Nueces River Authority

2010 Basin Highlights Report

San Antonio-Nueces Coastal Basin

Nueces River Basin

Nueces-Rio Grande Coastal Basin

July 2010

Prepared in cooperation with the Texas Commission on Environmental Quality
Clean Rivers Program

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List of Acronyms

ACWPP	Arroyo Colorado Watershed Protection Plan
AU	Assessment Unit
BEACON	Beach Advisory and Closing On-line Notification
BST	Bacteria Source Tracking
CBBEP	Coastal Bend Bays and Estuaries Program
CCIH	Corpus Christi Inner Harbor
CCNAS	Corpus Christi Naval Air Station
cfu	Colony Forming Units
CM	Channel Marker
CRP	Clean Rivers Program
CWQM	Continuous Water Quality Monitoring
DDE	Dichlorodiphenylethylene
DO	Dissolved Oxygen
DSHS	Department of State Health Services
FY	Fiscal Year
gpd	Gallons Per Day
HCID	Hidalgo County Irrigation District
Hr	Hour
ICWW	Intracoastal Waterway
IP	Implementation Plan
ISD	Independent School District
km	Kilometers
LP	Limited Partnership
m	Meters
mg/l	Milligrams Per Liter
MSL	Mean Sea Level
MUD	Municipal Utility District
N+N	Nitrite+Nitrate
NAS	Naval Air Station
NPS	Nonpoint Source
NRA	Nueces River Authority
OP	Orthophosphorus
PCB	Polychorinated byphenyl
RUAA	Recreational Use Attainability Analysis
su	Standard Units
SWQM	Surface Water Quality Monitoring
SWQMIS	Surface Water Quality Monitoring Information System
TCEQ	Texas Commission on Environmental Quality
TDS	Total Dissolved Solids
TGLO	Texas General Land Office
TMDL	Total Maximum Daily Load
TPWD	Texas Parks and Wildlife Department
TSS	Total Suspended Solids
TSSWCB	Texas State Soil and Water Conservation Board
TxDOT	Texas Department of Transportation
µg/l	Micrograms Per Liter
USGS	United States Geological Survey
WCID	Water Control and Improvement District
WSC	Water Supply Corporation
WWTP	Wastewater Treatment Plant

1.0 INTRODUCTION and 2009 HIGHLIGHTS

1.1 Introduction

In 1991, the Texas Legislature passed the Texas Clean Rivers Act requiring basin-wide water quality assessments to be conducted for each river basin in Texas. Under this act, the Clean Rivers Program (CRP) has developed an effective partnership involving the Texas Commission on Environmental Quality (TCEQ), other state agencies, river authorities, local governments, industry, and citizens. Using a watershed management approach, the Nueces River Authority (NRA) and TCEQ work together to identify and evaluate surface water quality issues and to establish priorities for corrective action. Under CRP, NRA is responsible for the San Antonio – Nueces Coastal Basin, the Nueces River Basin, the Nueces – Rio Grande Coastal Basin, and the adjacent bays and estuaries (Figure 1-1), an area roughly 31,500 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.

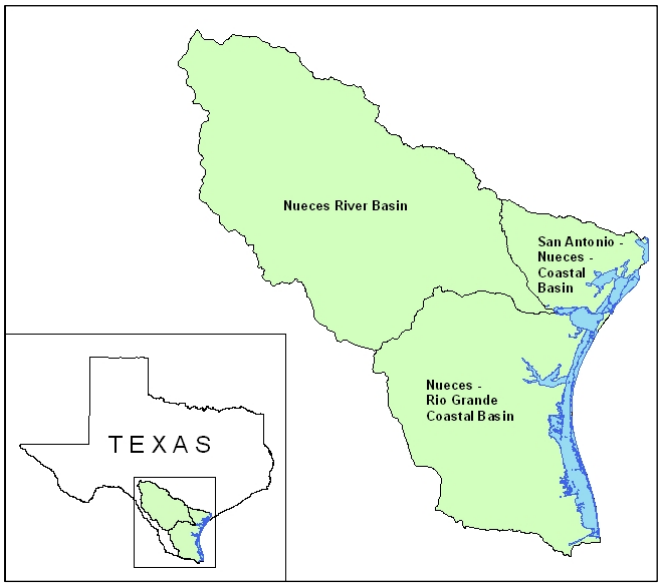


Figure 1-1. NRA's Basins of Responsibility

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 state-operated recreational areas. These include Goose Island State Park near Rockport, Copano Bay State Fishing Pier along State Highway 35 north of Fulton, Fulton Mansion State Historic Park 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 state-operated recreational areas including: Choke Canyon State Park on the south side of Choke Canyon Reservoir near Three Rivers, Lake Corpus Christi State Park on the southeast bank of Lake Corpus Christi near Mathis, Garner State Park north of Concan, Tips State Recreational Area on the Frio River in Three Rivers, Lipantitlan State Historic Park near Sandia, Lost Maples State Natural Area north of Vanderpool, and Hill Country State Natural Area 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. State-operated recreational areas are primarily along the coast and include Mustang Island State Park, Port Isabel Light House State Historic Park in Port Isabel, and the Padre Island National Seashore.

1.2 2009 Highlights

The drought affecting this region of Texas since early 2008 continued through the first two-thirds of 2009. September 2009 saw the first significant rainfall in almost two years, and led to a cooler and wetter winter than usual. The rain events were not related to any tropical activity. The Texas coast was not impacted by any tropical storms or hurricanes during the 2009 season.

The coast was affected by an abundance of red tide in the beginning in the fall of 2009 and dissipating in early 2010. Numerous fish kills were observed. Some coyotes and domesticated pets died after eating contaminated fish. The aerosols also caused some beachgoers to suffer from respiratory and eye irritations.

2.0 WATER QUALITY MONITORING

In general, the CRP and Surface Water Quality Monitoring (SWQM) programs conduct quarterly monitoring at routine monitoring sites. Most of these sites have been monitored for many years and provide valuable information with respect to trends and/or changing conditions. Routine water quality samples are analyzed for conventional and bacteria parameters. These samples are usually collected four times per year, once per quarter. Field parameters are also recorded as part of the sampling events.

Parameters analyzed for conventional monitoring include alkalinity, ammonia, total dissolved solids (TDS), total suspended solids (TSS), total phosphorous, ortho-phosphorous (OP), chlorides, sulfate, hardness (fresh water sites), nitrates, chlorophyll-*a*, pheophytin, and total organic carbon.

Routine bacteria analysis includes enterococcus in saltwater bodies and tidal segments and *E. coli* for fresh water sites. Additional bacterial analysis is being conducted for some of the special studies. These studies are discussed in Section 3.2, Watershed Summaries.

Measured field parameters include dissolved oxygen (DO), salinity (saltwater and tidal sites), flow (fresh water sites), pH, water temperature, air temperature, conductivity, secchi depth, and wind speed and direction. Observations such as water color, water odor, surface conditions, turbidity, current weather, and recent rainfall amounts are noted.

Additional monitoring is conducted at some sites. 24-Hour (Hr) DO measurements are generally conducted to more fully evaluate a low DO concern. Other analysis conducted for some sites include organics in water, metals in water, organics in sediment, and metals in sediment.

Sites and the type of monitoring being conducted during Fiscal Year (FY) 2010 are listed in summary tables at the beginning of each basin subsection within Section 3.2. Detailed information is available on the Statewide Coordinated Monitoring Schedule, http://cms.lcra.org/, maintained by the Lower Colorado River Authority.

3.0 WATER QUALITY CONDITIONS

3.1 Water Quality Terminology

The 2010 Draft Water Quality Inventory assesses all data in the State's water quality database (Surface Water Quality Monitoring Information System (SWQMIS)) for a 7-year period, and a new 7-year data set is assessed every two years. This has changed from the previous 5-year data sets. In most cases, a minimum of 10 samples is required to conduct the assessment. In some cases, the 10 samples are obtained by using a slightly longer period of time. The 2010 Assessment included data from December 1, 2001 through November 30, 2008.

Assessments evaluate DO, pH, total phosphorus, nitrite+nitrate (N+N), ammonia, chlorophyll-*a*, OP, TSS, and bacteria (*E.coli* for fresh water segments and Enterococcus on tidal and marine segments) values on each assessment unit (AU) of a classified segment. A single segment can consist of one to several AUs. TDS, chloride, and sulfate are assessed for the entire segment and only on fresh water segments. For each assessment, some AU boundaries were modified to be more representative and provide for a more accurate analysis.

The following chart explains the potential impacts when the water quality standards are not met along with an explanation of the most common causes for the standards not to be met.

Parameter	Impact	Cause
DO	Organisms that live in water need oxygen to live. In waters with depressed DO levels, organism may not have sufficient oxygen to survive.	Modifications to the riparian zone, human activity that causes water temperatures to increase, and increases in organic matter and bacteria, and over abundant algae.
pH	Most aquatic life is adapted to live within a narrow pH range. Different organisms can live and adjust to differing pH ranges, but all fish die if pH is below 4 (the acidity of orange juice) or above 12 (the pH of ammonia).	Industrial and wastewater discharge, runoff from quarry operations, and accidental spills.
Ammonia	Elevated levels of ammonia in the environment can adversely affect fish and invertebrate reproductive capacity and reduced growth of the young.	Ammonia is excreted by animals and is produced during the decomposition of plants and animals. It is an ingredient in many fertilizers and is also present in sewage, storm water runoff, certain industrial wastewaters, and runoff from animal feedlots.
Nutrients N+N OP Total phosphorus	These nutrients increase plant and algae growth. When plants and algae die, the bacteria that decompose them use oxygen so that is no longer available for fish and other living aquatic life. The more dead plants in the water, the more bacteria are produced to decompose the dead leaves. High levels of nitrate and nitrites can produce Nitrite Toxicity, or "brown blood disease," in fish. This disease reduces the ability of blood to transport oxygen throughout the body.	Nutrients are found in effluent released from wastewater treatment plants (WWTP)s, fertilizers, and agricultural runoff carrying animal waste from farms and ranches. Soil erosion and runoff from farms, lawns, and gardens can add nutrients to the water.
Chlorophyll-*a*	Chlorophyll-*a* is the photosynthetic pigment found in all green plants, algae, and cyanobacteria. Elevated levels indicate abundant plant growth which could lead to reduced DO levels.	Modifications to the riparian zone, human activity that causes water increases in organic matter and bacteria, and over abundant algae.
TSS	TSS measures the amount of particles that are suspended in water and which will not pass through a filter. It can also affect light penetration. Deposition of these particles can bury and/or destroy benthic habitat for most species of aquatic insects, snails and crustaceans.	TSS originates from multiple point and non-point sources (NPS) but most commonly results from erosion of soils substrates. A good measure of the upstream land use conditions is how much TSS rises after a heavy rainfall.
TDS Chloride Sulfate	High levels of these parameters may affect the aesthetic quality of water, interfering with washing clothes and corroding plumbing fixtures. They can also affect the permeability of ions in aquatic organisms.	Mineral springs, carbonate deposits, salt deposits, and sea water intrusion are natural sources of these parameters. Other sources can be attributed to oil exploration, drinking water treatment chemicals, storm water and agricultural runoff, and wastewater discharges.

Impairments for the following parameters are defined as follows:

Parameter	Criteria	Calculation Used for Impairment*
TDS, chloride, and sulfate	Segment specific	Average of samples are above the criteria
DO (for High Aquatic Life Use)	3.0 mg/l** grab sample 5.0 mg/l 24-Hr average or Segment specific	10% of samples are below either criteria
pH	6.5 su*** and 9 su	10% of samples are above or below the criteria
E. coli	126 cfu**** 394 cfu	Geometric mean is greater than the criteria 25% of samples are above the criteria
Enterococci	35 cfu 89 cfu	Geometric mean is greater than the criteria 25% of samples are above the criteria

*The percent of samples exceeding the criteria or screening level varies somewhat with small sample sizes (between 10 and 20). When sample sizes are greater than 20 samples, the percentage shown in the calculation column is much more accurate.
**mg/l: milligrams per liter
***su: standard units
****cfu: colony forming units

The TCEQ is proposing to raise the geometric mean standard for *E. coli* from 126 cfu to 206 cfu for primary contact recreation, from 605 cfu to 2,060 cfu for non-contact recreation, and create secondary contact recreation-1 and secondary contact recreation-2 categories. The secondary contact recreation-1 standard of 630 cfu is proposed for water bodies where activities do not pose a significant risk of ingestion of the water such as wading and fishing. The secondary contact recreation-2 standard of 1,030 cfu is proposed for the same types of activities, but for areas where the physical characteristic or limited access are prohibitive.

In order to determine the appropriate designation, a Recreational Use Attainability Analysis (RUAA) must be conducted. An RUAA is designed to: capture information of the types of recreational uses occurring in a water body; document physical stream characteristic that affect recreational uses; and document observed, historical, and anecdotal recreational uses. The information is obtained via questionnaires, field surveys, and research. Until an RUAA is conducted and a designation other than primary contact recreation is found to be more appropriate, a segment will continued to be assessed using the primary contact recreation criteria.

Concerns for the following parameters are defined as follows:

Parameter	Screening Levels*			Calculation Used for Concern
	Stream	Reservoir	Tidal Stream	
Ammonia-Nitrogen	0.33 mg/l	0.11 mg/l	0.46 mg/l	20% of samples are above the criteria
N+N	1.95 mg/l	0.37 mg/l	1.10 mg/l	
OP	0.37 mg/l	0.05 mg/l	0.46 mg/l	
Total phosphorus	0.69 mg/l	0.20 mg/l	0.66 mg/l	
Chlorophyll-a	14.1 µg/l**	26.7 µg/l l	21.0 µg/l	

*Screening levels to identify concerns have been developed by the State to enable an assessment of water quality for some of the parameters, primarily nutrients, that only have a narrative criteria. The levels were developed by calculating the 85th percentile for all water quality data in the TCEQ's water quality database over a 10 year period.
**µg/l: micrograms per liter

3.2 Watershed Summaries

This section contains detailed information for each segment in NRA's area of responsibility for CRP, grouped by basin. The information includes sub-watershed descriptions, maps and tables of FY 2010 monitoring sites, concerns and impairments listed in the Draft 2010 Assessment, and summaries of other studies. Figure 3-1 is a sample map displaying the symbols used to indicate sampling sites, United States Geological Survey (USGS) gauges, WWTP discharge locations, etc. The following scheme is used throughout the section:

- 2010 Monitoring Sites
- 2010 Assessment
- WW Outfalls
- USGS Gauge Sites
- Segment
- Segment
- Cities

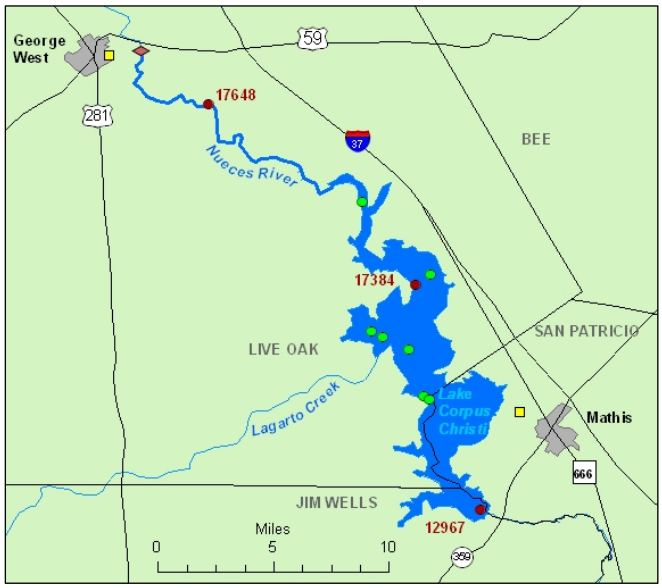


Figure 3-1. Sample Map

RED DOTS are stations that were monitored during FY 2010.
GREEN DOTS are stations with data used in the 2010 Assessment. (See Appendix A for station descriptions.)
YELLOW SQUARES are WWTP outfalls that ultimately discharge into the segment. (See Appendix B for permit information.)
PINK DIAMONDS are USGS gauge stations.
THICK BLUE LINES are river segments.
DARK BLUE POLYGONS are lakes or bays.

3.2.1 SAN ANTONIO – NUECES COASTAL BASIN (Figure 3-2)

The San Antonio – Nueces Coastal Basin is approximately 3,100 square miles, covering all or part of 7 counties.

The Aransas and Mission Rivers are the major rivers in the watershed, both of which flow to Copano Bay.

The tidal segments of both the Aransas and Mission Rivers are impaired for bacteria for contact recreation. Copano Bay is impaired for fecal coliform in oyster waters. The *Copano Bay Total Maximum Daily Load (TMDL) Project for Bacteria in Oyster-Harvesting Waters* was initiated in 2005 by TCEQ, focusing on the bay and the two tidal segments. NRA is under contract with the Texas State Soil and Water Conservation Board (TSSWCB) to conduct monitoring throughout the entire watershed to support the TMDL. Other project partners include the Coastal Bend Bays and Estuaries Program (CBBEP), Texas General Land Office (TGLO), and the Department of State Health Services (DSHS).

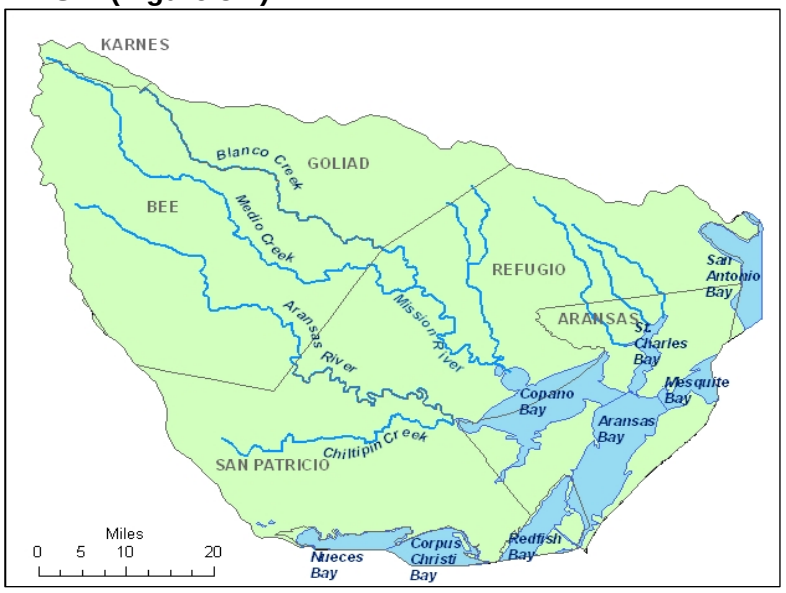


Figure 3-2. San Antonio Nueces Coastal Basin

A model is being developed to help determine the source of the bacteria. Initially, historical water quality data were used. These data were limited because the routine SWQM and CRP stations were all located in the lower portion of the watershed and on just the Aransas and Mission Rivers. The TSSWCB project includes sites on nearly every stream and creek, as shown in Figure 3-3. It also includes samples from WWTP outfalls. This additional data is being used to revise the model.

