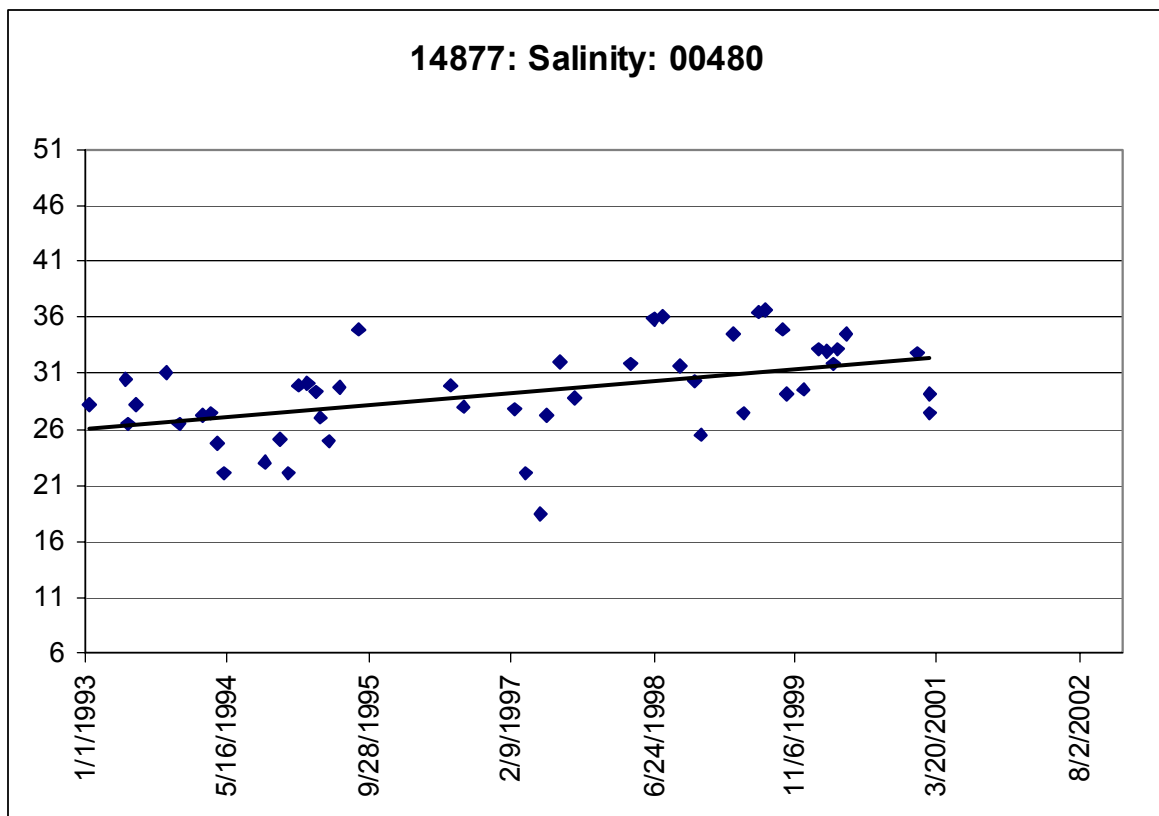
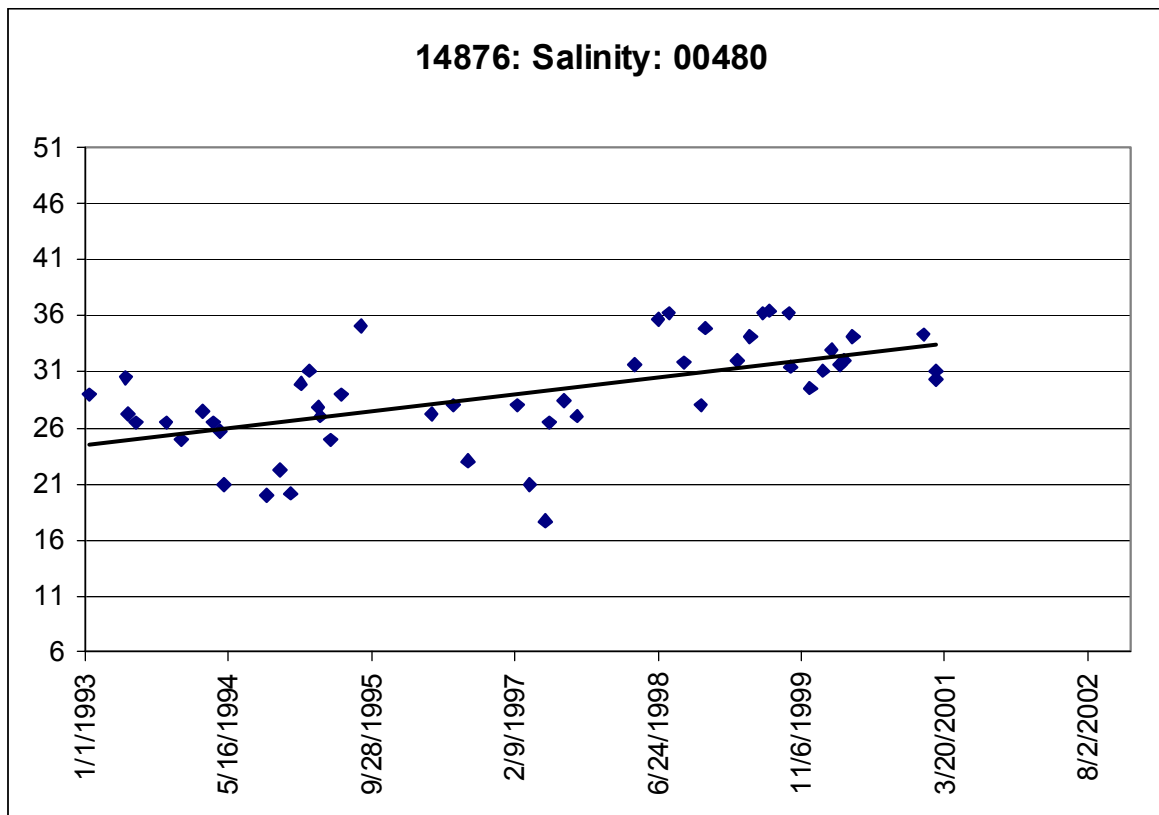


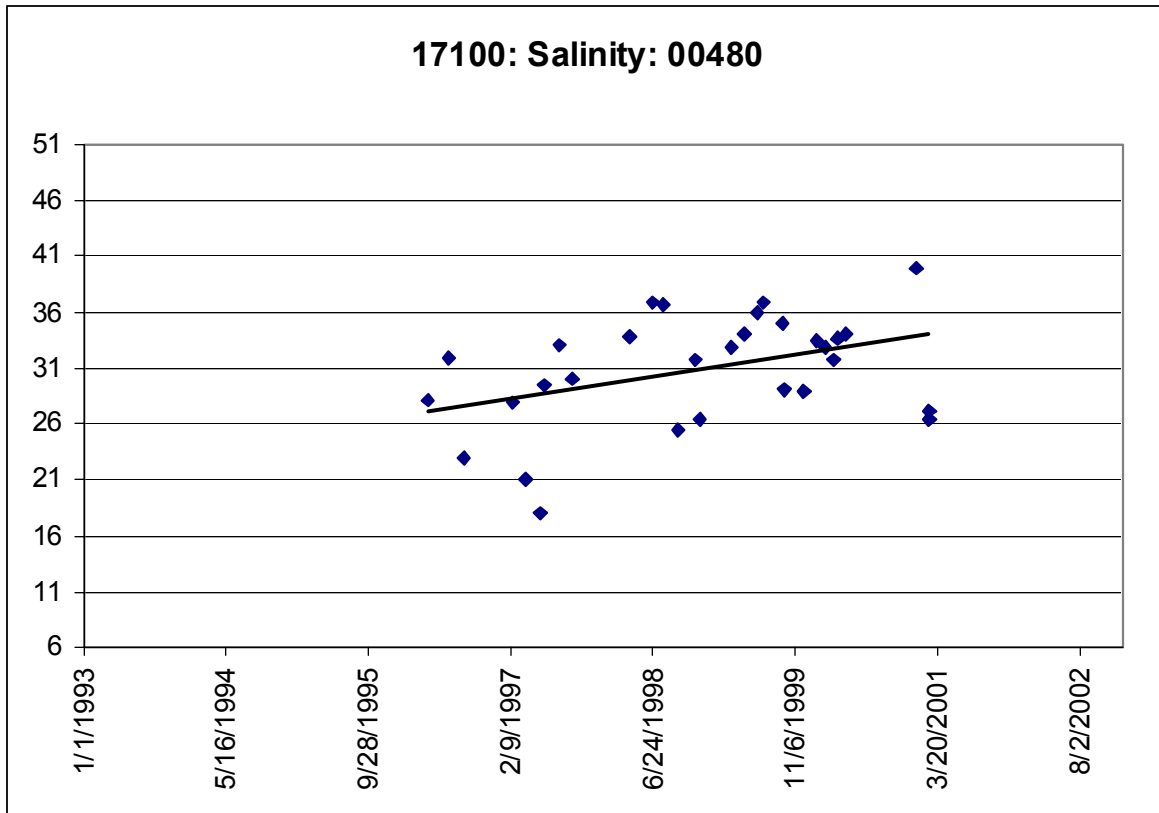


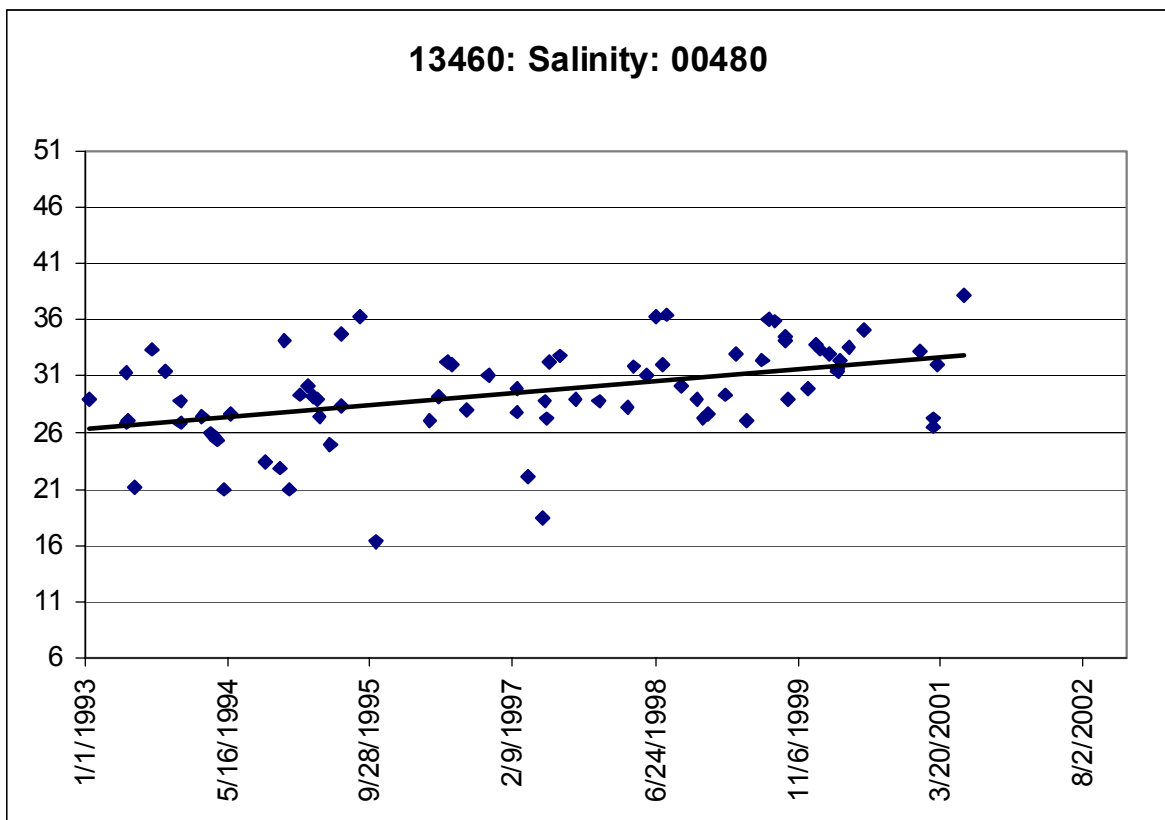
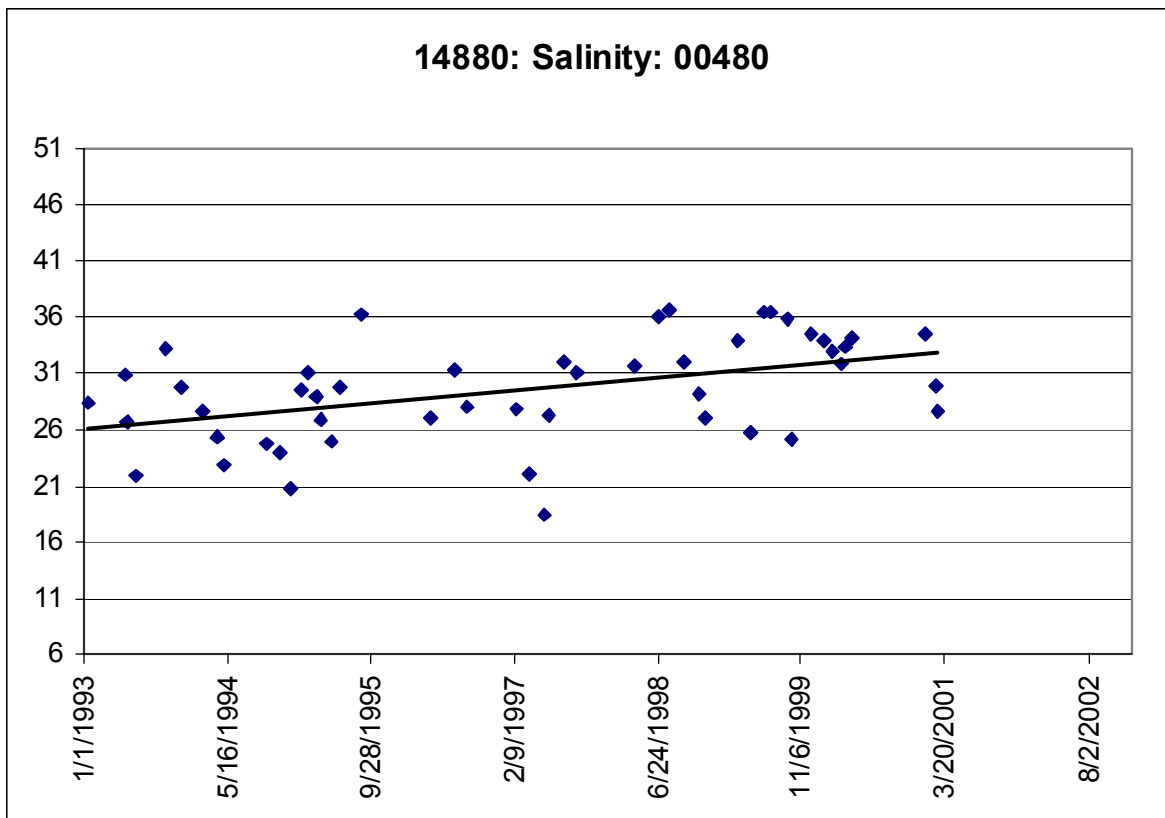




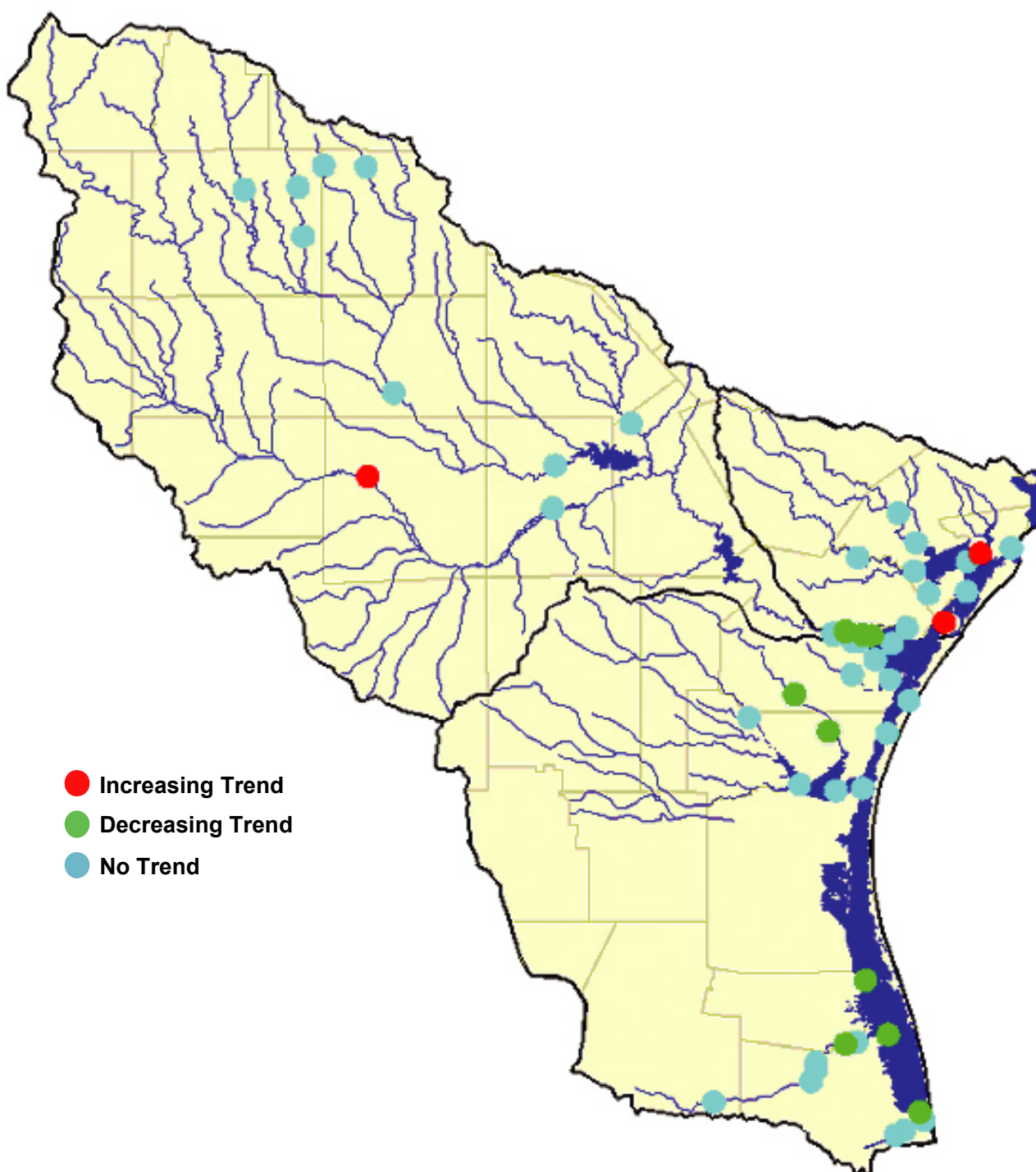








Total Suspended Solids - 00530



Total Number of Data Sets Analyzed: 52

Decreasing Trends: 9

Increasing Trends: 3

Decreasing Trends
Total Suspended Solids – 00530
Tidal

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2201	13071	40	0.139918	-2.48633	0.017418	7	316
2203	13090	27	0.135722	-1.98139	0.058647	29	1220

Decreasing Trends
Total Suspended Solids – 00530
Non-Tidal

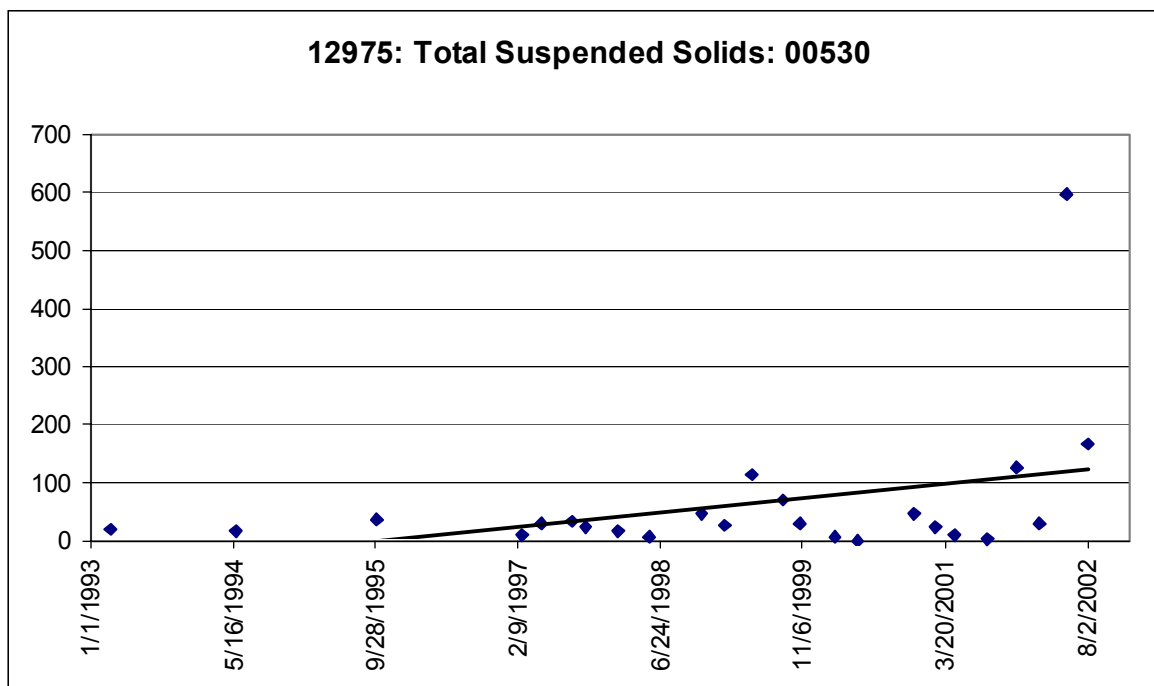
Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2204	13094	33	0.137252	-2.22074	0.03381	8	256

Decreasing Trends
Total Suspended Solids – 00530
Marine

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2482	13421	34	0.116646	-2.05562	0.048056	6	296
	13422	33	0.130359	-2.15566	0.038986	9	270
	13425	36	0.127574	-2.22975	0.032474	8	668
2491	13446	30	0.150404	-2.2264	0.03421	6	105
	13447	37	0.170532	-2.68248	0.011079	10	115
	13448	33	0.165593	-2.48035	0.018761	6	154

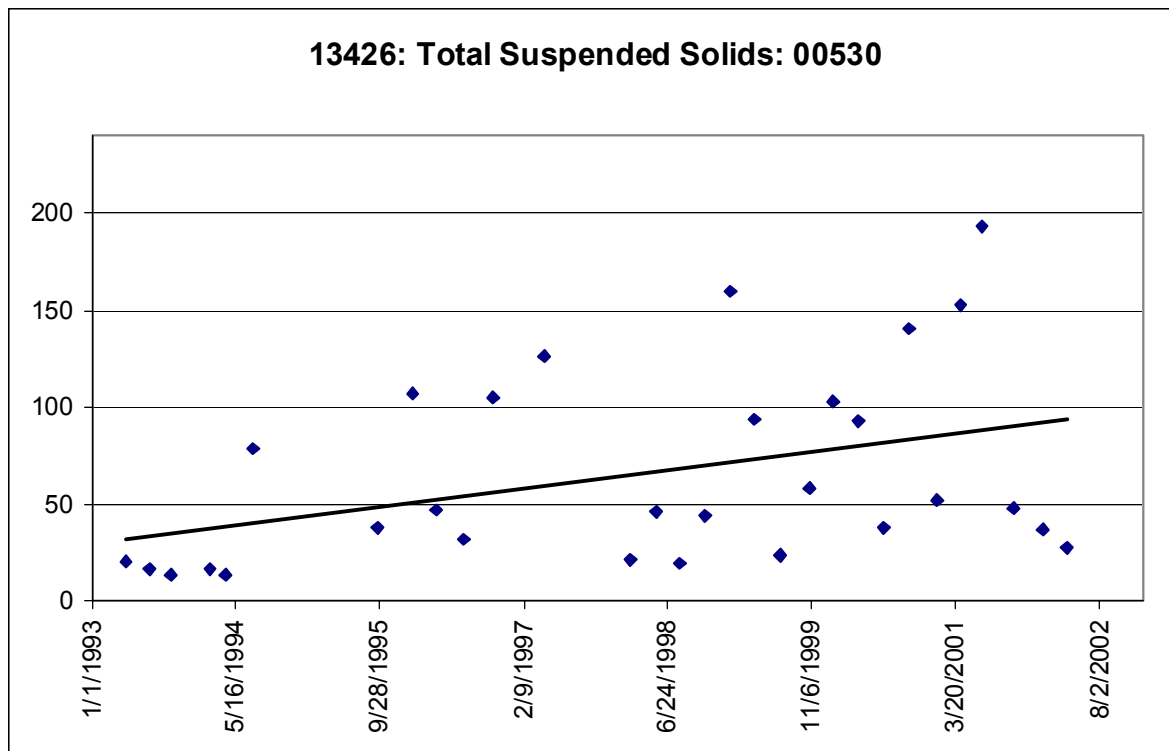
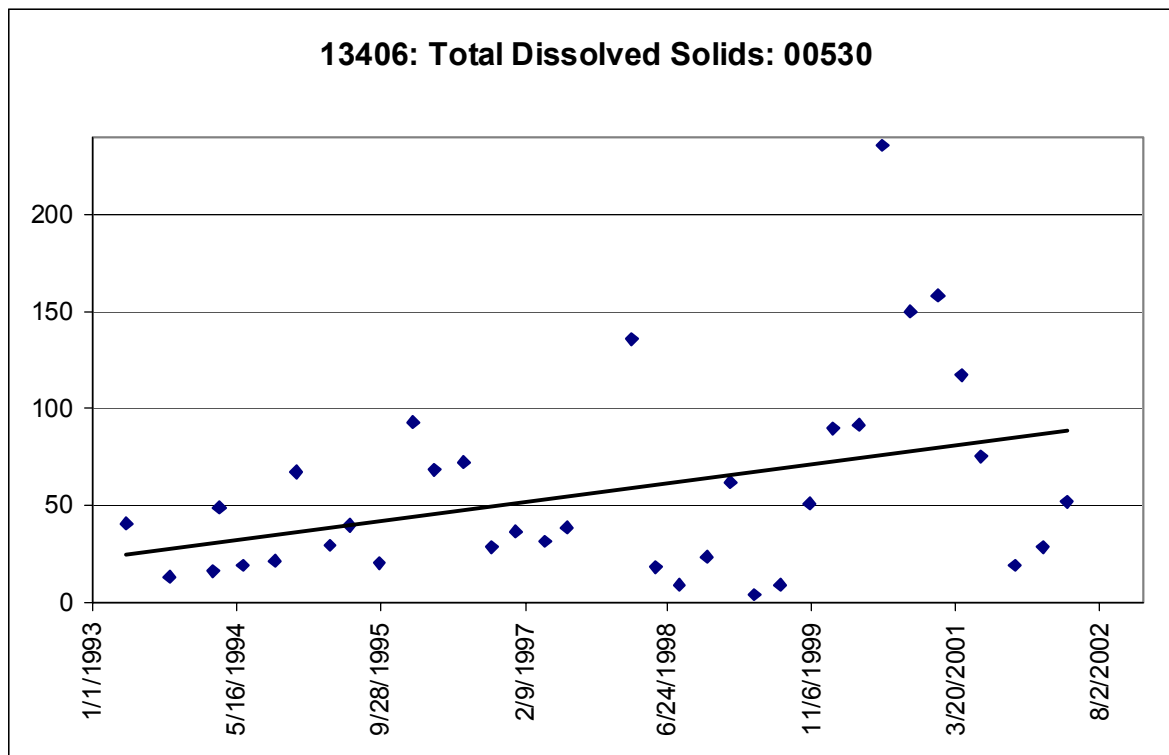
Increasing Trends
Total Suspended Solids – 00530
Non-Tidal

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2105	12975	24	0.140339	1.895122	0.071293	1	596

