



*Nueces River Authority*

**Basin Highlights Report  
for the  
Nueces River Basin  
and the  
San Antonio-Nueces and Nueces-Rio Grande  
Coastal Basins**

**June 2002**

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## Introduction

In 1991, the Texas Legislature passed the Texas Clean Rivers Act which requires 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 Natural Resource Conservation Commission (TNRCC), other state agencies, river authorities, local governments, industry, and citizens. Using a watershed management approach, the Nueces River Authority (NRA) and TNRCC work together to identify and evaluate surface water quality issues and to establish priorities for corrective action. Under CRP, NRA is responsible for the Nueces River Basin, the San Antonio – Nueces Coastal Basin, and the Nueces – Rio Grande Coastal Basin; an area roughly 31,500 square miles, ranging from the hill county in Edwards County to San Antonio Bay in Refugio County to the Brownsville Ship Channel in Cameron County.

## Year in Review

The Nueces River Basin has been experiencing a drought since mid to late 1993. Even though there have been a couple of substantial rain events during the past year (late August – early September 2001 and in November 2001), the area is still undergoing a new drought of record. Prior to these rains, Choke Canyon Reservoir was 24.9' below its maximum elevation, holding only 31.1% of its capacity. Lake Corpus Christi was 13.4' below its maximum elevation, holding only 21.3% of its capacity.

The draft 2002 305(b) Water Quality Inventory (305(b) Report) lists Choke Canyon Reservoir as an impaired water body for general use due to high Total Dissolved Solids (TDS) levels. During the last two years of the assessment period, March 1999 – February 2001, the reservoir dropped 5.4' or 12.5% of its capacity. During this time period, evaporation was almost twice as much measured inflows, allowing the TDS concentrations to increase. NRA is collecting extra samples for TNRCC during its quarterly sampling specifically for TDS evaluation.

After the rains, on November 18, 2001, Lake Corpus Christi filled for the first time since June 1993. By the middle of December 2001, Choke Canyon Reservoir rose 5.1' to reach 41.4% of its capacity, the highest this reservoir has been since February 2000. June 1993 was also the last time Choke Canyon Reservoir was full. However, the reservoir still has not refilled to the point that TDS levels are below the criteria.

The Lower Sabinal River, segment 2110, has also been added to this year's 305(b) Report for nitrate + nitrite nitrogen. The segment will continue to be monitored on a quarterly basis by the TNRCC Region 13 office.

For the area above Choke Canyon Reservoir, the rivers and creeks had little or no flow except during the rain events and for a short time afterwards. Below Choke Canyon, the flow of the rivers is dominated by discharge from Choke Canyon Reservoir and Lake Corpus Christi. Choke Canyon Reservoir releases 33 cubic feet per second (cfs) of water to fulfill downstream water rights. Lake Corpus Christi releases approximately 100cfs to fulfill downstream water rights plus additional water to fulfill bay and estuary requirements when necessary.

The San Antonio – Nueces and Nueces – Rio Grande Coastal Basins are also included in the new drought of record. The more inland rivers and creeks in these basins also had little or no flow

except during and subsequent to rain events. The segments closer to the coast maintained a more normal flow regime before and after the rain events. There are no major reservoirs in these basins.

For fiscal year 2002 (FY2002), NRA has added four routine and three flow sites to the monitoring plan. Three of the routine sites, 13005, 12997, and 17438, are on the Upper Nueces River. These sites were added in response to concerns about water quality impacts resulting from increased public use of the river. Litter, trespassing, vandalism, aquatic habitat destruction, poaching and other damages resulting from irresponsible behavior are threatening the integrity and value of the river, especially where access to the river is facilitated by the crossing of public roads. The fourth site, 17437, was added downstream of a petrochemical plant on the Frio river. A polluted groundwater plume has been identified very close to the river. Efforts have been made by the plant to keep the plume from entering the river. This station and the one just upstream of the refinery, 12977, are being sampled for volatile organic compounds in addition to conventional and field parameters. Three sites, 12932, 17435, and 17436, have been added to monitor flow for wastewater permit assessments.