The TMDL also includes a bacteria source tracking (BST) component. This research is being done to determine the biological source of the bacteria. The possibilities include wild hogs and other wildlife, cattle, horses, birds, ducks, and humans.

Through March 2010, 14 sampling events have occurred. The program was initially designed to try and capture up to four run-off events a year and sample during the July and September months to get samples representative of dry/low flow events. Each sampling event was to be conducted for three consecutive days. But Mother Nature had a different idea, and we had over a year of no significant rainfall events – except for when we were trying to conduct the dry weather sampling. The project has evolved and we are now sampling twice a month, one day only, at the stream sites and once a month at the WWTPs.

Table 3.1 lists all of the monitoring sites, the number of individual samples collected from October 2007 through March 2010 for the study, and the geometric mean for each of the indicator bacteria. Values shown in **bold** indicate that the standard was exceeded. The standard for fecal coliform is 200 cfu; for E. coli, 126 cfu; and for Enterococcus, 35 cfu.

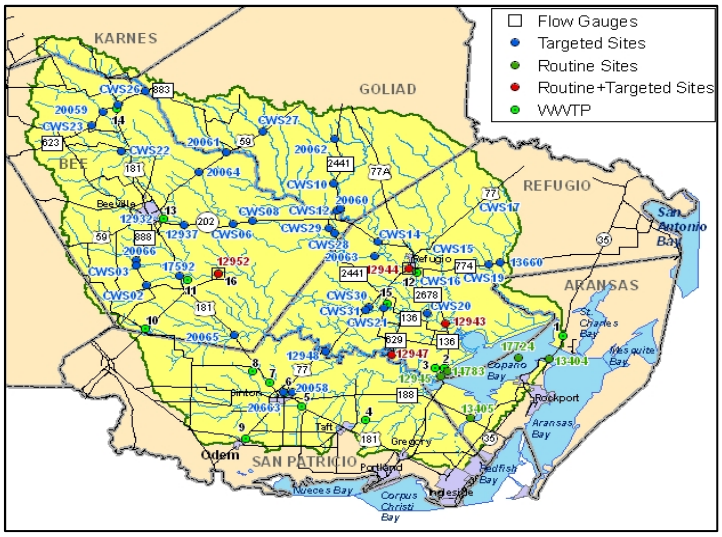


Figure 3-3. Copano Project Monitoring Sites

Table 3.2 lists all the CRP and SWQM sites monitored during FY 2010 in the San Antonio – Nueces Coastal Basin.

Table 3-1: Summary Results for Copano Project

Site		Fecal Coliform		E. coli		Enterococcus	
		#	Geomean	#	Geomean	#	Geomean
12932	Poesta Creek @ US 181 bypass	29	**355.05**	29	**387.31**	26	**877.03**
12944	Mission River @ US 77	34	157.83	31	**173.99**	31	**547.73**
12948	Aransas River at US 77	34	108.79	30	87.92	33	**122.44**
12952	Aransas River near Skidmore	34	160.23	33	**224.13**	30	**1,083.77**
13660	Copano Creek @ FM 774	17	**978.87**	17	**1,127.71**	14	**2,735.46**
20058	Chiltipin Creek At Bus. 77	22	**228.15**	20	**202.52**	17	**456.18**
20059	Medio Creek @ FM 623	11	32.63	11	34.43	8	**59.65**
20060	Sarco Creek at FM 3410	31	105.18	30	**122.13**	28	**474.91**
20061	Blanco Creek at US 59	11	25.15	11	23.25	8	**43.37**
20062	Sarco Creek @ FM 2441	13	18.35	13	16.71	10	**165.57**
20063	Medio Creek @ Kelly Rd.	34	190.00	33	**231.15**	31	**787.47**
20064	Medio Creek @ US 59	28	23.45	28	26.93	25	**73.91**
20065	Papalote Creek @ US 181	34	**394.45**	33	**286.01**	30	**1,068.86**
20066	Aransas Creek @ FM 888	18	143.44	18	**155.60**	15	**443.92**
20663	Chiltipin Creek @ SH 89	10	**1,119.04**	10	**1,065.02**	9	**1,271.89**
WQ0010055-001	City of Sinton	24	131.46	24	53.68	21	**138.84**
WQ0010124-002	City of Beeville	17	4.71	17	5.92	17	4.71
WQ0010124-004	Chase Field (City of Beeville)	18	6.83	18	5.09	18	10.05
WQ0010156-001	Town of Woodsboro	21	1.82	21	1.55	18	2.10
WQ0010237-001	City of Odem	24	145.65	24	124.04	21	**178.94**
WQ0010255-001	Town of Refugio	24	6.74	24	8.12	21	12.64
WQ0010705-001	City of Taft	24	1.49	24	1.46	21	1.59
WQ0010748-001	Pettus MUD	18	1.59	18	1.56	18	2.05
WQ0013892-001	Town of Bayside	20	**237.51**	20	**241.22**	17	**902.18**
WQ0014112-001	Skidmore WSC	18	1.19	18	1.39	18	1.51
WQ0014119-001	St. Paul WSC	24	**330.12**	24	**551.19**	21	**474.81**
WQ0014123-001	Tynan WSC	18	96.81	15	99.73	21	35.46

Table 3-2: CRP and SQWM Sites in the San Antonio – Nueces Coastal Basin

Segment Name	Station Id	Description	Monitoring Entity	Conventional, Bacteria, Field	Other
2001 Mission River Tidal	12943	Near south bank immediately downstream of FM 2678 between Refugio and Bayside	NRA	Quarterly	
2002 Mission River Above Tidal	12944	At US 77 upstream from bridge at Refugio	NRA	Quarterly	
2003 Aransas River Tidal	12947	At boat ramp at FM 629 terminus south of Bonnie View	NRA	Quarterly	
2004 Aransas River Above Tidal	12952	At county road east of Skidmore	NRA	Quarterly	4 24-Hr DO
2004A Aransas Creek	12941	At US 181 north of Skidmore	NRA		4 24-Hr DO

2001: Mission River Tidal (Figure 3-4)

The tidal segment flows 19 miles from a point 4.6 miles downstream of US 77 in Refugio County to its confluence with Mission Bay in Refugio County. The area is predominately ranch and farm land. The Town of Woodsboro is the only community in the watershed.

The segment has been impaired for bacteria for contact recreation since the 2004 Assessment and is included in the Copano Bay TMDL.

2002: Mission River Above Tidal (Figure 3-4)

The above tidal segment flows 9 miles from the confluence of Blanco Creek and Medio Creek to a point 4.6 miles downstream of US 77 in Refugio County. The area is predominately ranch and farm land. The Town of Refugio is the only community in the watershed.

All assessed parameters met the standards in this segment.

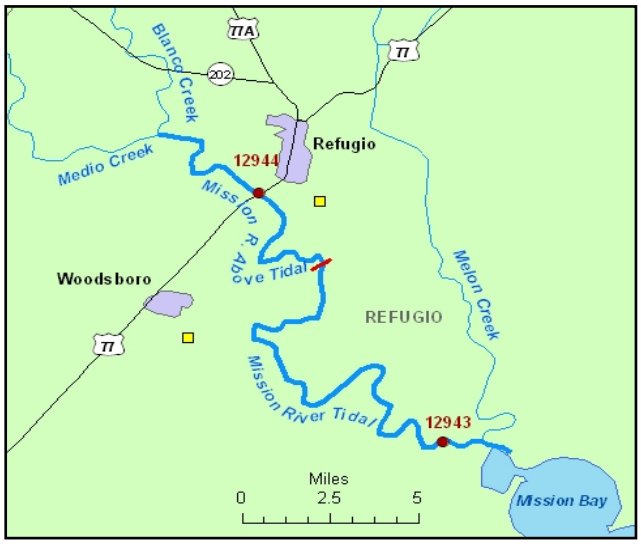


Figure 3-4. Segments 2001 and 2002

2003: Aransas River Tidal (Figure 3-5)

The tidal segment forms part of the county line between Refugio and San Patricio Counties. It flows 6 miles from a point 1.0 mile upstream of US 77 in to its confluence with Copano Bay.

The segment was first listed as being impaired for bacteria for contact recreation as a result of the 2004 Assessment and is included in the Copano Bay TMDL. Since the confluence of Chiltipin Creek with Copano Bay (Segment 2472), the WWTPs that discharge to the creek are more likely to influence the values recorded in Copano Bay (Segment 2472).

The segment is also listed as having a concern for OP.

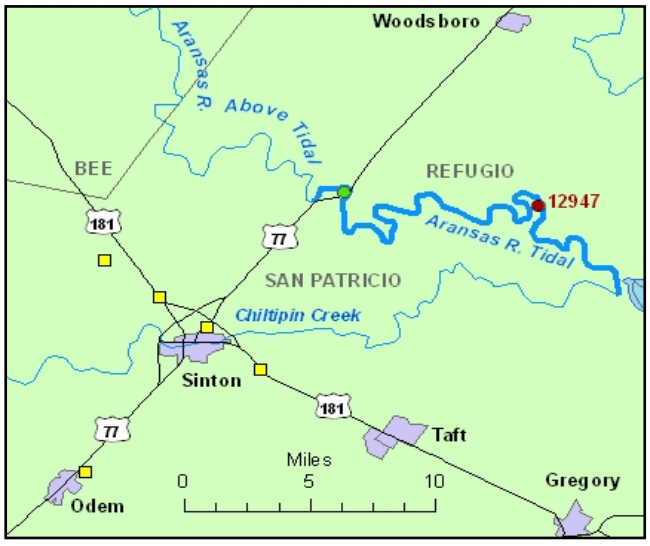


Figure 3-5. Segment 2003

2004: Aransas River Above Tidal (Figure 3-6)

The above tidal segment flows 35 miles from the confluence of Poesta Creek and Aransas Creek to a point 1.0 mile upstream of US 77. The segment is divided into two assessment units; the lower 17 miles (AU_01) and the upper 18 miles (AU_02).

The area is predominately ranchland. Skidmore and Tynan are the only communities in the watershed.

The segment is listed as having concerns for nitrate, OP, total phosphorus, and depressed DO. 24-Hr DO measurements are being collected to determine whether or not a DO problem really exists. It is included in the Copano Bay TMDL

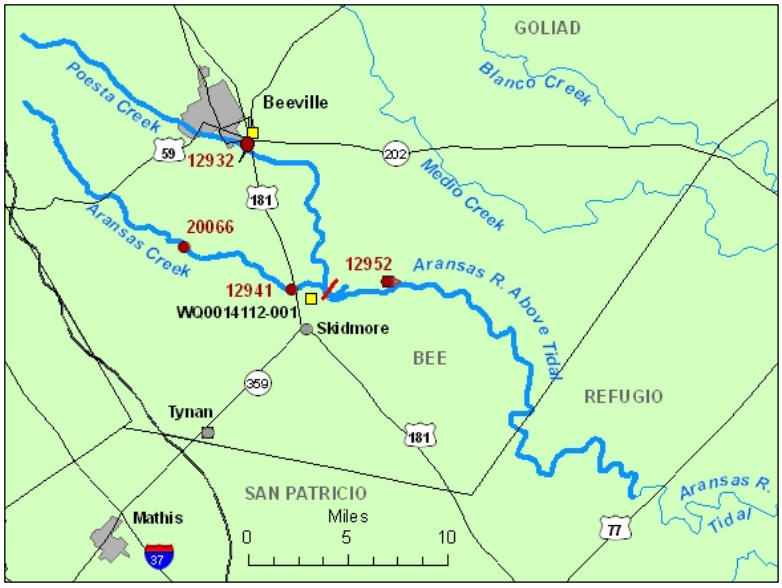


Figure 3-6. Segments 2004, 2004A, and 2004B

2004A: Aransas Creek (Figure 3-6)

The segment is 20 miles long, beginning west of Beeville to its confluence with the Aransas River.

The area is predominately ranchland. There are no major communities in the watershed.

The segment was listed as being impaired for bacteria in 2006 based on Fecal coliform analysis. For several years, Station 12941, at US 181, was accidently monitoring instead of at Station 12952 on the Aransas River. The impairment is being carried forward since there were not enough data points for the 2010 Assessment. An RUAA is being considered for FY 2011. (See Section 3.1 for information concerning RUAAs.)

The segment is also listed as having a concern for depressed DO. 24-Hr DO measurements are being collected to determine whether or not a DO problem really exists.

2004B: Poesta Creek (Figure 3-6)

The segment is approximately 24 miles long, beginning northwest of Beeville, 7.5 km upstream of FM 673, to its confluence with the Aransas River.

The area is predominately ranchland. Beeville is the only community in the watershed.

Only DO was assessed in this segment. The data set was determined not to be temporally representative. Additional data are needed to fully assess this segment.

3.2.2 NUECES BASIN (Figure 3-7)

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.

There are several TMDLs that have been conducted in the basin. Specific results and findings are discussed in the individual segment summaries: Segment 2104, Nueces River above Frio River, for depressed DO; Segment 2107, Atascosa River, for bacteria and depressed DO; Segment 2110, Lower Sabinal River, for nitrates; and Segment 2113, Frio River above Choke Canyon Reservoir, for depressed DO.

Table 3.3 lists all the CRP and SWQM sites monitored during FY 2010 in this basin.

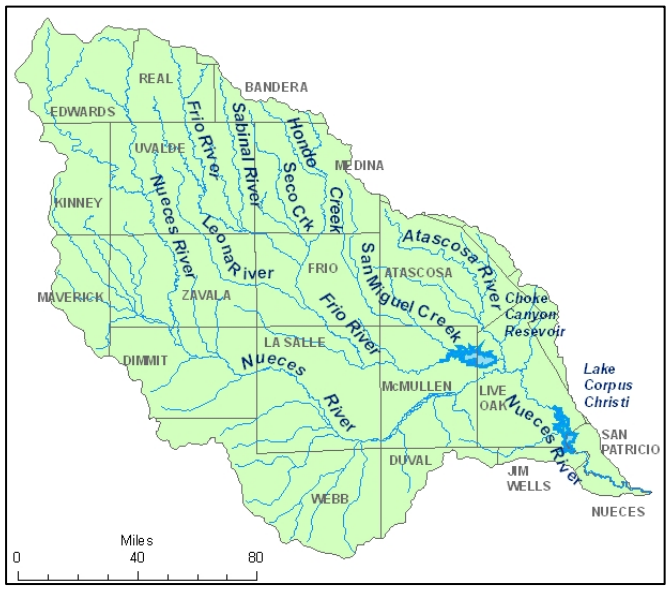


Figure 3-7. Nueces River Basin

Table 3-3: CRP and SQWM Sites in the Nueces Basin

Segment Name	Station Id	Description	Monitoring Entity	Conventional, Bacteria, Field	Other
2101 Nueces River Tidal	12960	North of Viola Turning Basin	TCEQ Region 14	Quarterly	
2102 Nueces River Below Lake Corpus Christi	12964 (AU_01)	At Bluntzer Bridge at FM 666	NRA	Quarterly	
	12965 (AU_02)	At La Fruta Bridge on SH 359	NRA	Quarterly	
2103 Lake Corpus Christi	12967 (AU_01)	380 meters (m) NNW of northern tip of dam	NRA	Quarterly	4 24-Hr DO
	17384 (AU_04)	0.2 miles off western shore directly west of Hideaway Hill	NRA	Quarterly	
	17648 (AU_06)	At Live Oak County Road (CR) 151 near River Creek Acres	NRA	Quarterly	2 Metals in water
2104 Nueces River Above Frio River	12972 (AU_01)	At FM 1042 bridge 1.2 miles north of Simmons	NRA	Quarterly	4 24-Hr DO
	12973 (AU_02)	At SH 16 south of Tilden	NRA	Quarterly	4 24-Hr DO
2105 Nueces River Above Holland Dam	12975 (AU_01)	At Bus. Interstate Highway (IH 35) south of Cotulla	TCEQ Region 13	Quarterly	
	12976 (AU_02)	At FM 190-north of Asherton	TCEQ Region 13	Quarterly	
	20156 (AU_02)	Immediately upstream of SH 85 approx 12 miles east of Carrizo Springs	TCEQ Region 13	Quarterly	
2106 Nueces / Lower Frio River	12977 (AU_02)	At US 72 in Three Rivers	NRA	Quarterly	2 Metals in water
	12979 (AU_01)	At US 281 south of Three Rivers	NRA	Quarterly	2 Metals in water
	20701 (AU_01)	NE of the intersection of Airport Rd and CR 379 / Paisano Drive Dr	NRA	Quarterly	
2107 Atascosa River	12980 (AU_01)	At FM 99 west of Whitsett	NRA	Quarterly	
	12982 (AU_03)	At US 281 at Pleasanton	TCEQ Region 13	Quarterly	4 24-Hr DO
2108 San Miguel Creek	12983 (AU_01)	At SH 16 north of Tilden	NRA	Quarterly	

Table 3-3: CRP and SQWM Sites in the Nueces Basin (cont.)