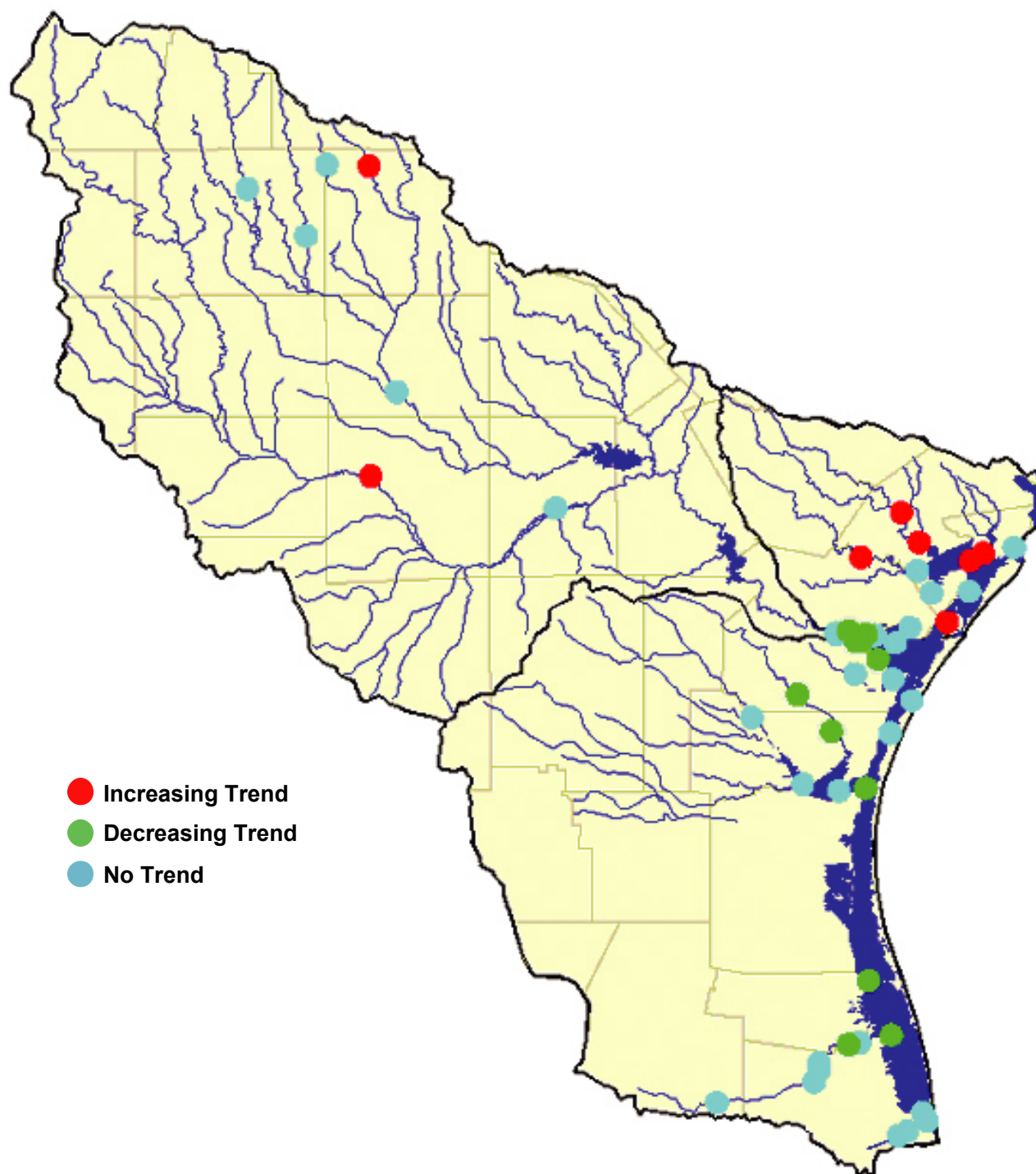


Increasing Trends
Total Suspended Solids – 00530
Marine

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2473	13406	35	0.145323	2.368776	0.023855	4	236
2483	13426	38	0.150269	2.225217	0.034298	13	193



Volatile Suspended Solids - 00535



Total Number of Data Sets Analyzed: 49

Decreasing Trends: 11

Increasing Trends: 8

Decreasing Trends
Volatile Suspended Solids – 00535
Tidal

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2201	13071	40	0.171556	-2.80519	0.007883	1	24
2203	13090	27	0.18791	-2.40515	0.023893	6	180

Decreasing Trends
Volatile Suspended Solids – 00535
Non-Tidal

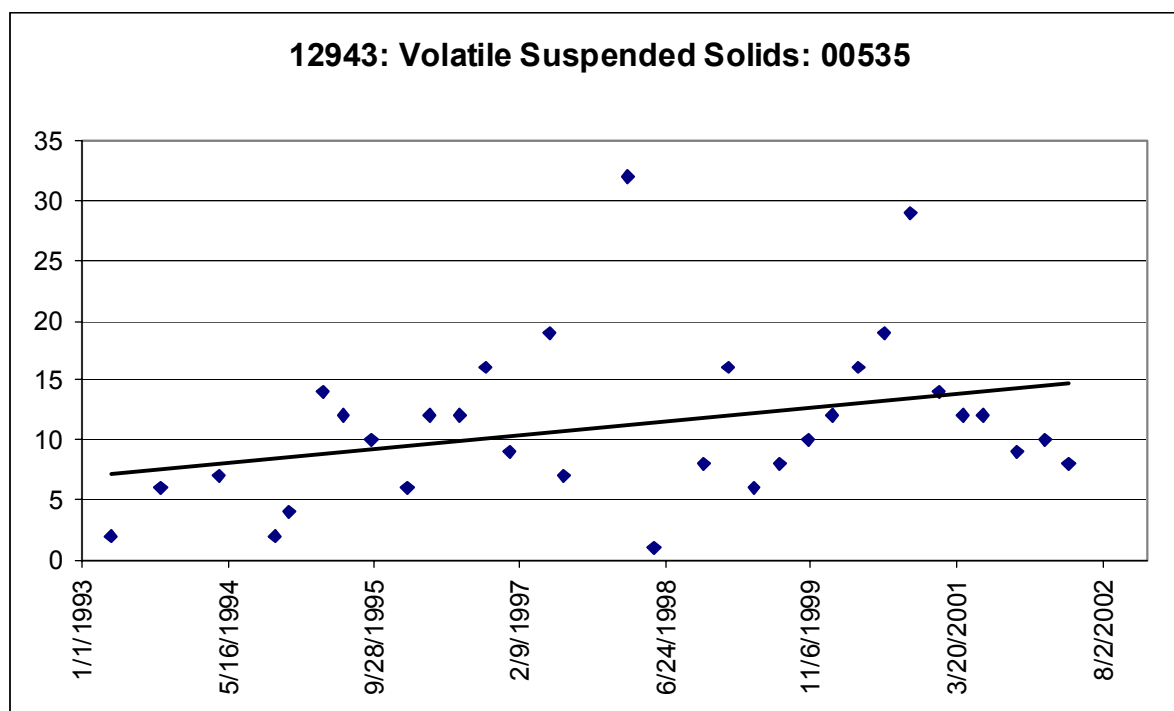
Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2204	13094	32	0.179572	-2.56247	0.015654	3	36

Decreasing Trends
Volatile Suspended Solids – 00535
Marine

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2481	13411	34	0.123672	-2.12509	0.041396	1	26
2482 2484	13422	33	0.167103	-2.49389	0.018178	2	35
	13425	36	0.150636	-2.45559	0.019333	1	114
	13430	38	0.142643	-2.44735	0.019401	1	27
	13432	38	0.352555	-4.42754	8.51-E05	1	10
2491	13444	29	0.104455	-1.77461	0.08724	2	54
	13447	38	0.194292	-2.94639	0.005609	2	30
	13448	33	0.226109	-3.00954	0.005162	1	47

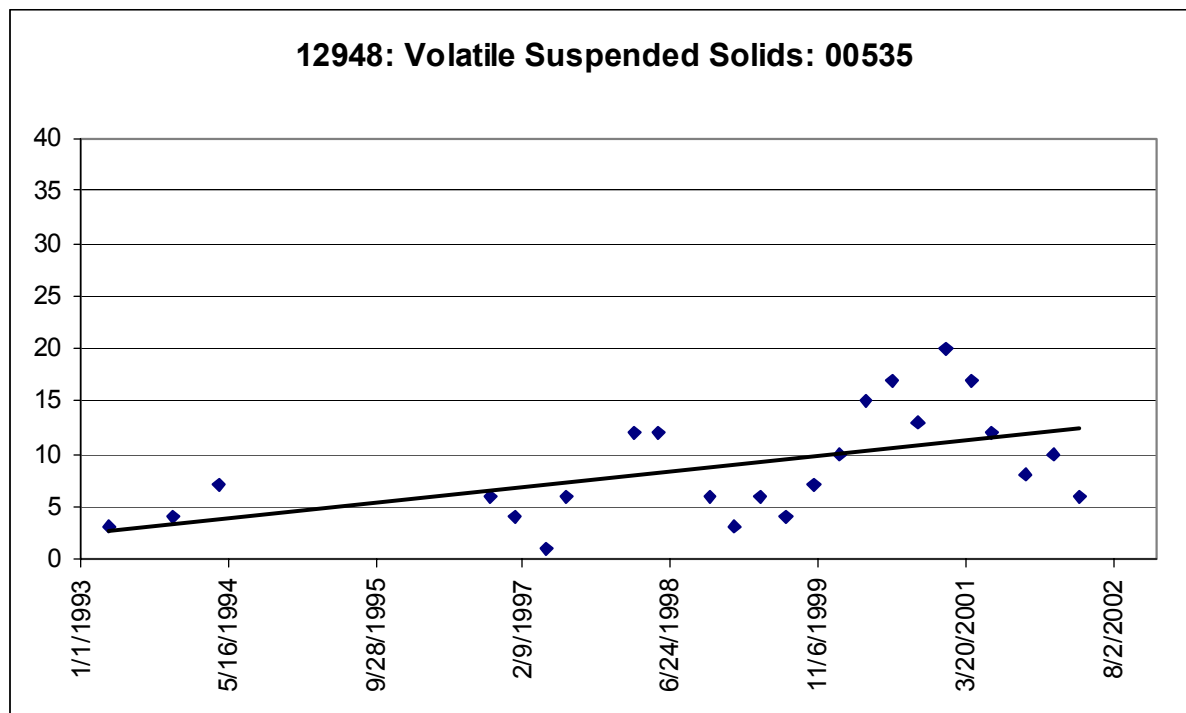
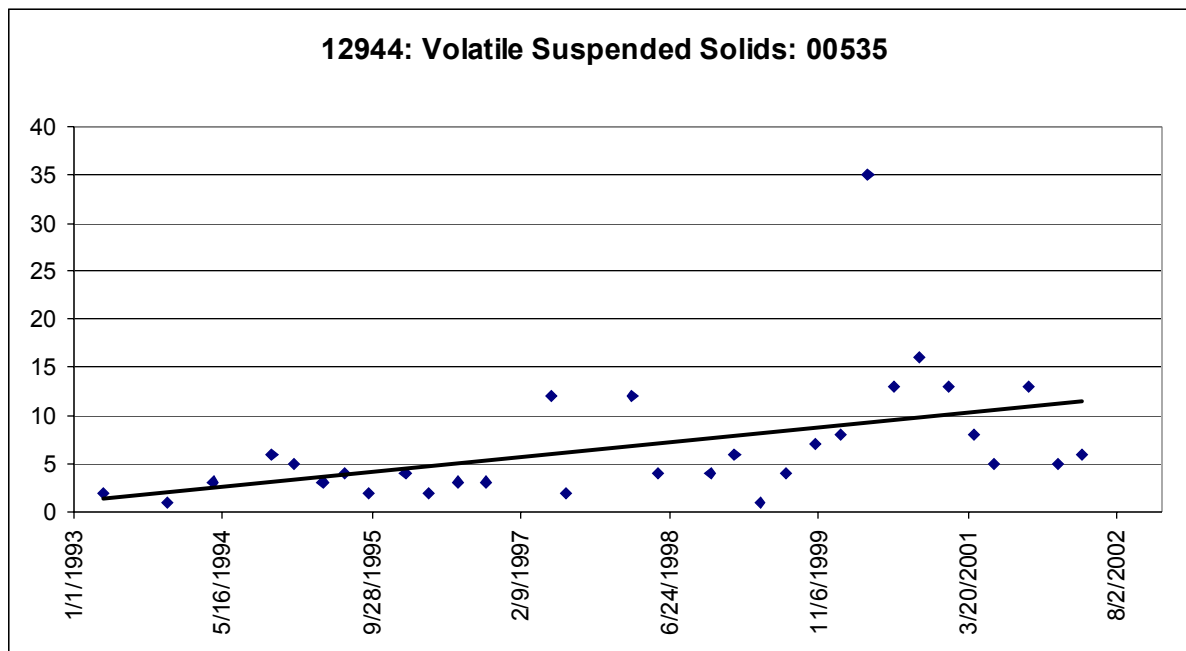
Increasing Trends
Volatile Suspended Solids – 00535
Tidal

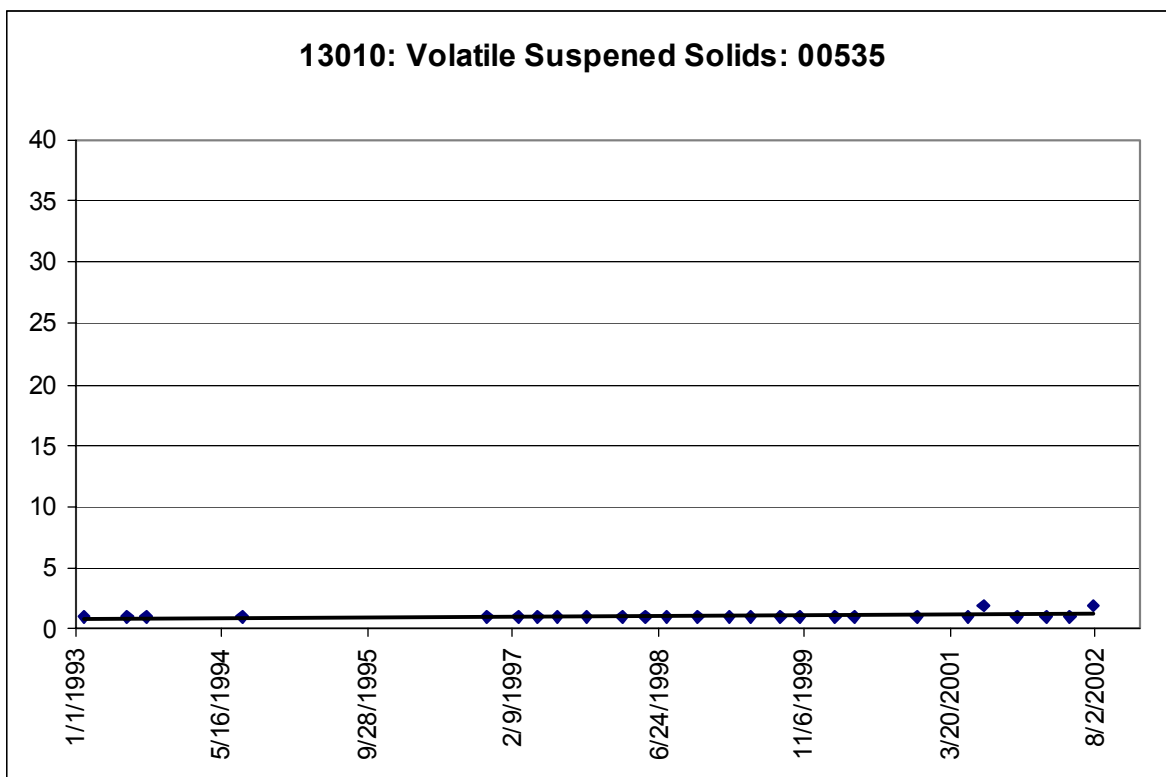
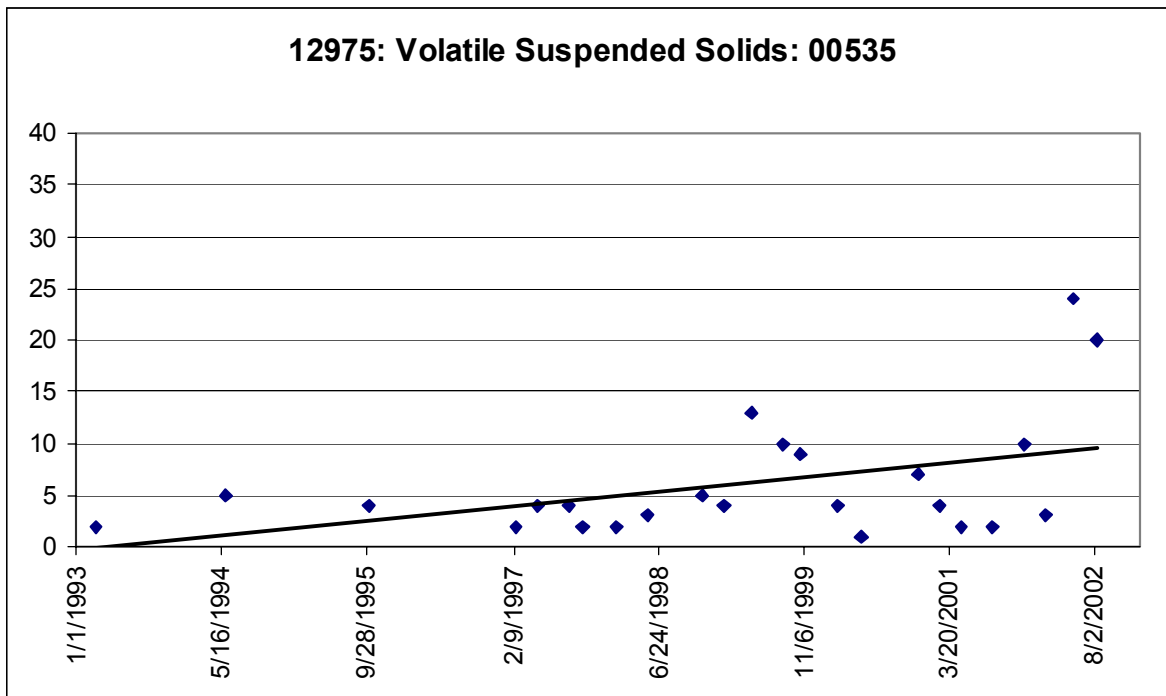
Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2001	12943	32	0.106234	1.888344	0.068684	1	32



**Increasing Trends
Volatile Suspended Solids – 00535
Non-Tidal**

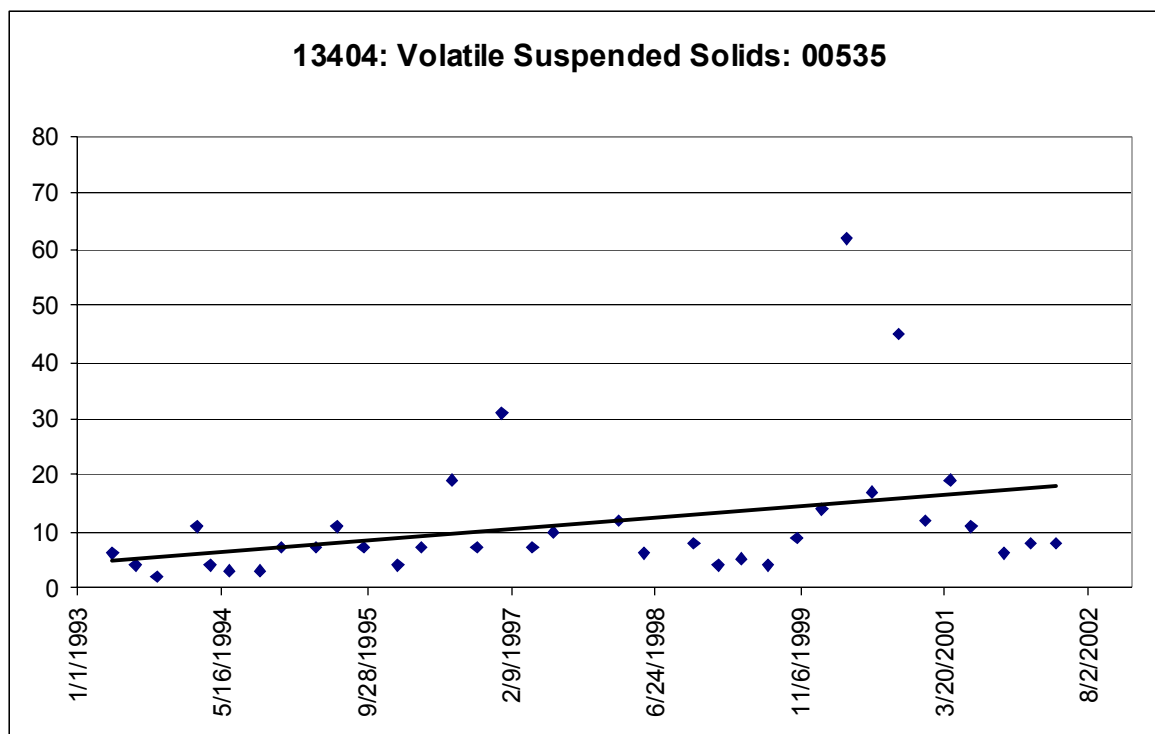
Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2002	12944	31	0.196063	2.65941	0.012613	1	35
2003	12948	24	0.291399	3.007838	0.006476	1	20
2105	12975	24	0.196816	2.32185	0.029893	1	24
2114	13010	26	0.127998	1.876928	0.072737	1	2

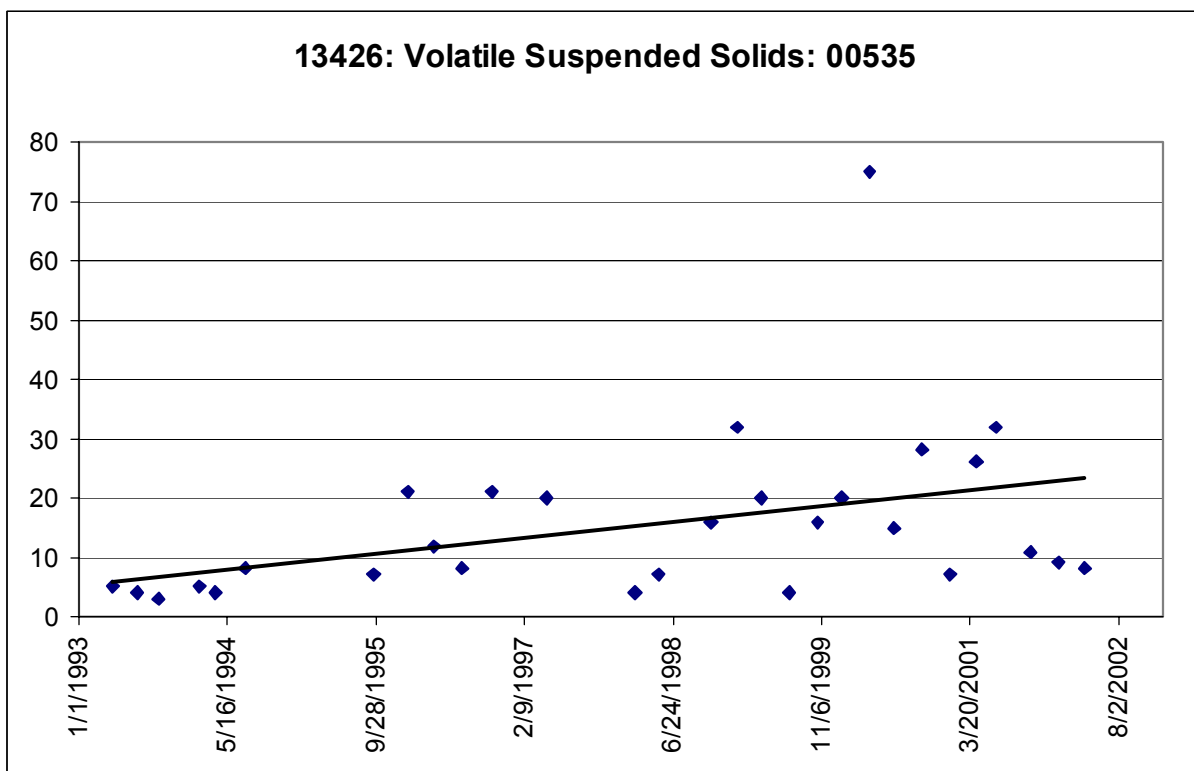
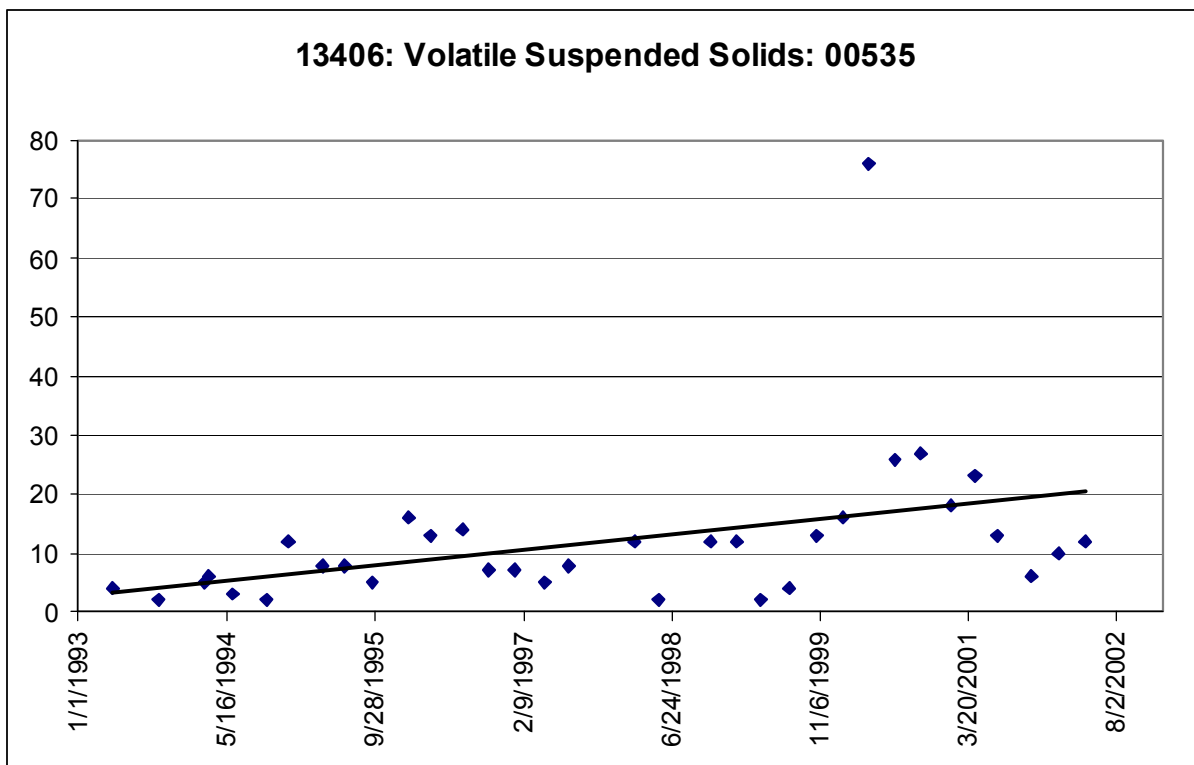


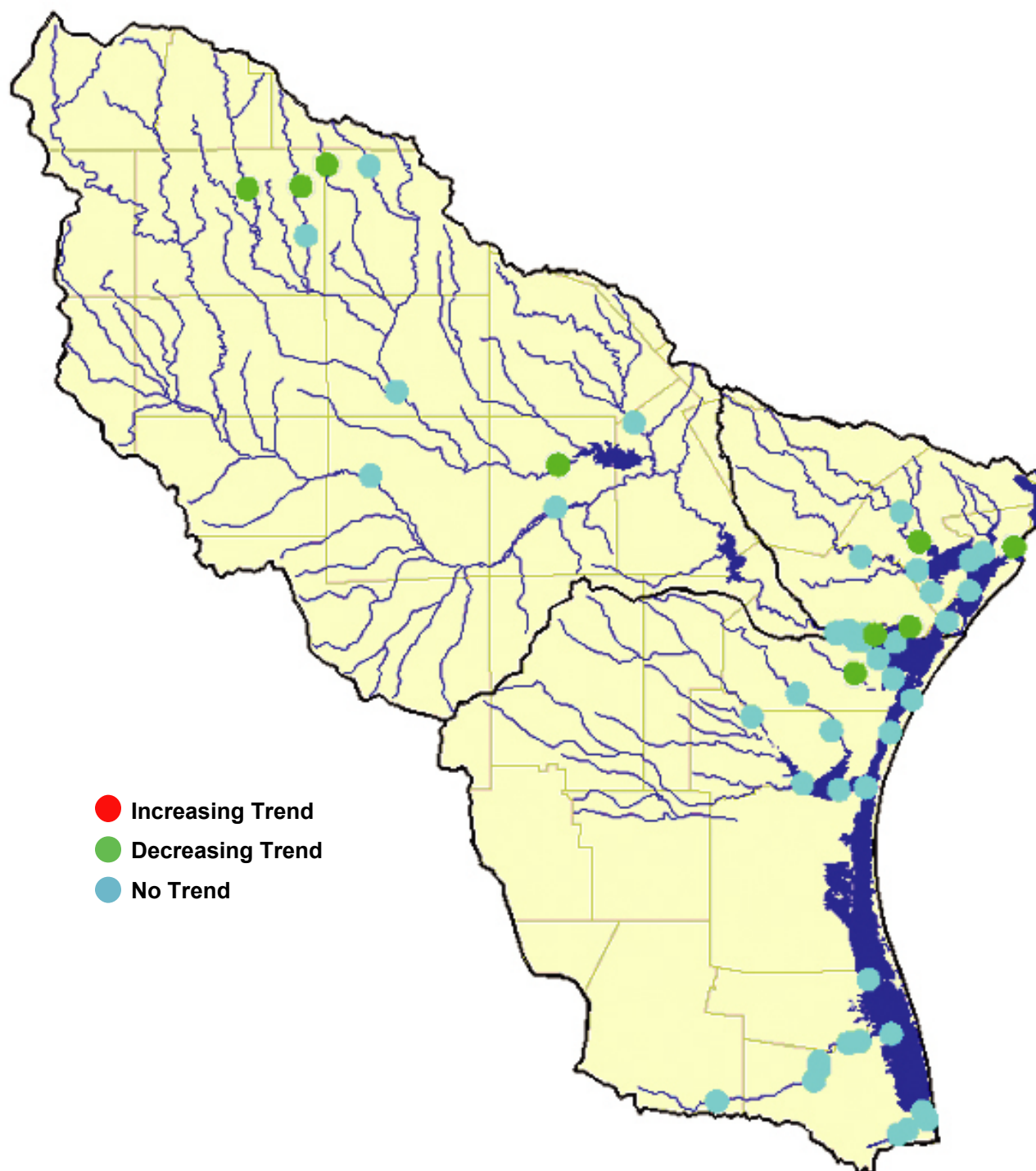


Increasing Trends
Volatile Suspended Solids – 00535
Marine

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2472	13404	35	0.115297	2.073797	0.045977	2	62
2473	13406	34	0.157979	2.450263	0.019926	2	76
2483	13426	29	0.151886	2.19894	0.03663	3	75