### **Overview of Water Quality Monitoring**

Water quality monitoring is conducted for CRP by NRA and for TNRCC's Surface Water Quality Monitoring (SWQM) Program by Regions 13, 14, and 15. NRA conducts routine monitoring at 26 sites and monthly flow data at three sites. Regions 13, 14, and 15 conduct routine monitoring at 15, 28, and 17 sites, respectively. Figure 1 is a map showing the site locations for each entity. Table 1 lists the stations, station information, and the frequency of sampling, per year, for various parameter sets for the sites monitored by NRA. A table which also includes the regions' sites is available at <http://nueces-ra.tamucc.edu/fy2002mp.html>.

The individual parameters collected under Routine Benthics, Organics in Water, Conventional, Bacteria, and Field are listed in Table 2. Field and conventional parameters are collected to provide a variety of information about the effects of spatial and temporal changes on water quality, establish impacts of point and nonpoint source pollution, and assess the general health of each segment. In particular, field parameters, such as dissolved oxygen, water temperature, specific conductance, and pH, are measurements used to assist in the creation of water quality criteria. Conventional parameters, which are analyzed in laboratories from water samples collected, supply information about a segment's reaction to excessive plant growth or how pollutants are dispersed. Routine benthics can provide some understanding about species composition and how biological systems react to changes in water quality. Fecal coliform and *E. coli* analyses are important measured parameters because they can determine whether or not a water body is supportive of contact recreation use. Organics in water are collected to monitor potential pollution from industry.