2109 Leona River	12985 (AU_01)	At FM 1581 SW of Pearsall	TCEQ Region 13	Quarterly	
	12987 (AU_02)	At US 57 near Batesville	TCEQ Region 13	Quarterly	
	12989 (AU_03)	At Hoags Dam, upstream side	TCEQ Region 13	Quarterly	
	18418 (AU_03)	370 m upstream of FM 140	NRA	Quarterly	
2110 Lower Sabinal River	12993	At US 90 west of Sabinal	TCEQ Region 13	Quarterly	
2111 Upper Sabinal River	12994 (AU_01)	12.5 miles north of Sabinal and 2.3 miles downstream from the mouth of Onion Creek	TCEQ Region 13	Quarterly	
2112 Upper Nueces River	12996 (AU_01)	20 m upstream of US 57 south of Uvalde	TCEQ Region 13	Quarterly	
	13005 (AU_04)	At SH 55 south of Barksdale	NRA	Quarterly	
	16704 (AU_03)	Immediately downstream of SH 55 southbound bridge approx 2.5 kilometers (km) south of Laguna	TCEQ Region 13	Quarterly	
	17143 (AU_01)	At Lake Averhoff / Upper Nueces Lake 1.62 km upstream of Texas Parks and Wildlife Department (TPWD) boat ramp	TCEQ Region 13	Quarterly	
2113 Upper Frio River	13006	At SH 127 east of Concan	TCEQ Region 13	Quarterly	
2114 Hondo Creek	13010 (AU_02)	150 m downstream of Ranch Road (RR) 462 bridge near Tarpley	TCEQ Region 13	Quarterly	
2115 Seco Creek	13013 (AU_02)	At Medina CR 111 on Miller Ranch near Utopia at 4th crossing downstream of SH 470	TCEQ Region 13	Quarterly	2 24-Hr DO
2116 Choke Canyon Reservoir	1302 (AU_03)	Mid-lake 15 m east of Live Oak/McMullen County line near old FM 99 1.25 km north of Choke Canyon State Park Point	NRA	Quarterly	
	17389 (AU_06)	0.45 km SE of FM 99 southern most bridge crossing the Frio River Arm	NRA	Quarterly	3 24-Hr DO
2117 Frio River Above Choke Canyon Reservoir	13023 (AU_01)	At SH 16 in Tilden	NRA	Quarterly	
	13024 (AU_03)	At IH 35 northbound bridge north of Dilley	TCEQ Region 13	Quarterly	4 24-Hr DO
	15449 (AU_05)	At FM 187 8 miles south of Sabinal	TCEQ Region 13	Quarterly	
	18373 (AU_02)	Immediately upstream of SH 97 north of Fowlerton	NRA	Quarterly	

2101: Nueces River Tidal (Figure 3-8)

The tidal segment forms part of the county line between Nueces and San Patricio Counties. It flows 12 miles from the Calallen Saltwater Barrier Dam 1.7 km (1.1 miles) upstream of US 77 / IH 37 to its confluence with Nueces Bay.

The City of Corpus Christi borders the south bank of the river. A large portion of the area north of the river is included in the CBBEP's Nueces Delta Preserve. The rest is owned by private ranches.

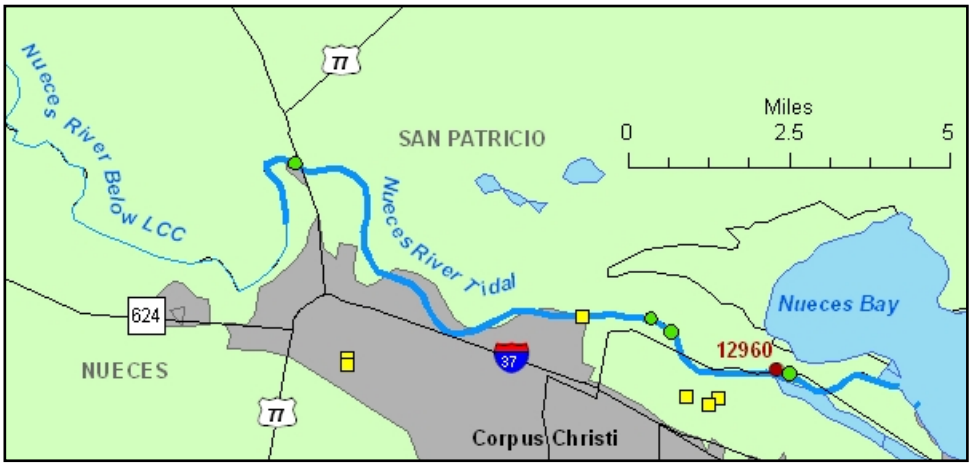


Figure 3-8. Segment 2101

The segment is listed as having a concern for chlorophyll-*a*. One possible explanation is that the tidal portion is not flushed on a regular basis. In general, the amount of water released from Lake Corpus Christi for freshwater inflows into the Nueces Estuary is based on the amount of water that has flowed into the reservoir system. Except during times of major flooding, the water more or less sloshes back and forth with the tides. The Rincon Bayou Pipeline diverts some of the freshwater inflows to the upper delta instead of being passed down the river. This may also contribute to less frequent flushing of the river.

The Lon C. Hill Power Plant discharge permit was recently re-issued for 1,098,000 gallons per day (gpd).

2102: Nueces River Below Lake Corpus Christi (Figure 3-9)

The segment forms part of the county line between Jim Wells and San Patricio Counties and between Nueces and San Patricio Counties. It flows 39 miles from Wesley Seale Dam at Lake Corpus Christi to the Calallen Saltwater Barrier Dam 1.7 km (1.1 miles) upstream of US 77 / IH 37. The segment is divided into two assessment units, from the downstream end of the segment to the confluence with Javelin Creek (AU_01) and from the confluence of Javelin Creek to Wesley Seale Dam (AU_02).

The City of Corpus Christi borders the south bank of the river in the lower 10 miles of the segment. They conducts their own water quality monitoring as this is the primary drinking water source for the area. There are several freshwater intakes in the Calallen Pool just above the Saltwater Barrier Dam. The upper half of the segment is primarily private ranches and farm. There are numerous, active and inactive, sand and gravel pits in the lower half.

AU_01 is listed as having a concern for chlorophyll-*a*.

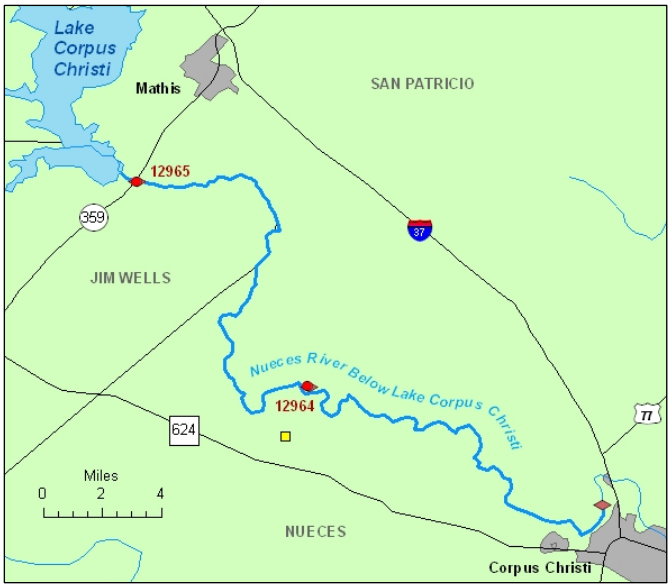


Figure 3-9. Segment 2102

2103: Lake Corpus Christi (Figure 3-10)

Lake Corpus Christi is formed by Wesley Seale Dam near Mathis and impounds the Nueces River. It is defined by the 94' Mean Sea Level (MSL) elevation. The lake covers portions of Live Oak, Jim Wells, and San Patricio Counties. The segment extends upstream to a point 100 m (110 yards) upstream of US 59 in Live Oak County. When the lake is near capacity, the river levels are influenced by the lake level as far north as Airport Rd north of George West.

The segment is divided into six AUs; mid-lake near the dam (AU_01), the area approximately 4 miles SE of FM 3162 and FM 534 intersection near the western shore (AU_02), the western arm of the lake near the Lagarto Creek Inlet (AU_03), the upper portion of the lake on the opposite shore from Hideaway Hill (AU_04), the upper arm of the lake at the FM 534 crossing (AU_05), and the remainder of the segment (AU_06).

The City of George West is located near the upstream end of the segment. There are many smaller communities and individual homes surrounding the lake and along the river.

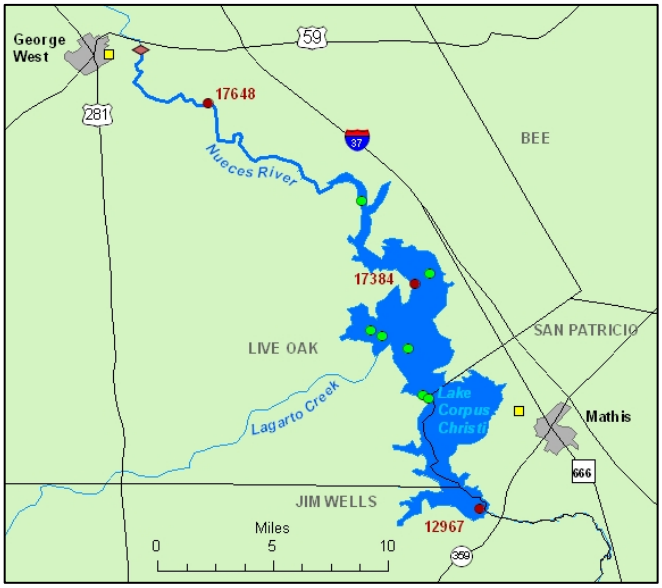


Figure 3-10. Segment 2103

The segment is listed as being impaired for TDS as a result of the 2010 Assessment. TDS levels are related to lake levels and evaporation. Figure 3-11 displays the lake elevation during the assessment period.

The segment is also listed as having concerns for OP (AU_01, AU_04, and AU_06), total phosphorus (AU_06), and chlorophyll-*a* (AU_02, and AU_06).

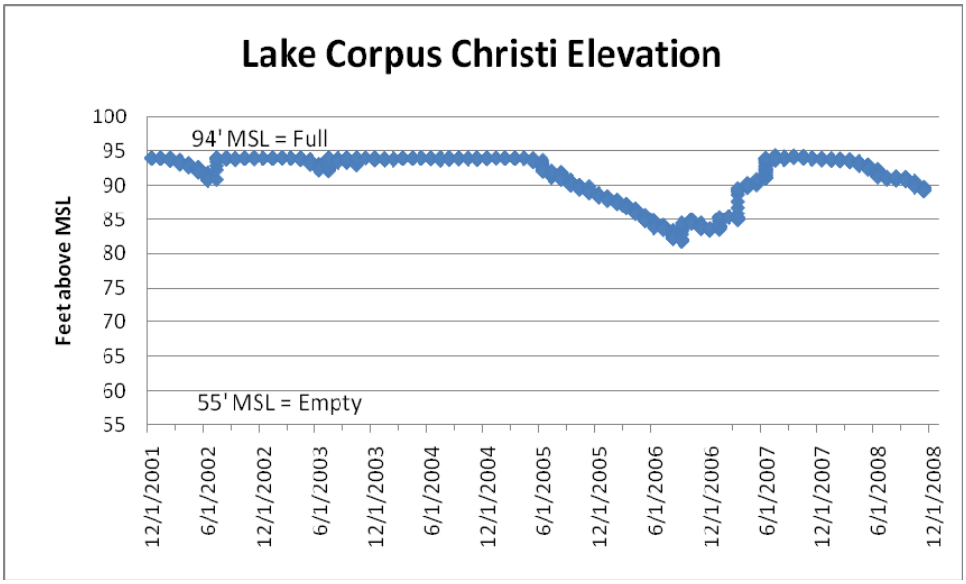


Figure 3-11. Lake Corpus Christi Elevation December 1, 2001 – November 30, 2008.

2104: Nueces River Above Frio River (Figure 3-12)

The segment flows 91 miles from Holland Dam in La Salle County to its confluence with the Frio River in Live Oak County. It is divided into three AUs; from the downstream end of the segment to the confluence with Dragon Creek (AU_01), from the confluence with Dragon Creek to the confluence with Guadalupe Creek (AU_02), and from the confluence with Guadalupe Creek to Holland Dam (AU_03).

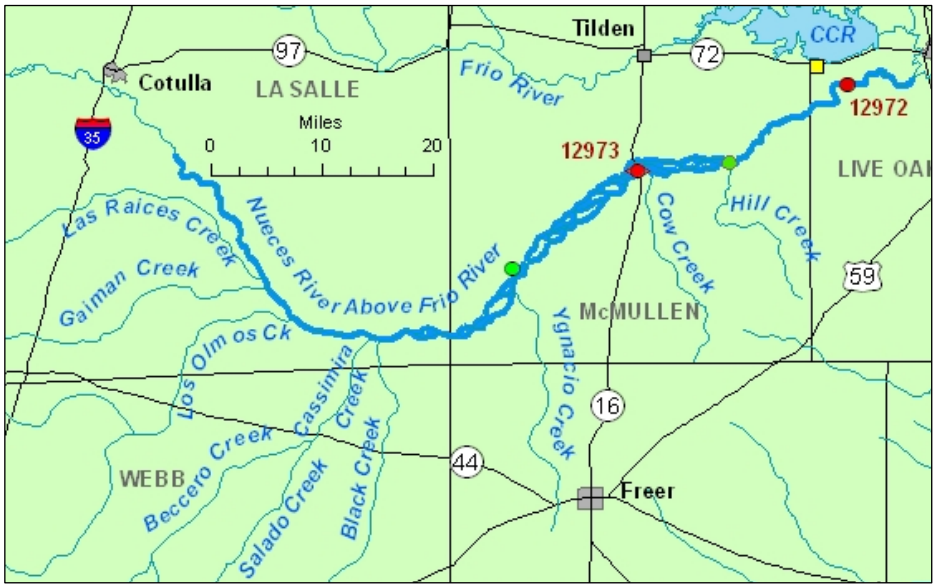


Figure 3-12. Segment 2104

The area is dominated by large ranches.

AU_01 has listed impairments for impaired fish community and impaired macrobenthic community as a result of the 2010 Assessment. AU_02 and AU_03 have concerns for impaired fish community. The segment was listed as impaired for depressed DO in the 1999 Assessment. A TMDL was conducted from 2002 to 2004 to address this issue. The study documented that 24-Hr DO measurements were meeting the standard and the segment was de-listed with respect to DO in the 2008 Assessment. The TMDL also provided for collection of biological, physical, and chemical data, which resulted in the current impairments and concerns. The TMDL reports can be accessed at http://www.tceq.state.tx.us/implementation/water/tmdl/31-sc_bacox_project.html.

2105: Nueces River Above Holland Dam (Figure 3-13)

The segment flows 78 miles from FM 1025 in Zavala County to Holland Dam in La Salle County. It is divided into three AUs; from the downstream end of the segment to the confluence with Sauz Mocho Creek (AU_01), from the confluence with Sauz Mocho Creek to the confluence with Line Oak Slough (AU_02), and from the confluence of Line Oak Slough to the upstream end. (AU_03).

The Cities of Crystal City, Carrizo Springs, Asherton, Big Wells, and Cotulla are all in this watershed. Each of these cities have WWTPs that discharge into the river.

AU_01 and AU_02 have concerns for depressed DO. The lower readings in both AUs correlate to periods of low flow in the river. No 24-Hr DO measurements have been taken.

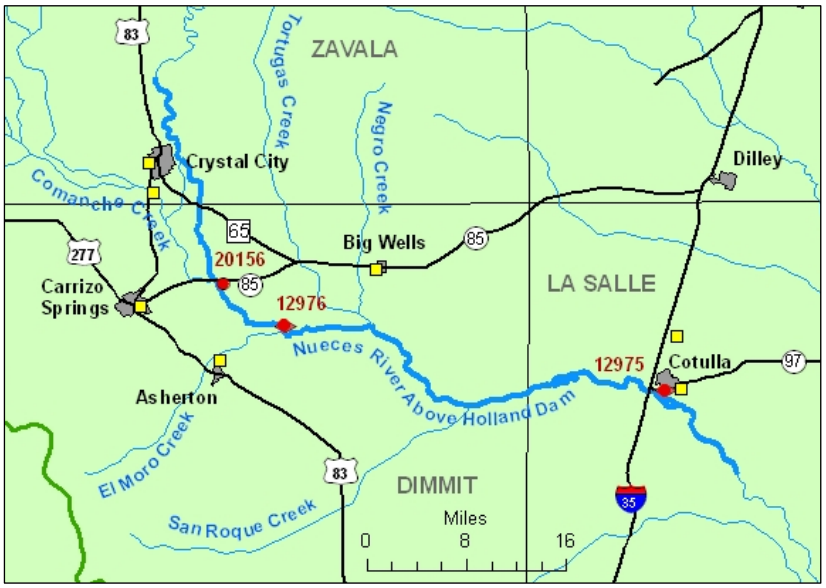


Figure 3-13. Segment 2105

2106: Nueces River / Lower Frio River (Figure 3-14)

The segment flows 27 miles from Choke Canyon Reservoir Dam to just upstream of US 59. It is divided into two AUs; the Nueces River from the downstream end to the confluence with the Frio River (AU_01), and the Frio River from the confluence with the Nueces River to the Choke Canyon Reservoir Dam (AU_02).

Station 12978 was replaced with Station 20701 because the river levels are influenced by the elevation of Lake Corpus Christi when the lake is near capacity. The influence has been seen as far north as Airport Rd.

The City of Three Rivers and the Diamond Shamrock Refinery WWTPs discharge to the Frio River below SH 72.

Both AUs have been listed as being impaired for TDS since the 2006 Assessment. The standard is based on the average of all values and is currently 500 mg/l for both AUs. Alan Plummer and Associates, Inc., working on behalf of the City of Corpus Christi, worked with TCEQ to develop revised and separate standards for each AU. The proposed changes will increase the TDS standard to 950 mg/l in AU_01 and 735 mg/l in AU_02. Both AUs meet the proposed revised standards.

Figure 3-14. Segment 2106

Standards revisions are also being proposed for chloride and sulfate in the segment. Again, the standard is based on the average of all values. For AU_01, chloride would increase from 250 mg/l to 350 mg/l and sulfate would decrease from 250 mg/l to 165 mg/l. For AU_02, chloride would increase from 250 mg/l to 285 mg/l and sulfate would decrease from 250 mg/l to 145 mg/l.

Both AUs are also listed as having a concern for chlorophyll-*a*.

2107: Atascosa River (Figure 3-15)

The segment flows 103 miles from the confluence of the West Prong Atascosa River and the North Prong Atascosa River in Atascosa County to the confluence with the Frio River in Live Oak County. It is divided into four AUs; from the downstream end to the confluence with Borrego Creek (AU_01), from the confluence with Borrego Creek to the confluence with Galvan Creek (AU_02), from the confluence with Galvan Creek to the confluence with Palo Alto Creek (AU_03), and from the confluence with Palo alto Creek to the upper end of the segment.