Ammonia - 00610

Total Number of Data Sets Analyzed: 52

Decreasing Trends: 9

Increasing Trends: 0

**Decreasing Trends
Ammonia – 00610
Tidal**

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2001	12943	32	0.161058	-2.39986	0.02814	0.01	0.107

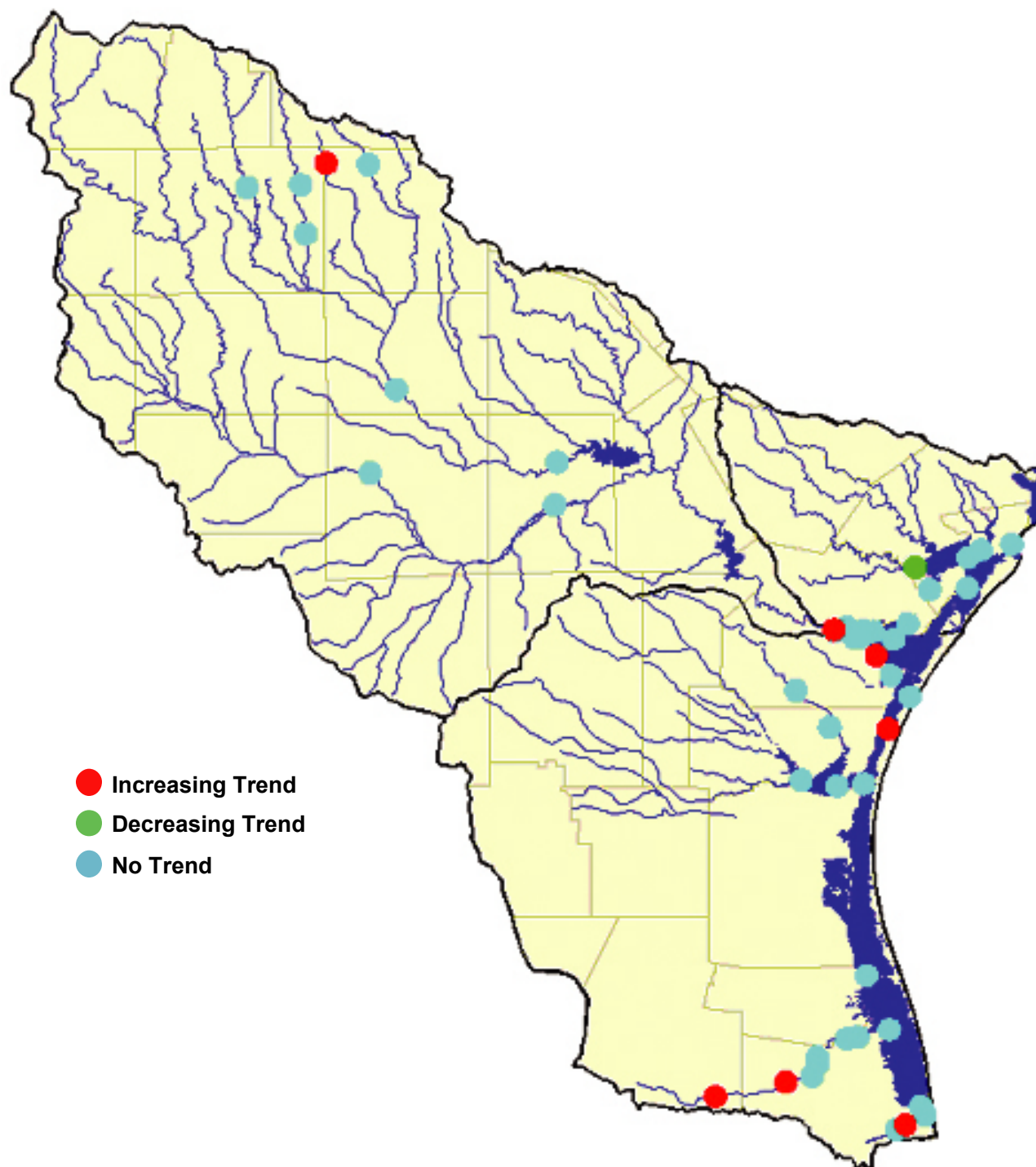
**Decreasing Trends
Ammonia – 00610
Non-Tidal**

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2111	12994	28	0.287192	-3.23658	0.00329	0.01	0.04
2113	13006	23	0.186521	-2.19432	0.0396	0.01	0.02
2115	13013	26	0.376483	-3.80675	0.000857	0.01	0.03
2117	13023	27	0.10866	-1.74575	0.093134	0.02	0.1

**Decreasing Trends
Ammonia – 00610
Marine**

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2463	13400	32	0.126278	-2.08227	0.045945	0.01	0.09
2481	13409	23	0.278599	-2.84781	0.009636	0.01	0.03
2482	13421	35	0.241649	-3.24275	0.002709	0.01	0.15
2485	13028	33	0.217599	-2.93626	0.005212	0.02	0.63

Kjeldahl Nitrogen - 00625



Total Number of Data Sets Analyzed: 46

Decreasing Trends: 1

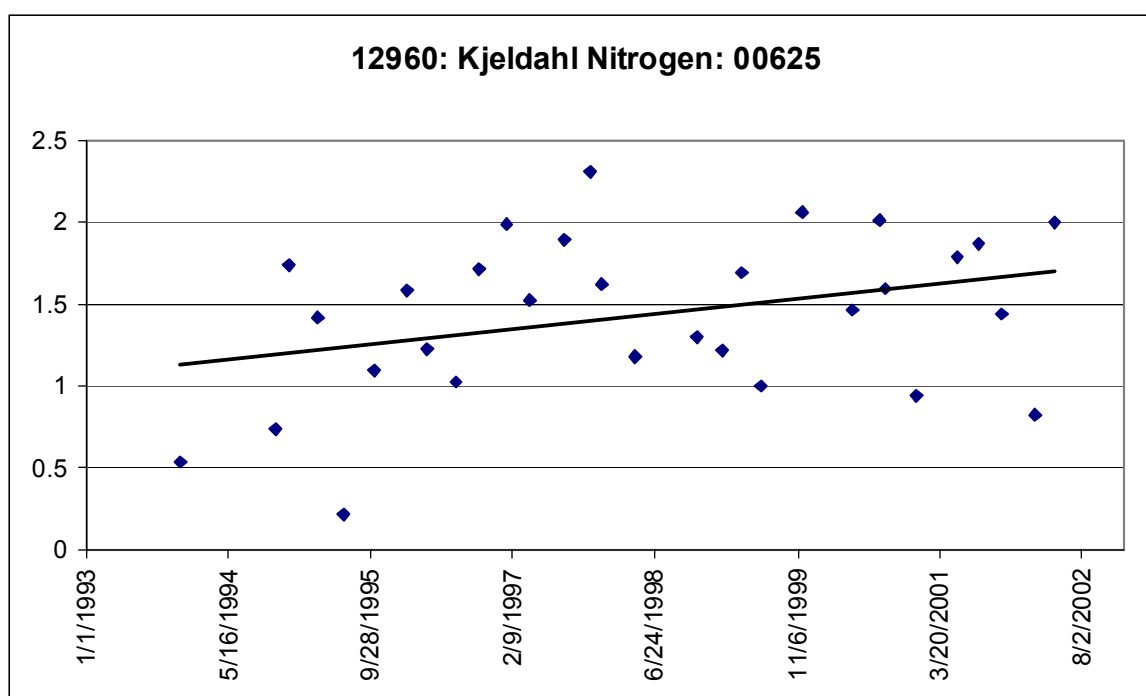
Increasing Trends: 7

Decreasing Trends
Kjeldahl Nitrogen – 00625
Marine

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2472	12945	22	0.299651	-2.92527	0.008368	0.07	1.46

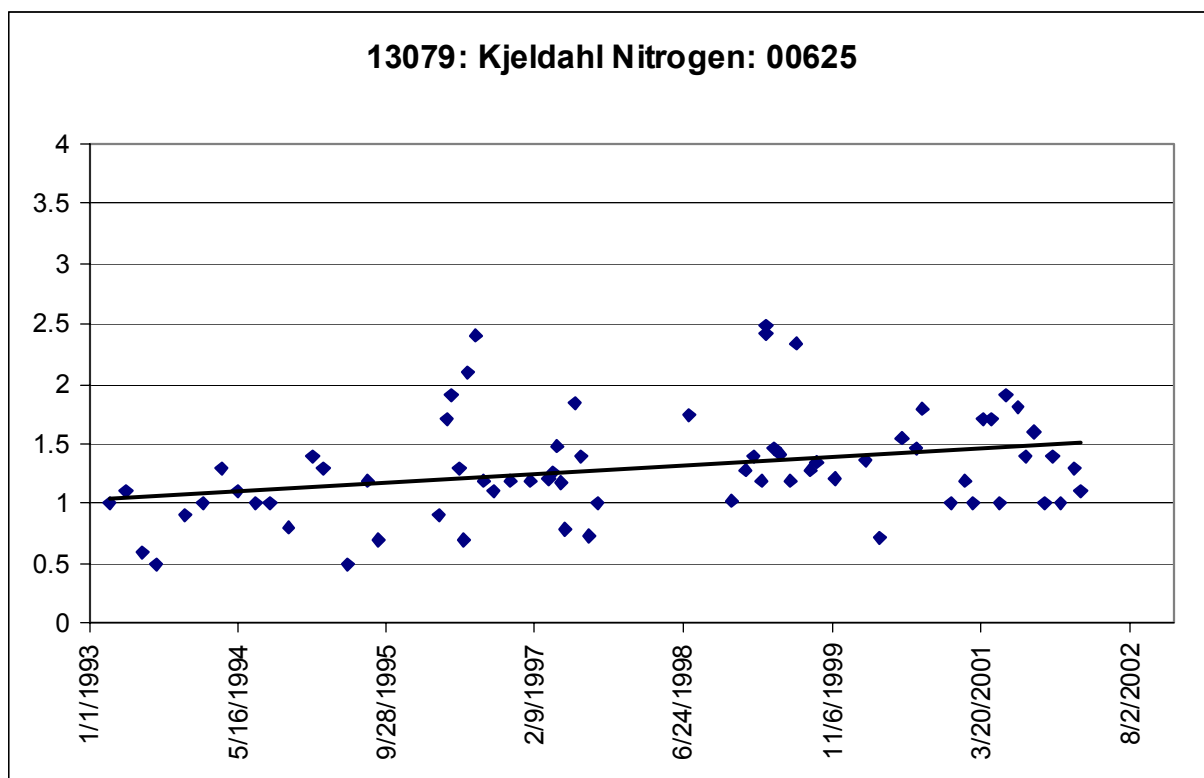
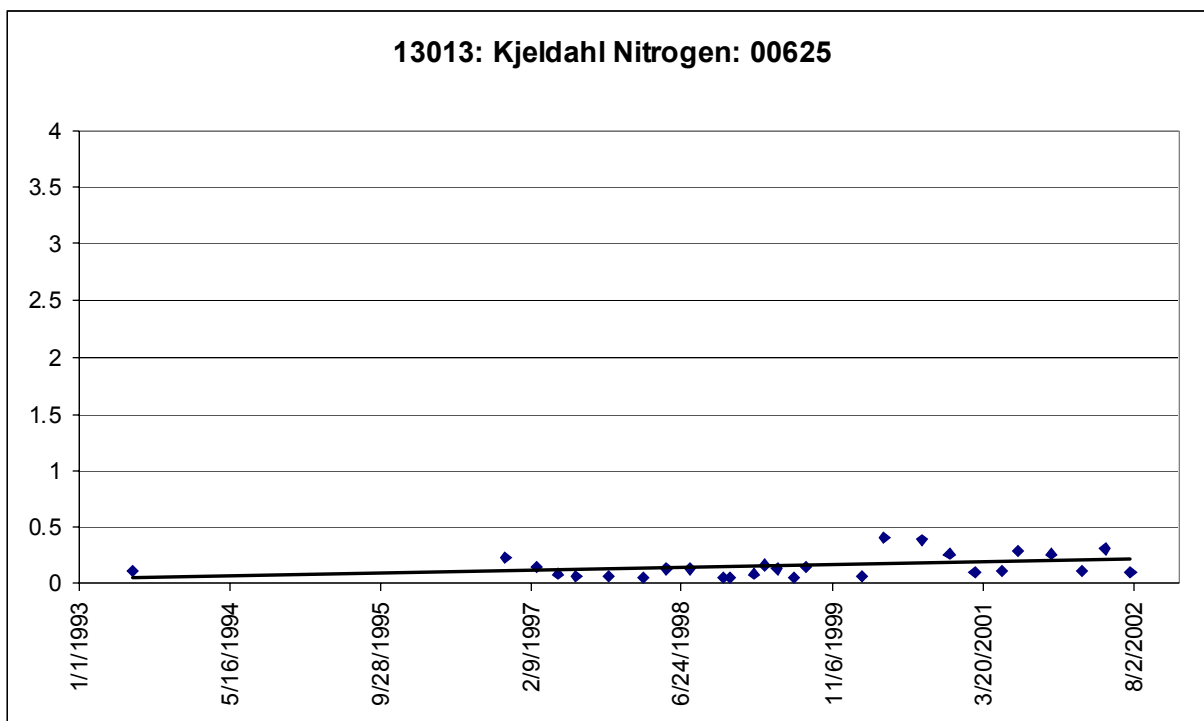
Increasing Trends
Kjeldahl Nitrogen – 00625
Tidal

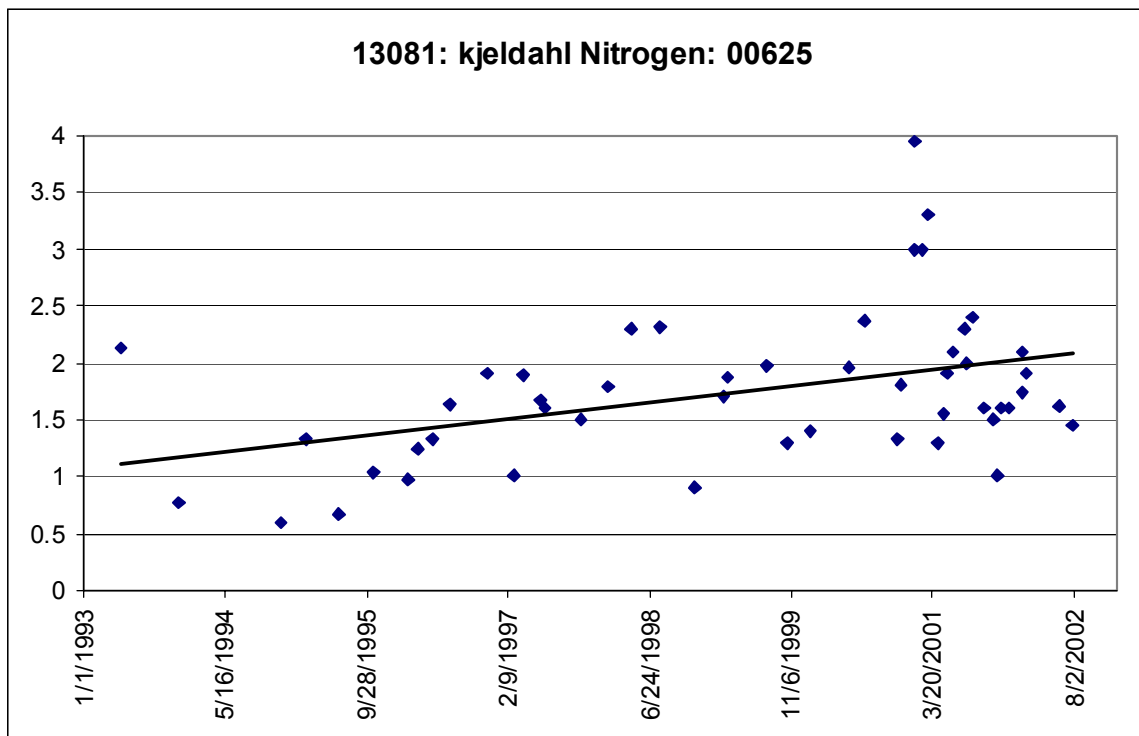
Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2101	12960	30	0.114879	1.90633	0.066919	0.21	2.31



Increasing Trends
Kjeldahl Nitrogen – 00625
Non-Tidal

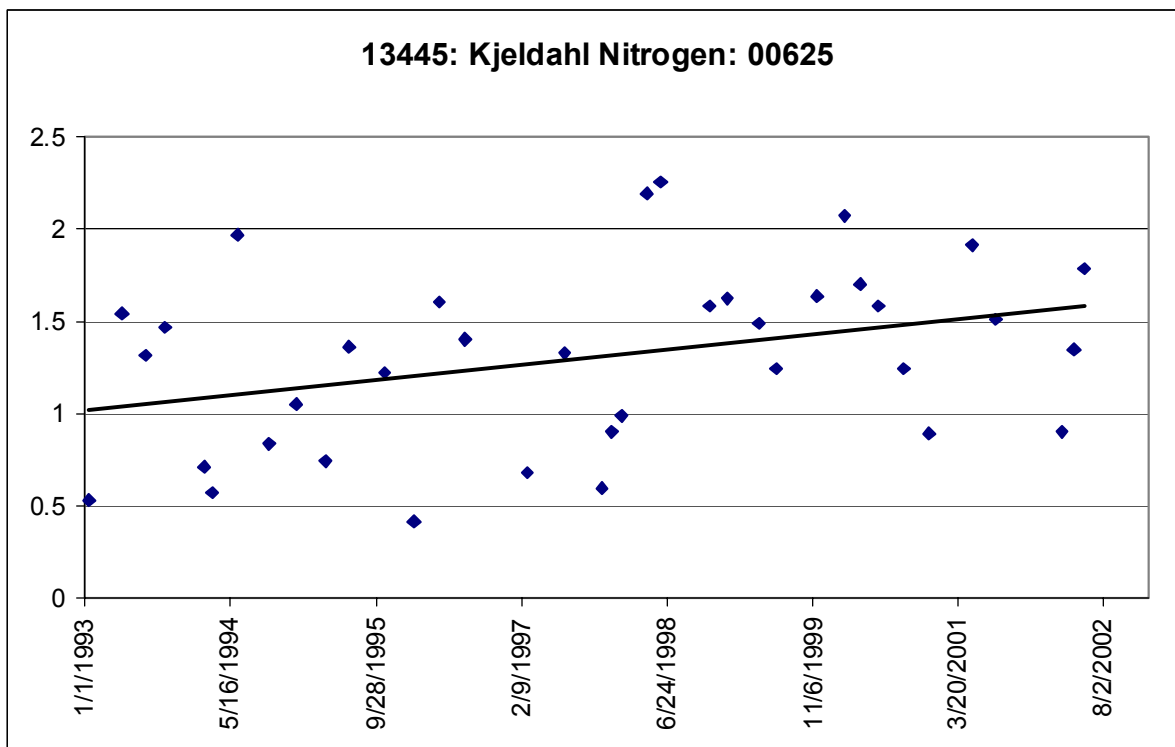
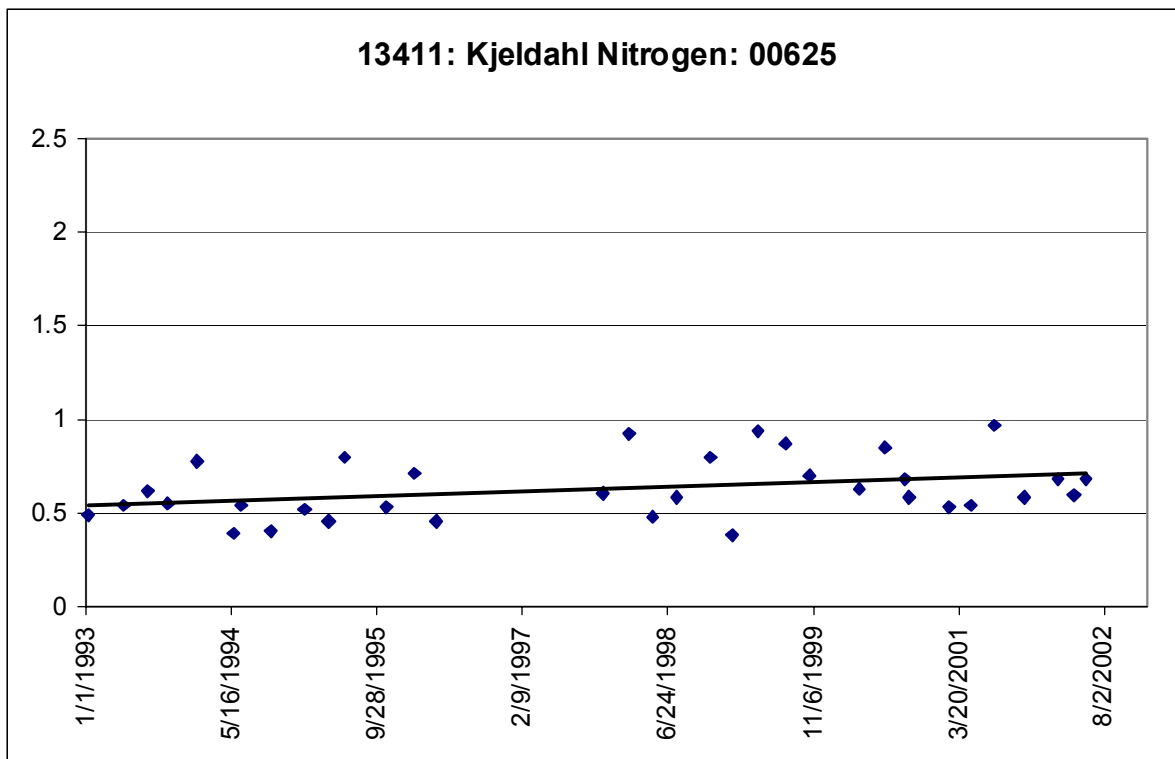
Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2115	13013	27	0.128891	1.923293	0.065904	0.05	0.4
2202	13079	70	0.10035	2.754073	0.007544	0.5	2.49
	13081	50	0.170247	3.138236	0.002904	0.6	3.95

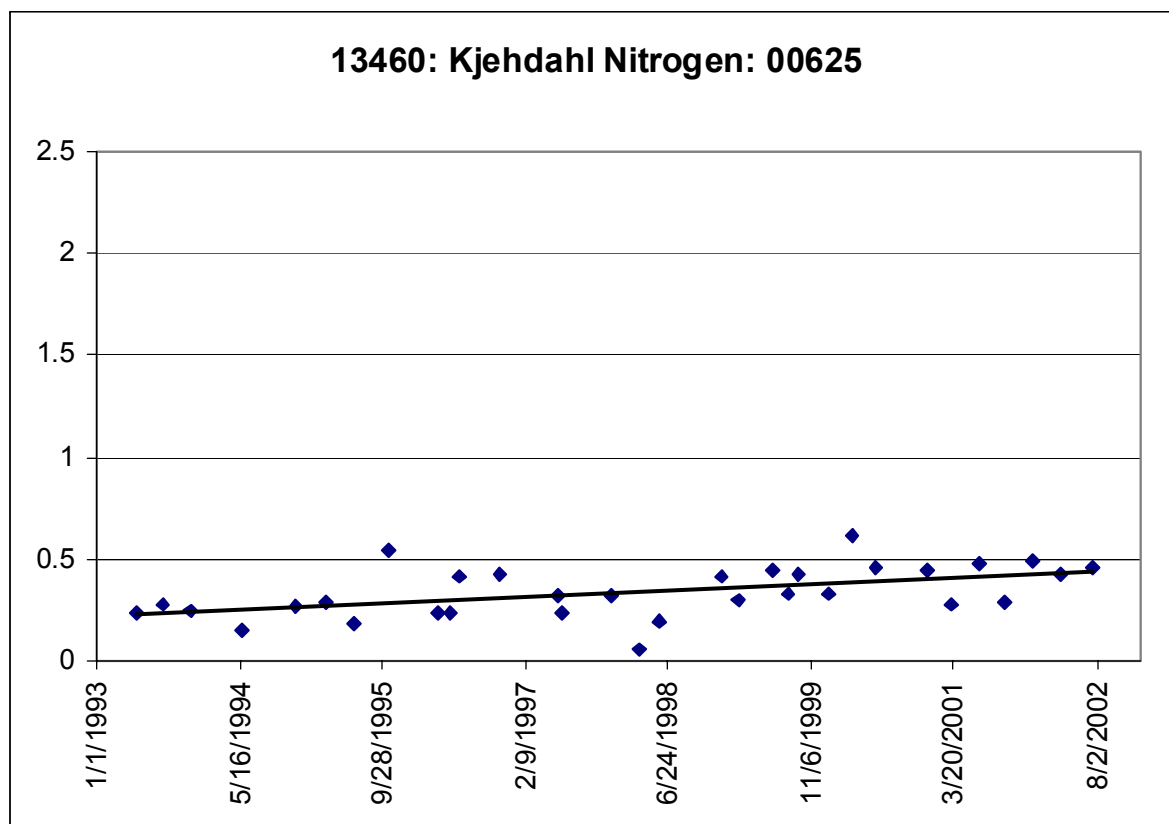


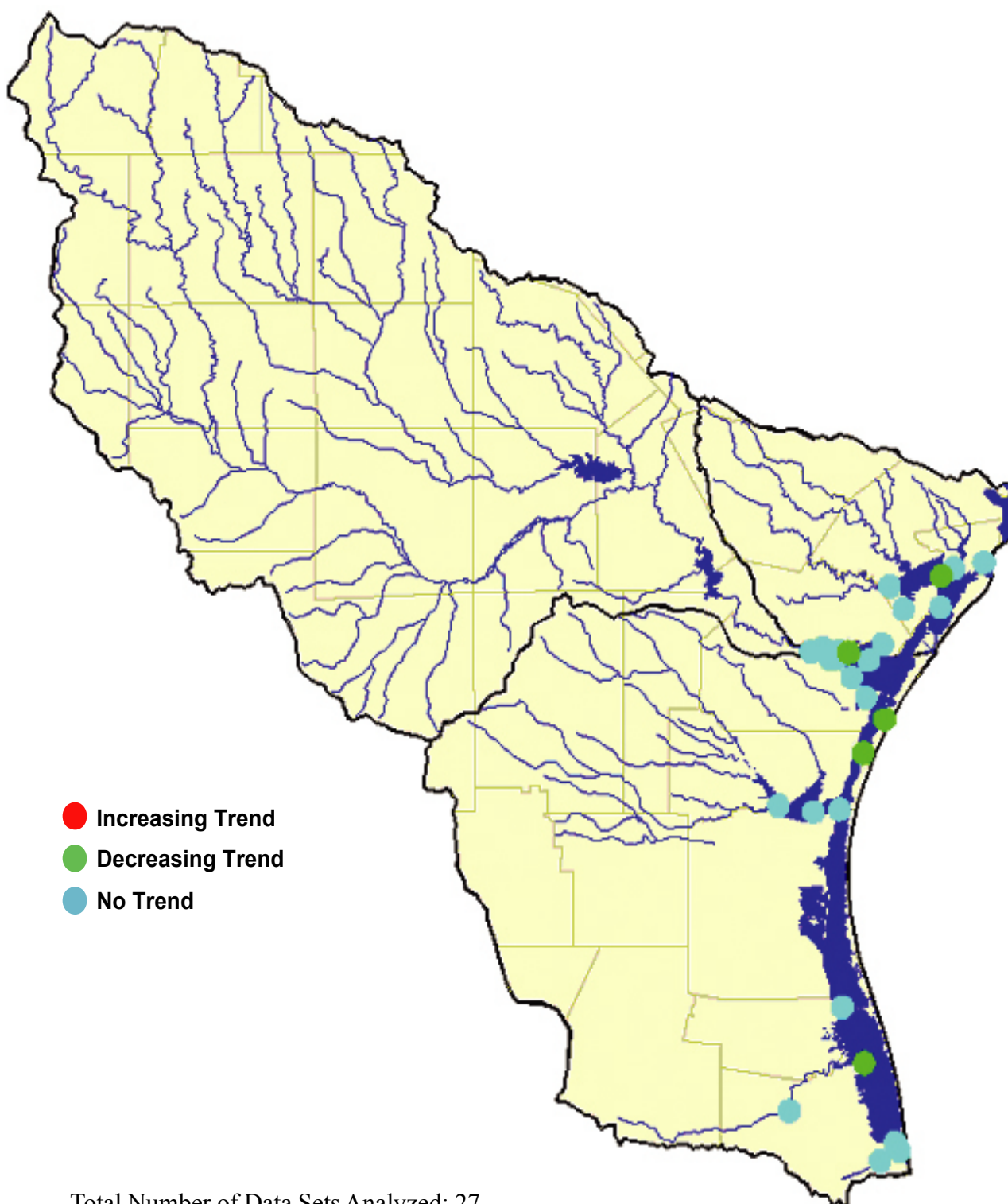


**Increasing Trends
Kjeldahl Nitrogen – 00625
Marine**

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2481	13411	34	0.117095	2.060091	0.0476	0.38	0.97
2491	13445	37	0.123351	2.219175	0.033053	0.42	2.26
2494	13460	32	0.26441	3.283838	0.002607	0.05	0.61