# CRP and SWQM Monitoring Sites

FY 2002

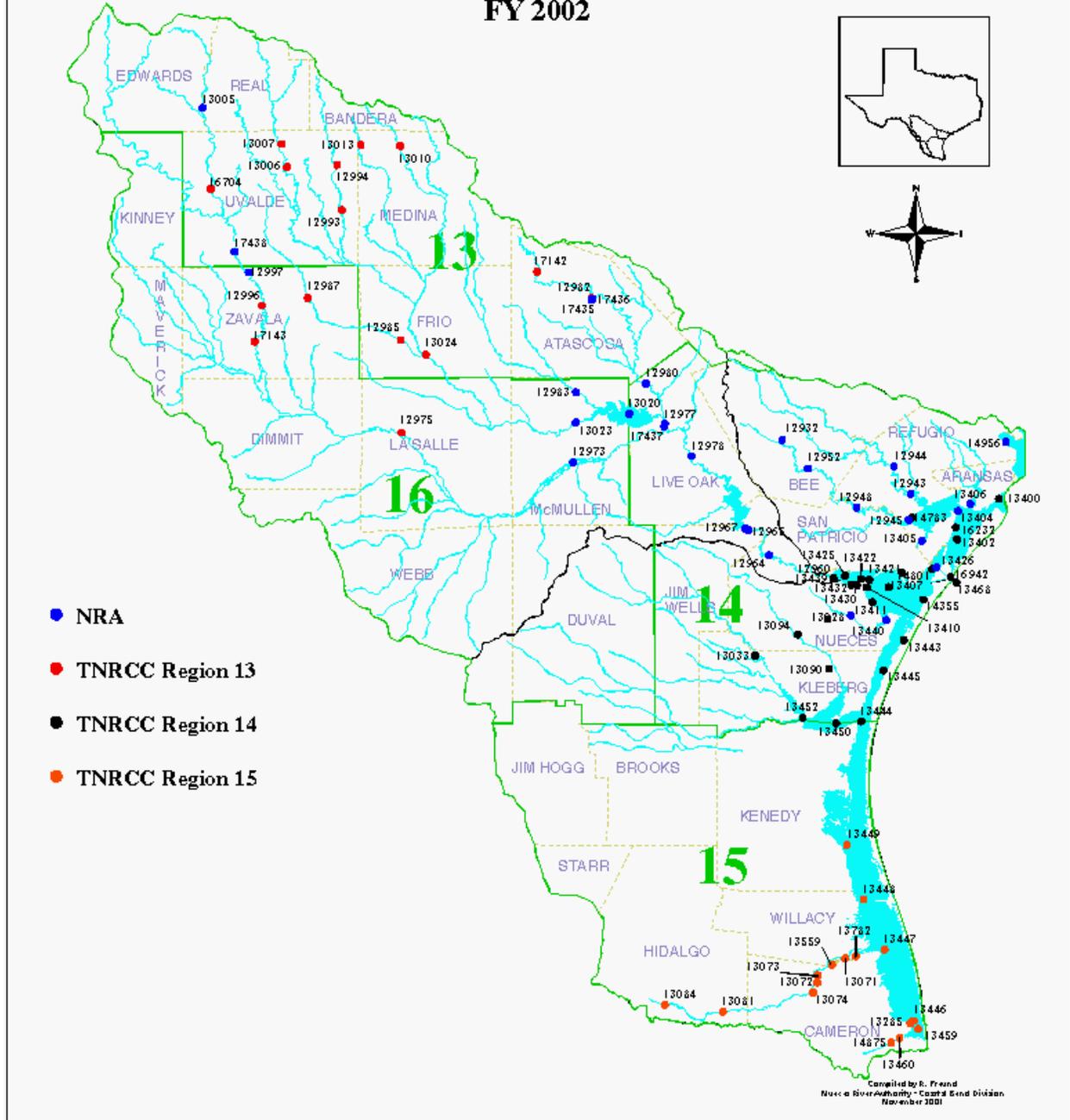


Figure 1. Water Quality Monitoring Sites

**Table 1. FY 2002 Water Quality Monitoring Stations and Sampling Plan**

Segment	SWQM ID	Station Description	Type of Monitoring	Benthics	Organics in Water	Conventional	Bacteria	Flow	Field
2001	12943	Mission River Tidal: FM 2678 bridge between Refugio and Bayside	Routine			4	4		4
2002	12944	Mission River: US 77 upstream from bridge at Refugio	Routine			4	4	4	4
2003	12945	Aransas River Tidal: FM 136 bridge south of Bayside	Routine	3		4	4		4
	12948	Aransas River: US 77 bridge between Woodsboro and Sinton	Routine			4	4		4
2004	12932	Poesta Creek at US 181 Bypass	Flow					12	12
	12952	Aransas River: County Road east of Skidmore	Routine			4	4	4	4
2102	12964	Nueces River: Bluntzer Bridge on FM 666	Routine			4	4	4	4
	12965	Nueces River: La Fruta Bridge on SH 359	Routine			4	4	4	4
2103	12967	Lake Corpus Christi: Mid-lake at the dam	Routine			4	4		4
2104	12973	Nueces River: SH 16 south of Tilden	Routine			4	4		4
2106	12977	Frio River: US 72 in Three Rivers	Routine	3	4	4	4	4	4
	12978	Nueces River: US 59 east of George West	Routine			4	4	4	4
	17437	Frio River: ~ 1 mile downstream of SH 72 in Three Rivers near Diamond Shamrock outfall	Routine	3	4	4	4	4	4
2107	12980	Atascosa River: FM 99 bridge east of George West	Routine			4	4	4	4
	17345	Bonita Creek: Pleasanton at US 281 and E. White St	Flow					12	12
	17436	Atascosa River: East Hunt St. in Pleasanton	Flow					12	12
2108	12983	San Miguel Creek: SH 16 north of Tilden	Routine			4	4	4	4
2112	12997	Nueces River: US 83 bridge south of Uvalde	Routine			4	4	4	4
	13005	Nueces River: SR 55 south of Barksdale	Routine			4	4	4	4
	17438	Nueces River: Marisole Ranch ~ 2.5 miles upstream from RR 418 southwest of Uvalde	Routine			4	4	4	4
2116	13020	Choke Canyon Reservoir: Mid-lake on Live Oak – McMullen county line	Routine			4	4		4
2117	13023	Frio River: SH 16 in Tilden	Routine			4	4	4	4
2462	14956	Hynes Bay: Austwell at TPWD boat ramp	Routine	3		4	4		4
2472	13404	Copano Bay: West side of fishing pier alongside SH 35	Routine	3		4	4		4
	13405	Port Bay: FM 881 west of Rockport	Routine	3		4	4		4
2473	13406	St. Charles Bay: Northeast of Goose Island State Park	Routine	3		4	4		4
2483	13426	Redfish Bay: SH 361 at 3 <sup>rd</sup> bridge between Aransas Pass and Port Aransas	Routine	3		4	4		4
2485	13028	Oso Creek: SH 286 south of Corpus Christi	Routine	3		4	4		4
	13440	Oso Bay: SH 358	Routine	3		4	4		4