AU_01 and AU_02 have been listed as being impaired for bacteria for contact recreation since the 1996 Assessment. Sampling for a TMDL to address the bacteria impairment was conducted between 2002 and 2004. The TMDL reports can be accessed at http://www.tceq.state.tx.us/implementation/water/tmdl/31-sc_bacox_project.html. The sampling confirmed the impairment and an RUAA is being conducted by Texas Institute for Applied Environmental Research at Tarleton State University.

AU_02 has been listed as being impaired for depressed DO since the 1996 Assessment. AU_03 had also been listed, but the 2010 Assessment determined that it now meets the standard.

24-Hr DO measurements taken in 2002 and 2003 confirm that while the minimums meet the standard, the average does not.

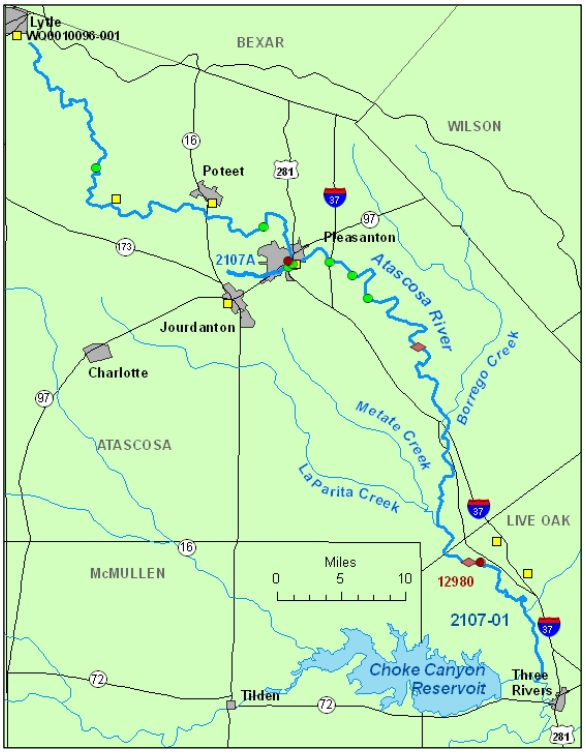


Figure 3-15. Segment 2107

AU_02 and AU_03 are listed for impairments for impaired fish community and impaired macrobenthic community. The impaired fish community was first listed in the 2006 Assessment and the impaired macrobenthic community was added in the 2010 Assessment. These are a result of the data collected during the TMDL. AU_02 also has a concern for impaired habit.

Chlorophyll-*a* is a concern in AU_01 and AU_03. Nitrate and OP are concerns in AU_02.

2107A: Bonita Creek (Figure 3-16)

The segment flows about 5 miles from the headwaters upstream of CR 433 to the confluence with the Atascosa River in Pleasanton. Only field measurements were collected during the Atascosa TMDL. Only TDS was assessed and it met the standard. DO was not assessed since the measurements were collected over a short time period and not considered to be temporally representative.

Figure 3-16. Segment 2107A

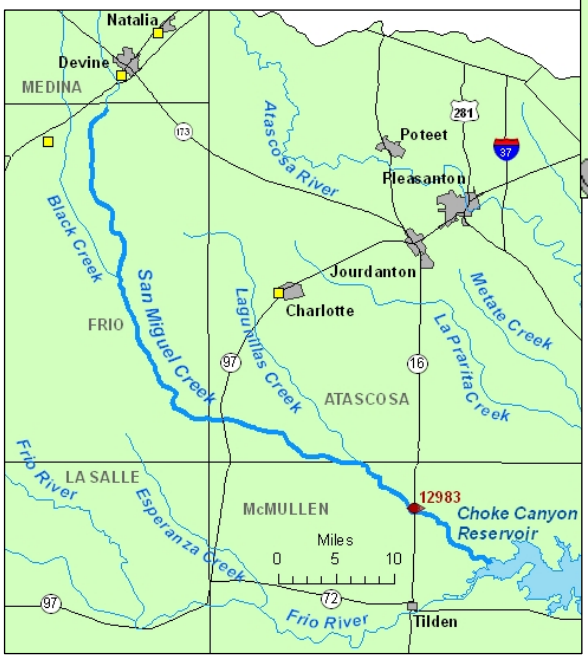


Figure 3-17. Segment 2108

2108: San Miguel Creek (Figure 3-17)

The segment flows 66 miles from the confluence of San Francisco Perez Creek and Chacon Creek in Frio County to Choke Canyon Reservoir. It is divided into two AUs; from Choke Canyon Reservoir to the confluence with Live Oak Creek (AU_01), and from the confluence with Live Oak Creek to the upstream end.

The Cities of Charlotte, Devine, and Natalia and the Moore Water Supply Corporation (WSC) ultimately discharge to San Miguel Creek.

AU_01 has been listed as being impaired for bacteria for contact recreation since the 2006 Assessment.

The segment also has concerns for depressed DO and chlorophyll-*a*.

2109: Leona River (Figure 3-18)

The segment flows 85 miles from US 83 in Uvalde County to the confluence of the Frio River in Frio County. It is divided into three AUs; from the confluence with the Frio River to the confluence with Yoledigo Creek (AU_01), from the confluence with Yoledigo Creek to the confluence with Camp Lake Slough (AU_02), and from the confluence with Camp Lake Slough to the upstream end.

The Cities of Uvalde and Batesville WWTPs discharge to the Leona River.

The segment was first listed as being impaired for bacteria for contact recreation as a result of the 2006 Assessment.

There is also a concern for nitrates for all AUs. The values tend to increase from upstream to downstream.

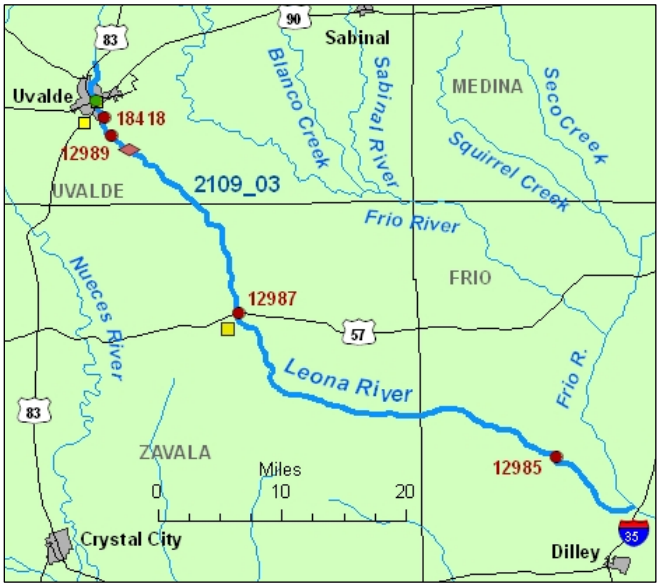


Figure 3-18. Segment 2109

2110: Lower Sabinal River (Figure 3-19)

The segment flows 27 miles from a point 100 m upstream of SH 127 to the confluence with the Frio River.

The City of Sabinal is the only community in the watershed.

The segment was first listed as being impaired for nitrates in the 2002 Assessment. The suspected source is the Sabinal WWTP which is subject to inundation during floods. A TMDL was conducted and an Implementation Plan (IP) has been approved. The IP calls for the construction of a new plant. The new plant has been permitted and construction began early March 2010. The expected completion date is May 2011.

2111: Upper Sabinal River (Figure 3-19)

The segment flows 48 miles from the most upstream crossing FM 187 in Bandera County to a point 100 m upstream of SH 127 in Uvalde County. It is divided into two AUs; from the downstream end to the confluence with the West Sabinal River (AU_01), and from the confluence with the West Sabinal River to the upstream end.

The Cities of Utopia and Vanderpool are the only communities in the watershed. Lost Maples State Park is near the headwaters.

All assessed parameters met the standards.

Figure 3-19. Segments 2110 and 2111

2112: Upper Nueces River (Figure 3-20)

The segment flows 48 miles from the most upstream crossing of FM 187 in Bandera County to a point 100 m upstream of SH 127 in Uvalde County. It is divided into four AUs; from the downstream end to the confluence with Sand Ridge Creek (AU_01), from the confluence with Sand Ridge Creek to just downstream of US 90 (AU_02), from just downstream of US 90 the confluence with Miller Creek (AU_03), and from the confluence with Miller Creek to the upstream end.

There are several smaller communities in the watershed.

All assessed parameters met the standards.

2113: Upper Frio River (Figure 3-21)

The segment flows 47 miles from the confluence with the West Frio River and the East Frio River in Real County to a point 100 m upstream of US 90 in Uvalde County. It is divided into two AUs; from the downstream end to the confluence with Bear Creek (AU_01), and from the confluence with Bear Creek to the upstream end.

Figure 3-21. Segment 2113

AU_01 has impairments for impaired fish community and impaired macrobenthic community as a result of the 2006 Assessment and a concern for impaired habitat. AU_02 has concerns for impaired habitat and impaired fish community. The impaired fish community in AU_02 had previously been listed as an impairment but the data were reassessed with more valid procedures.

The segment was listed as impaired for depressed DO in the 2000 Assessment. A TMDL was conducted from 2002 to 2004. The study documented that 24-Hr DO measurements were meeting the standard and the segment was de-listed with respect to DO in the 2008 Assessment. The TMDL also provided for collection of biological, physical, and chemical data, which resulted in the current impairments and concerns. The TMDL reports can be accessed at http://www.tceq.state.tx.us/implementation/water/tmdl/31-sc_bacox_project.html.

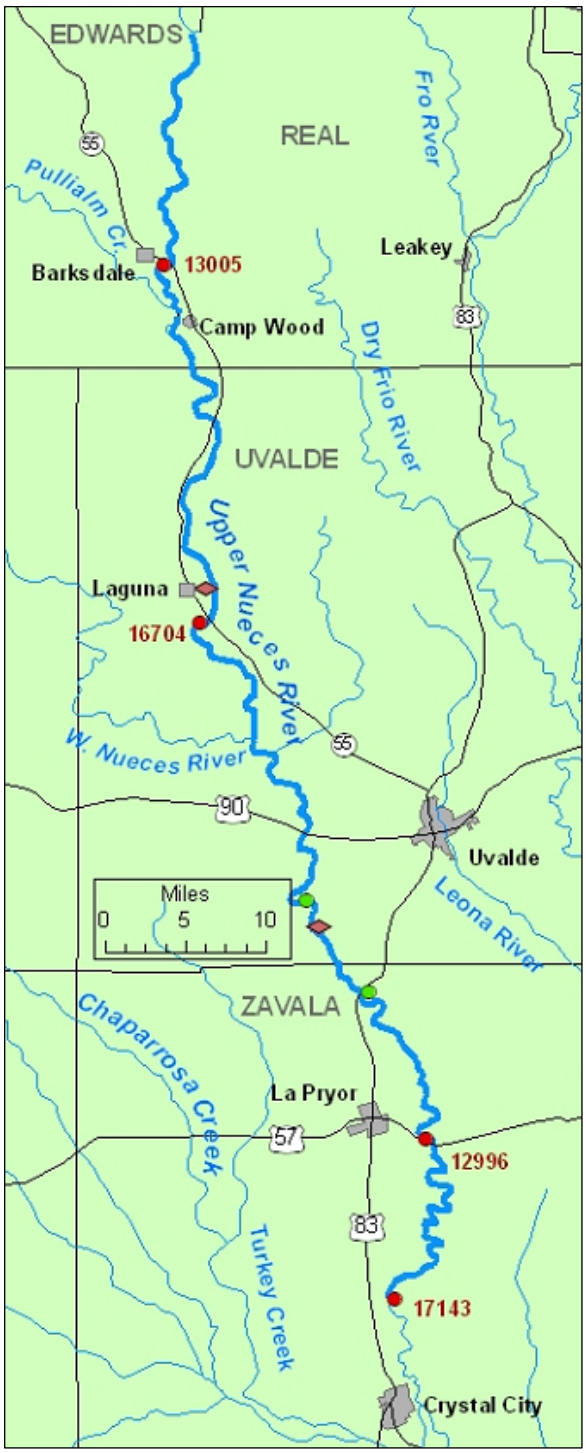


Figure 3-20. Segment 2112

2114: Hondo Creek (Figure 3-22)

The segment flows 78 miles from FM 470 in Bandera County to the confluence with the Frio River in Frio County. It is divided into two AUs; from the downstream end to just upstream of FM 2676 (AU_01), and from just upstream of FM 2676 to the upstream end.

There is a concern for nitrate in AU_01. The City of Hondo WWTP discharges to this segment.

2115: Seco Creek (Figure 3-22)

The segment flows 70 miles from the confluence with West Seco Creek in Bandera County to the confluence with Hondo Creek in Frio County. It is divided into two AUs; from the downstream end to the confluence with an unnamed tributary near FM 1796 (AU_01), and from the confluence with an unnamed tributary near FM 1796 to the upstream end (AU_02).

All assessed parameters met the standards in AU_02. There are no sampling sites AU_01. Therefore, except for TDS, it was not assessed.

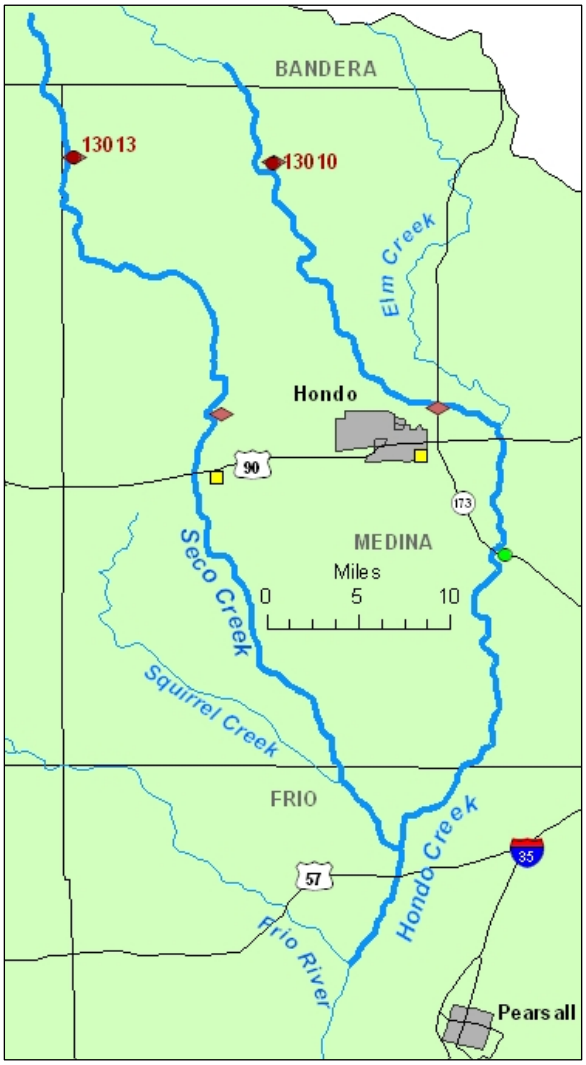


Figure 3-22. Segments 2114 and 2115

2116: Choke Canyon Reservoir (Figure 3-23)

Choke Canyon Reservoir impounds the Frio River and is defined by the 220.5' MSL elevation. The reservoir covers portions of McMullen and Live Oak Counties. When near capacity, the water levels at the Frio River at Tilden are affected.

The reservoir is divided into seven AUs; the 5120 acres near the dam (AU_01), the small north arm near the dam and Willow Hollow Tank (AU_02), the 5120 acres in the middle of the reservoir (AU_03), the large north arm near mid-reservoir and Jacob Oil Field (AU_04), the southern arm near mid-reservoir and Recreation Road 7 west of Calliham (AU_05), the western end of the reservoir up to RR 99 (AU_06), and the from RR 99 to the upper end (AU_07).

USGS also conducts its own water quality monitoring on the reservoir.

AU_06 was first listed as being impaired for DO as a result of the 2006 Assessment. 24-Hr DO measurements have been taken at Station 17389.

All other assessed parameters met the standards. The TDS standard is based on the average of all values for all AUs. The current standard is 500 mg/l. The proposed standards revisions will increase the TDS standard to 720 mg/l. Figure 3-24 displays the lake elevation during the assessment period.

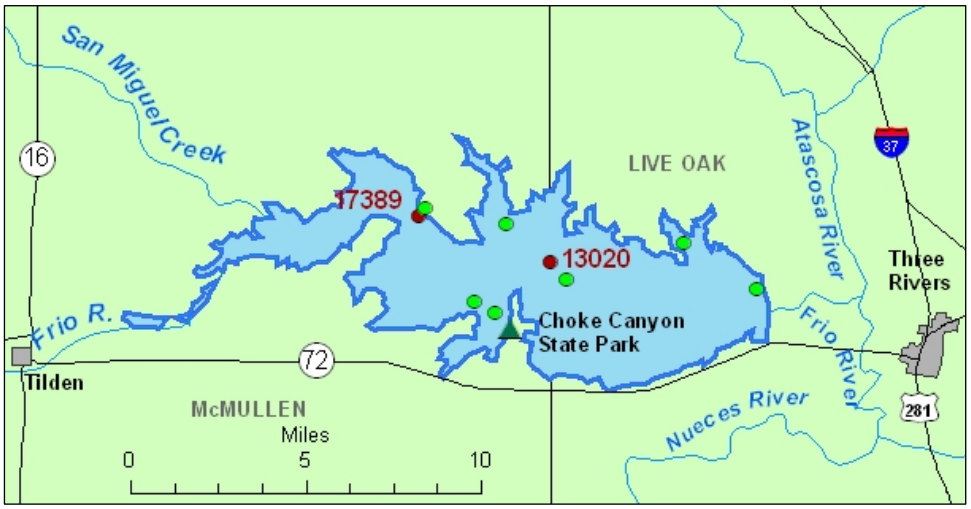


Figure 3-23. Segment 2116

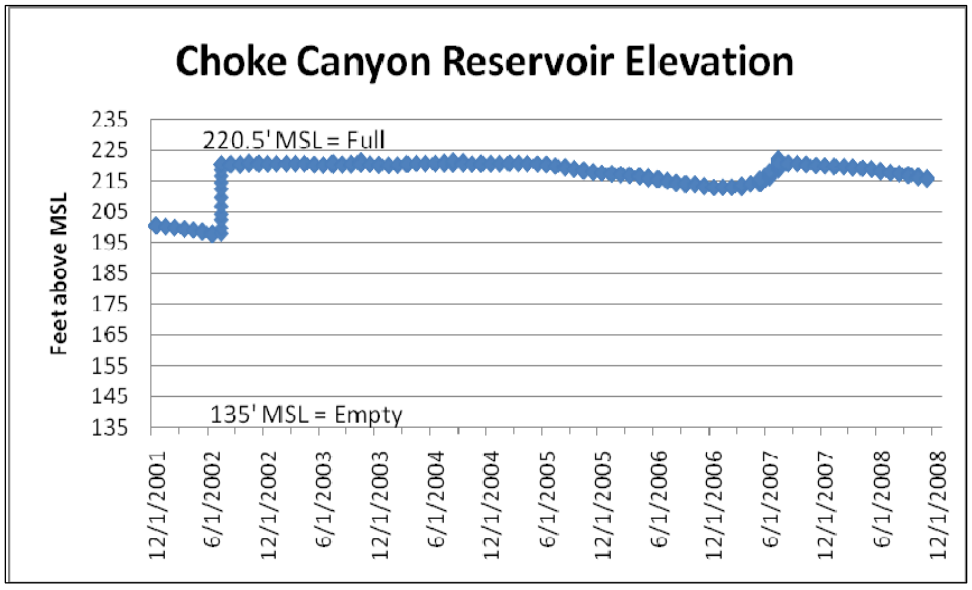


Figure 3-24. Choke Canyon Reservoir Elevation December 1, 2001 – November 30, 2008.