Nitrite + Nitrate - 00630

Total Number of Data Sets Analyzed: 27

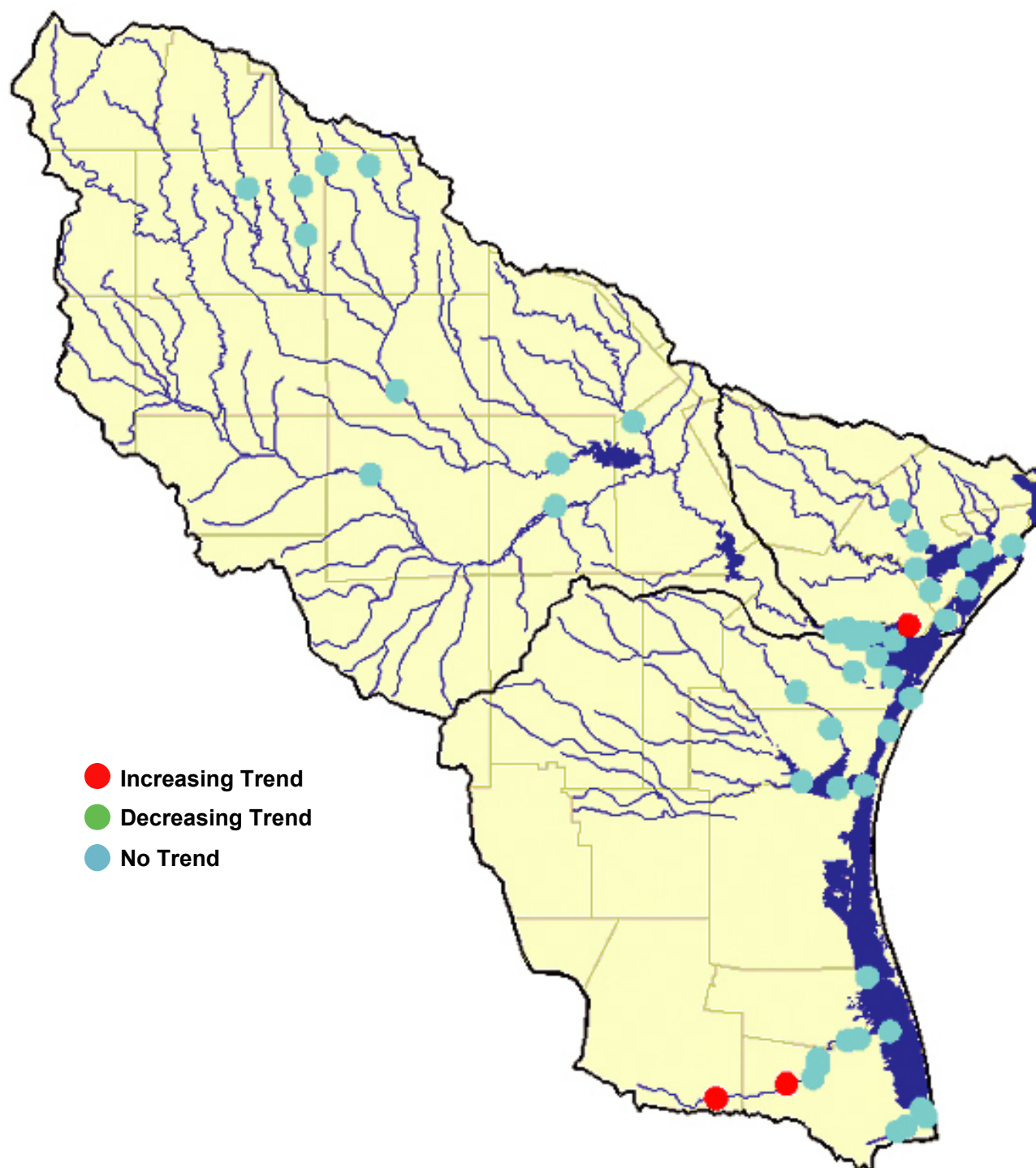
Decreasing Trends: 5

Increasing Trends: 0

Decreasing Trends
Nitrite + Nitrate –00630
Marine

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2472	13404	22	0.236149	-2.48659	0.02185	0.01	0.08
2482	13421	20	0.181339	-1.99678	0.0612	0.01	0.25
	13443	19	0.15355	-1.7561	0.09707	0.01	0.05
2491	13445	22	0.15611	-1.92348	0.068772	0.01	0.08
	13447	22	0.1925	-2.18353	0.041082	0.01	1.85

Total Phosphorus - 00665



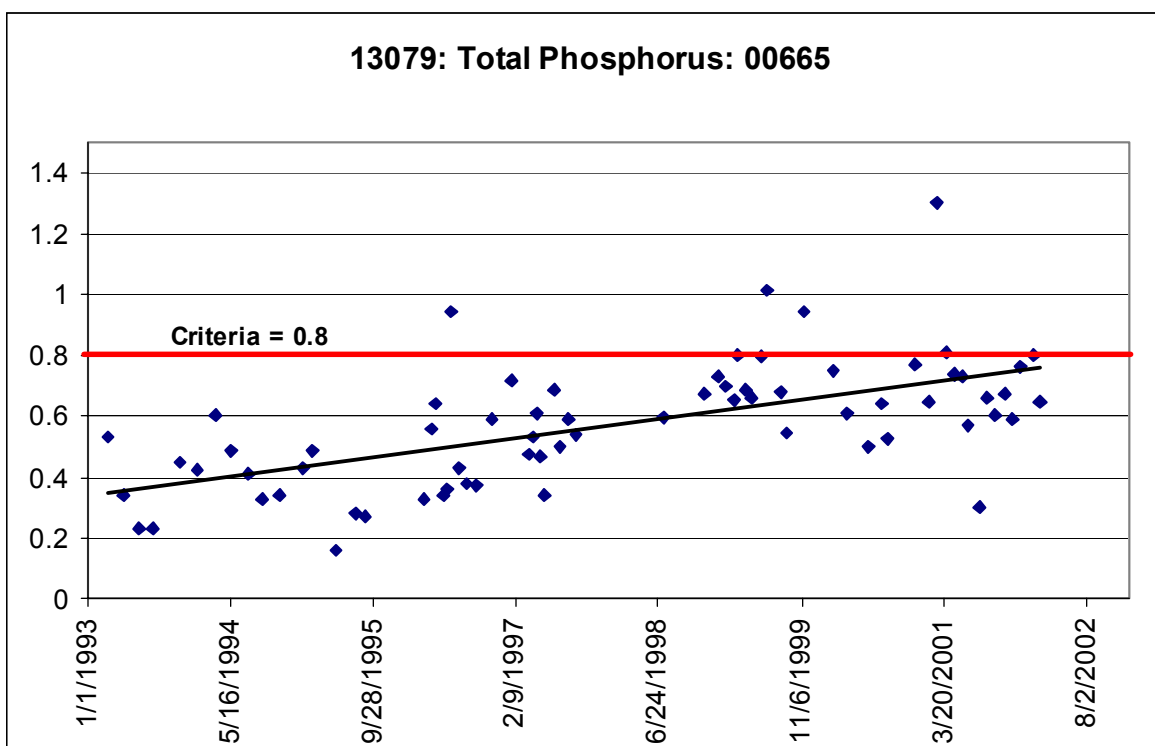
Total Number of Data Sets Analyzed: 51

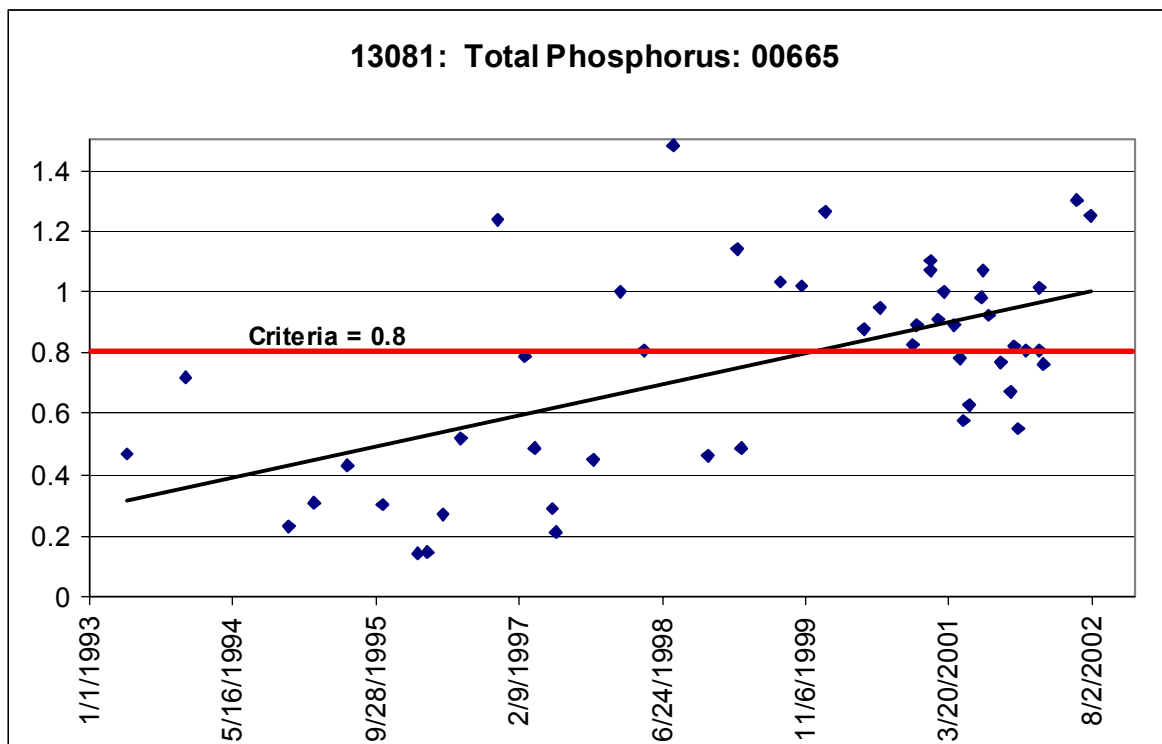
Decreasing Trends: 0

Increasing Trends: 3

Increasing Trends
Total Phosphorus – 00665
Non-Tidal

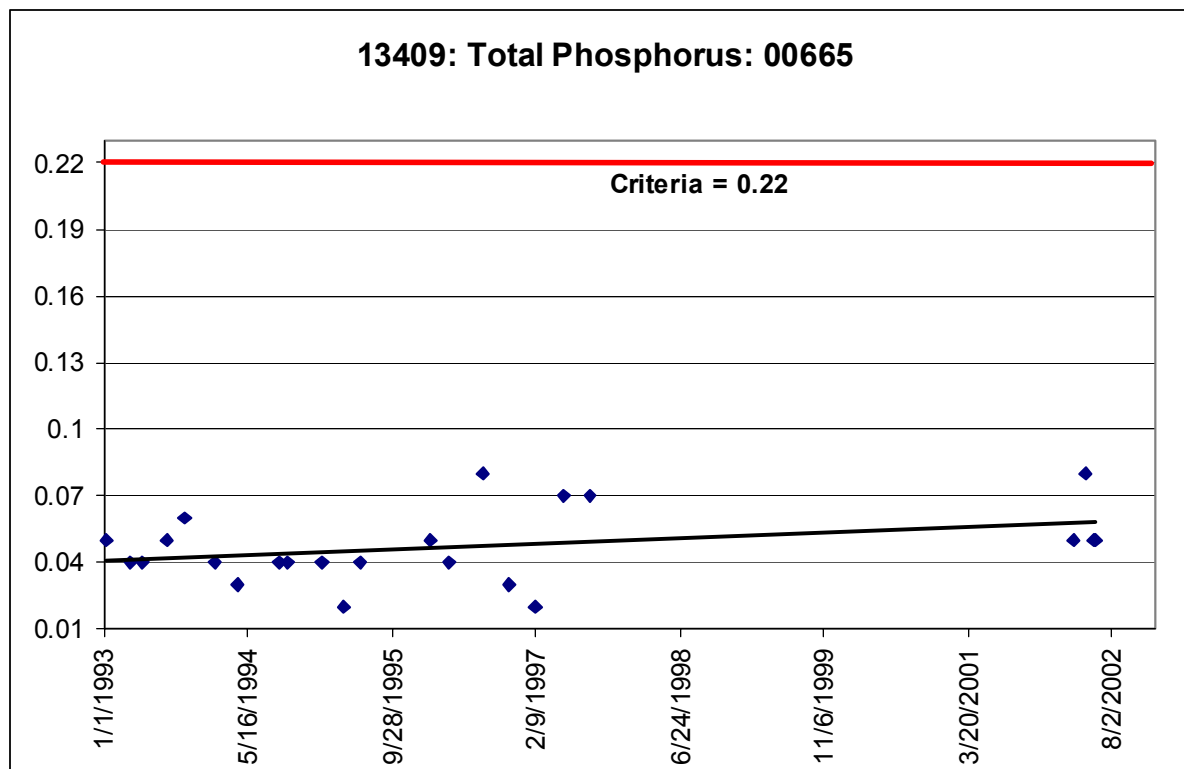
Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2202	13079	69	0.366096	6.220475	3.66E-08	0.16	1.3
	13081	50	0.324687	4.903039	1.04E-05	0.14	1.48



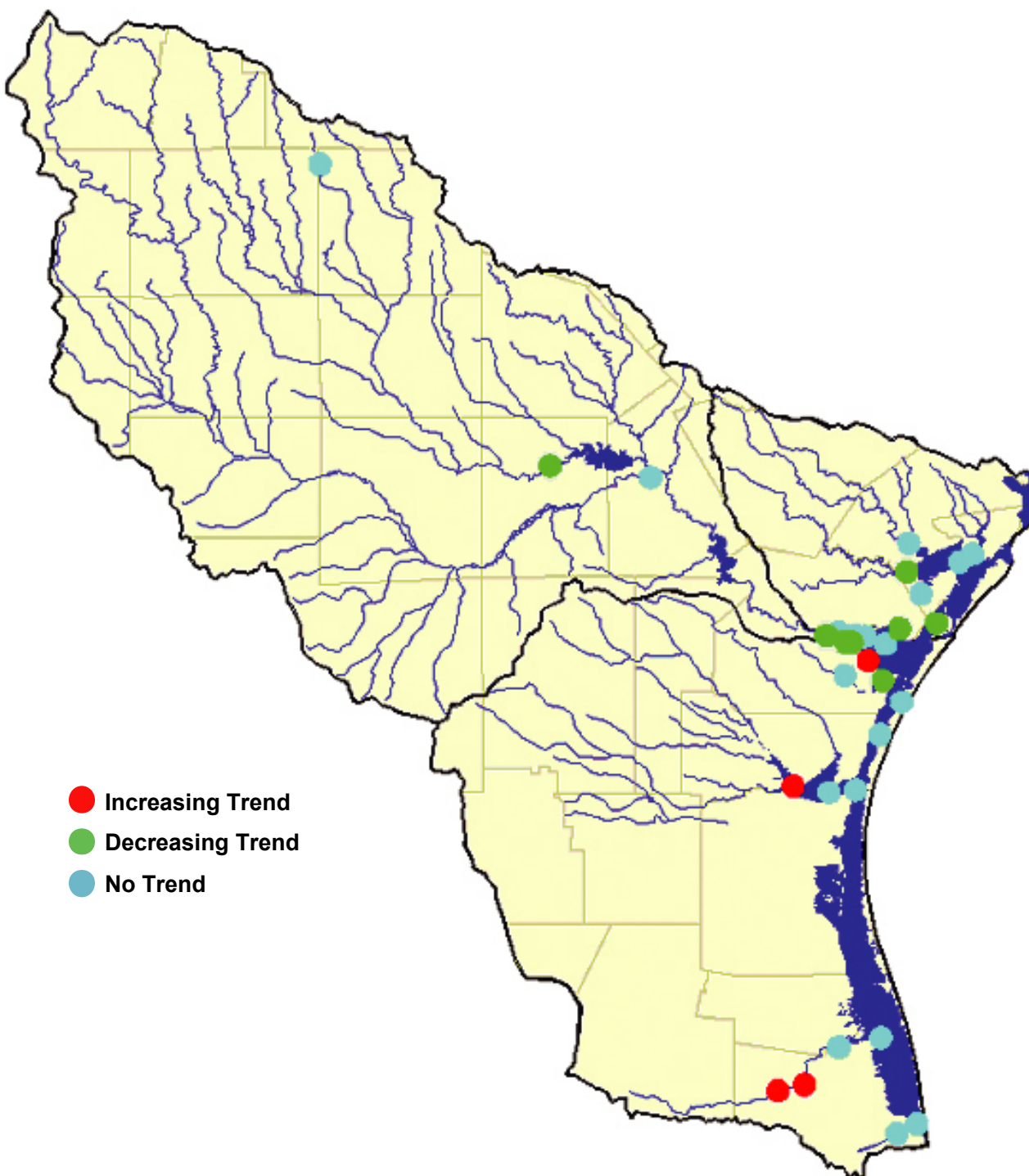


**Increasing Trends
Total Phosphorus – 00665
Marine**

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2481	13409	23	0.124884	1.731134	0.098096	0.02	0.08



Ortho-Phosphorus - 00671



Total Number of Data Sets Analyzed: 31

Decreasing Trends: 8

Increasing Trends: 4

Decreasing Trends
Ortho-Phosphorus – 00671
Non-Tidal

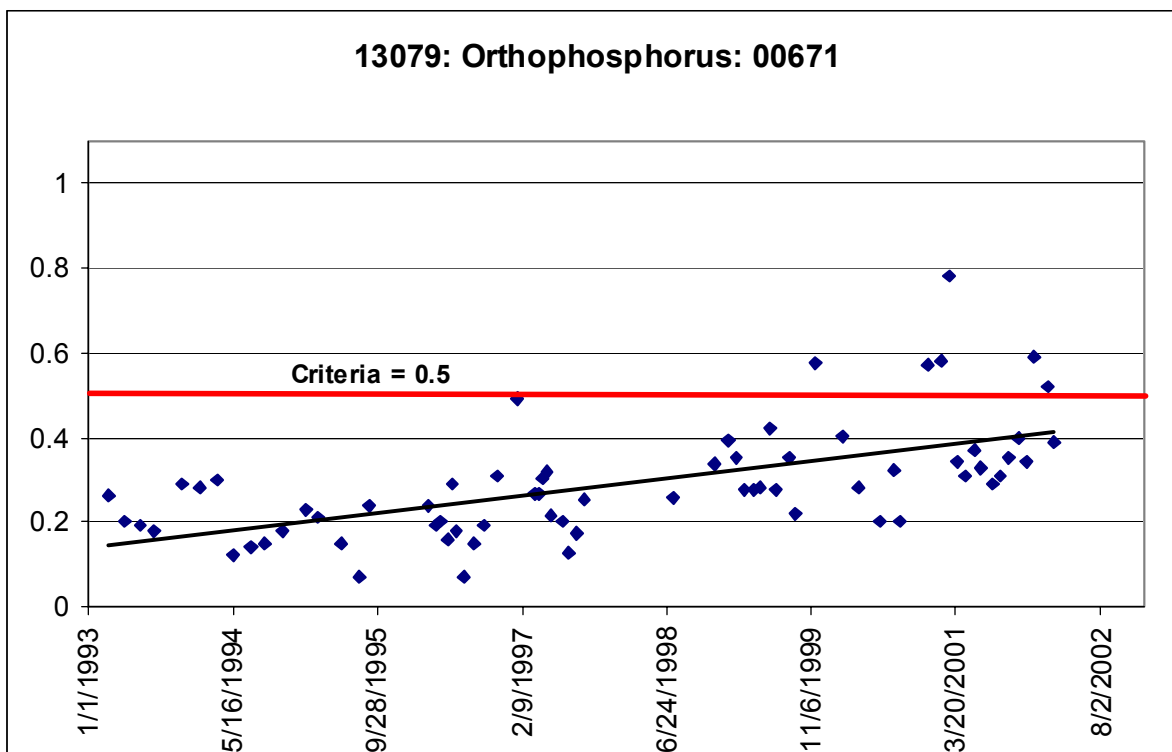
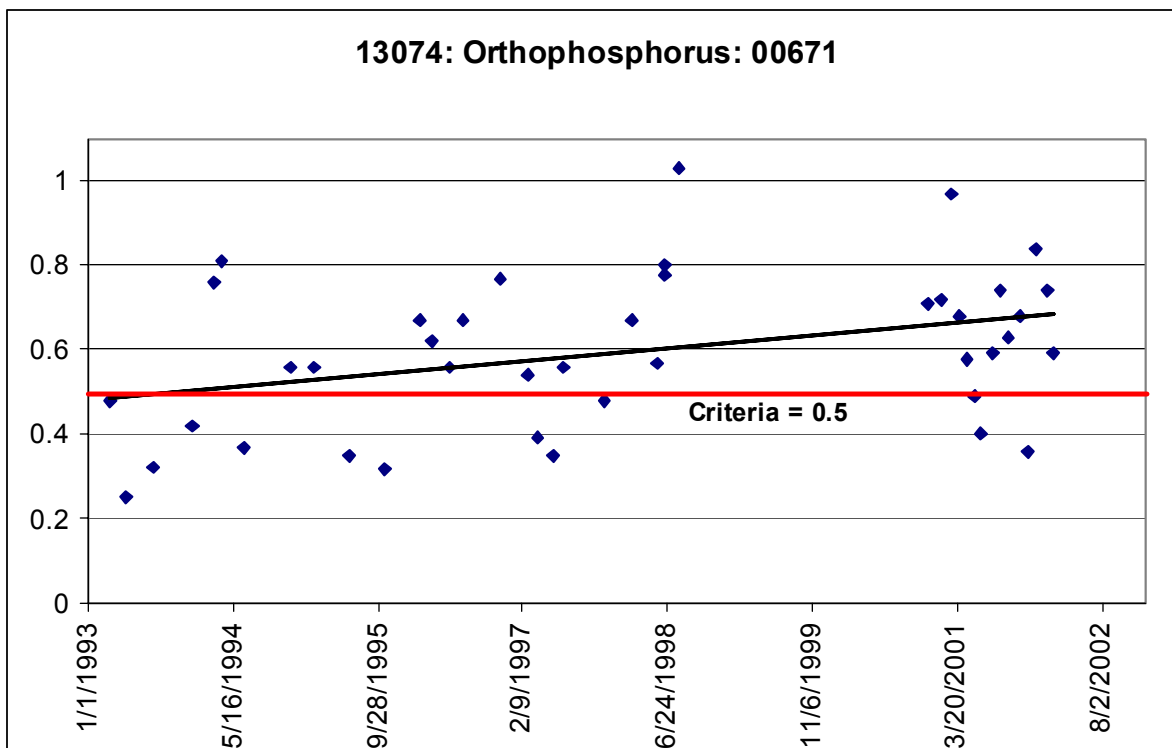
Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2117	13023	35	0.108841	-2.00759	0.052933	0.01	0.418

Decreasing Trends
Ortho-Phosphorus – 00671
Marin

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2472	12945	30	0.102002	-1.78339	0.085367	0.01	0.53
2481	13409	19	0.385995	-3.26911	0.004522	0.01	0.04
2483	13426	28	0.360172	-3.82569	0.000735	0.01	0.07
2484	13430	22	0.131571	-1.74072	0.097097	0.01	0.14
	13432	22	0.189753	-2.16421	0.042724	0.01	0.19
	13439	22	0.179938	-2.09485	0.049121	0.01	0.18
2485	13440	31	0.108294	-1.87668	0.070657	0.01	0.31

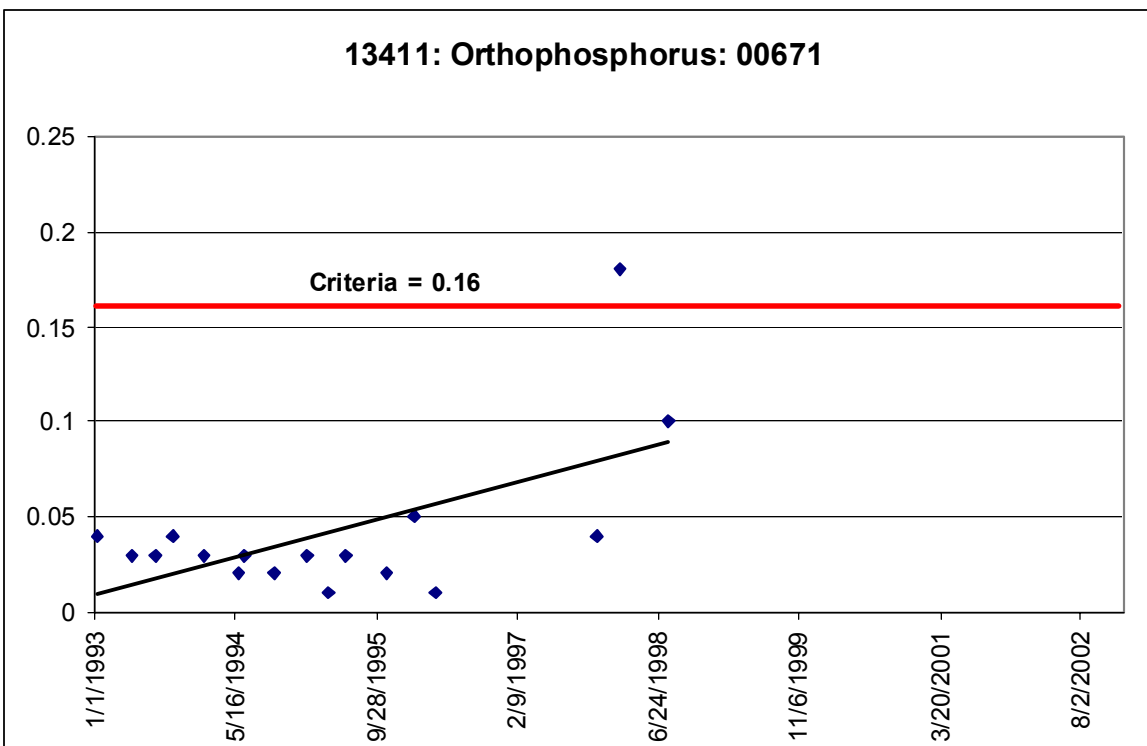
Increasing Trends
Ortho-Phosphorus – 00671
Non-Tidal

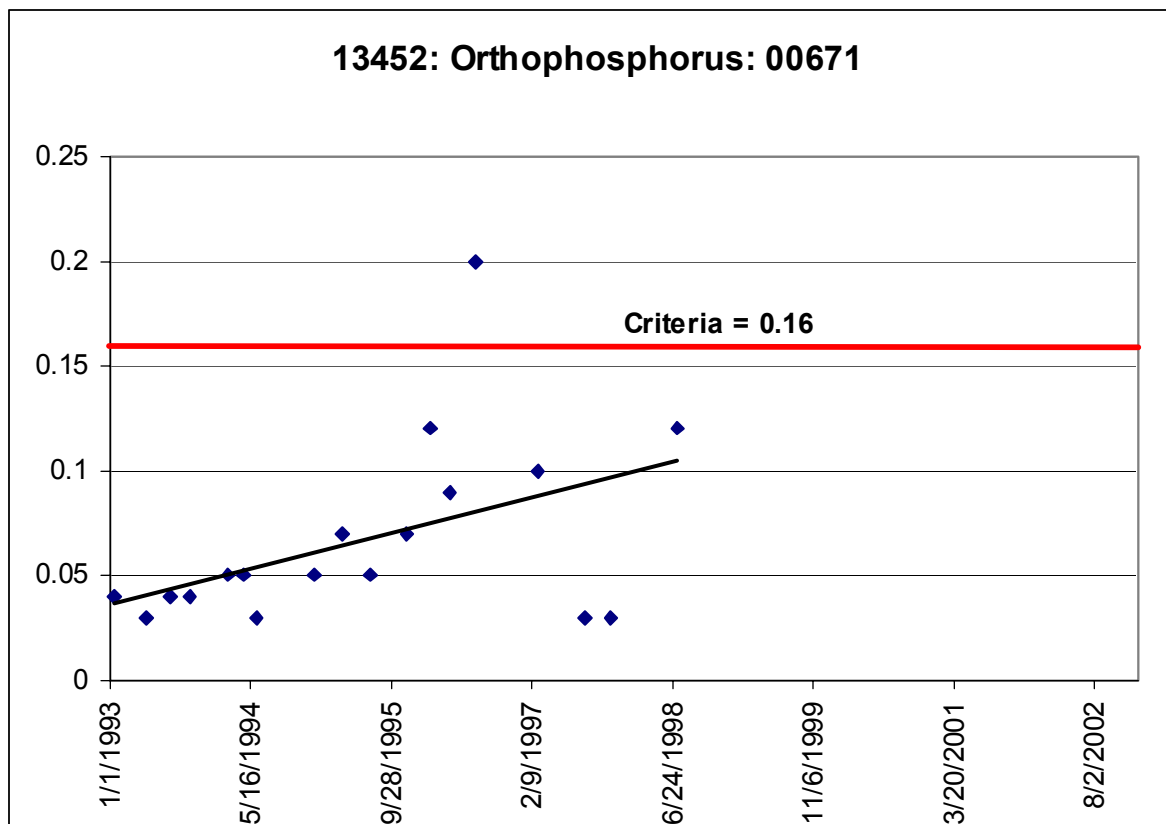
Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2202	13074	41	0.133508	2.451337	0.018817	0.25	1.03
	13079	68	0.366735	6.182371	4.47E-08	0.07	0.78