**Table 2. Monitoring Parameters**

Routine Benthics	Organics in Water	Conventional	Bacteria	Field
Number of individuals from sub-sample	1,1,1-Trichloroethane 1,1,1,2,2-Tetrachloroethane 1,1,2-Trichloroethane 1,1-Dichloroethane 1,1-Dichloroethylene 1,2-Dichloroethane 1,2-Dichloropropane Acrylonitrile Benzene Bromomethane Caron Tetrachloride Chlorobenzene Chloroethane Chloroform Chloromethane Cis-1,3-Dichloropropene Dibromochloromethane Ethylbenzene Methyl tert-butyl ether	Total suspended solids Total dissolved solids Sulfate Chloride Chlorophyll-a <sup>1</sup> Pheophytin <sup>1</sup> Ammonia-N Total hardness Nitrate / nitrite-N O-phosphate-P Turbidity Alkalinity Total organic carbons Total phosphate-P Volatile suspended solids	<i>E. coli</i> <sup>2</sup> <i>Enterococci</i> <sup>3</sup> Fecal coliform <sup>4</sup>	pH Dissolved Oxygen Conductivity Salinity <sup>3</sup> Temperature Secchi depth Days since last significant rainfall Air temperature Wind direction Wind intensity Present weather

<sup>1</sup>Not measured at stations 13005, 12997, 17438

<sup>2</sup>Measured at non-tidal stations

<sup>3</sup>Measured at tidal stations

<sup>4</sup>Measured only if more measurements are need for an assessment

## **2001 Water Quality Assessment**

Along with other river authorities around the state, NRA assists the TNRCC in assessing the surface water quality of Texas. Under Section 305(b) of the 1972 Federal Clean Water Act (CWA), states are required to produce a periodic inventory comparing water quality conditions to established standards. The 305(b) Water Quality Inventory Report is an overview of the status of surface waters of the state, including concerns for public health, fitness for use by aquatic species and other wildlife, and specific pollutants and their possible sources. The most recent 305(b) Report included data collected by NRA in the five year period between March 1, 1996 and February 28, 2001.

In conjunction with the 305(b) Report, Section 303(d) of the CWA requires the state to develop a list of “impaired” water bodies that do not currently meet established standards. Surface waters included on the 303(d) List of Impaired Waters are determined to be impaired, partially supporting, or not supporting of standards based on the number of criteria exceedances. Water bodies that do not yet constitute impairments, but are considered worthy of further investigation, are identified as concerns. Based on the 303(d) List, the state must take appropriate action to improve impaired waters through such actions as additional monitoring and the development of total maximum daily loads (TMDLs).