2117: Frio River Above Choke Canyon Reservoir (Figure 3-25)

The segment flows 158 miles from 100 m upstream of US 90 in Uvalde County to the confluence with Choke Canyon Reservoir in McMullen County. The segment is divided into six AUS; from Choke Canyon Reservoir to the confluence with Experanza Creek (AU_01), from the confluence with Experanza Creek to the confluence with Ruiz Creek (AU_02), from the confluence with Ruiz Creek to the confluence with Live Oak Creek (AU_03), from the confluence with Live Oak Creek to the confluence with Elm Creek (AU_04), from the confluence with Elm Creek to the confluence with Spring Branch (AU_05), and from the confluence with Spring Branch to the upper end of the segment.

AU_02 was first listed as being impaired for bacteria for contact recreation as a result of the 2008 Assessment.

AU_01 through AU-05 have a concern for nitrates. Although there are no sampling sites in AU_04, it was assumed that it would also be impacted since the AUs on either side have high levels. The values decrease from upstream to downstream.

Figure 3-25. Segment 2117

3.2.3 NUECES – RIO GRANDE COASTAL BASIN (Figure 3-26)

The Nueces – Rio Grande Coastal Basin covers approximately 10,400 square miles, encompassing all or part of 12 counties in South Texas.

Several TMDLs and special studies have been conducted in the basin. Specific results and findings are discussed in the individual segment summaries: Segment 2201, Arroyo Colorado Tidal, for depressed DO; Segment 2202, Arroyo Colorado Above Tidal, for bacteria; and Segment 2204, Petronila Creek, for TDS, chloride, and sulfate.

Table 3.4 lists all the CRP and SWQM sites monitored during FY 2010 in this basin.

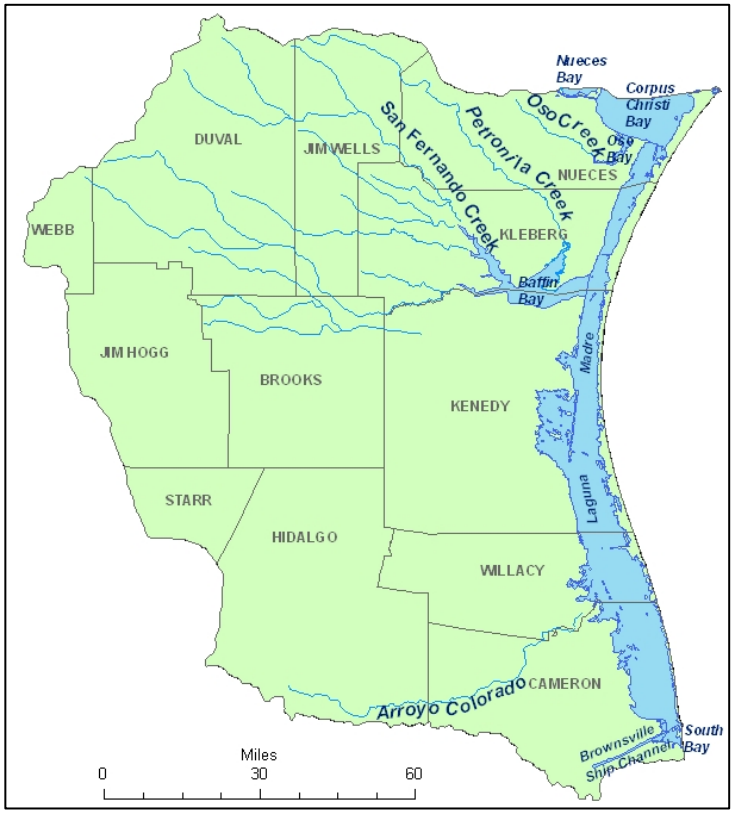


Figure 3-26: Nueces – Rio Grande Coastal Basin

Table 3-4: CRP and SQWM Sites in the Nueces – Rio Grande Coastal Basin

Segment Name	Station Id	Description	Monitoring Entity	Conventional, Bacteria, Field	Other
2201 Arroyo Colorado Tidal	13072 (AU_05)	At FM 106 bridge at Rio Hondo	TCEQ Region 15	Quarterly	
	13073 (AU_04)	At Camp Perry north of Rio Hondo 177 m downstream from confluence with unnamed ditch on the west side of Arroyo Colorado	TCEQ Region 15	Quarterly	
	13559 (AU_03)	At Marker 27, Mile 15, 0.8 km north of the point where channel becomes boundary between Willacy and Cameron counties	TCEQ Region 15	Quarterly	
	13782 (AU_01)	Near Marker 16 at Arroyo City 492 m downstream of confluence with Arroyo Colorado and Arroyo Colorado cutoff	TCEQ Region 15	Quarterly	
2202 Arroyo Colorado Above Tidal	13074 (AU_01)	At low water bridge at Port Harlingen at Cemetery Rd bridge	TCEQ Region 15	Quarterly	2 Metals & 2 Organics in sediment
	13079 (AU_02)	At US 77 in SW Harlingen	NRA	Quarterly	
	13080 (AU_02)	At FM 506 south of La Feria	NRA	Quarterly	
	13081 (AU_03)	At FM 1015 south of Weslaco	TCEQ Region 15	Quarterly	
	13084 (AU_03)	At US 281 south of Pharr	TCEQ Region 15	Quarterly	
	16445 (AU_02)	At low water crossing at Dilworth Rd east of La Feria	NRA	Quarterly	
2203 Petronila Creek Tidal	13090	1.2 km upstream of the confluence with Tunas Creek	TCEQ Region 14	Quarterly	
2204 Petronila Creek Above Tidal	13094 (AU_01)	At FM 892 SE of Driscoll	TCEQ Region 14	Quarterly	
	13096 (AU_02)	At FM 665 east of Driscoll	TCEQ Region 14	Quarterly	

2201: Arroyo Colorado Tidal (Figure 3-27)

The segment flows 26 miles from 110 yards downstream of Cemetery Rd south of the Port of Harlingen to its confluence with the Laguna Madre. The segment forms part of the county line between Cameron and Willacy Counties. The segment is divided into five AUs; from the confluence with the Laguna Madre to the confluence with San Vincente Drainage Ditch (AU_01), from the confluence with San Vincente Drainage Ditch to the confluence with an unnamed drainage ditch at 26.31, -97.53 (AU_02), from an unnamed drainage ditch at 26.31, -97.53 to the confluence with the Harding Ranch Ditch tributary (AU_03), from the confluence with the Harding Ranch Ditch tributary to just upstream of the City of Hondo wastewater discharge point (AU_04), and from just upstream of the City of Hondo wastewater discharge point to the upstream end of the segment (AU_05).

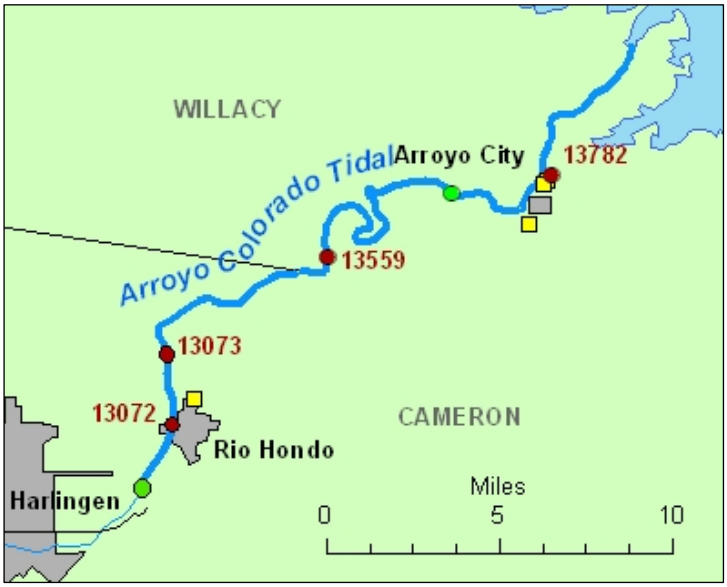


Figure 3-27. Segment 2201

The area is predominately farmland. The Arroyo Colorado Tidal segment serves as the waterway from the Laguna Madre to the Port of Harlingen. The City of Rio Hondo is just downstream of the Port. Arroyo City is located along the southern shore, with many homes lining the river.

AU-04 and AU_05 have been impaired for low DO since the 1996 Assessment. A TMDL to address this impairment found that a 90% reduction of loading would have to occur in order for the segment to meet water quality standards. This lead to the development of the Arroyo Colorado Watershed Protection Plan (ACWPP). The physical properties of the segment, including the Port of Harlingen, manipulated by dredging and other mechanical changes to the river contribute to this impairment. At times, barge traffic to the Port causes the anoxic water near the bottom of the channel to rise to the surface which results in fish kills.

AU_03, AU_04, and AU_05 have been impaired for bacteria for contact recreation since the 2006 Assessment. The impairment is being addressed as part of the ACWPP.

AU_05 is also impaired for mercury and polychlorinated biphenyl (PCB) in edible fish tissue since the 2008 Assessment and for dichlorodiphenylethyline (DDE) in edible fish tissue for the 2010 Assessment.

All AUs have a concern for nitrates, mostly associated with the unloading of fertilizers at the Port of Harlingen and from runoff from agricultural fields. All AUs have a concern for chlorophyll-*a*. AU_03, AU_04, and AU_05 have a concern for OP. AU_05 also has a concern for ammonia.

2201A: Harding Ranch Drainage Ditch Tributary (Figure 3-28)

The segment flows from 20.8 km upstream of the FM 508 crossing to the confluence with the Arroyo Colorado Tidal.

There are no active monitoring sites on the segment. Data were collected at Station 17113 at the confluence of the Harding Ranch Drainage ditch and the Arroyo Colorado Tidal during 2001 and 2002 as part of the TMDL study.

The segment has a concern for ammonia based on a screening level of 0.11 mg/l which is usually associated with reservoirs. All values met the screening level of 0.46 mg/l for tidal streams.

2201B: Unnamed Drainage Ditch Tributary in Cameron County Drainage District #3 (Figure 3-28)

The segment flows from 17.6 km upstream the FM 510 crossing to the confluence with the Arroyo Colorado Tidal in the Rio Hondo turning basin.

There are no active monitoring sites on the segment.

The segment is impaired for bacteria for contact recreation. The data for this analysis were collected during a study in 2004 and 2005 to gather information prior to the development of a constructed wetland to filter runoff from the Green Valley Farms Colonia. The project was not funded.

The segment also has concerns for nitrates and chlorophyll-*a*.

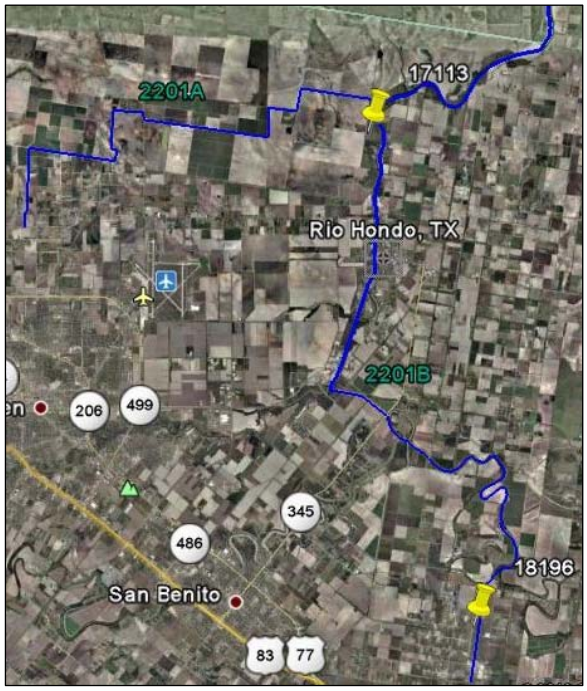


Figure 3-28. Segments 2201A and 2201B

2202: Arroyo Colorado Above Tidal (Figure 3-29)

The segment flows 63 miles FM 2062 in Hidalgo County to 110 yards downstream of Cemetery Rd south of the Port of Harlingen. The segment is divided into four AUs; from the downstream end of the segment to the confluence with Little Creek just upstream of State Loop 499 (AU_01), from the confluence with Little Creek to the confluence with La Feria Main Canal just upstream of Dukes Highway (AU_02), from confluence with La Feria Main Canal to the confluence with La Cruz Resaca just downstream of FM 907 (AU_03), and from the confluence with La Cruz Resaca to the upstream end of the segment (AU_04).

This area is one of the fastest growing area in the State of Texas. There are numerous cities along US 83 just north of the Arroyo Colorado, with farming activities in between. The Arroyo Colorado is the primary conveyance of wastewater and agricultural runoff for this area.

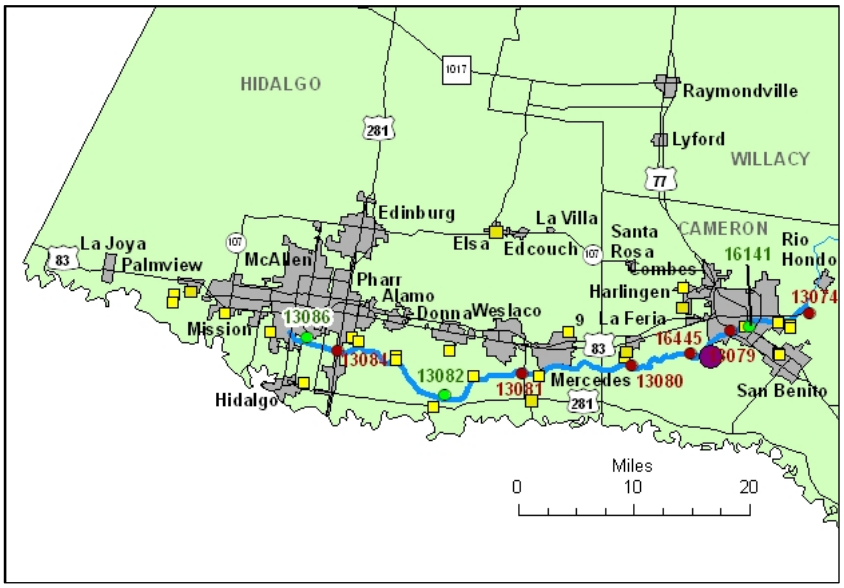


Figure 3-29. Segment 2202

All AUs have been impaired for bacteria for contact recreation since the 1996 Assessment. The impairment is being addressed as part of the ACWPP. The segment could meet the standard if the proposed standards revision is approved.

In addition, NRA is completing a special study on the segment to compare the three indicator bacteria; Fecal coliform, *E. coli*, and enterococcus. Monthly sampling was conducted at Stations 13086, 13084, 13082, 13081, 16141, and 13074 from January 2009 through December 2009. The raw data shows that 17% of the measurements exceeded the single sample criteria for *E. coli*, 74% exceeded for Fecal coliform, and 89% exceeded for Enterococcus. Table 3.5 lists all of the monitoring sites, the number of individual samples collected for the study, and the geometric mean for each of the indicator bacteria, all of which exceeded the standard. The standard for fecal coliform is 200 cfu; E. coli is 126 cfu; and Enterococcus is 35 cfu. These data were not used in the 2010 Assessment.

Table 3-5: Summary Results for Arroyo Colorado Indicator Bacteria Study

Site		Fecal Coliform		E. coli		Enterococcus	
		#	Geomean	#	Geomean	#	Geomean
13086	At FM 336 south of McAllen	12	406	12	226	12	269
13084	At US 281 south of Pharr	12	467	12	220	12	278
13082	At FM 493 south of Donna	12	780	12	307	12	298
13081	At FM 1015 south of Weslaco	12	877	12	255	12	240
16141	Downstream from Commerce Street (St) in Harlingen	12	797	12	304	12	214
13074	At Cemetery Bridge Rd in Harlingen	12	660	12	244	12	158

Based solely on the special study data, regardless of the indicator bacteria used, the segment would remain listed on the 303(d) list. However, with the implementation of best management practices through the ACWPP, we may begin to see the numbers decline. It is possible that the *E. coli* levels could improve enough to de-list the segment long before Enterococcus levels could. NRA recommends that Enterococcus be the indicator bacteria for this segment, but that analysis for both *E. coli* and Enterococcus continue until there are sufficient samples for a water quality assessment. An RUAA is also being conducted in 2010 to help determine the proper contact recreation designation for this segment.

All AUs also impaired for mercury and PCBs in edible fish tissue since the 2008 Assessment and for DDE in edible fish tissue for the 2010 Assessment.

All AUs have a concern for nitrates, chlorophyll-*a*, OP, and total phosphorus. AU_01, AU_03, and AU_04 also have a concern for ammonia. The nutrients are most likely the result of runoff from agricultural practices and WWTP discharges. These are being addressed by the ACWPP.