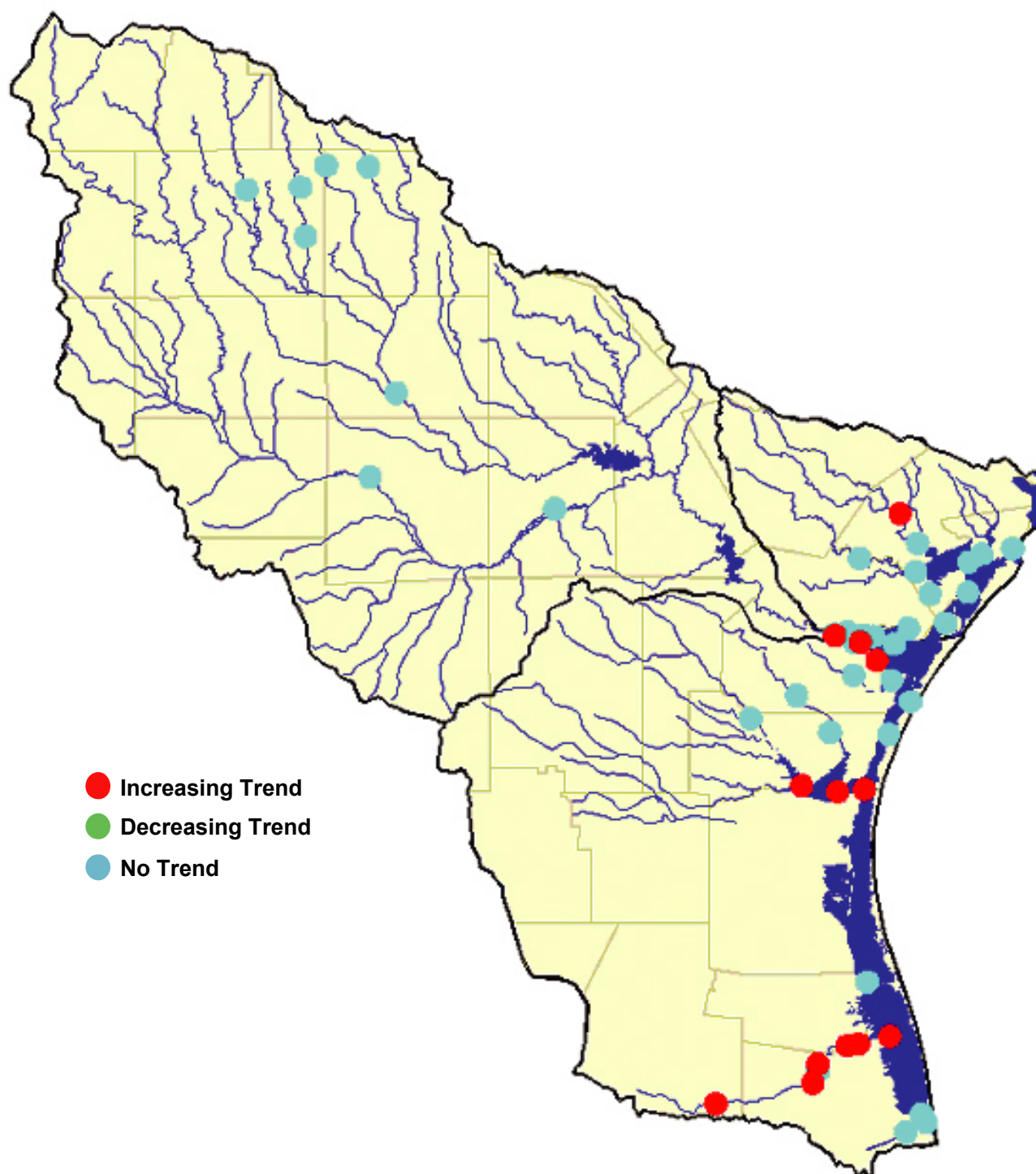
Increasing Trends
Ortho-Phosphorus – 00671
Marine

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2481	13411	17	0.345336	2.812922	0.13113	0.01	0.18
2492	13452	18	0.212103	2.075387	0.054435	0.03	0.2





Total Organic Carbon - 00680



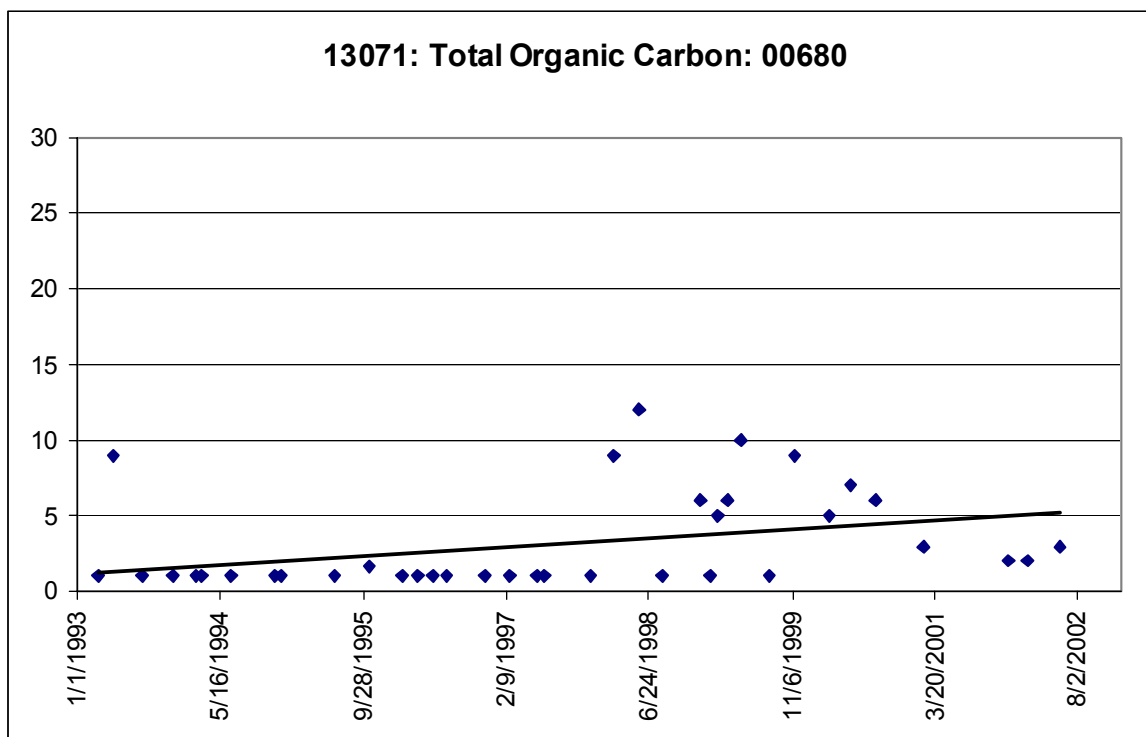
Total Number of Data Sets Analyzed: 49

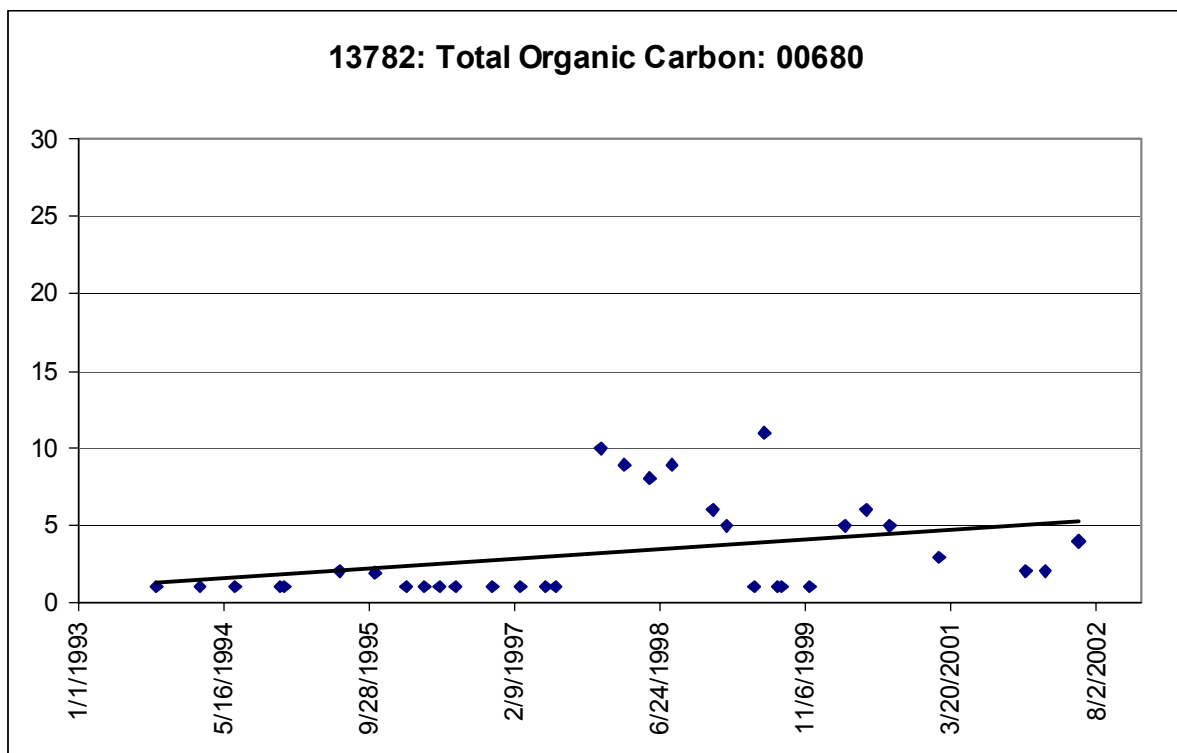
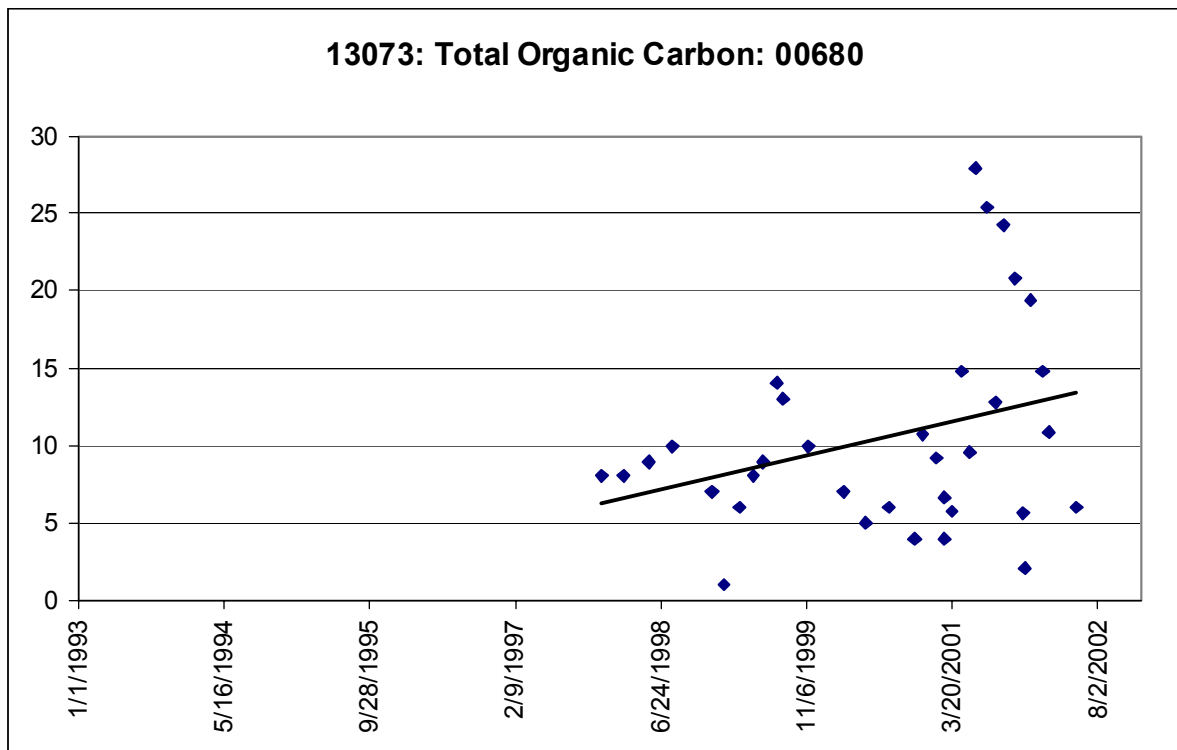
Decreasing Trends: 0

Increasing Trends: 13

Increasing Trends
Total Organic Carbon – 00680
Tidal

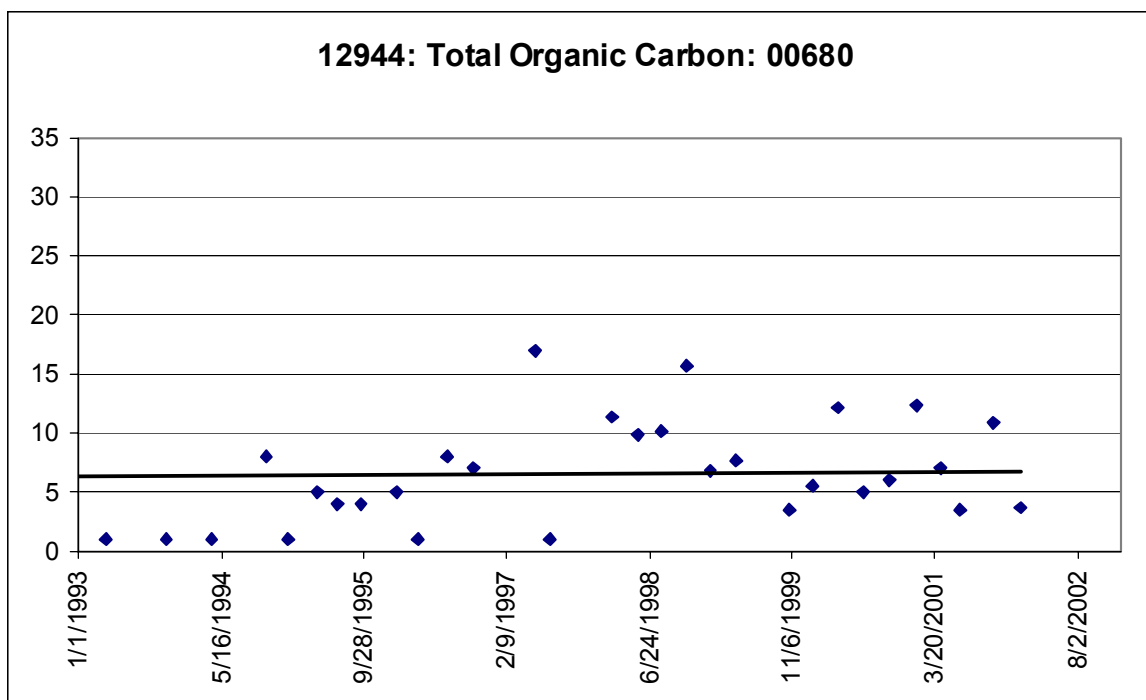
Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2201	13071	37	0.116351	2.146735	0.038824	1	12
	13073	34	0.100343	1.889209	0.067955	1	28
	13782	33	0.119461	2.050784	0.048823	1	11

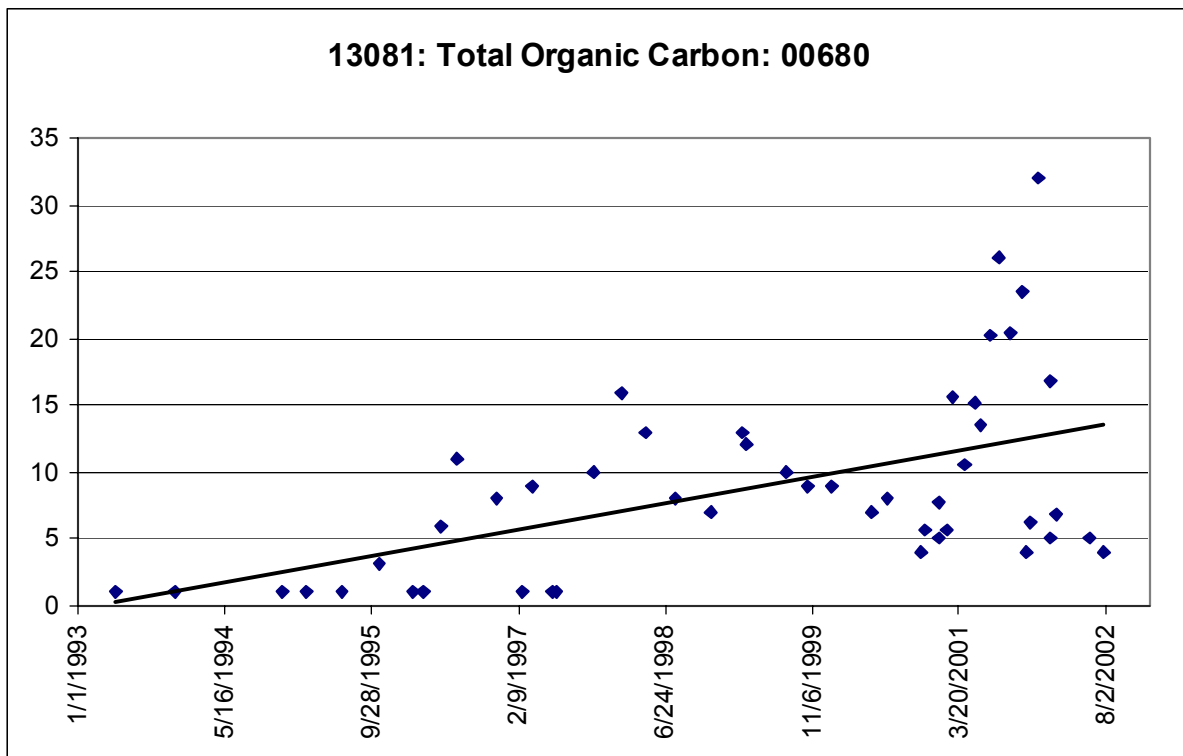
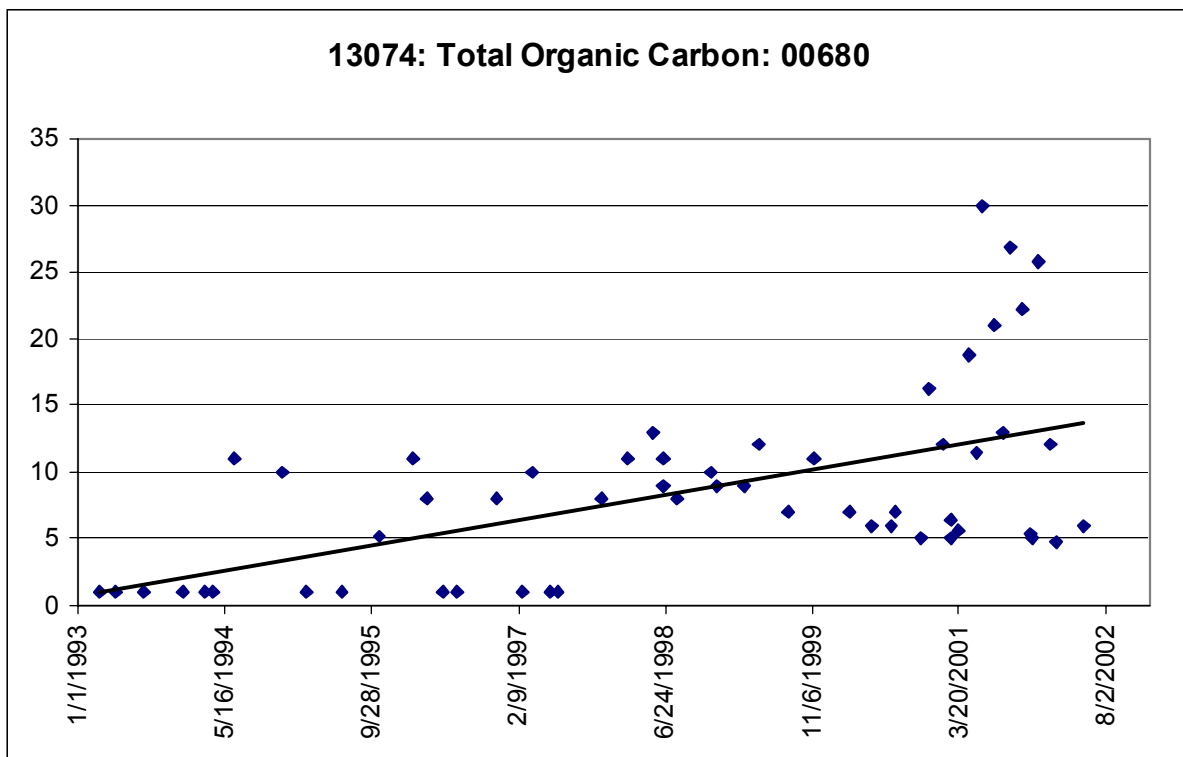




Increasing Trends
Total Organic Carbon – 00680
Non-Tidal

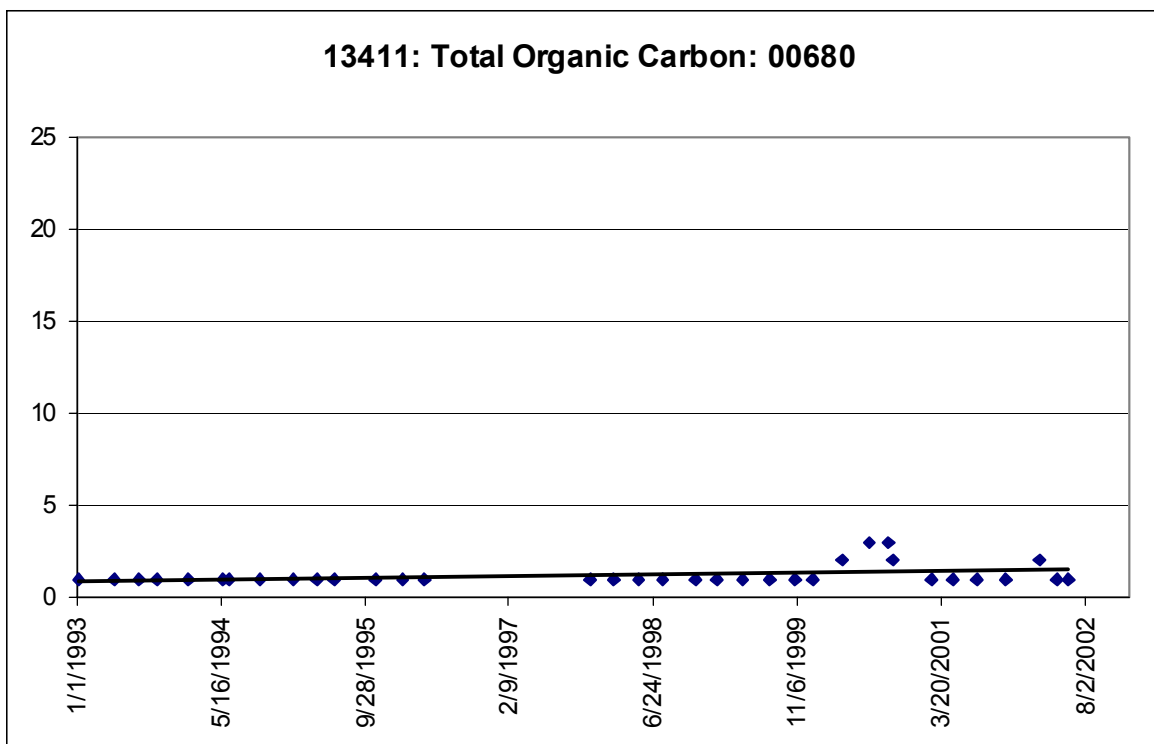
Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2002	12944	31	0.116274	1.953356	0.060486	1	17
2202	13074	55	0.305217	4.825299	1.22E-05	1	30
	13081	48	0.270806	4.133204	0.00015	1	32

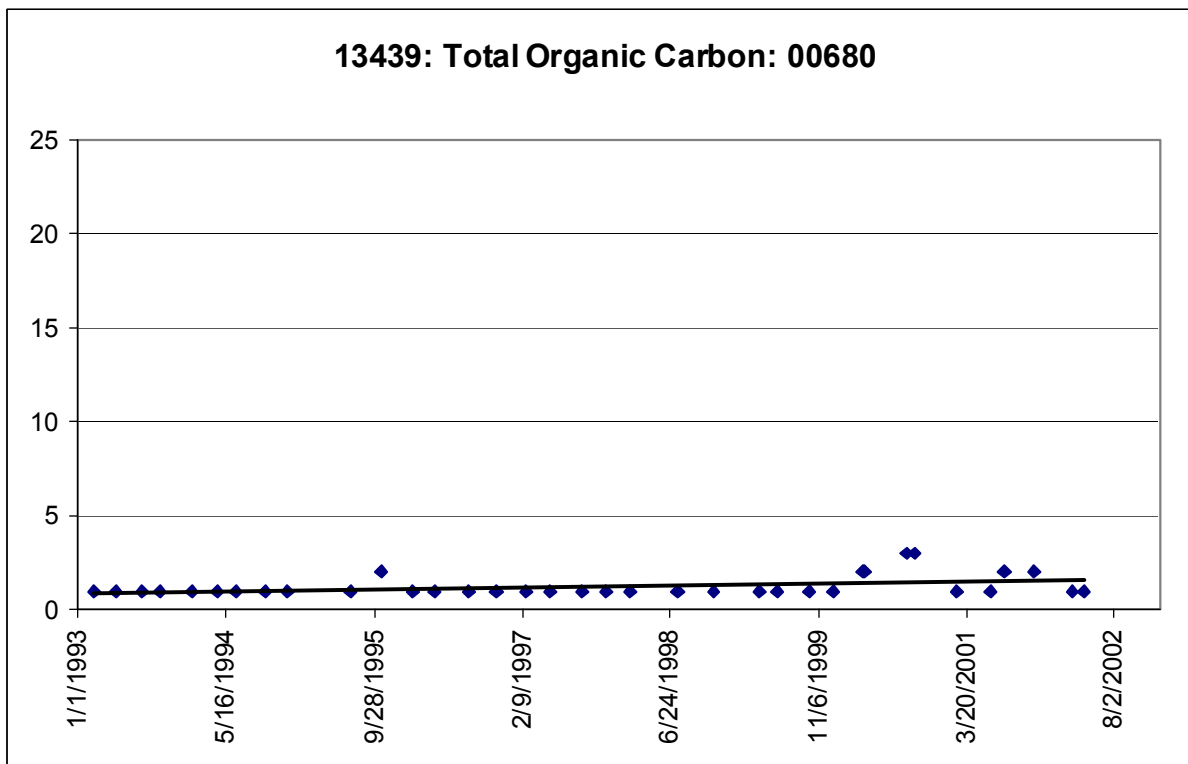
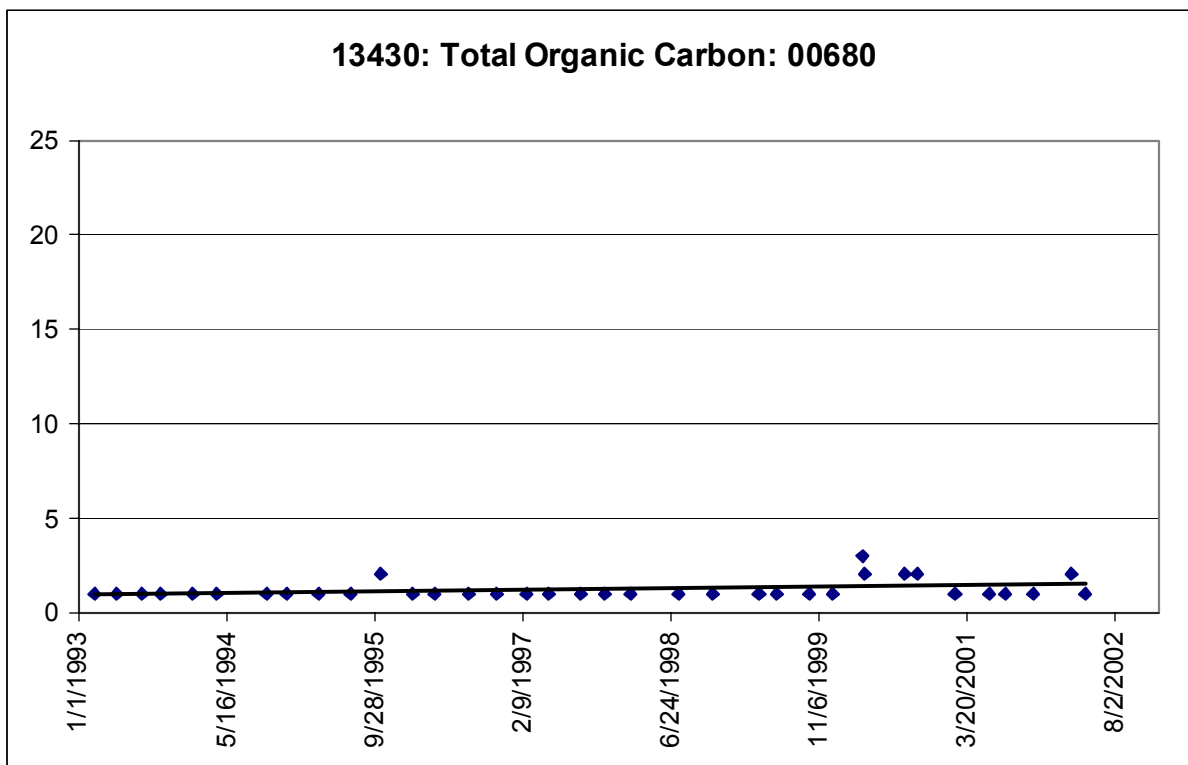