The objective of the TMDL Program is to restore and maintain the beneficial uses (drinking water, recreation, aquatic life, etc.) of impaired or threatened water bodies in Texas. All states are required by the CWA to develop TMDLs for water bodies that are impaired, and federal regulations prohibit the addition of certain new sources and new discharges of pollutants to waters on the 303(d) List until a TMDL is established.

## **Water Quality Data Review**

Both the 305(b) Report and the 303(d) List serve as focal points for planning agencies like NRA in developing water quality monitoring strategies. During the spring of 2002, NRA contributed additional information to the assessment process by providing verification and review of findings as part of the draft 305(b) Report comment process. This review, Table 3, identifies the segments and the parameters of concern/impairments, along with information on stream characteristics, local land use, and possible explanations and recommendations for addressing the 303(d) listed waters. Figure 2 is a map of all the segments in the NRA area of responsibility that are in the 305(b) Report. Table 3 lists these segments and the parameters of concerns or impairments. The Map # referenced in Table 3 corresponds to the numbered segment in illustrated Figure 2.

If a particular area does not appear in either Table 3 or Figure 2, then that portion of the segment was either not assessed because of minimal data, no concerns were identified based on limited data, or the water body was fully supporting of current water quality standards.

**Table 3. Review of 305(b) Concerns and Impairments**

Segment	Waterbody	Cause(s) of Concern / Impairment	TMDL Priority / Level of Support
2001 Concern Map #1	Mission River Tidal Entire Segment	Bacteria (Enterococci ) – Contact Recreation Use Concern	Low / Limited Data
2002 Concern Map #2	Mission River Above Tidal Entire Segment	Dissolved Oxygen – Aquatic Life Use Concern Bacteria (E. coli) – Contact Recreation Use Concern	Low / Limited Data Low / Concern
2003 Concern Map #3	Aransas River Tidal Entire Segment	Mostly row crop, one small city, no wastewater treatment plants within 25 miles upstream of monitoring site, one 1 mile downstream. The segment experience low flow and minimal rainfall during the assessment period. The segment needs additional monitoring of bacteria to collect the minimum number of samples for complete analysis. Bacteria (Enterococci ) – Contact Recreation Use Concern Orthophosphorus – Nutrient Enrichment Concern	Low / Limited Data Low / Concern
2004 Concern Map #4	Aransas River Above Tidal Upper 25 miles of segment	Mostly range land, no cities, no wastewater treatment plants. The segment experience low flow and minimal rainfall during the assessment period. There was also the development of Mary Rhodes Memorial Pipeline close to monitoring station and sand and gravel were dumped at site. The segment needs additional monitoring of bacteria to collect the minimum number of samples for complete analysis. Dissolved Oxygen – Aquatic Life Use Concern	Low / Concern
2101 Concern Map #5	Nueces River Tidal Entire Segment	Mostly range land, no cities, three municipal wastewater treatment plants within 25 miles upstream of the monitoring site, one just downstream. The segment experienced low flow and minimal rainfall during the assessment period. Chlorophyll a – Algal Growth Concern	Low / Concern
2104 Concern Map #6	Nueces River Above Frio River Entire Segment	Mostly range land, one large city, one municipal and one industrial wastewater treatment plants within 25 miles upstream of the monitoring site. Except during local rain events, this segment primarily receives fresh water as passthru from Lake Corpus Christi. The amounts of freshwater varies by month, but is usually released at one time towards the end of each month. The City of Corpus Christi continues to evaluate the passthru requirements and management of those passthru to optimize water storage and environmental concerns. Chloride – Public Water Supply Concern Total Dissolved Solids – Public Water Supply Concern	Low / Concern Low / Concern
2106 Concern Map #7	Nueces / Lower Frio River Upper 10 miles of segment	Mostly range land and row crop agriculture, no cities, no wastewater treatment plants. The concerns are possibly caused by non-point source from ranching operations as well as natural runoff from local geology. Bacteria (E. coli) – Contact Recreation Use Concern	Low / Limited Data
		Mostly range land and row crop agriculture, two small cities, one municipal and one industrial wastewater treatment plants just down stream of site 12977. The concerns are possibly caused by contamination due to wastewater discharges and proximity to Tips State Park adjacent to river. The segment needs additional monitoring of bacteria to collect the minimum number of samples for complete analysis. A receiving water assessment may need to be done.	