2202A: Donna Reservoir (Figure 3-30

The segment is an off-channel irrigation reservoir pumped from the Rio Grande River near the City of Donna.

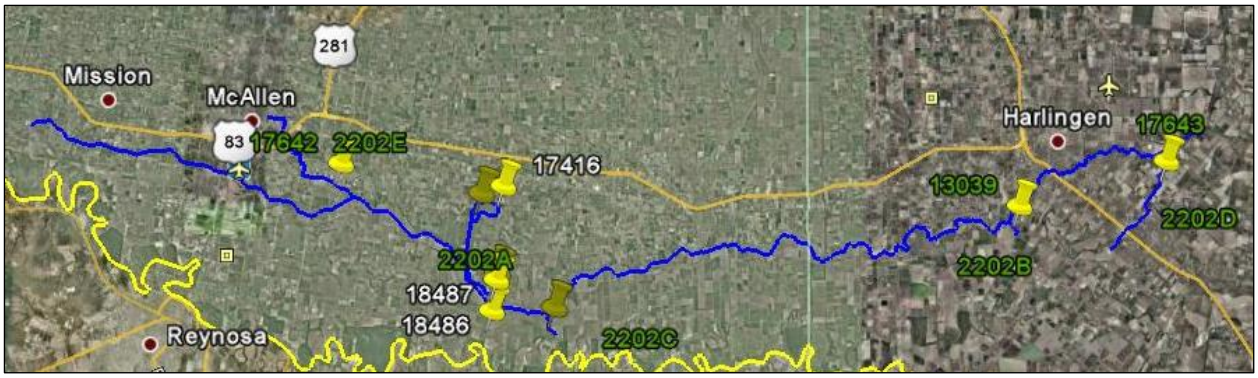


Figure 3-30. Segments 2202A, 2202B, 2202C, 2202D and 2202E

There are no active monitoring sites on the segment.

The segment has been impaired for PCBs in edible fish tissue since the 1996 Assessment. A TMDL was conducted and an IP was approved in 2001. This pollutant is considered a background source that reflects the site-specific application histories and loss rates. Any continuing source of pollutant loadings occur from nonpoint source runoff, leaching, or erosion of sinks that may exist within the watershed. Residual PCB contamination from a site near the Donna Canal is likely to remain a continuing source until site investigation and remediation is completed. No authorized point source discharges of this pollutant are allowed by law. The IP is available at http://www.tceq.state.tx.us/assets/public/implementation/water/tmdl/07arroyoleg/07-implan_arroyo.pdf.

2202B: Unnamed Drainage Ditch Tributary to Arroyo Colorado (Figure 3-30)

The segment is a perennial drainage ditch that flows into the Arroyo Colorado in Harlingen.

There are no active monitoring sites on the segment. In order to have enough data points to assess this segment, data from Station 13039 from December 1, 1998 through November 30, 2008 were used.

The segment is impaired for bacteria for contact recreation as a result of the 2010 Assessment. The impairment is being addressed as part of the ACWPP.

The segment has concerns for chlorophyll-*a* and ammonia. The nutrients are most likely the result of runoff from agricultural practices and WWTP discharges. These are being addressed by the ACWPP.

2202C: Unnamed Drainage Ditch Tributary to Arroyo Colorado (Figure 3-30)

The segment is from a point 1.1 miles upstream of US 281 to its confluence with the Arroyo Colorado SE of Donna.

There are no active monitoring sites on the segment. In order to have enough data points to assess this segment, data from Station 13056 from December 1, 1998 through November 30, 2008 were used.

The segment has concerns for bacteria and ammonia, most likely the result of runoff from the many WWTP discharges. These are being addressed by the ACWPP.

2202D: Unnamed Drainage Ditch Tributary to Arroyo Colorado (Figure 3-30)

The segment is from a point 5.1 miles upstream at Ratliff St / Pennsylvania Ave to its confluence with the Arroyo Colorado in Harlingen.

There are no active monitoring sites on the segment. Data from Station 17643 were used for the assessment.

DO was the only parameter assessed for this segment and it met the standard.

2202E: Unnamed Drainage Ditch Tributary to Arroyo Colorado (Figure 3-30)

The segment is from a point 6.6 miles upstream of S. Col. Rowe Blvd to its confluence with the Arroyo Colorado in Pharr.

There are no active monitoring sites on the segment. Data from Station 17642 were used for the assessment.

DO was the only parameter assessed for this segment and it met the standard.

2203: Petronila Creek Tidal (Figure 3-31)

The segment flows 14 miles from a point 0.6 miles upstream of a private road crossing near Laureles Ranch in Kleberg County to the confluence with Chiltipin Creek / Alazan Bay in Kleberg County.

This segment of Petronila Creek is within the King Ranch.

Due to Station 13090 being on King Ranch property, accessibility is sometimes an issue.

The segment is impaired for bacteria for contact recreation as a result of the 2010 Assessment.

The segment also has a concern for chlorophyll-*a* .

2204: Petronila Creek Above Tidal (Figure 3-31)

The segment flows 35 miles from the confluence of Agua Dulce and Banquete Creeks in Nueces County to a point 0.6 miles upstream of a private road crossing near Laureles Ranch in Kleberg County. The segment is divided into two AUs; from the downstream end to the confluence with 2204A (AU_01) and from the confluence with 2204A to the upstream end of the segment (AU-02).

The segment is primarily farmland interspersed with a number of small communities and cities. It flows through the City of Driscoll, at US 77, and several colonias.

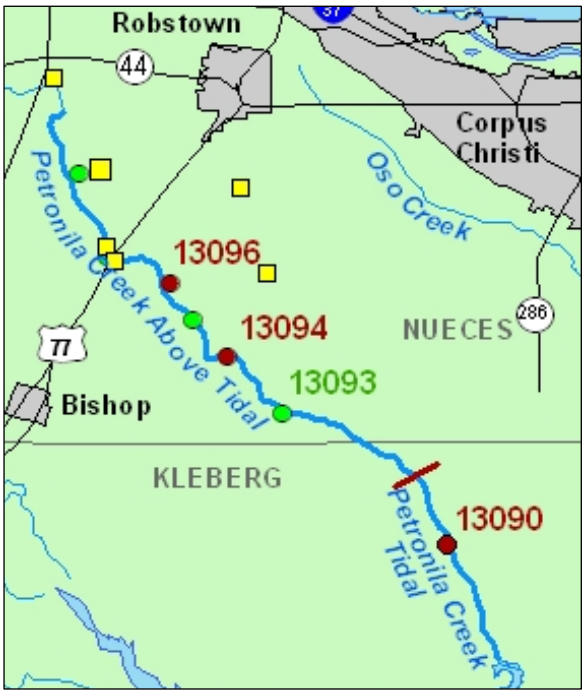


Figure 3-31. Segments 2203 and 2204

TCEQ collected additional field data and bacteria samples from Stations 13098 and 13099 in the upper reaches of the segment to address complaints from citizens about bacteria levels in the creek. There are a number of WWTPs that discharge to this segment. The 2010 Assessment did not identify bacteria as either an impairment nor a concern. There is also a storm water discharge permit for a hazardous waste landfill.

Although the stretch is frequently dry, a permanent site is being proposed beginning in FY 2011.

The segment has been impaired for chloride, total dissolved solids (TDS), and sulfates since 1999. A TMDL was conducted and concluded that the impairments were the result of historic oil and gas operations. A continuous water quality monitoring (CWQM) station was installed by TCEQ at the location of Station 13093 at FM 70. NRA performs the routine maintenance. The CWQM data is assessable at http://www.tceq.state.tx.us/cgi-bin/compliance/monops/water_daily_summary.pl?cams=731.

The segment also has a concern for chlorophyll-*a*.

3.2.4 Bay, Estuaries and Gulf of Mexico (Figure 3-32)

Several TMDLs and special studies have been conducted in the basin. Specific results and findings are discussed in the individual segment summaries: Segment 2472, Copano Bay, for bacteria is oyster waters (See Section 3.2.2); Segment 2482, Nueces Bay, for zinc in oyster tissue; Segment 2485, Oso Bay for bacteria and depressed DO; Segment 2485A for bacteria; and Segment 2491, Laguna Madre for depressed DO.

Beach Watch is a TGLO sponsored program that collects bacteria samples at Texas Beaches. There are five bays with Beach Watch Stations: Segment 2471, Aransas Bay – Rockport Beach; Segment 2481, Corpus Christi Bay; Segment 2483, Redfish Bay; Segment 2491, Laguna Madre; and Segment 2491, Baffin Bay - Cayo del Grullo Bay. Specific sites are discussed in their respective segments. The data are used to alert the public for times when it may be unsafe to be in water and can be found on the Beach Advisory and Closing On-line Notification (BEACON) Website (http://iaspub.epa.gov/waters10/beacon_national_page.main).

Nine bays are listed as having concerns for iron in sediment: Segment 2462, Mesquite Bay; Segment 2471, Aransas Bay; Segment 2472, Copano Bay; Segment 2481, Corpus Christi Bay; Segment 2482, Nueces Bay; Segment 2484, Corpus Christi Inner Harbor; Segment 2491, Laguna Madre; Segment 2492, Baffin Bay, and 2494, Brownville Ship Channel. In all cases the exceedances are several orders of magnitude greater than the criteria. It is possible that this is related to marinas and shipyards where there is concentrated boat traffic and maintenance.

Red tide was present along the Texas Coast for most of 2009. There were numerous fish kills. Coyotes and dogs also died as a result of eating the contaminated fish. The red tide appears to have dissipated as the region experience a cooler than normal winter. TWPD maintains a website with periodic updates on the situation: www.tpwd.state.tx.us/landwater/water/environconcerns/hab/redtide/status.phtml.

Table 3.6 lists all the CRP and SWQM sites monitored during FY 2010 in the bays, estuaries, and Gulf of Mexico.

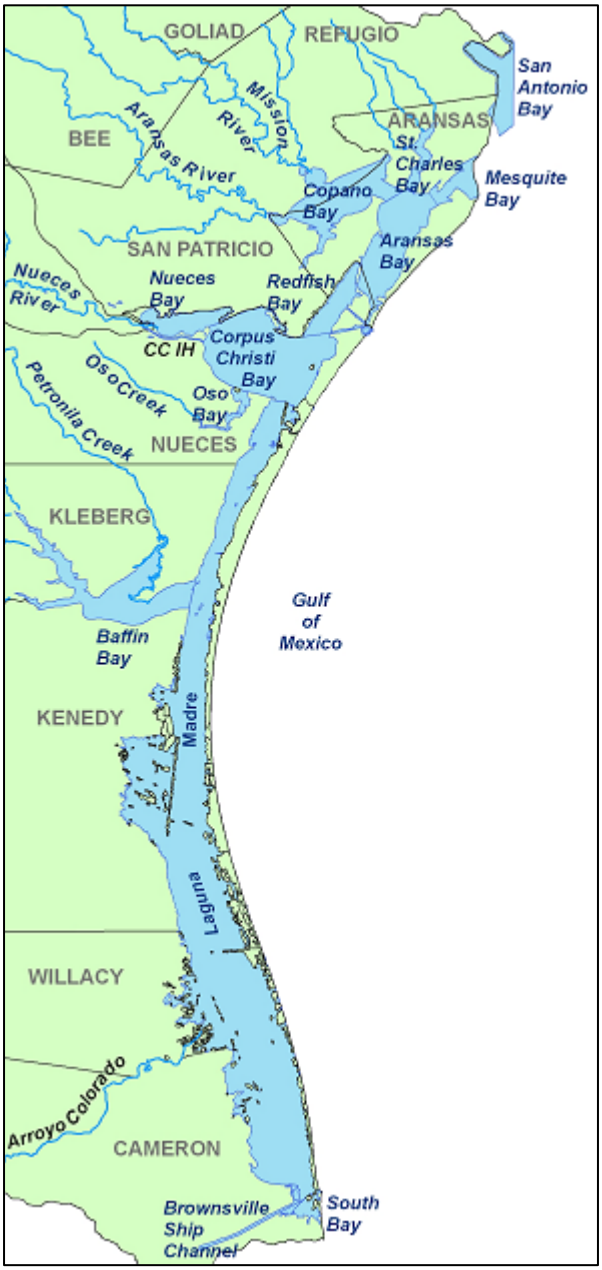


Figure 3-32: Bays, Estuaries and Gulf of Mexico

Table 3-6: CRP and SQWM Sites in the Bays and Estuaries and Gulf of Mexico

Segment Name	Station Id	Description	Monitoring Entity	Conventional, Bacteria, Field	Other
2462 San Antonio Bay / Hynes Bay/ Guadalupe Bay	13397	At Intracoastal Water Way (ICWW) Buoy C-17	TCEQ Region 14	Quarterly	
	14956	At Austwell at TPWD public boat ramp	NRA	Quarterly	
2463 Mesquite Bay	13400	South of ICWW Marker 13	TCEQ Region 14	Quarterly	
2471 Aransas Bay	13402	At intersection of ICWW and Lydia Ann Channel south of Rockport	TCEQ Region 14	Quarterly	
	16492	Lydia Ann / Palacios Channel 2.04 km north and 660 m west of northern tip of Oliver Point and west of Aransas Light House	TCEQ Region 14	Quarterly	
2471A Little Bay	16232	At Broadway and the inlet Canal to Canoe Lake in Rockport	TCEQ Region 14	Quarterly	
2472 Copano Bay / Port Bay / Mission Bay	12945	At FM 136 bridge 355 m from intersection with Egery Island Rd south of Bayside	NRA	Quarterly	
	13404	At west side of fishing pier near south end of SH 35 Causeway	NRA	Quarterly	
	13405	Port Bay at middle of SH 118 west of Rockport	NRA	Quarterly	
	14783	125 m south and 655 m east of Copano Bay Dr at Spoonbill east of Bayside	TCEQ Region 14	Quarterly	
2473 St. Charles Bay	13406	NE of Goose Island State Park 95 m south of Lamar Beach Rd at 4th St	TCEQ Region 14	Quarterly	
2481 Corpus Christi Bay	13407 (AU_01)	At Corpus Christi Channel Marker (CM) 62	TCEQ Region 14	Quarterly	
	13409 (AU_01)	La Quinta CM 16	TCEQ Region 14	Quarterly	
	13410 (AU_01)	Near Corpus Christi CM 86 0.8 km east of US 181	TCEQ Region 14	Quarterly	
	13411 (au_02)	1 km NE of intersection of Doddridge St and Ocean Dr	TCEQ Region 14	Quarterly	
	14355 (AU_03)	0.4 km east of Shamrock Island and 1.5 km NE of Shamrock Point	TCEQ Region 14	Quarterly	
	17791 (AU_01)	3.1 mi SW of Shamrock Point on Shamrock Island	TCEQ Region 14	Quarterly	
2482 Nueces Bay	13421	US 181 bridge at causeway north side, 0.5 km NE of Rincon Point	TCEQ Region 14	Quarterly	
	13422	0.5 mi from south shore at east overhead powerline	TCEQ Region 14	Quarterly	2 Metals in sediment
	13425	0.8 km SE of Whites Point	TCEQ Region 14	Quarterly	
2483 Aransas Bay	13426	At SH 361 at 3rd bridge between Aransas Pass and Port Aransas	NRA	Quarterly	
2483A Conn Brown Harbor	18848	Mid-harbor 50 m NE of the intersection of Huff St and E Maddox Ave in Aransas Pass	NRA	Quarterly	
2484 Corpus Christi Inner Harbor	13430	In Avery turning basin	TCEQ Region 14	Quarterly	2 Metals in water, 2 Metals & 2 Organics in sediment
	13432	0.4 km east of Navigation Blvd draw bridge	TCEQ Region 14	Quarterly	
	13439	In Viola turning basin	TCEQ Region 14	Quarterly	2 Metals in water

Table 3-5: CRP and SQWM Sites in the Bays and Estuaries and Gulf of Mexico (cont.)

2485 Oso Bay	13440	Immediately offshore at tip of peninsula at Padre Island Drive/southbound SH 358	NRA	Quarterly	
2485A Oso Creek	13028	Immediately downstream of SH 286 south of Corpus Christi	NRA	Quarterly	
2491 Laguna Madre	13443 (AU_01)	South of the intersection of ICWW and Padre Island Causeway	TCEQ Region 14	Quarterly	
	13444 (AU_01)	1.87 km NW of Point Penascal at intersection of ICWW at Baffin Bay marker	TCEQ Region 14	Quarterly	
	13445 (AU_01)	At ICWW approx 1.6 km SW from the southernmost point of south Bird Island	TCEQ Region 14	Quarterly	
	13446 (AU_03)	At ICWW at Marker 129 east of Port Isabel	TCEQ Region 15	Quarterly	
	13447 (AU_02)	At ntersection of ICWW and Arroyo Colorado	TCEQ Region 15	Quarterly	
	13448 (AU_01)	At intersection of ICWW and Port Mansfield Channel	TCEQ Region 15	Quarterly	
	13449 (AU_01)	At CM C-225A north of Port Mansfield	TCEQ Region 15	Quarterly	
	14844 (AU_03)	At ICWW CM 49	TCEQ Region 15	Quarterly	
	14870 (AU_03)	200 yards off Laguna Vista shoreline	TCEQ Region 15	Quarterly	
2492 Baffin Bay / Alazan Bay / Cayo Del Grullo / Laguna Salada	13450	At CM 14	TCEQ Region 14	Quarterly	
	13452	At CM 36	TCEQ Region 14	Quarterly	2 Metals in water
2492A San Fernando Creek	13033	At US 77 at Kingsville	TCEQ Region 14	Quarterly	
2493 South Bay	13459	Near ship CM 17	TCEQ Region 15	Quarterly	
	14865	Middle of bay	TCEQ Region 15	Quarterly	
2494 Brownsville Ship Channel	13460	Near ship CM 35 / black buoy	TCEQ Region 15	Quarterly	
	14871	Mid-channel 595 m east of SH 48 at Foust Rd	TCEQ Region 15	Quarterly	2 24-Hr DO
	14875	Mid-channel at entrance to San Martin Lake	TCEQ Region 15	Quarterly	
2494A Port Isabel Fishing Harbor	13285	Port Isabel Fishing Harbor	TCEQ Region 15	Quarterly	
2501 Gulf of Mexico	13468 (AU_06)	At Aransas Pass 165 m south and 413 m east of tip of South Jetty near Marker R-7	TCEQ Region 14	Quarterly	
	13470 (AU_08)	At Port Isabel, 1.18 km east and 35 m south of Brazos Santiago Pass North Jetty	TCEQ Region 15	Quarterly	

2462: San Antonio Bay / Hynes Bay (Figure 3-33)

This segment is primarily in Refugio and Calhoun Counties and includes Guadalupe Bay. The official boundary for the San Antonio – Nueces Coastal Basin includes all of Hynes Bay and only a portion of San Antonio Bay.