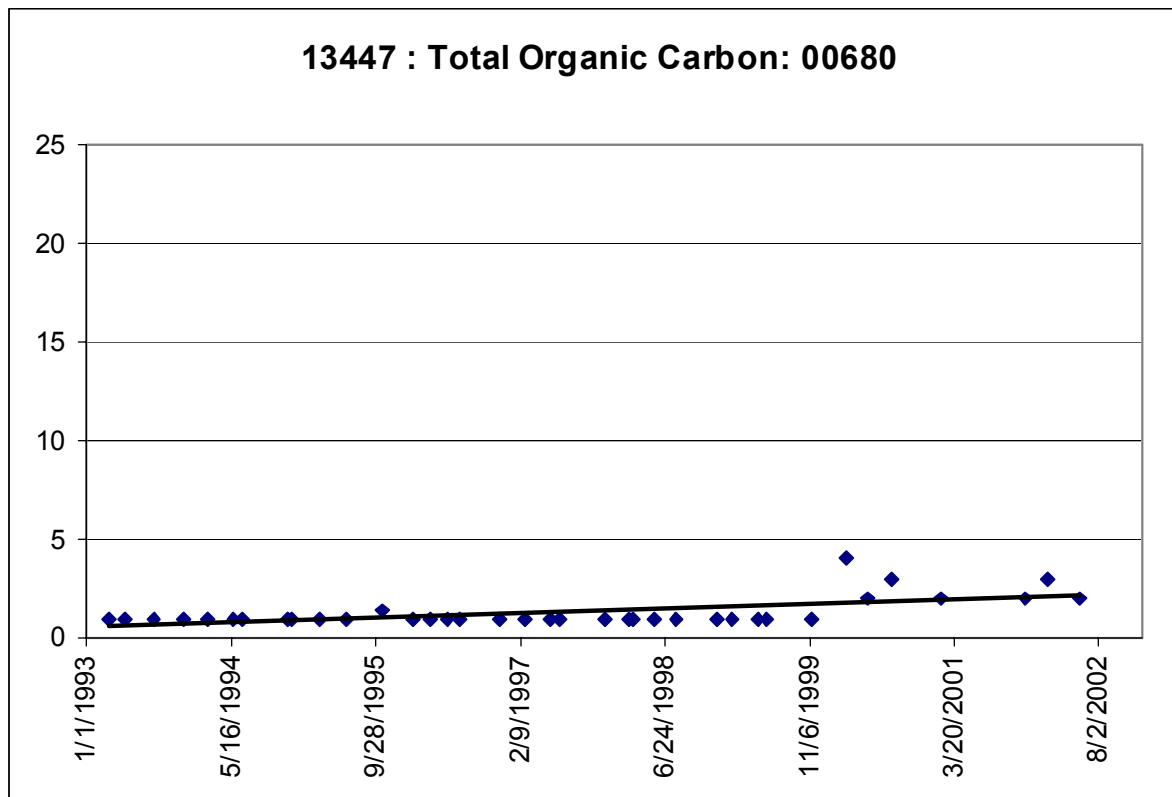
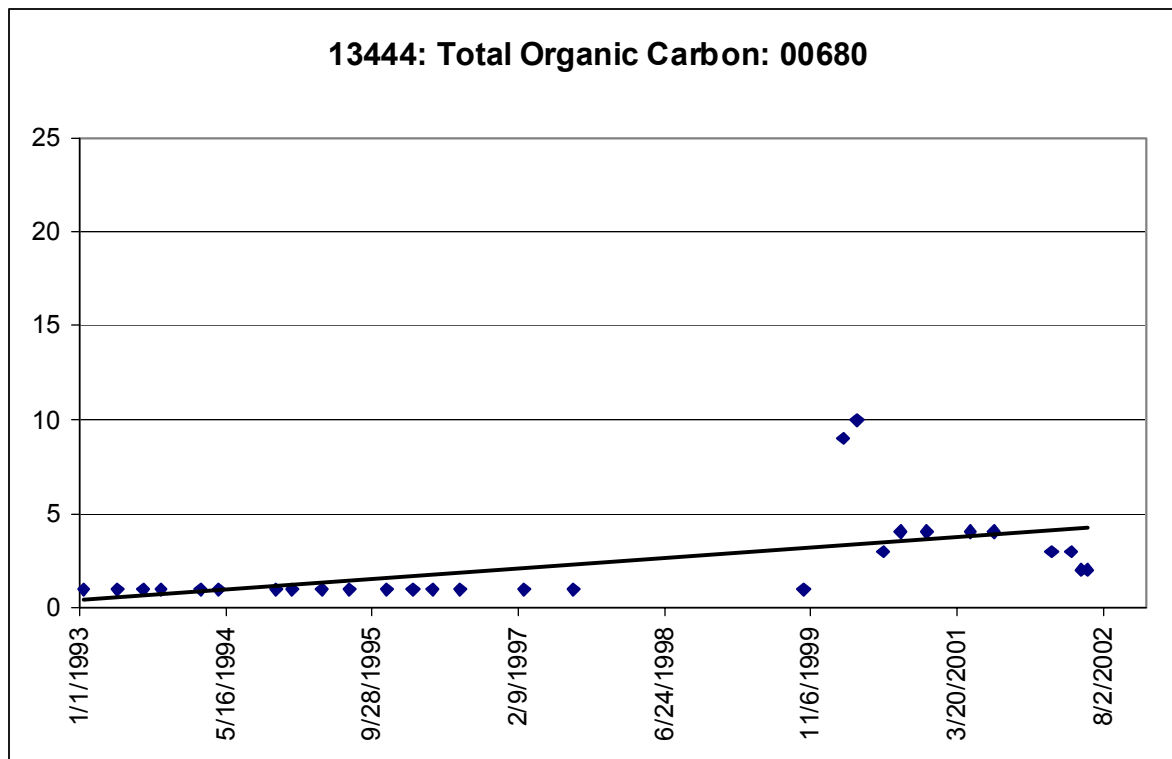


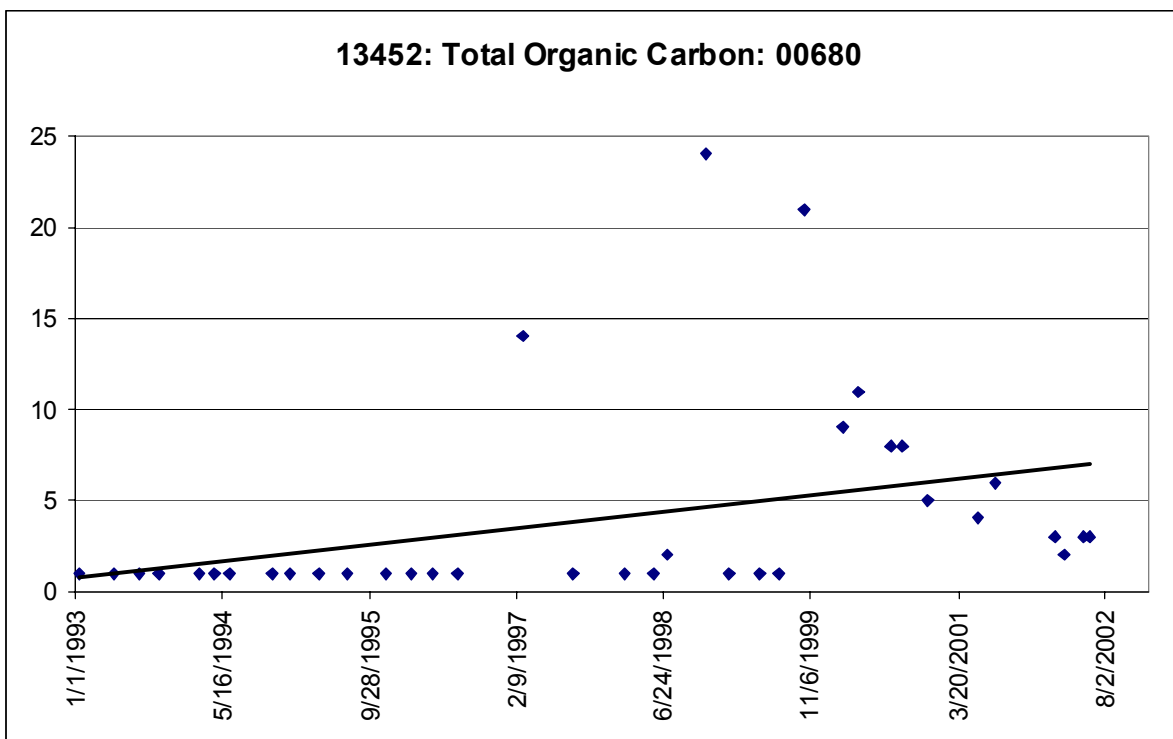
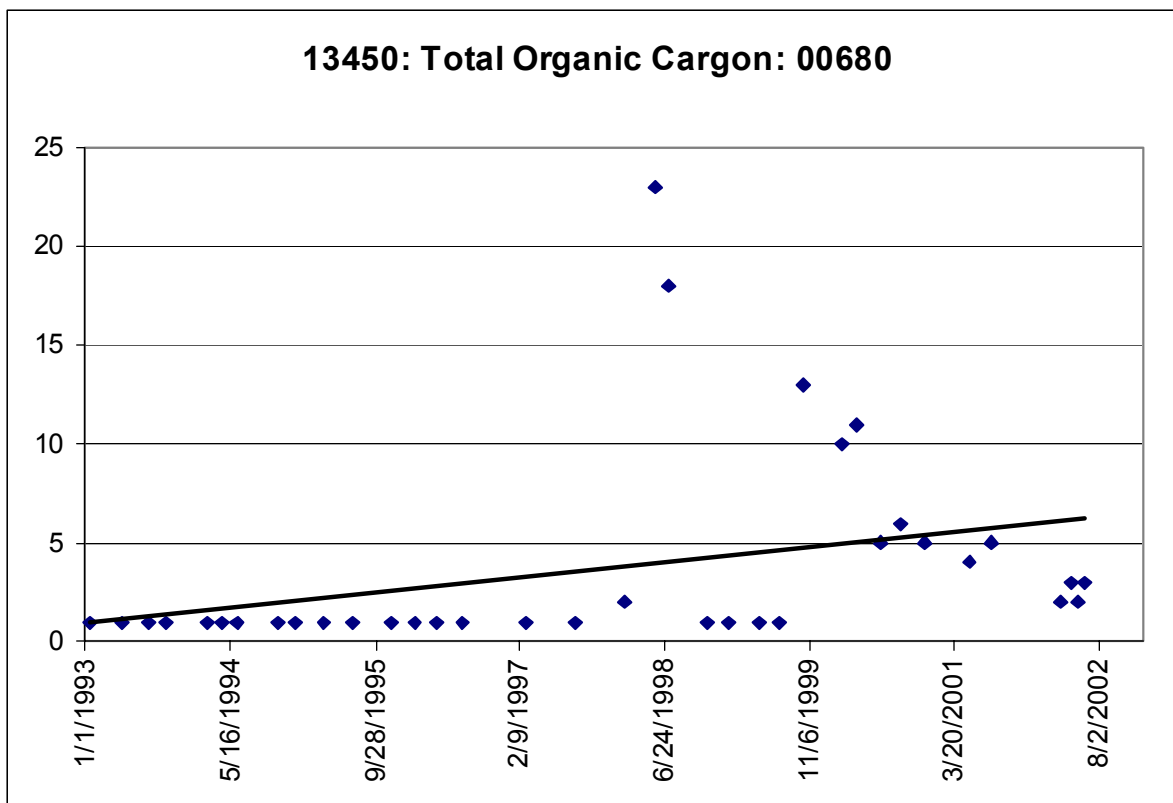
Increasing Trends
Total Organic Carbon – 00680
Marine

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2481	13411	35	0.128738	2.208192	0.034289	1	3
2484	13430	36	0.113009	2.081306	0.045007	1	3
	13439	36	0.164752	2.589684	0.014042	1	3
2491	13444	28	0.314179	3.451198	0.00192	1	10
	13447	37	0.358731	4.424844	8.99E-05	1	4
2492	13450	36	0.110293	2.053003	0.047831	1	23
	13452	36	0.124273	2.196562	0.034969	1	24

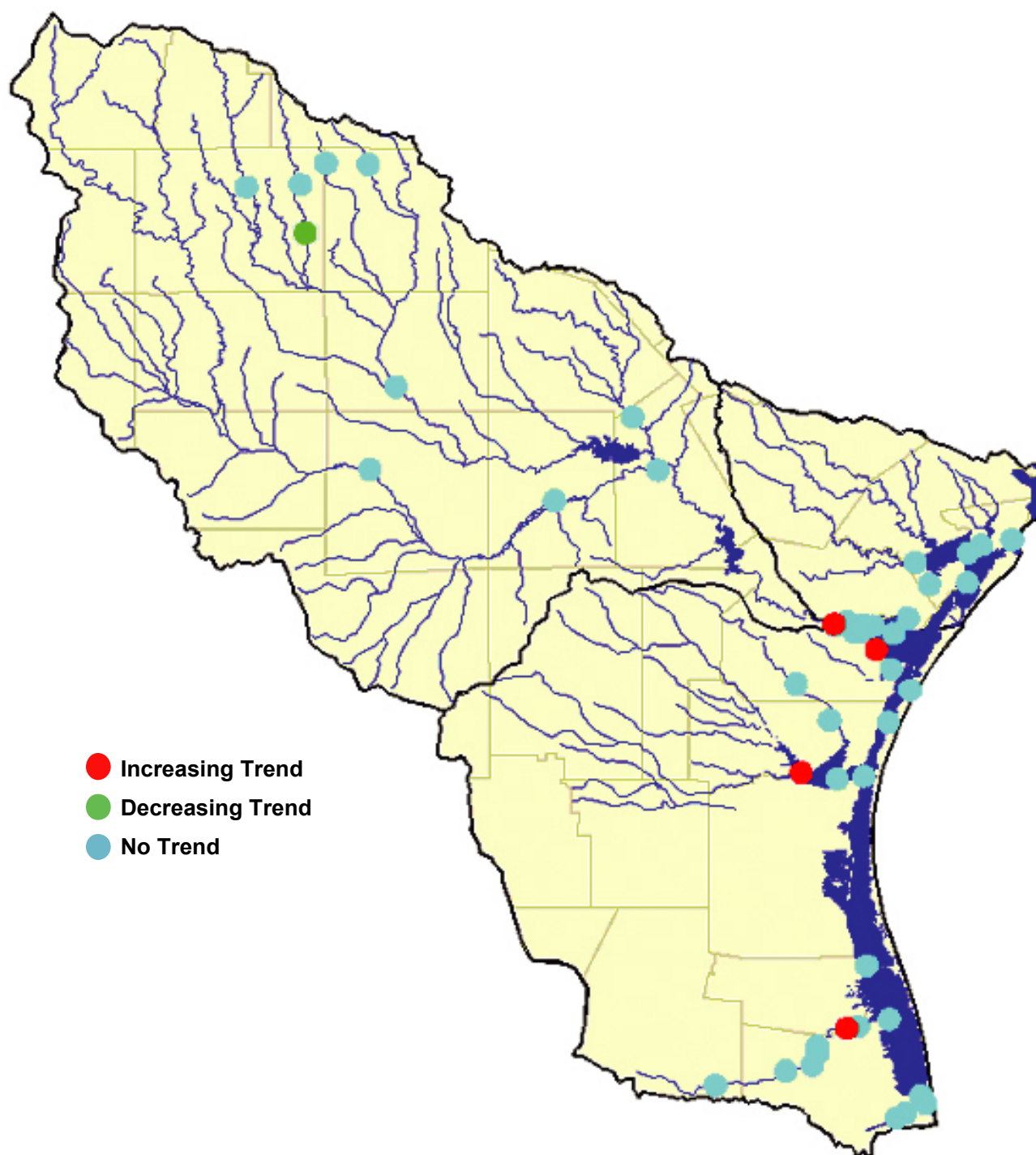








Chloride - 00940 (Log)



Total Number of Data Sets Analyzed: 47

Decreasing Trends: 1

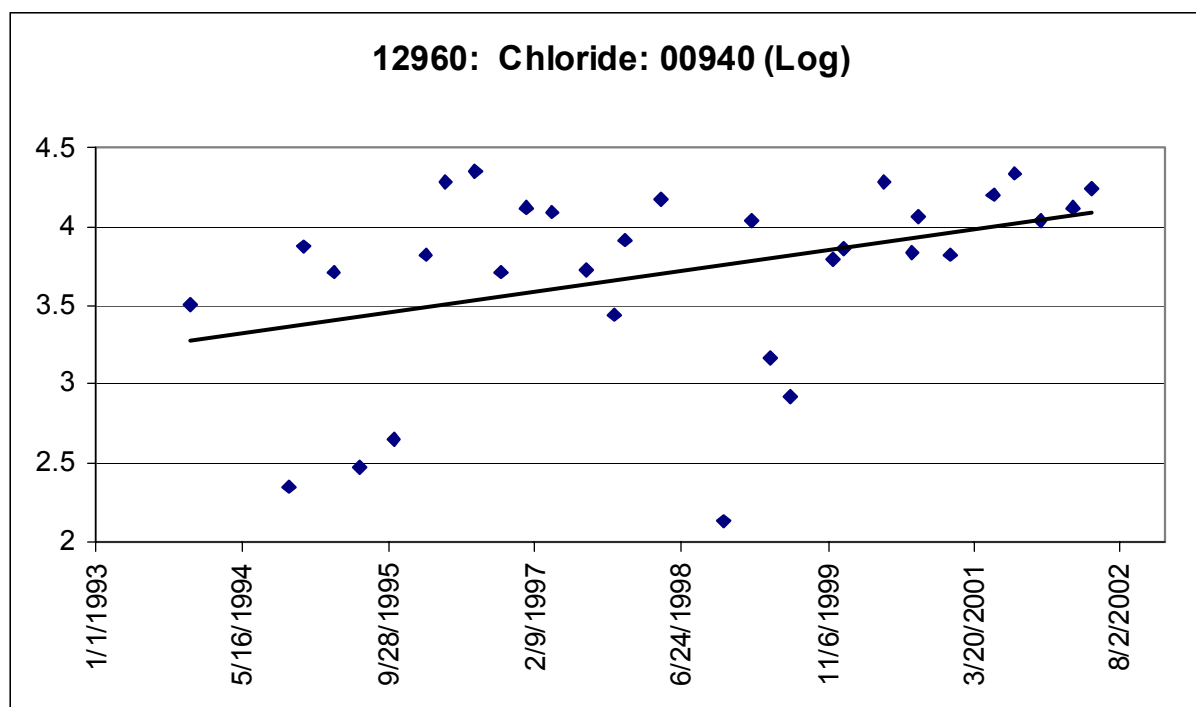
Increasing Trends: 4

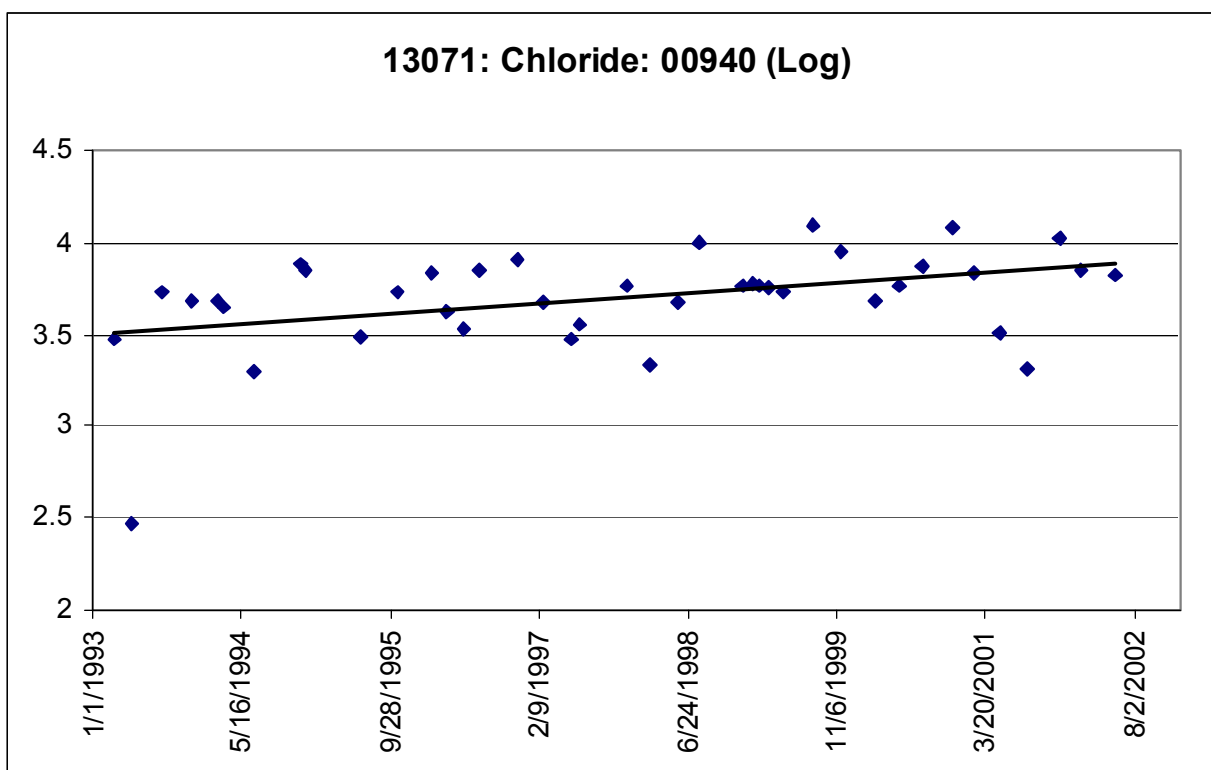
Decreasing Trends
Chloride – 00940 (Log)
Non-Tidal

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2110	12993	26	0.142459	-1.99675	0.057314	1.04	2.21

Increasing Trends
Chloride – 00940 (Log)
Tidal

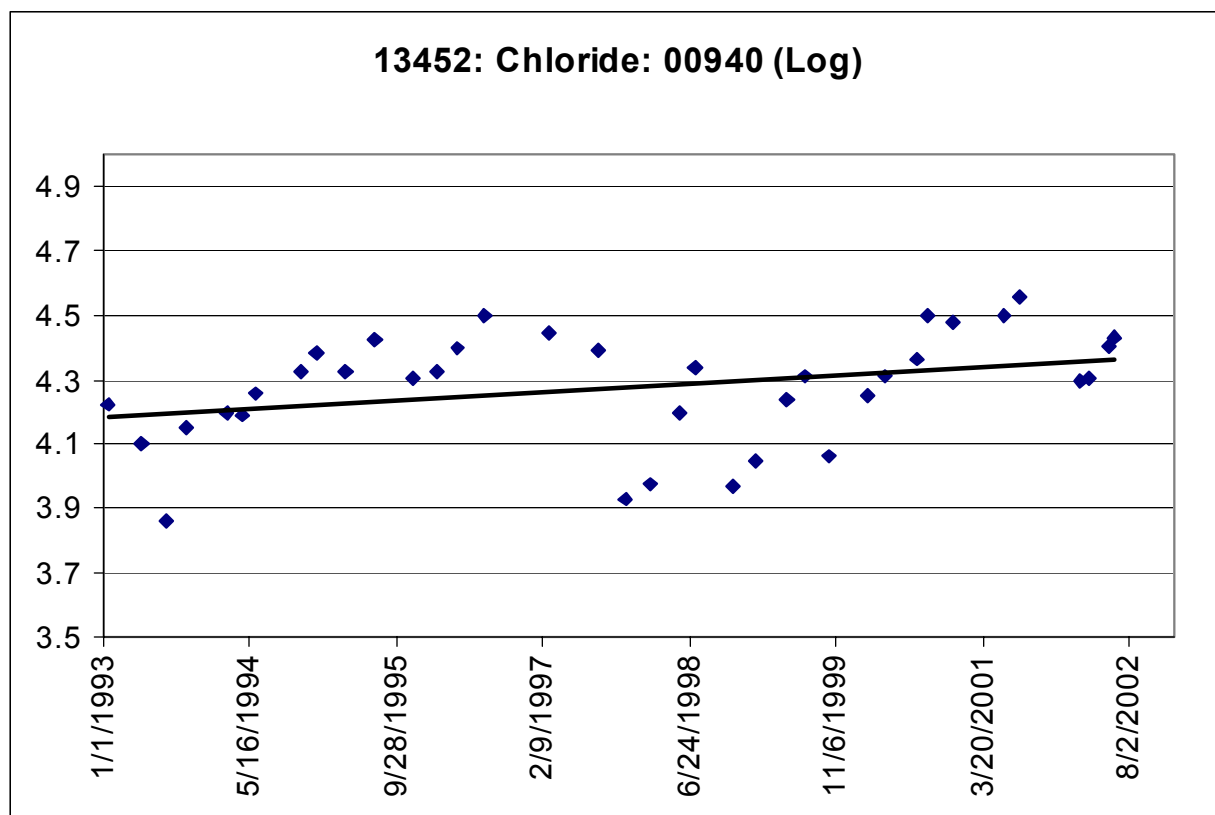
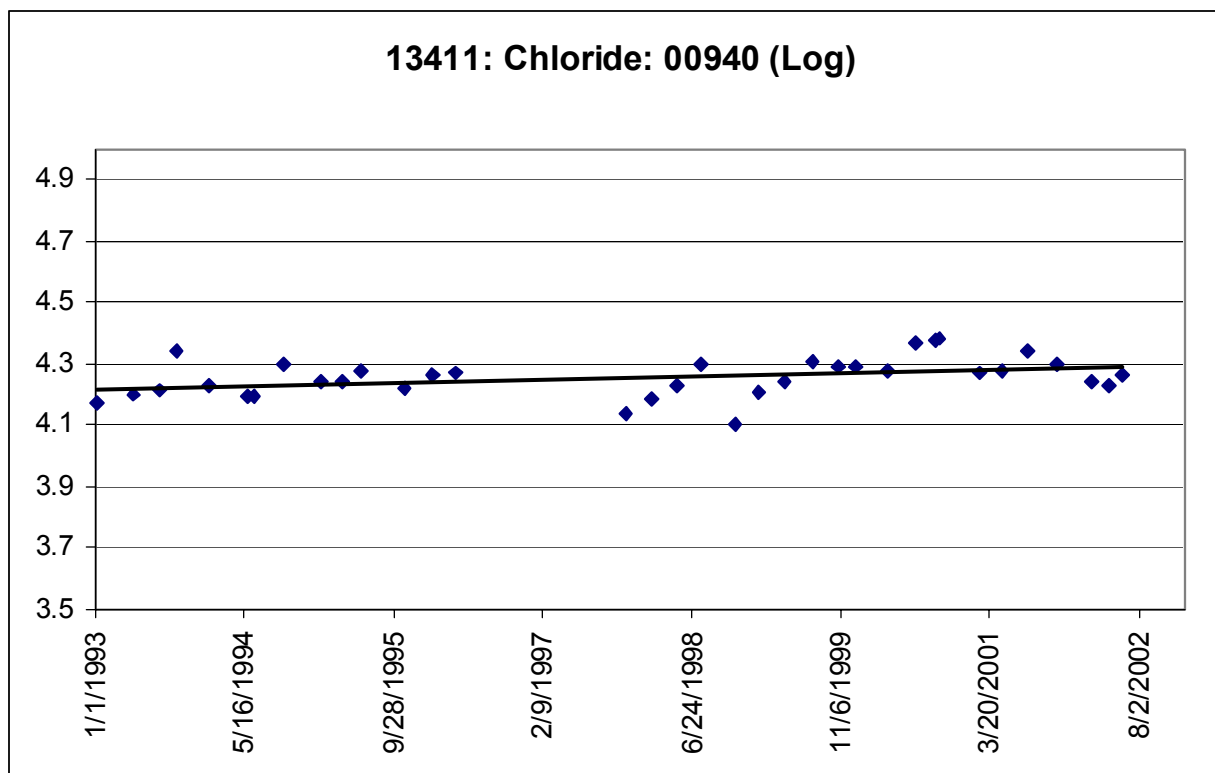
Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2101	12960	31	0.146876	2.234441	0.033325	2.13	4.35
2201	13071	40	0.159326	2.683624	0.010727	2.47	4.10