Segment	Waterbody	Cause(s) of Concern / Impairment	TMDL Priority / Level of Support
2107 Concern Map #8	Atascosa River 25 miles surrounding US 281	Bacteria (Fecal coliform) – Contact Recreation Use Concern Ammonia – Nutrient Enrichment Concern Chlorophyll a – Algal Growth Concern	Low / Limited Data Low / Concern Low / Concern
	Atascosa River Lower 25 miles of segment	Bacteria (E. coli) – Contact Recreation Use Concern Bacteria (Fecal coliform) – Contact Recreation Use Concern	Low / Limited Data Low / Limited Data
	Atascosa River Entire segment	Total Dissolved Solids – Public Water Supply Concern	Low / Concern
	Mostly range land and row crop agriculture, four small cities, one medium-sized city, four municipal and two industrial wastewater treatment plants on segment. The segment experienced low flow and minimal rainfall during the assessment period. Dead animals, dumped at the site, have been found on several occasions. The segment needs additional monitoring of bacteria to collect the minimum number of samples for complete analysis. The segment needs additional monitoring and, if concerns do not improve after high flow events, then investigate upstream discharges.		
2109 Concern Map #9	Leona River Entire segment	Nitrate+Nitrite Nitrogen – Nutrient Enrichment Concern Sulfate – Public Water Supply Concern	Low / Concern Low / Concern
		Mostly range land and row crop agriculture, one small and one medium-sized city, one municipal wastewater treatment plant five miles upstream of 12988. The segment experienced low flow and minimal rainfall during the assessment period. The segment needs additional monitoring and if concerns do not improve after high flow events, then investigate upstream discharges.	
2110 Concern / Impairment Map #10	Lower Sabinal River Entire segment	Nitrate+Nitrite Nitrogen – Public Water Supply Use Impairment Nitrate+Nitrite Nitrogen – Nutrient Enrichment Concern	High / Not Supporting High / Not Supporting
		Mostly range land and row crop agriculture, one small city, one municipal wastewater treatment plant one-half mile upstream of 12993. The segment experienced low flow and minimal rainfall during the assessment period. The segment needs additional monitoring and if concerns do not improve after high flow events, then investigate upstream discharges.	
2115 Concern Map #11	Seco Creek Upper 25 miles	Temperature – General Use Concern	Low / Concern
		Mostly range land and row crop agriculture, no cities, one municipal wastewater treatment plant far below site. The segment experienced low flow and minimal rainfall during the assessment period. This segment often has so little flow that the sampling often takes place in shallow pools.	
2116 Concern / Impairment Map #12	Choke Canyon Reservoir Entire Segment	Total Dissolved Solids – General Use Impairment	Low / Not Supporting
	Choke Canyon Reservoir W end of lake to RR99 bridge	Dissolved Oxygen – Aquatic Life Use Concern	Low / Limited Data
2117 Concern / Impairment Map #13		Mostly range land, no cities, no wastewater treatment plants. During the sampling period (March 1999 through February 2001), the reservoir's elevation fell 5.4 feet and its volume decreased by 87, 084 acre-feet (12.5% of volume). During the same time period, the reservoir lost 161, acre feet due to evaporation, and only received 84, 407 acre feet of inflows.	
	Frio River Above Choke Canyon Reservoir Entire Segment	Chloride – Public Water Supply Concern Total Dissolved Solids – Public Water Supply Concern	Low / Concern Low / Concern