The area around the bay is dominated by farm and ranch lands. The small town of Austwell is on the bay is the only community in the area.

DSHS has listed the bay as being non-supporting for bacteria in oyster waters. The segment has concerns for chlorophyll-*a* and nitrates.

2463: Mesquite Bay (Figure 3-33)

This segment is in Aransas County.

The bay surrounded by natural areas. The Aransas Wildlife Refuge is to the NW and uninhabited San Jose and Matagorda Islands are to the SE.

DSHS has listed the bay as being non-supporting for bacteria in oyster waters.

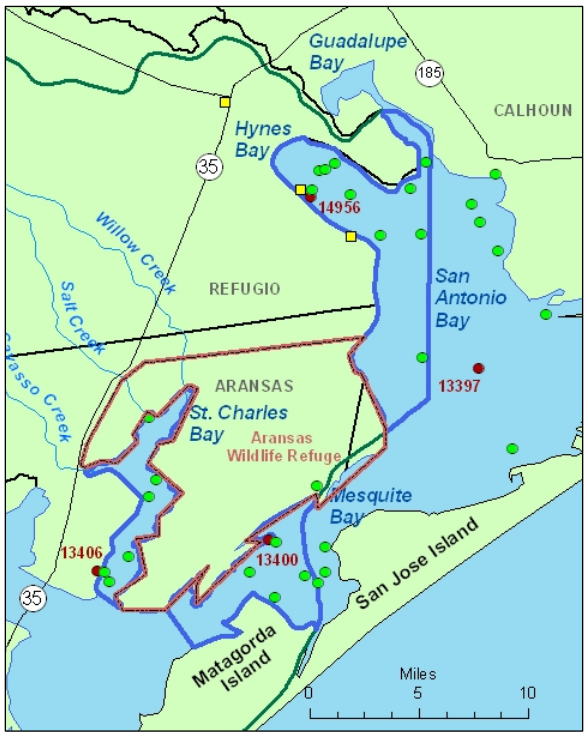


Figure 3-33. Segments 2462, 2463, and 2473

Figure 3-34. Segments 2471 and 2472

2471A: Little Bay (Figure 3-35)

This segment is located between Aransas Bay, Broadway Street in Rockport, and Rockport Beach.

The segment has a concern for chlorophyll-*a*. The elevated concentrations may be due to limited circulation within the bay.

2471: Aransas Bay (Figure 3-34)

This segment is primarily in Aransas County.

The City of Rockport is along the western shore of the bay and the uninhabited Matagorda Island is on the east. The Aransas Wildlife Refuge is to the north.

Beach Watch data have identified Rockport Beach Park as having a concern for bacteria for contact recreation.

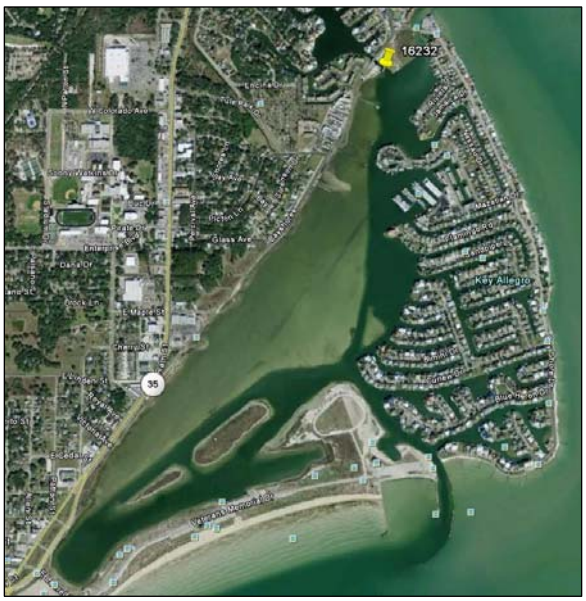


Figure 3-35. Segment 2471A

2472: Copano Bay / Port Bay / Mission Bay (Figure 3-34)

The bays are located in Refugio and Aransas Counties.

The south and east sides of the bay have a number of developments and small communities. The north and west sides are mostly farm and ranch lands.

The bay has had an impairment for bacteria in oyster waters since 1998. See Section 3.2.1 for information concerning the TMDL and other studies that are being conducted to address this impairment.

The enterococcus samples used in the 2010 Assessment met the criteria for contact recreation.

2473: St. Charles Bay (Figure 3-33)

This segment is located in Aransas County.

The bay is nearly surrounded by the Aransas Wildlife Refuge. The small community of Lamar is located on the southwest side adjacent to Aransas Bay.

The segment has a concern for depressed DO. The sampling site is located at a boat ramp and may not be representative of the bay. NRA and TCEQ will research a new location for FY 2011.

2481: Corpus Christi Bay (Figure 3-36)

The bay is located in Nueces County. It is split between the San Antonio – Nueces and Nueces – Rio Grande Coastal Basins. The bay is divided into four AUs: from the Corpus Christi Ship Channel (CCSC) east to Pelican Island, south to Demit Island including the La Quinta Channel and the CCSC adjacent to Redfish Bay (AU_01); from the CCSC east to Pelican Island, south to Demit Island including the area from the CCSC to Demit Island (Oso Bay and City of Corpus Christi area) (AU_02);

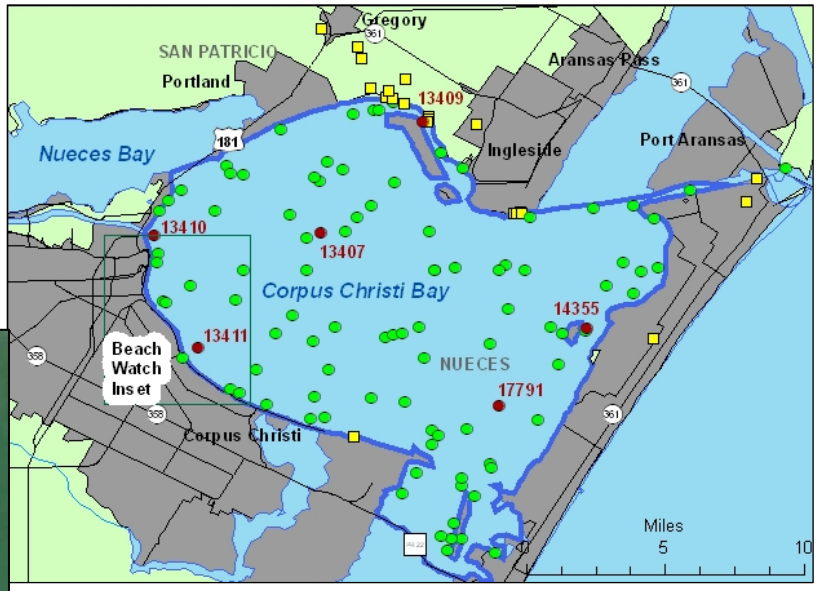


Figure 3-36. Segment 2481

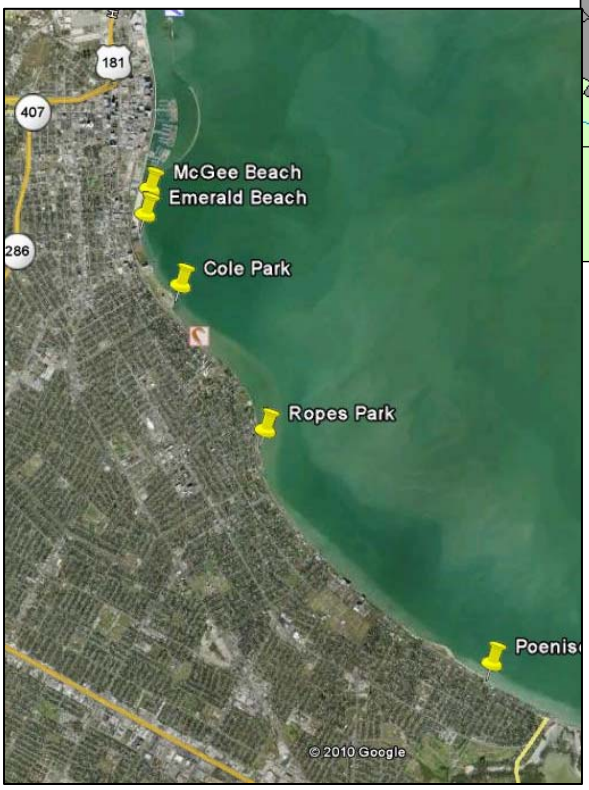


Figure 3-37. Corpus Christi Bay Beach Watch Locations

from Pelican Island south to Demit Island, to Mustang Island and the area along Mustang Island State Park to the CCSC (AU_03); and from the JFK Causeway to a line from Demit Island across to Mustang Island State Park (AU_04).

The bay is nearly surrounded by cities and industries. The City of Corpus Christi borders the south side of the bay and encompasses a large portion of Mustang Island. Along the northern shore are the cities of Portland, Ingleside, and Ingleside-By-The-Bay. There are several industries located along La Quinta Channel, along with the recently closed Naval Station Ingleside.

Beach Watch data have identified Cole Park and Ropes Park as having impairments for bacteria for contact recreation. See Figure 3-37 for Beach Watch locations. Beach Watch data also identified McGee Beach, Poenisch Park, and Emerald Beach as having concerns for bacteria for contact recreation.

2482: Nueces Bay (Figure 3-38)

The bay is located in Nueces County. It is split between the San Antonio – Nueces and Nueces – Rio Grande Coastal Basins. The bay is bordered on the south by the City of Corpus Christi where there are many industries associated with the CCSC. A large portion of the Nueces Delta has been bought and designated as a preserve. The area north of the bay is primarily farm and ranch lands.

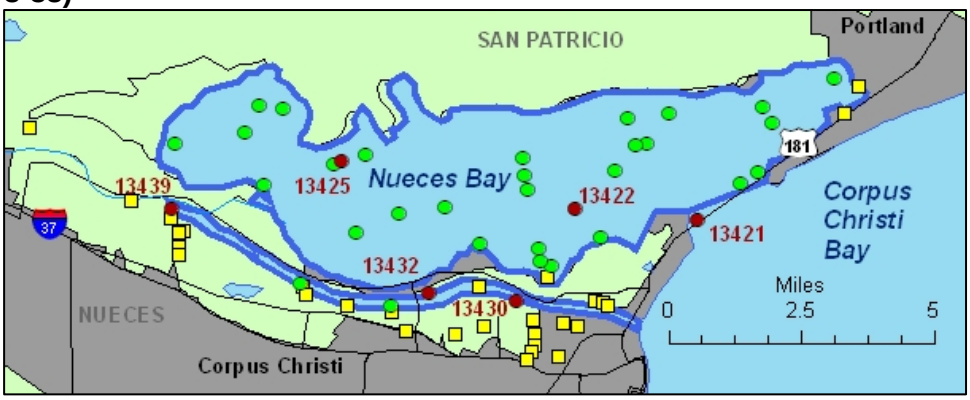


Figure 3-38. Segments 2482 and 2484

The bay has had an impairment for zinc in edible tissue since 1998. A TMDL was conducted and concluded that the impairment was caused discharges from a smelting plant that closed in 1895. The plant's water intake was in the Corpus Christi Inner Harbor and it discharged to Nueces Bay. An IP has been approved. The evaluation of zinc loadings to Nueces Bay in the TMDL indicated that there are no existing discharges that would result in violation of the proposed revised zinc criterion. For this reason, implementation strategies will address zinc in oyster tissue as a legacy pollutant. The attenuation of the pollutant will be monitored by means of targeted sampling in the impaired area. In addition, the TCEQ also recalculated a more protective criterion for total zinc in water to be protective of human health via ingestion of oysters. The IP recommends that this be included as a site-specific criterion for Nueces Bay in the 2008 water quality standards triennial revision.

The 2010 Assessment shows that Beach Watch data have identified Nueces Bay Causeway #3 as having a concern for bacteria for contact recreation. However, the BEACON Website does not list this site.

2483: Redfish Bay (Figure 3-39)

The bay is located in Nueces County.

There is very little undeveloped land on the western shore of the bay. The main cities are Ingleside and Aransas Pass, with numerous small communities all the way to Rockport. Port Aransas encompasses most of the eastern shoreline.

The bay has had an impairment for bacteria in oyster waters since 2006.

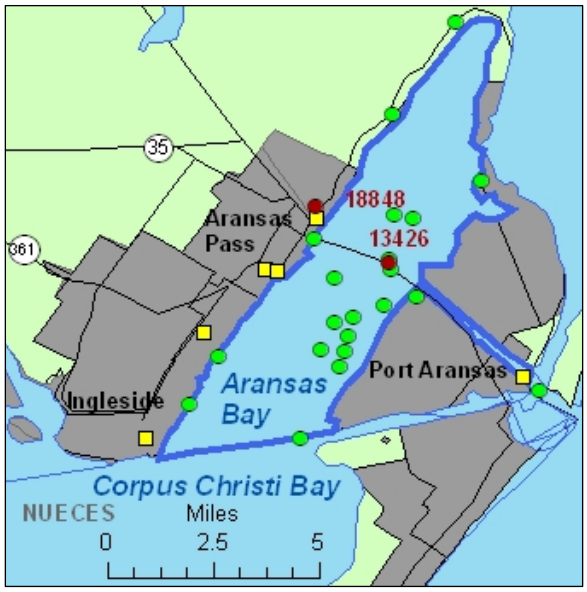


Figure 3-39. Segment 2483

2483A: Conn Brown Harbor (Figure 3-40)

The harbor is within the City of Aransas Pass. The NE end is in Aransas County and the SW end is in San Patricio County.

Conn Brown Harbor is a commercial harbor, used primarily by shrimpers.

All assessed parameters met the standards.

2484: Corpus Christi Inner Harbor (Figure 3-38)

The Corpus Christi Inner Harbor (CCIH) is located in the City of Corpus Christi in Nueces County.

CCIH is home to the Port of Corpus Christi, the second deepest port in the State of Texas. Many refineries and other industries are located all along the harbor. There are also numerous permitted wastewater outfalls, many of which are for storm water. Only the outfalls for treated effluent are shown on the map.

The harbor has concerns for nitrates and ammonia which may be related to the numerous WWTP and storm water discharge permits.

2485: Oso Bay (Figure 3-41)

The bay is located in the City of Corpus Christi in Nueces County. The bay is divided into three AUs; the upper bay from Holly Rd to CR 24 (AU_01), middle bay from SH 358 to Holly Rd (AU_02), and from Ocean Dr to SH 358 (AU_03). The NW portion of the bay between Ward Island and Ennis Joslin Rd in AU_03 is known as the Blind Oso.

Oso Bay receives much of the storm water runoff from the City of Corpus Christi as well as the cooling water from the Barney Davis Power Plant. The housing developments around the bay range from large, multi-acre tracts to neighborhoods with many houses per acre.

Figure 3-40. Segment 2483A

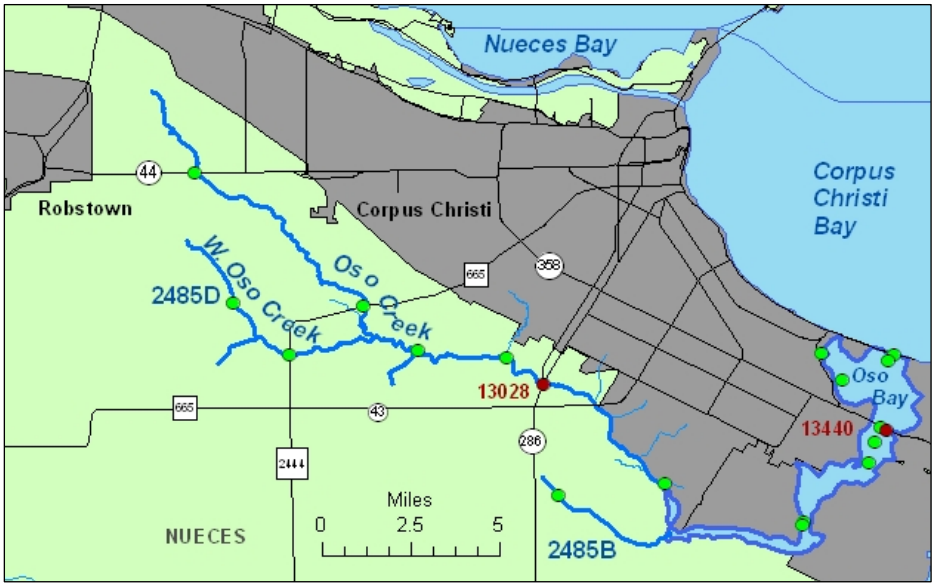


Figure 3-41. Segments 2485A, 2485B, and 2485D

AU_03 has had an impairment for bacteria for contact recreation and oyster waters since 2004. A TMDL has been completed. The report concludes that the Blind Oso differs significantly in physical characteristics and uses from the main portion of Oso Bay. It is extremely shallow, and has a soft muddy bottom and wetland areas. Local area stakeholders indicate that the Blind Oso is not used for contact recreation, but is used extensively by waterfowl since it provides high quality habitat for waterfowl and shorebirds. Thus, it should be evaluated further to determine if it would be more appropriate to consider the Blind Oso an unclassified water body. If TCEQ determines that an adjustment of the recreational use and/or criteria for the Blind Oso is appropriate, load reductions in the Blind Oso area may not be needed. The model analyses indicate that actual loads to Oso Bay proper are substantially less than the allowable TMDLs, and that the bay is generally compliant with contact recreation standards and that the allowable loading is more than ten times the existing loading. Therefore, no load reductions are required for Oso Bay proper at this time.