**Increasing Trends
Chloride – 00940 (Log)
Marine**

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2481	13411	35	0.140448	2.322087	0.026544	4.10	4.39
2492	13452	37	0.109708	2.076763	0.045229	3.86	4.46



Sulfate - 00945



Total Number of Data Sets Analyzed: 54

Decreasing Trends: 2

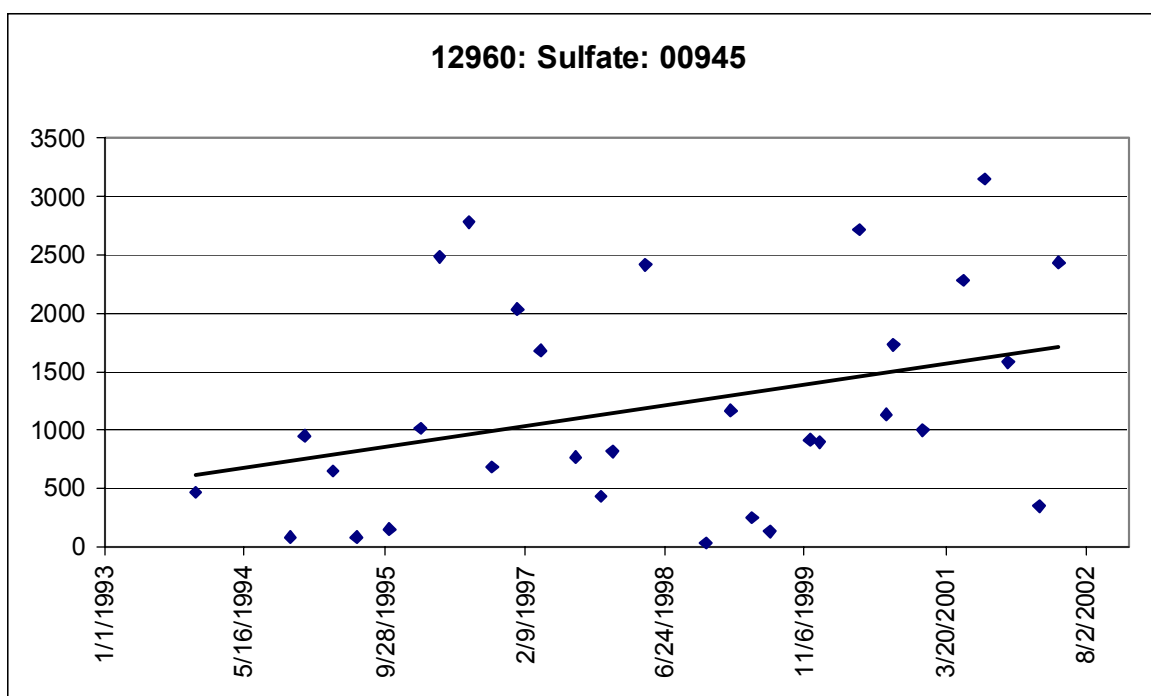
Increasing Trends: 5

Decreasing Trends**Sulfate – 00945****Non-Tidal**

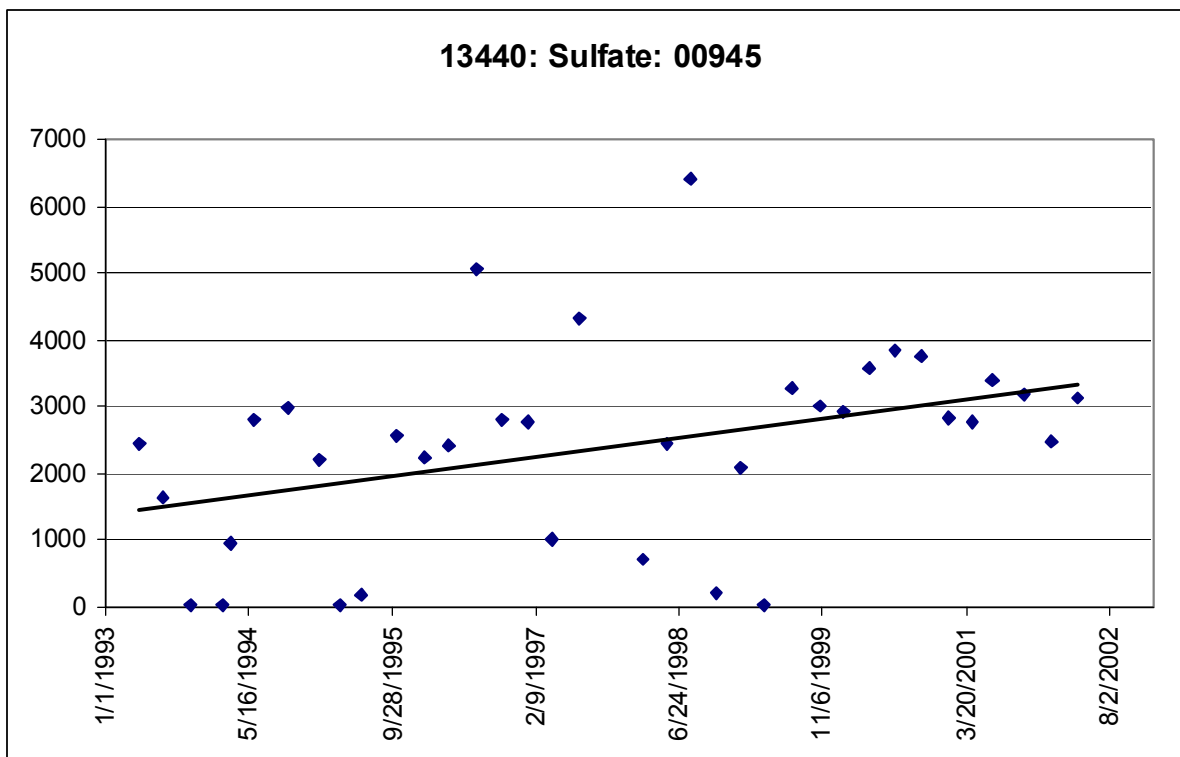
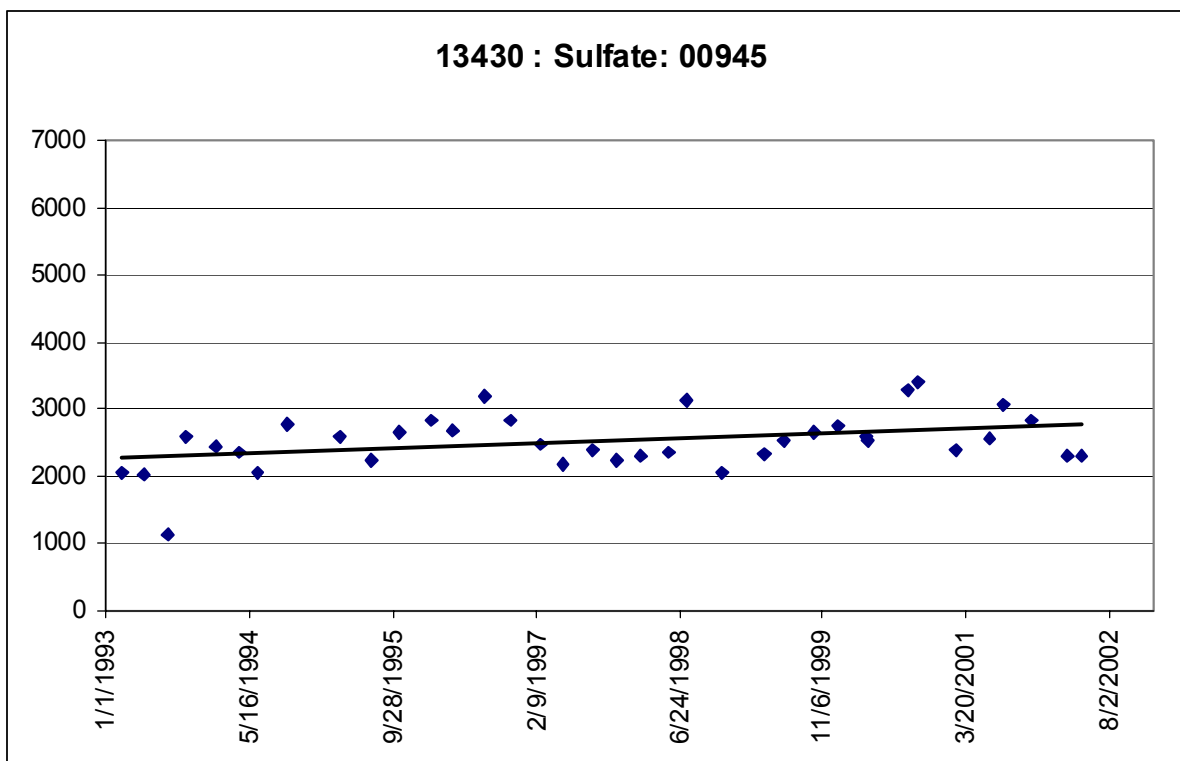
Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2106	12979	48	0.121238	-2.15192	0.015301	8.7	110
2110	12993	34	0.145815	-2.33722	0.025846	20	70

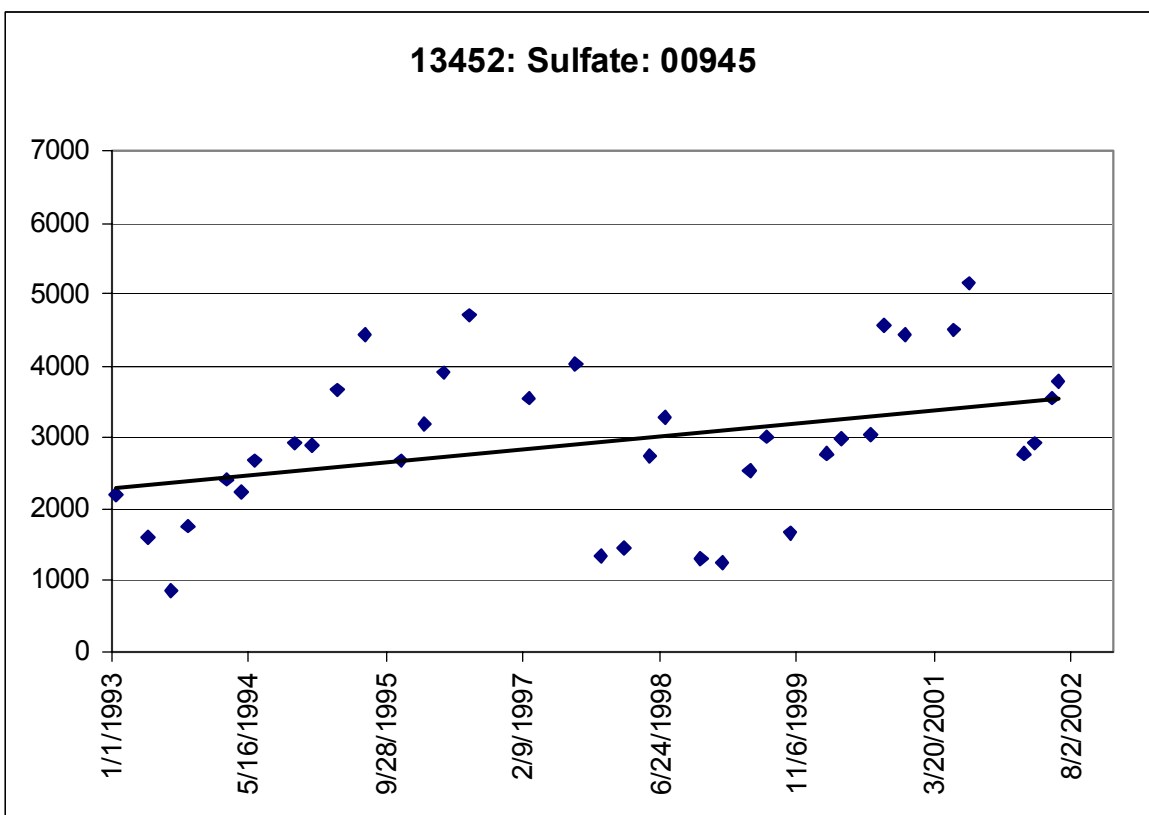
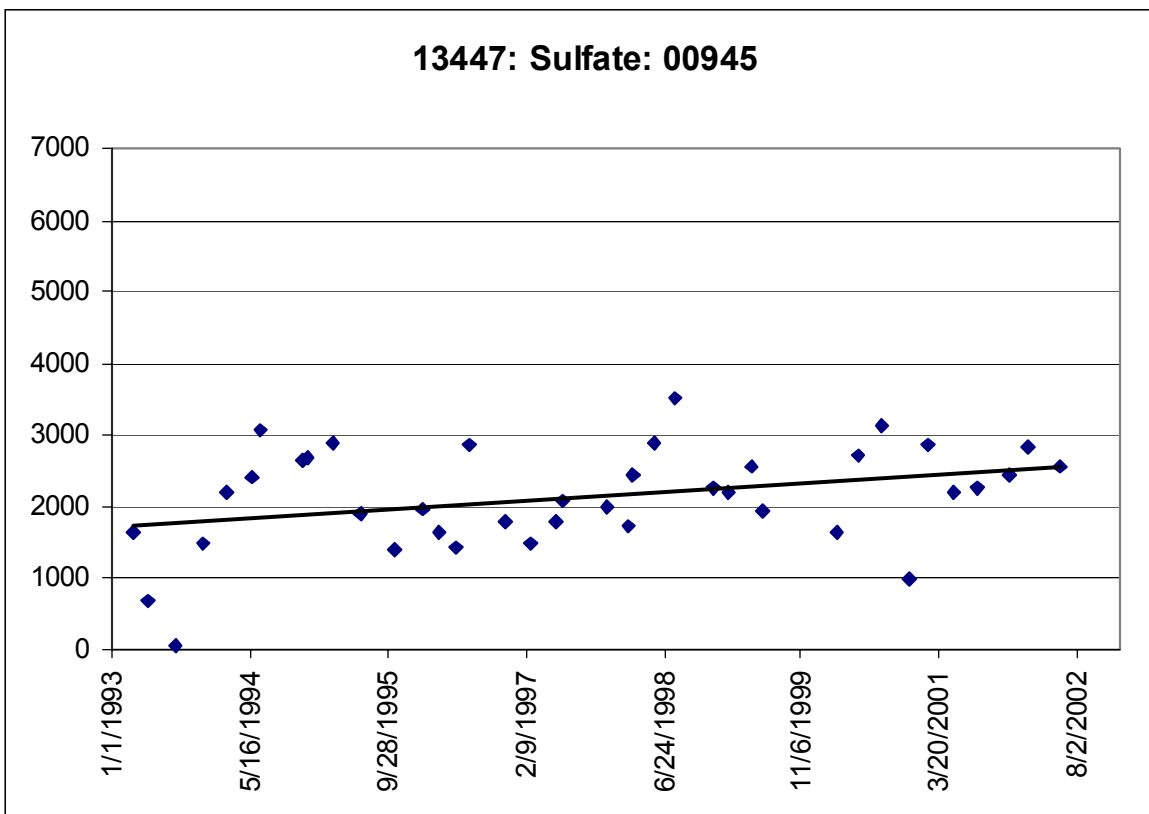
Increasing Trends**Sulfate – 00945****Tidal**

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2101	12960	31	0.115977	1.950529	0.060837	39	3150

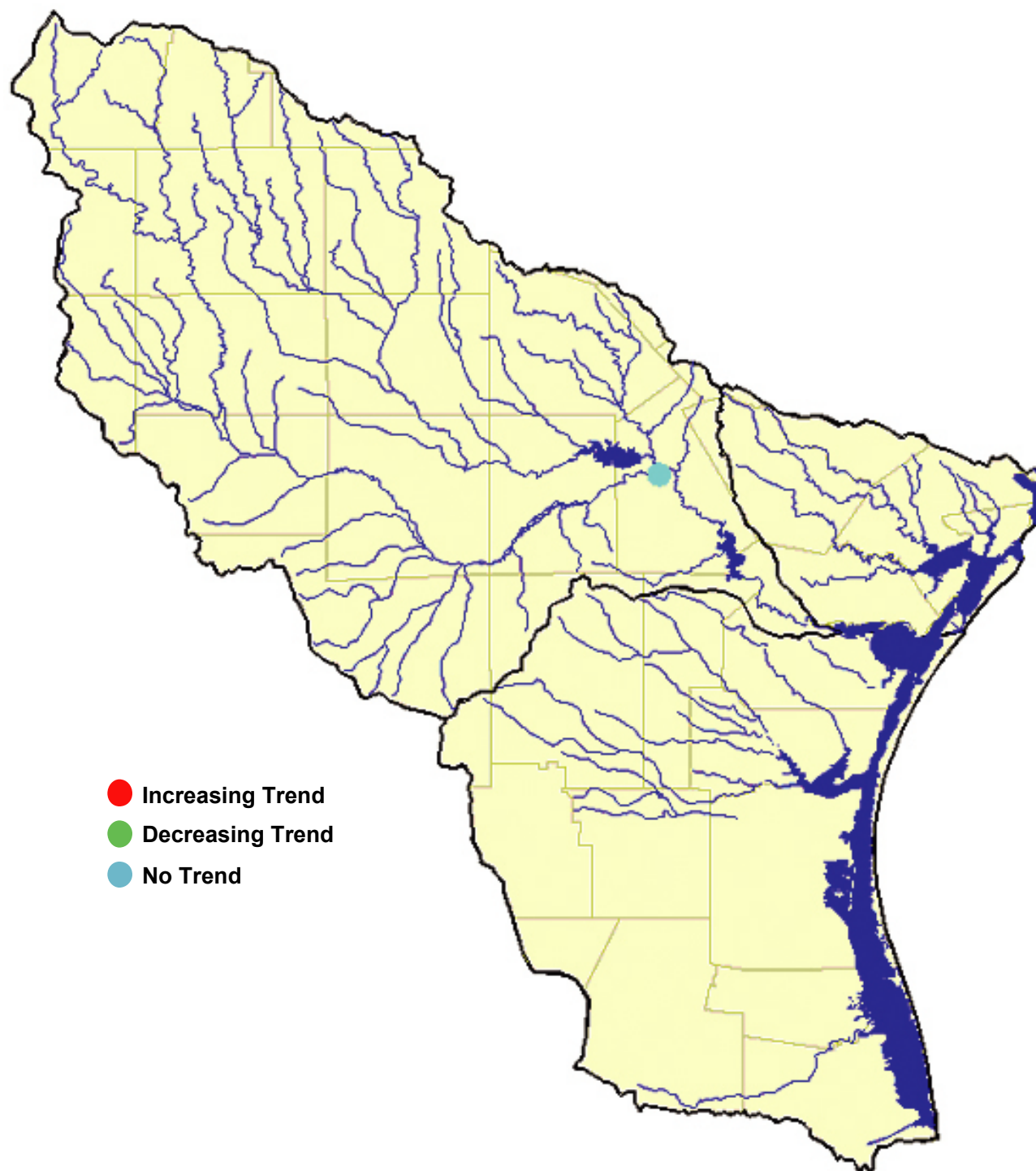
**Increasing Trends****Sulfate – 00945****Marine**

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2484	13430	37	0.141601	2.402825	0.021716	1120	3400
2485	13440	36	0.152062	2.469267	0.01872	19.9	6390
2491	13447	39	0.119508	2.240972	0.031115	61	3520
2492	13452	37	0.124375	2.229679	0.032282	862	5160





Dissolved Arsenic - 01000

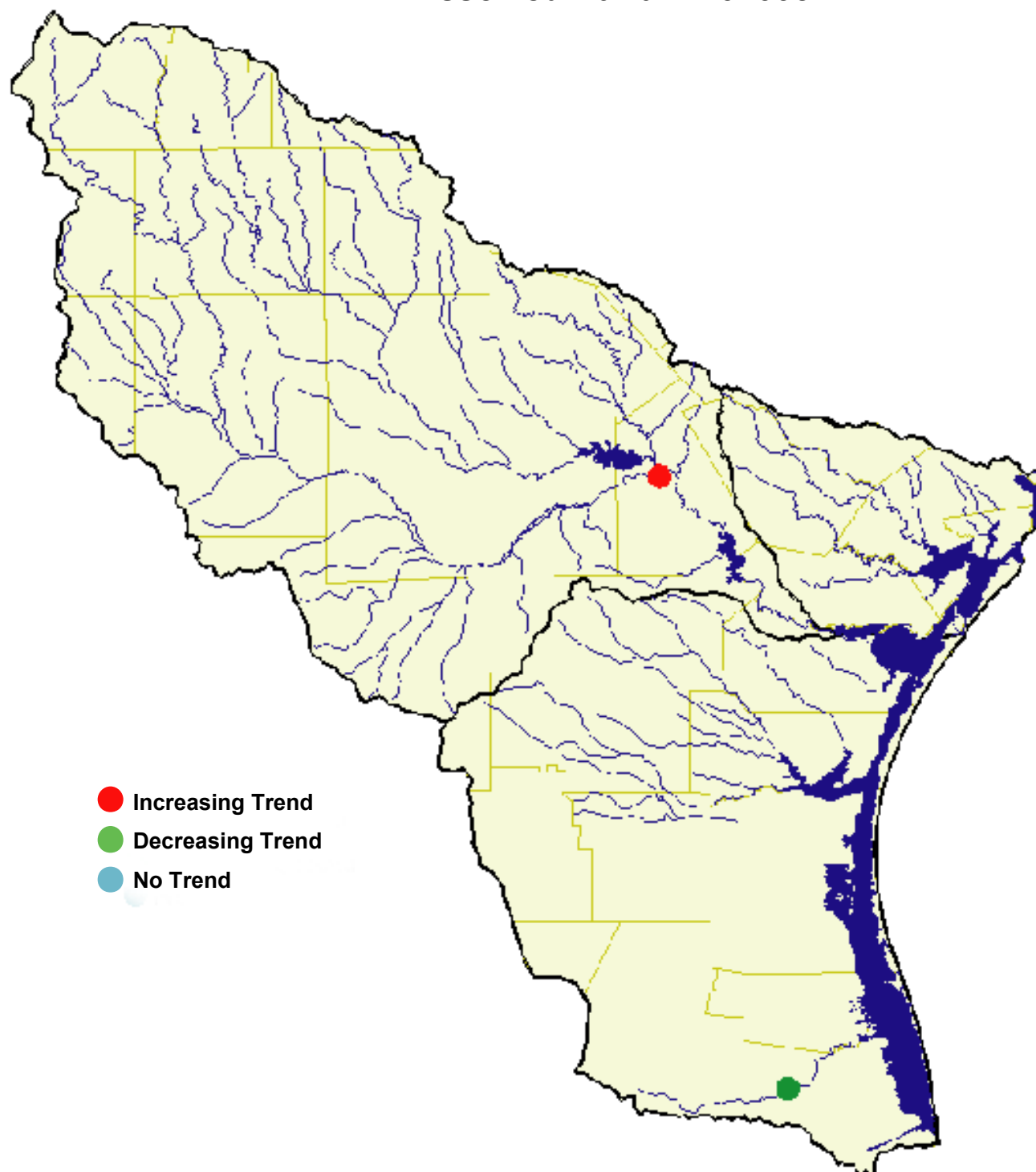


Total Number of Data Sets Analyzed: 1

Decreasing Trends: 0

Increasing Trends: 0

Dissolved Barium - 01005



Total Number of Data Sets Analyzed: 2

Decreasing Trends: 1

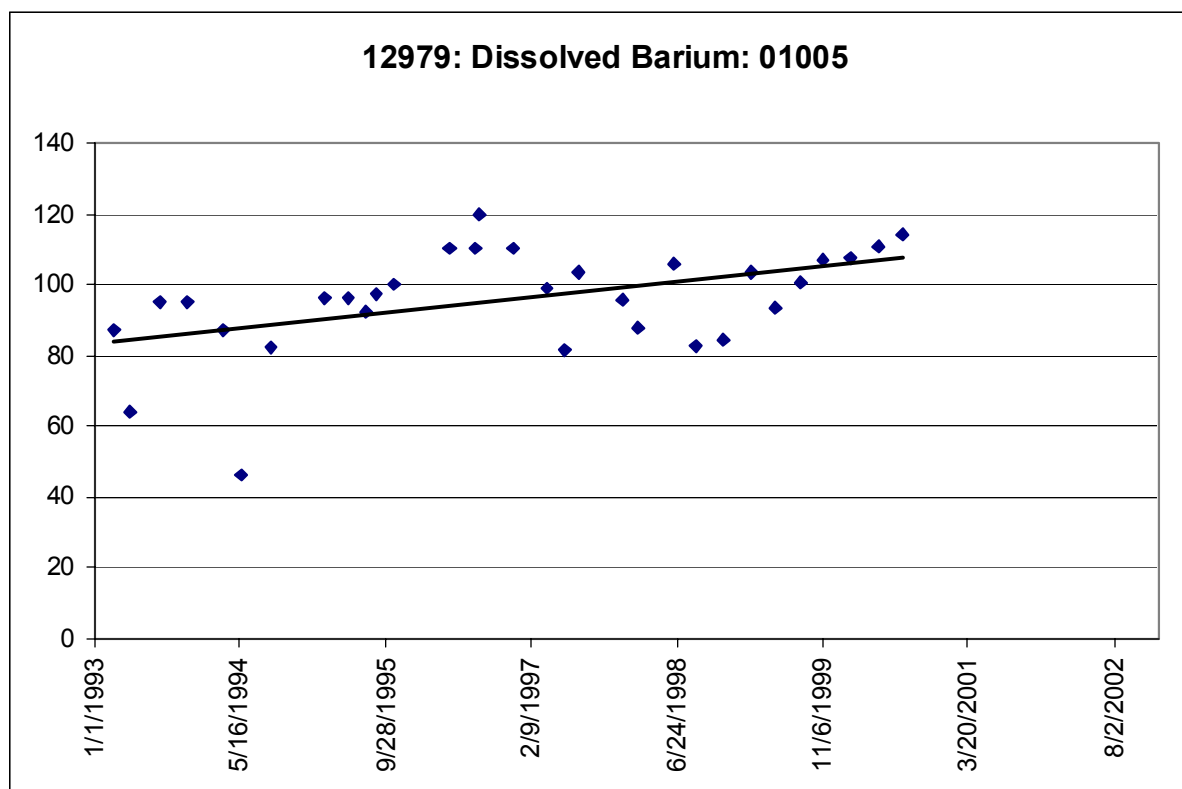
Increasing Trends: 1

**Decreasing Trends
Dissolved Barium – 01005
Non-Tidal**

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2202	13079	37	0.138862	-2.37569	0.023123	39.26	143

**Increasing Trends
Dissolved Barium - 01005
Non-Tidal**

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2106	12979	31	0.229475	2.938823	0.006402	46	120