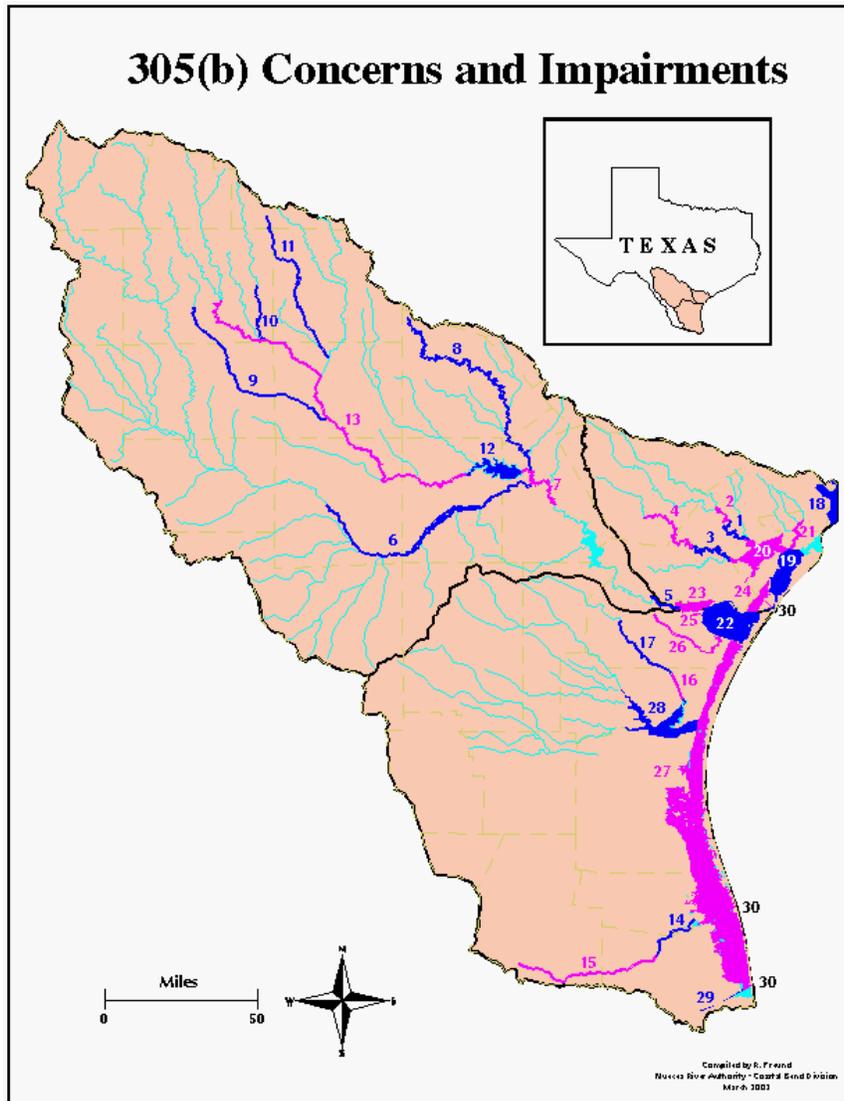
<b>Segment</b>	<b>Waterbody</b>	<b>Cause(s) of Concern / Impairment</b>	<b>TMDL Priority / Level of Support</b>
2117 Concern / Impairment Map #13	Frio River Above Choke Canyon Reservoir 25 miles surrounding IH 35	Dissolved Oxygen – Aquatic Life Use Concern Nitrate_Nitrite Nitrogen – Nutrient Enrichment Concern	Low / Concern Low / Concern
	Frio River Above Choke Canyon Reservoir 2 mi downstream of SH 97 to 14 mi upstream of SH 97	Bacteria (Fecal coliform) – Contact Recreation Use Concern	Low / Limited Data
	Frio River Above Choke Canyon Reservoir Lower 25 miles of segment	Bacteria (E. coli) – Contact Recreation Use Impairment Bacteria (Fecal coliform) – Contact Recreation Use Impairment Nitrate_Nitrite Nitrogen – Nutrient Enrichment Concern Chlorophyll a – Algal Growth Concern	High / Not Supporting High / Not Supporting Low / Concern Low / Concern
	Mostly range land and row crop agriculture, two small cities, three municipal wastewater treatment plants on segment. The segment experienced low flow and minimal rainfall during the assessment period. The segment needs additional monitoring and if concerns do not improve after high flow events, then investigate upstream discharges.		
2201 Concern Map #14	Arroyo Colorado Tidal .1 mi upstream to 3 mi downstream of Camp Perry	Nitrate+Nitrite Nitrogen – Nutrient Enrichment Concern	Low / Concern
	Arroyo Colorado Tidal .3 mi upstream to 2 mi downstream of Marker 27	Nitrate+Nitrite Nitrogen – Nutrient Enrichment Concern	Low / Concern
	Arroyo Colorado Tidal Upper 4 miles of segment	Nitrate+Nitrite Nitrogen – Nutrient Enrichment Concern Ammonia – Nutrient Enrichment Concern Dissolved Oxygen – Aquatic Life Use Concern	Low / Concern Low / Concern Low / Concern
	Mostly range land and row crop agriculture, one small city, one municipal and two industrial wastewater treatment plants on segment. Non point source pollution from agriculture runoff and aquaculture practices. Additionally, the segment has numerous outfalls upstream. Need to development and implement best management practices.		
2202 Concern / Impairment Map #15	Arroyo Colorado Above Tidal 14 mi upstream to 11 mi downstream of FM 1015	Bacteria (Fecal coliform) – Contact Recreation Use Impairment DDD in fish tissue – Fish Consumptions Use Impairment DDE in fish tissue – Fish Consumptions Use Impairment DDT in fish tissue – Fish Consumptions Use Impairment Chlordane in fish tissue– Fish Consumptions Use Impairment Dieldrin in fish tissue– Fish Consumptions Use Impairment Heptachlor epoxide in fish tissue– Fish Consumptions Use Impair. Hexachlorobenzene in fish tissue– Fish Consumptions Use Impair. Ammonia – Nutrient Enrichment Concern Nitrate+Nitrite Nitrogen – Nutrient Enrichment Concern Orthophosphorus – Nutrient Enrichment Concern Total phosphorus – Nutrient Enrichment Concern Chlorophyll a – Algal Growth Concern	High / Not Supporting Medium / Partially Supporting Low / Concern Low / Concern Low / Concern Low / Concern Low / Concern