AU_02 has had an impairment for low DO since 1996. A DO impairment for AU_01 and AU_03 has been removed as the data used the 2010 Assessment shows that the DO standards are now being met. The final report for a TMDL conducted to address the impairment states:

> The shallow nature of this bay system plays a large part in the naturally occurring fluctuations of DO, a vital aquatic life parameter. Data analysis revealed wide diurnal fluctuations. However, this is common and expected in such shallow, warm water, highly saline systems typical of the South Texas region. The exceptional habitat designation for Oso Bay may be justified, but it is clear that the natural hydrodynamics of this system, coupled with the nutrient loadings, may play a critical part in low DO levels occurring in this bay system.

Based on data collected for the TMDL, a revision to the DO criteria is being proposed: The TCEQ recommends changing the 24-Hr average criteria from 5.0 mg/l to 4.5 mg/l, but local stakeholders have requested that they consider 4.0 mg/l. The recommended change for the 24-Hr minimum criteria is from 4.0 mg/l to 1.5 mg/l. If the proposed revisions are approved, the bay would meet the DO standard in all AUs.

All AUs have a concern for chlorophyll-*a*. AU_02 also has a concern for total phosphorus. Oso Creek also has concerns for these parameters and may be contributing to the concern in the bay.

2485A: Oso Creek (Figure 3-41)

Oso Creek flows 29.5 miles from a point 3 miles upstream of SH 44 west of Corpus Christi to the confluence with Oso Bay in Nueces County.

The southeastern end of the creek flows through highly developed areas of Corpus Christi. The northwestern end is primarily rural, but development is rapidly encroaching.

The creek has had an impairment for bacteria for contact recreation since 2002. It was initially included in with the TMDL for Oso Bay, which has been completed. In coordination with TSSWCB, additional studies for the creek impairment, in an effort to understand bacteria sources and quantities, continue.

The creek also has concerns for low DO, nitrates, chlorophyll-*a*, OP, and total phosphorus.

2485B: Unnamed Tributary of Oso Creek (Figure 3-41)

The segment is from a point 3.2 miles west of SH 286 to the confluence with Oso Creek.

This tributary is a primarily rural area, but development is rapidly encroaching.

There are no active monitoring sites on the segment. Data for the assessment were collected during the TMDL studies.

There are concerns for OP, and total phosphorus.

2485D: West Oso Creek (Figure 3-41)

The segment is from a point 0.3 miles west of FM 1694 to the confluence with Oso Creek.

This tributary is a primarily rural area, but development is rapidly encroaching.

There are no active monitoring sites on the segment. Data for the assessment were collected during the TMDL studies.

There is a concern for total phosphorus.

2491: Laguna Madre (Figure 3-42)

The Laguna Madre runs along the Texas coast from Corpus Christi Bay in Nueces County to the Brownsville Ship Channel in Cameron County. It is divided into three AUs; the upper portion north of the Arroyo Colorado confluence (AU_01); the area adjacent to the Arroyo Colorado confluence (AU_02); and the lower portion south of the Arroyo Colorado confluence (AU_03).

The Laguna Madre is a very unique body of water. The only development is the very northern and very southern ends: Corpus Christi and Port Isabel, respectively. Padre Island National Seashore encompasses most of the barrier island to the east. The land to the west is predominantly large ranches such as the King Ranch.

There is little water exchange directly from the Gulf of Mexico. The Laguna is connected to Corpus Christi Bay and there are two channels through the island at Port Mansfield and Port Isabel. Additional channels open periodically with tropical storms and hurricanes.

There are numerous WWTP permitted to discharge to the Laguna Madre via the North Floodway, some of which as far west as McAllen. Only those outfalls that are within the mapped area are shown.

AU_02 has had an impairment for bacteria for contact recreation and oyster waters since 2006. The Arroyo Colorado flows in the Laguna Madre in this AU and may be the source of the impairment.

AU-01 and AU_02 have had an impairment for low DO since 1999. Based on data collected for the TMDL that was conducted to address the impairment, a revision to the DO criteria is being proposed: The TCEQ recommends changing the 24-Hr average criteria from 5.0 mg/l to 4.5 mg/l, but local stakeholders have requested that they consider 4.0 mg/l. The recommended change for the 24-HR minimum criteria is from 4.0 mg/l to 1.5 mg/l. If the proposed revisions are approved, the bay would meet the DO standard in all AUs.

AU_01 and AU_02 have concerns for chlorophyll-*a* which may be related to limited circulation. AU_02 has a concern for nitrates which may be related to the Arroyo Colorado.

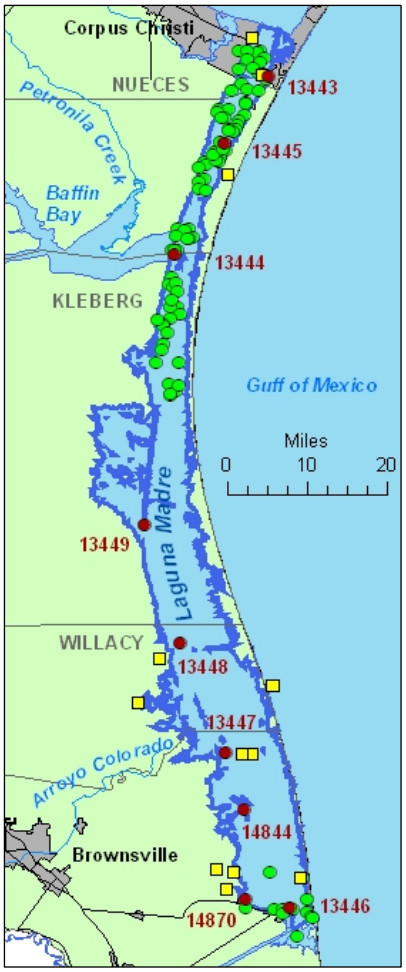


Figure 3-42. Segment 2491

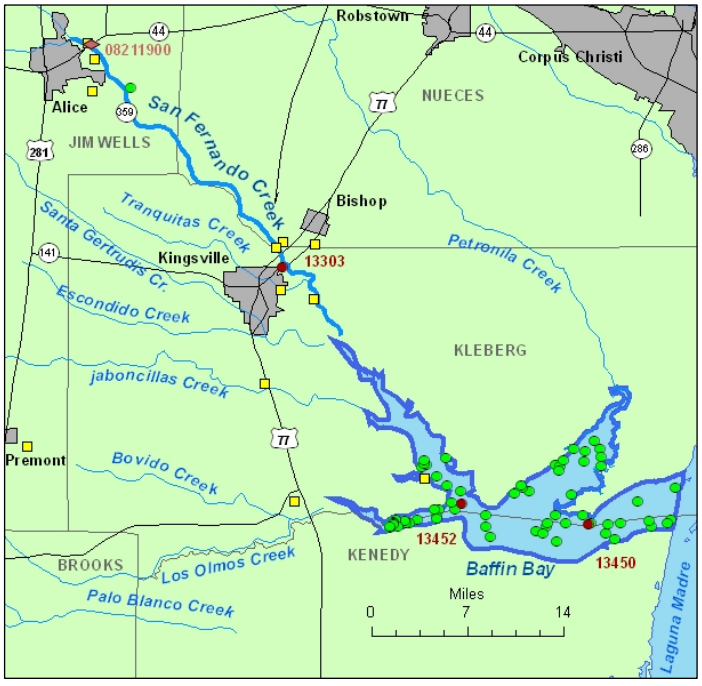


Figure 3-43. Segments 2492 and 2492A

2492: Baffin Bay / Alazan Bay / Cayo del Grullo / Laguna Salado (Figure 3-43)

Baffin Bay is located in Kleberg and Kenedy Counties. Alazan Bay is the northeastern arm in Kleberg County, Cayo del Grullo is the northwestern arm in Kleberg County, and Laguna Salado is the western arm in Kleberg and Kenedy Counties.

The City of Kingsville is the only large city in the watershed. Most of the bay is surrounded by large ranches such as the King Ranch. There are only a few public access points.

The bay has concerns for chlorophyll-*a* which may be related to limited circulation.

2492A: San Fernando Creek (Figure 3-43)

San Fernando Creek flows 45.6 miles from a point just east of the Nueces and Jim Wells County line to the confluence of the Cayo del Grullo arm of Baffin Bay in Kleberg County.

While primarily rural, the creek flows through the City of Alice and the City of Kingsville.

The creek has had an impairment for bacteria for contact recreation since 2006. There are a number WWTPs that discharge into the creek. There are also smaller communities on septic systems in the area.

The creek also has concerns for nitrates, OP, and total phosphorus which may be related to NPS run off from area agricultural fields.

2493: South Bay (Figure 3-44)

South Bay is located south of the Brownsville Ship Channel in Cameron County.

South Bay is the southernmost bay in Texas and is part of the South Bay Coastal Preserve. It supports the largest concentration of oysters in the Lower Laguna Madre and is relatively inaccessible.

All assessed parameters met the standards.

2494: Brownsville Ship Channel (Figure 3-44)

The ship channel extends from the Port of Brownsville to the Laguna Madre.

The ship channel is part of the Port of Brownsville, a major center of industrial development with over 230 companies doing business there.

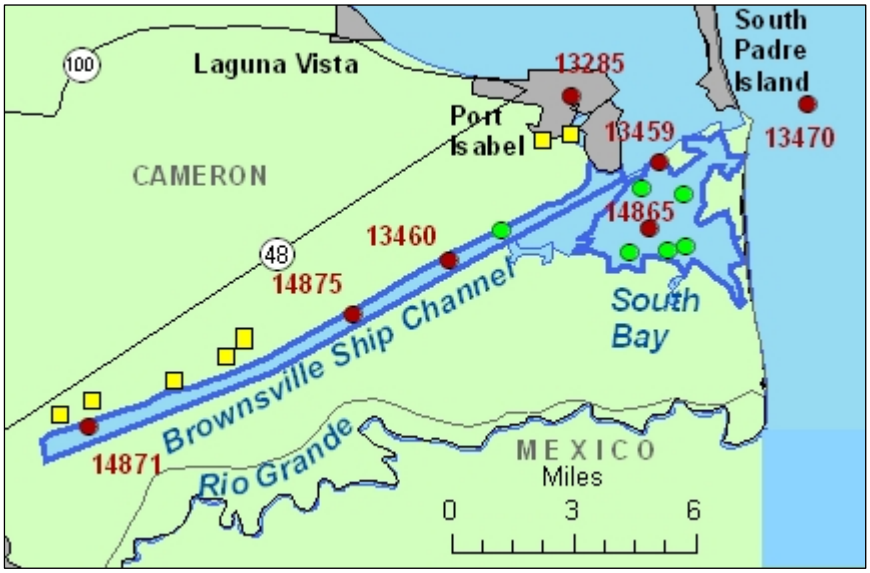


Figure 3-44. Segments 2493 amd 2494

The segment is listed as having an impairment for bacteria for contact recreation as a result of the 2010 Assessment. This impairment may be related to the numerous WWTPs that discharge to the segment.

The ship channel also has a concern for depressed DO based on grab samples. 24-Hr DOs will be conducted beginning in FY 2011 at Station 13460 to assess this concern.

2494A: Port Isabel Fishing Harbor (Figure 3-45)

The fishing harbor is located within the City of Port Isabel in Cameron County. It is connected to the Laguna Madre to the north and to the Brownsville Ship Channel to the south.

The properties along the canals are a combination of businesses and residential properties.

The segment is listed as having an impairment for bacteria for contact recreation as a result of the 2010 Assessment. The source of the bacteria is thought to be from NPS runoff since there are no permitted discharges into the harbor.

2501: Gulf of Mexico (Figures 3-33 and 3-44)

The Gulf of Mexico along the entire Texas coast has been listed by the Department of State Health Services as being impaired for mercury in edible tissue (King Mackerel > 43") since 1998.

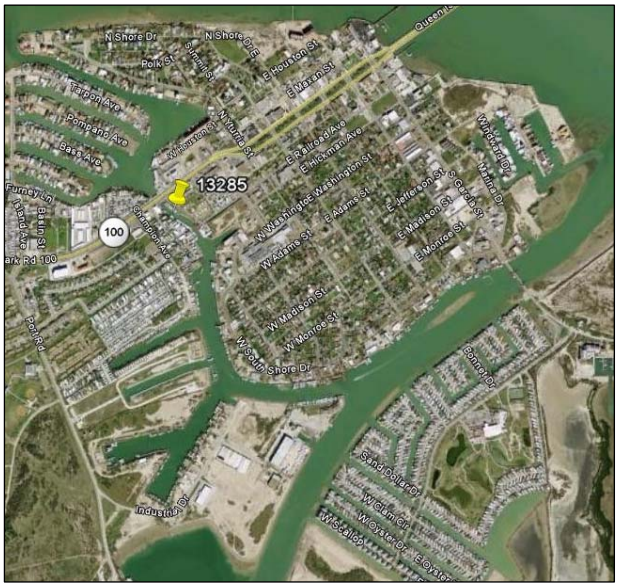


Figure 3-45. Segment 2494A

4.0 Stakeholder Participation and Public Outreach

4.0.1 STAKEHOLDER PARTICIPATION

CRP depends on public involvement and input from stakeholders to assist in understanding the needs of the basins and the areas of concern. The NRA steering committee serves as the focus for public input and assists with:

- Creation of specific achievable water quality objectives and basin priorities
- Review and development of work plans and allocation of resources
- Development and review of major reports
- Establishing monitoring priorities and developing monitoring plans
- Improving awareness of water quality, water resources, and pollutant source issues
- Increasing opportunities for citizens to identify pressing issues, concerns, and contributing ideas to the CRP process
- Expanding the public's role in water quality management issues

The steering committee includes stakeholder volunteers from across NRA's area of responsibility, representing:

- Private citizens
- Fee-payers (identified in Texas Water Code 26.0135(h))
- Political subdivisions (including local, regional, and state officials)
- TSSWCB)
- Other appropriate state agencies including: TPWD, Texas Water Development Board, TGLO, DSHS, Texas Department of Agriculture, Texas Railroad Commission, and Texas Department of Transportation.
- Other entities interested in water quality matters including: TCEQ regional staff, business and industry, agriculture, environmental, and other public interest groups

NRA encourages stakeholder participation to provide suggestions for additional monitoring, special studies, outreach opportunities, and to be a voice for local concerns. For more information about stakeholder participation, the steering committee process, or how to become a steering committee member, visit our Public Involvement web page at http://www.nueces-ra.org/CP/CRP/public.php, or contact NRA using the contact information at the end of this report.

4.0.2 PUBLIC OUTREACH

NRA participated in numerous CRP supported activities to help educate students and adults on pollution sources, the importance of keeping our waters clean, and what they can to do help protect our rivers, lakes, and bays.

Watershed Model Demonstrations

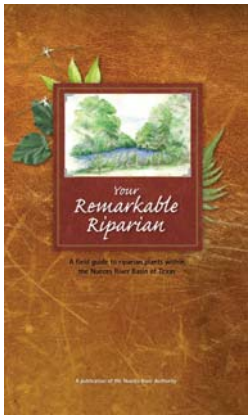
NRA had two watershed models of the Nueces River Basin, and a third model is owned by the City of the Corpus Christi. NRA also has a model of the Arroyo Colorado Watershed, which is on loan to the Arroyo Colorado Watershed Protection Partnership, and a second one will be completed by summer 2010. These models are taken to class rooms and outreach events and are used to demonstrate point and non-point source pollution. Primarily geared for 5th and 6th graders, participants of all ages enjoy participating in the demonstrations. Food coloring is dripped onto the model to simulate oil leaks, fertilized lawns, illegal dump sites, etc. Water is then squirted onto the model using spray bottles to simulate rain. Being an actual scale model of the basin, students locate where they live in the basin, and can see how pollution upstream can reach their communities and how pollution in their communities affect those downstream. This education program reaches thousands of children year school year.

Funds from CRP, the City of Corpus Christi, CBBEP, and a special study funded by TCEQ have been used to purchase the model. The watershed demonstrations are funded by these programs and other grants and contracts with outreach and education requirements.

Up2U Campaign

NRA, with guidance from local partners, designed and launched print and media components of the Up2U Clean Rivers Program in 2004 in the headwaters of the Nueces River Basin. It was expanded to include the coastal area in 2009. Partners now include the City of Corpus Christi, the City of Port Aransas, the City of Rockport, CBBEP, Friends of the Frio, Nueces County, Port Aransas Chamber of Commerce, and TCEQ. The cornerstone of the campaign is a logo emblazoned mesh litter bag which is both a litter prevention tool and an advertizing tool. These bags are now being distributed to beach goers, boaters, students, and litter prevention advocates from the Nueces headwaters to the coast. NRA received the Governor's 2008 Environmental Excellence Award for Education for this project.

Riparian Network



NRA facilitates riparian workshops twice a year to educate landowners of the importance of riparian function. The one day workshops (½ classroom, ½ field) are taught by leading riparian experts. Participants learn basic riparian dynamics: the interaction of hydrology, vegetation, and erosion/deposition. This information has been successfully used in many locations to promote cooperative riparian management among landowners. The workshops answer the questions: *How do rivers work? Why do they move? Are floods bad? Is gravel natural? What keeps rivers flowing during drought? How can riparian function enhance wildlife habitat and sustain water on your land?*

This program also resulted in the publication of the *Your Remarkable Riparian Field Guide*, a field guide to riparian plants within the Nueces River Basin. It can be viewed online at www.nueces-ra.org/CP/LS/literature/yrr.php. This popular publication is now in its second printing.

Aquatic Education Program

The Aquatic Education Program at the Center for Coastal Studies at Texas A&M University – Corpus Christi is designed to teach people the importance our riparian corridors, fresh water inflow, and the health of our bays and estuaries. The Wetland on Wheels is a trailer that has been made into a model of a waterway. The model starts in a stream/river habitat and shows the water flowing into the bays and estuaries, and finally ends in the Gulf of Mexico. Taxidermy mounts on display are representative of the wildlife in the variety of habitats found beside waterways. Also included are three video monitors that show films of these diverse habitats and animals living in these areas (riparian corridors, marshes, open bays and estuaries, and ocean habitat). The trailer is used at a variety of events, such as Bayfest, Hummingbird Festival, and Sea Fair, as well as area schools. Mini lectures are given on environmental issues and the importance of these waterways for humans and animals alike. NRA personnel help with these presentations, allowing for more events to be attended.

CONTACT INFORMATION

For more information on CRP, other activities of NRA, or to obtain additional copies of this report, contact:

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