Dissolved Cadmium - 01025

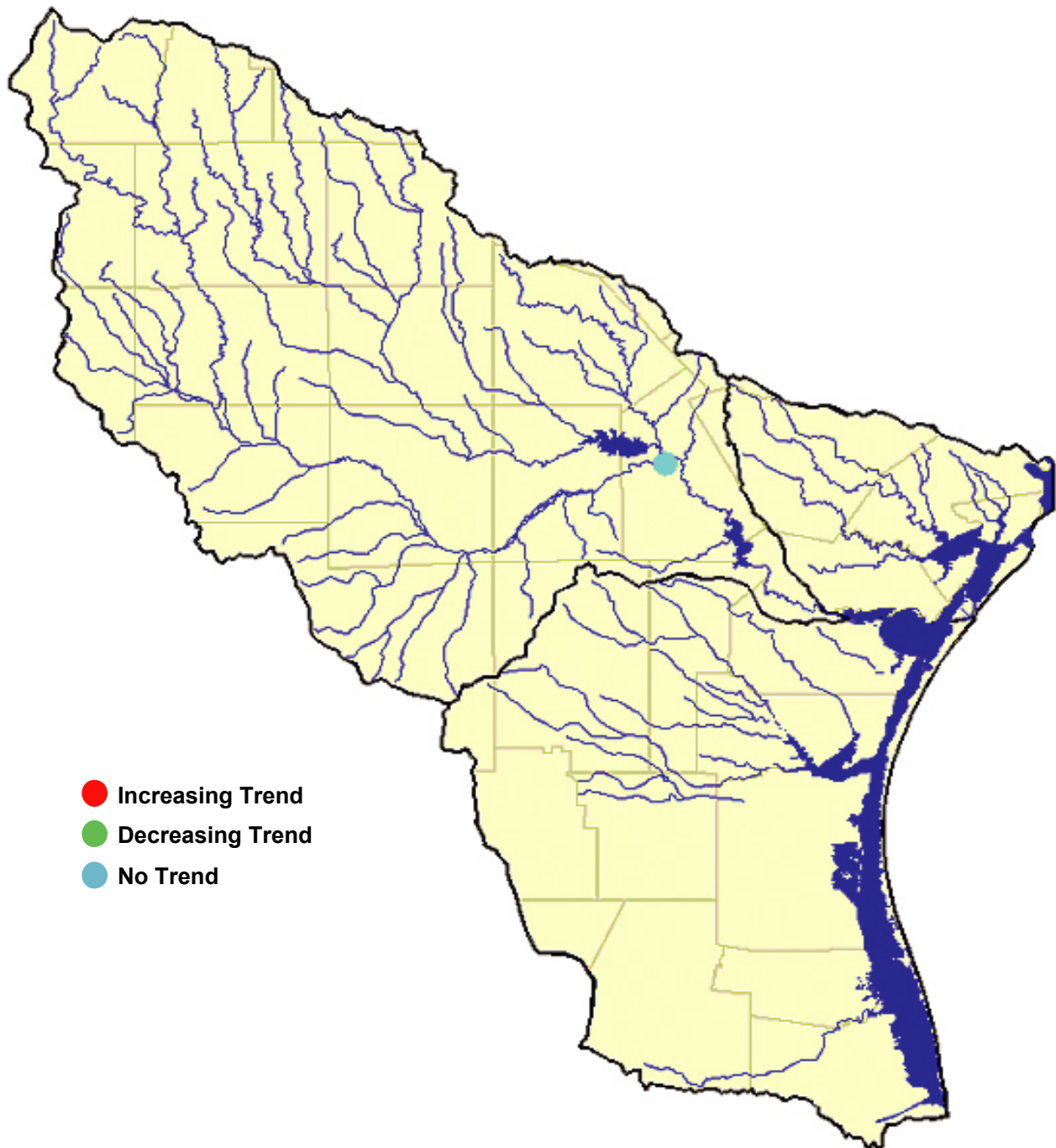


Total Number of Data Sets Analyzed: 1

Decreasing Trends: 0

Increasing Trends: 0

Dissolved Chromium - 01030



Total Number of Data Sets Analyzed: 1
Decreasing Trends: 0
Increasing Trends: 0

Dissolved Copper - 01040



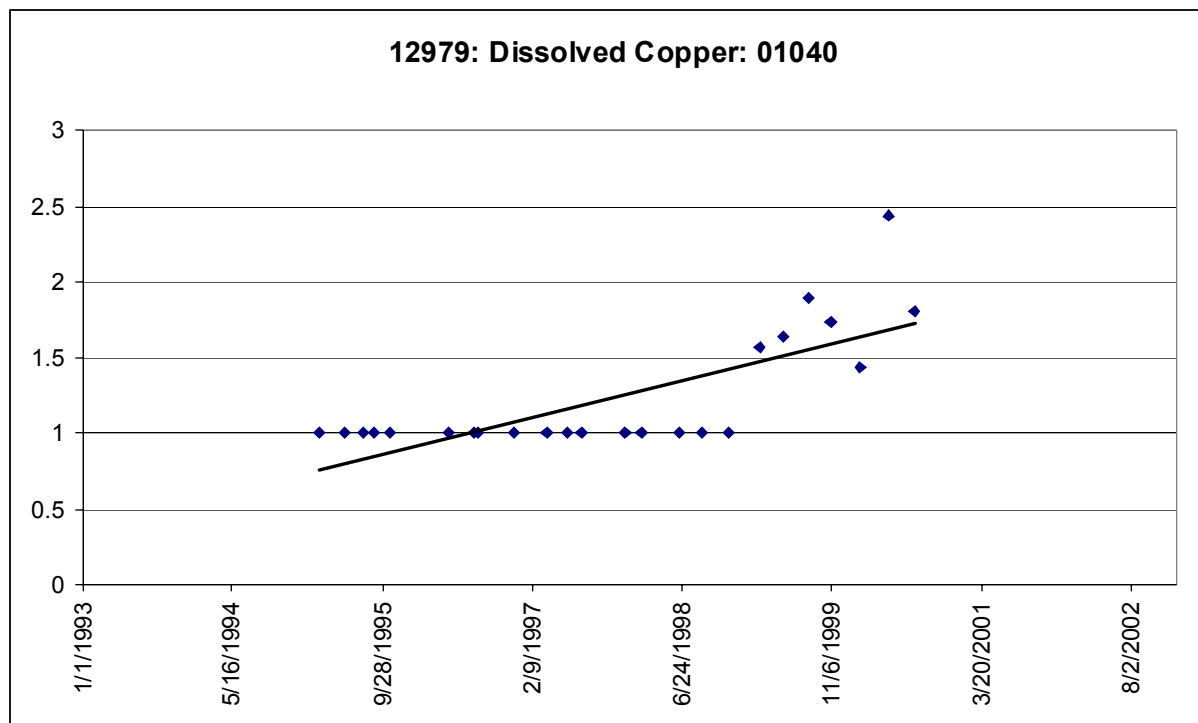
Total Number of Data Sets Analyzed: 1

Decreasing Trends: 0

Increasing Trends: 1

Increasing Trends
Dissolved Copper – 01040
Non-Tidal

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2106	12979	24	0.565855	5.354836	2.24E-05	1	2.433



Dissolved Lead - 01049



Total Number of Data Sets Analyzed: 1

Decreasing Trends: 0

Increasing Trends: 0

Dissolved Silver - 01075

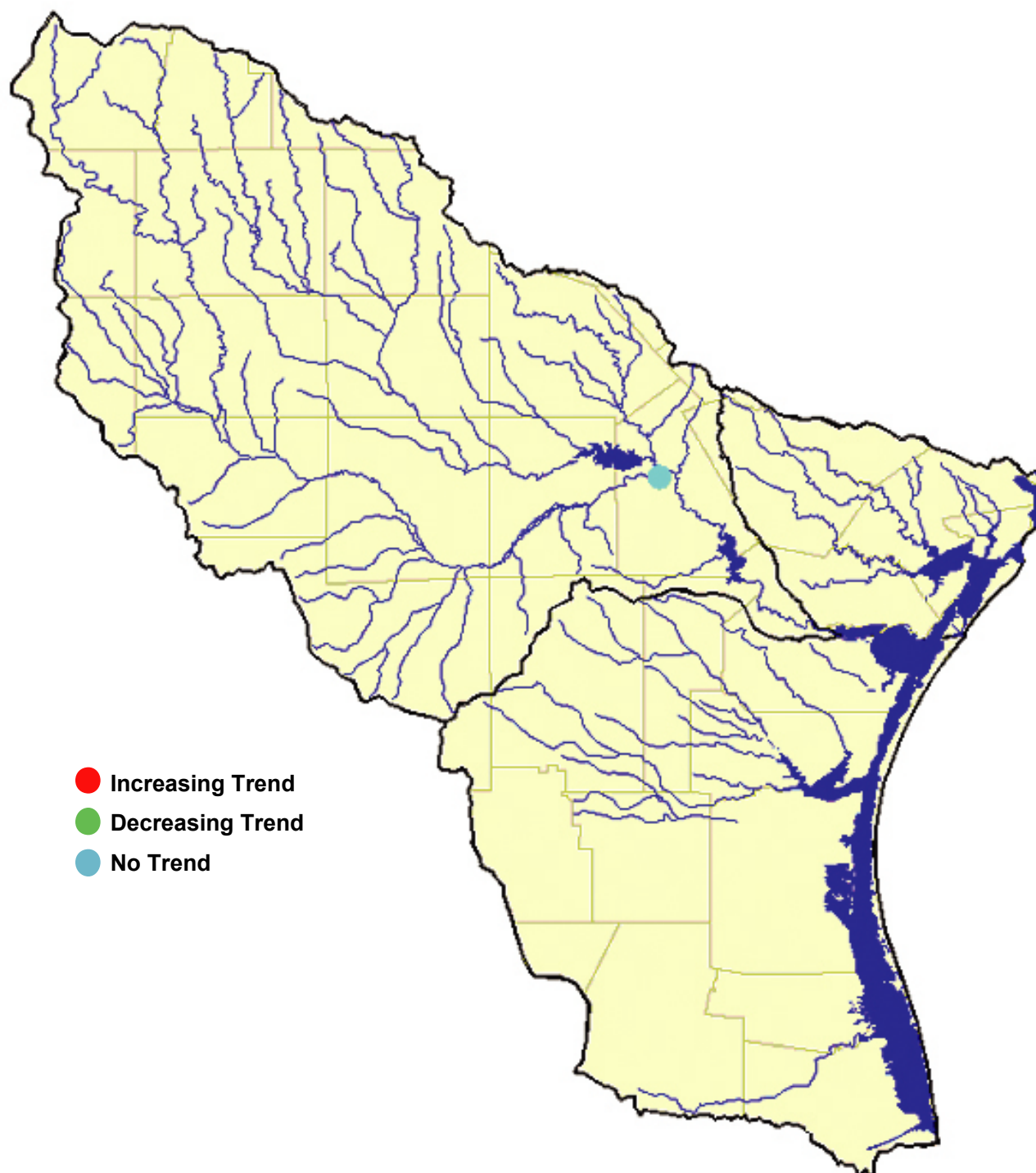


Total Number of Data Sets Analyzed: 2

Decreasing Trends: 0

Increasing Trends: 0

Dissolved Zinc - 01090

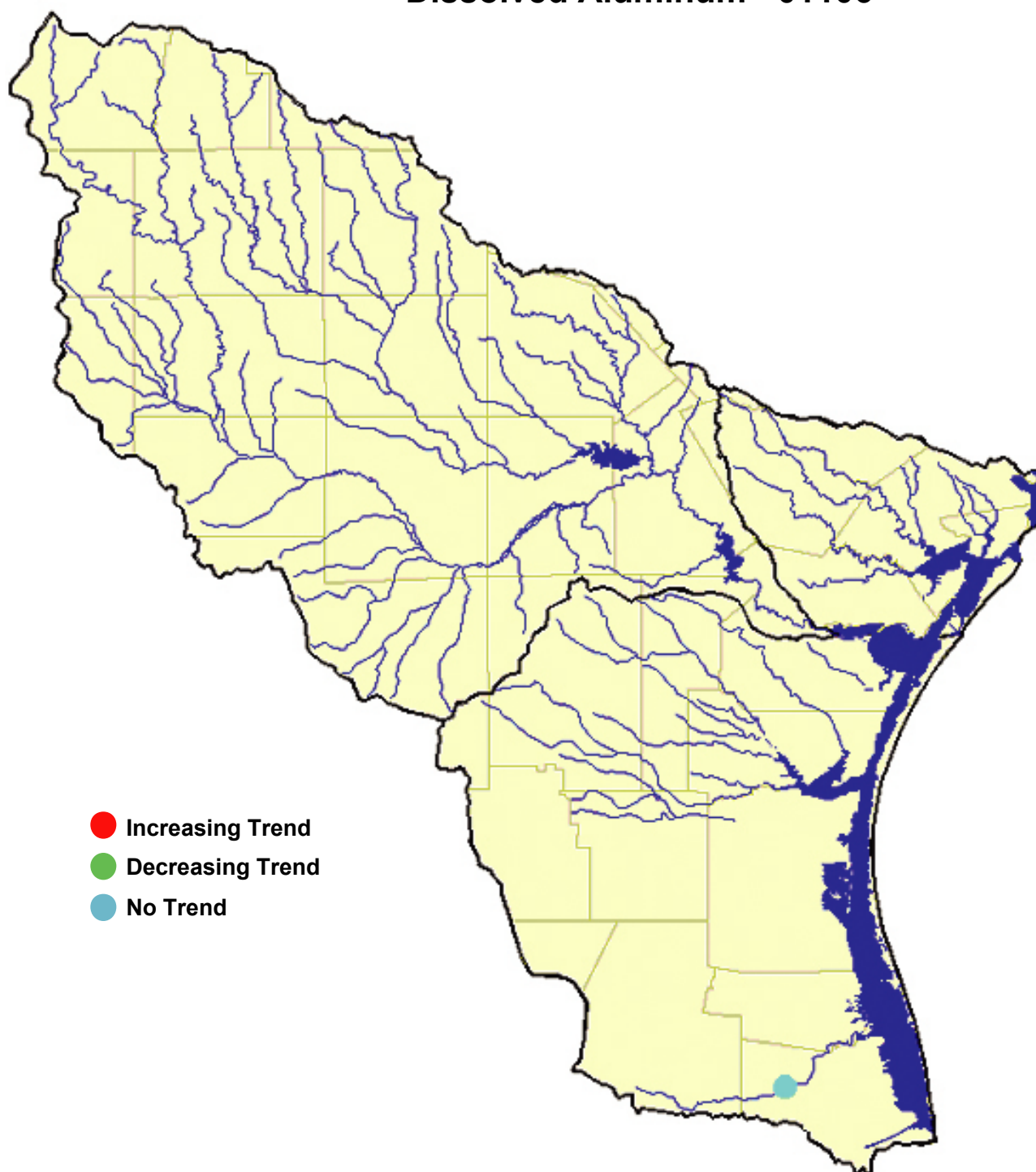


Total Number of Data Sets Analyzed: 1

Decreasing Trends: 0

Increasing Trends: 0

Dissolved Aluminum - 01106



Total Number of Data Sets Analyzed: 1

Decreasing Trends: 0

Increasing Trends: 0

Fecal Coliform - 31616



Total Number of Data Sets Analyzed: 29

Decreasing Trends: 2

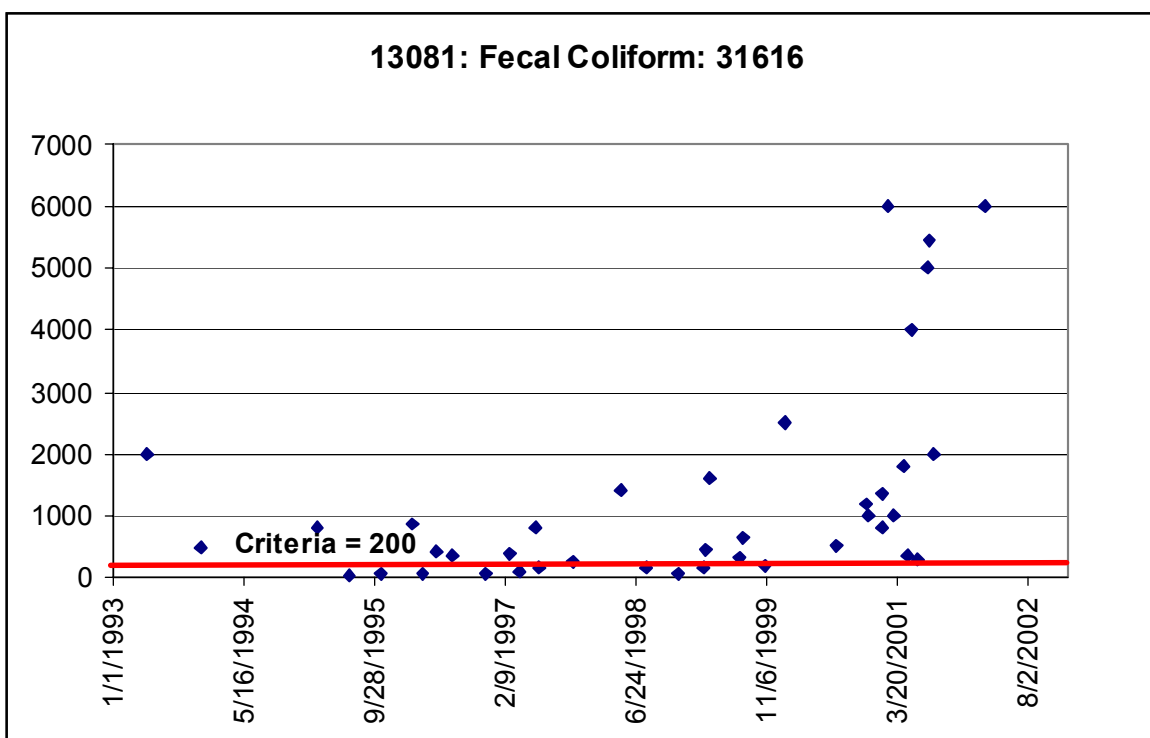
Increasing Trends: 2

**Decreasing Trends
Fecal Coliform – 31616
Marine**

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2491	13443	33	0.155536	-2.38949	0.02314	1	46.9
	13448	30	0.122869	-1.98047	0.057553	1	7

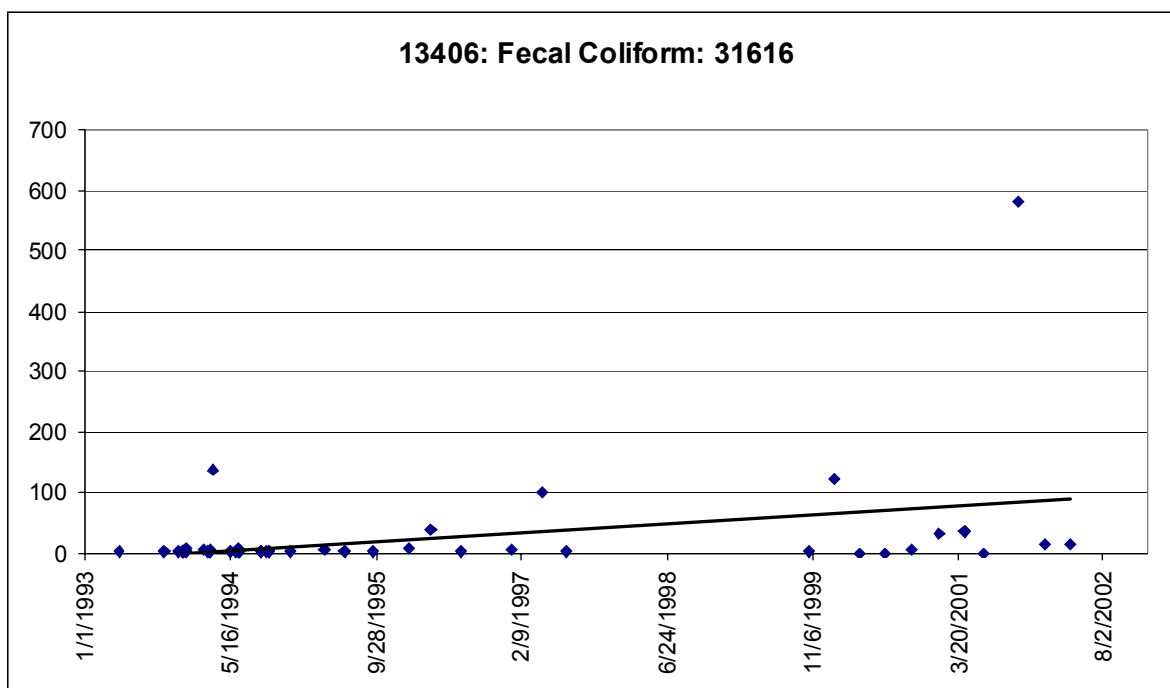
**Increasing Trends
Fecal Coliform – 31616
Non-Tidal**

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2202	13081	36	0.109534	2.045055	0.048652	1160	24400



Increasing Trends
Total Dissolved Solids – 70300
Marine

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2473	13406	44	0.109647	2.27427	0.028121	1	580



Chlorophyll a - 32211



Total Number of Data Sets Analyzed: 44

Decreasing Trends: 7

Increasing Trends: 1

**Decreasing Trends
Chlorophyll a – 32211
Non-Tidal**

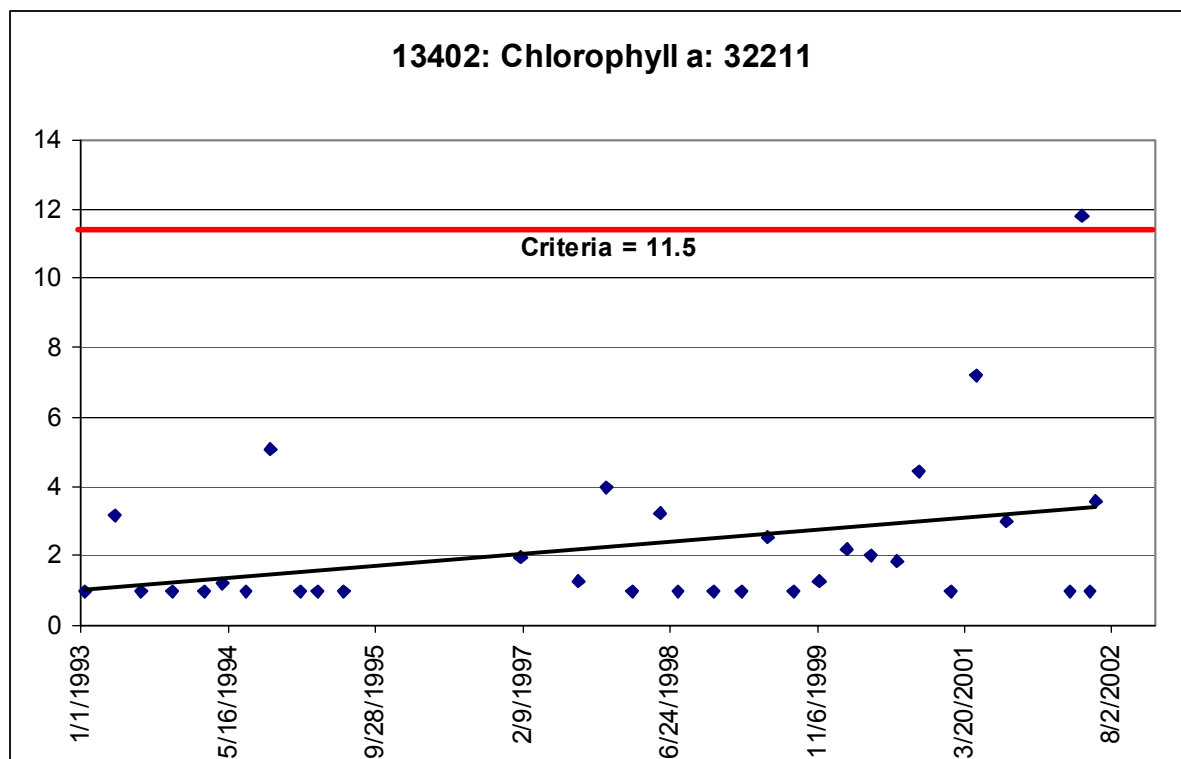
Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2113	13006	24	0.265749	-2.82179	0.009931	1	6.19

**Decreasing Trends
Chlorophyll a – 32211
Marine**

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2472	12945	26	0.18562	-2.33886	0.028	0.65	37
2481	13407	40	0.130586	-2.38906	0.021961	1	19.9
2491	13443	33	0.155536	-2.38949	0.02314	1	46.9
	13444	29	0.21382	-2.70985	0.01155	1	77.8
	13448	32	0.169179	-2.47161	0.019348	1	31.2
2492	13450	37	0.12278	-2.21331	0.033489	1	119

**Increasing Trends
Chlorophyll a – 32211
Marine**

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2471	13402	33	0.11886	2.044915	0.049433	1	11.8



Total Dissolved Solids - 70300



Total Number of Data Sets Analyzed: 37

Decreasing Trends: 3

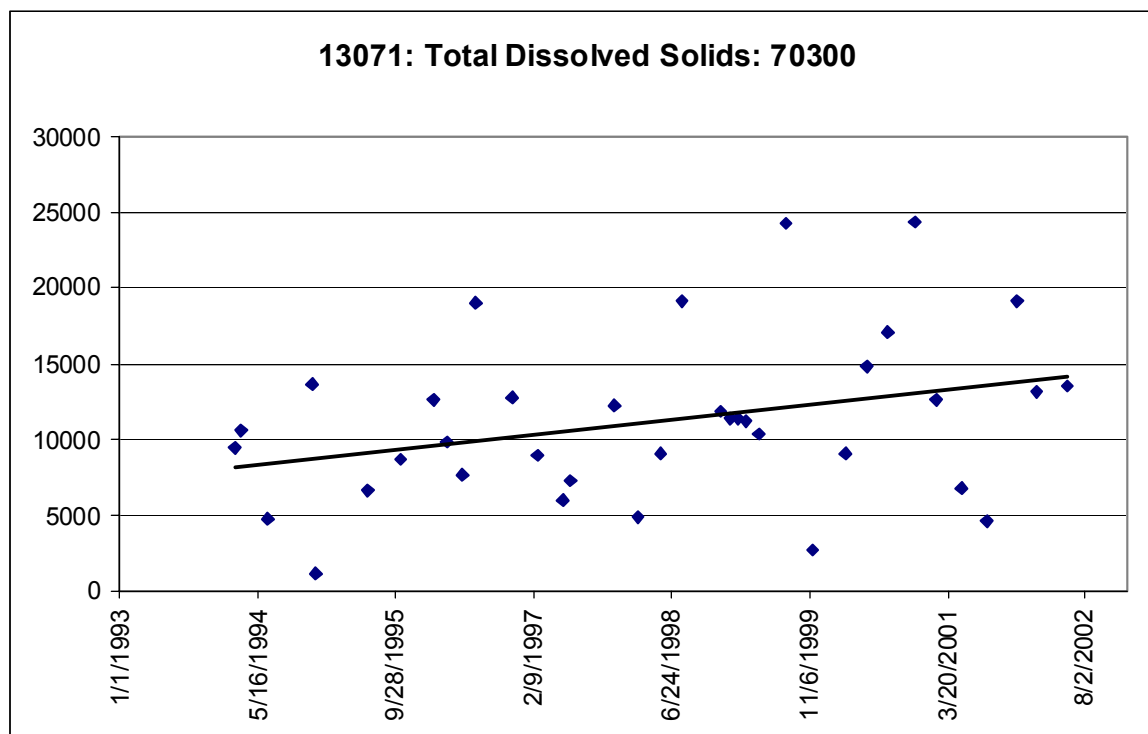
Increasing Trends: 5

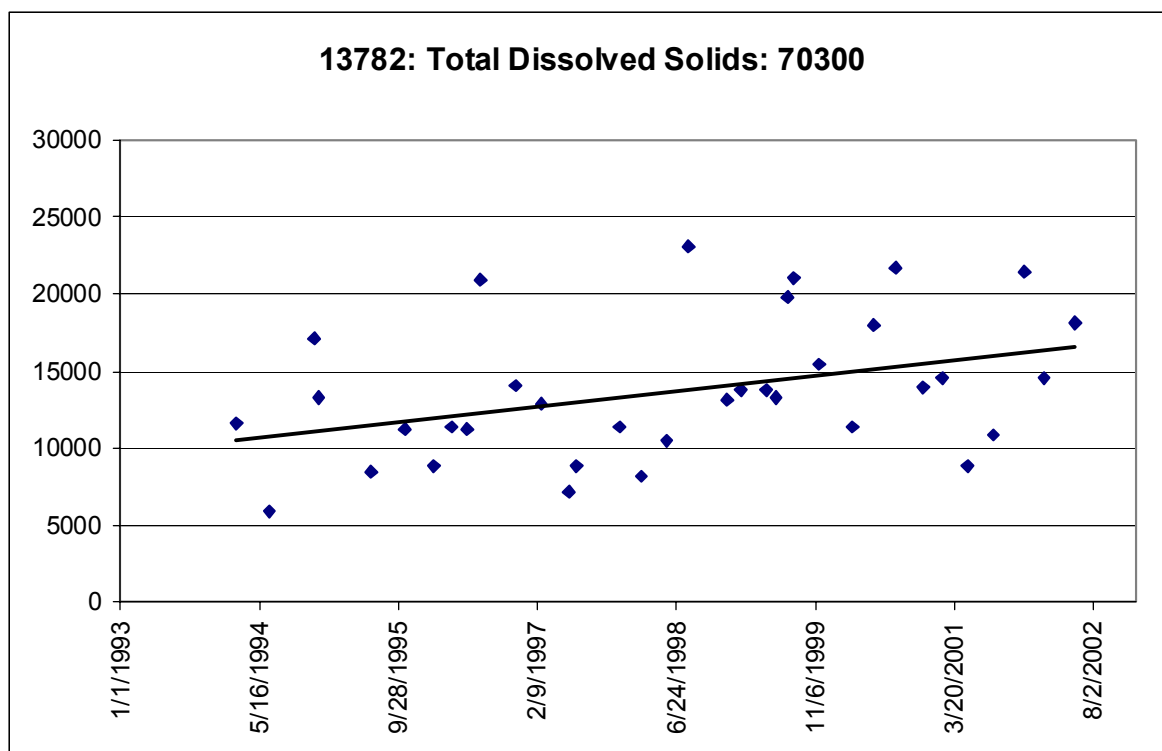
Decreasing Trends
Total Dissolved Solids – 70300
Non-Tidal

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2110	12993	32	0.183255	-2.59445	0.014517	183	820
2202	13074	53	0.123568	-2.6815	0.00985	516	5480
	13079	70	0.104148	-2.81165	0.006435	472	3840

Increasing Trends
Total Dissolved Solids – 70300
Tidal

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2201	13071	36	0.109534	2.045055	0.048652	1160	24400
	13782	35	0.150246	2.41553	0.021411	5930	23100





Increasing Trends
Total Dissolved Solids – 70300
Marine

Segment	Station ID	# Data Points	R-squared	t-ratio	P-value	Min Value	Max Value
2481	13411	31	0.123961	2.02572	0.052082	11100	47400
2491	13446	29	0.102993	1.76071	0.089612	3380	48600
	13447	36	0.158159	2.527388	0.016308	300	54300