Segment	Waterbody	Cause(s) of Concern / Impairment	TMDL Priority / Level of Support
2202 Concern / Impairment Map #15	Arroyo Colorado Above Tidal 11 mi upstream of 4 mi downstream of US 77	DDD in fish tissue – Fish Consumptions Use Impairment DDE in fish tissue – Fish Consumptions Use Impairment DDT in fish tissue – Fish Consumptions Use Impairment Chlordane in fish tissue– Fish Consumptions Use Impairment Dieldrin in fish tissue– Fish Consumptions Use Impairment Heptachlor epoxide in fish tissue– Fish Consumptions Use Impair. Hexachlorobenzene in fish tissue– Fish Consumptions Use Impair. Bacteria (Fecal coliform) – Contact Recreation Concern Nitrate+Nitrite Nitrogen – Nutrient Enrichment Concern	Medium / Partially Supporting Medium / Partially Supporting Low / Concern Low / Concern Low / Concern Low / Concern Low / Concern High / Not Supporting
	Arroyo Colorado Above Tidal Lower 4 miles of segment	DDD in fish tissue – Fish Consumptions Use Impairment DDE in fish tissue – Fish Consumptions Use Impairment DDT in fish tissue – Fish Consumptions Use Impairment Chlordane in fish tissue– Fish Consumptions Use Impairment Dieldrin in fish tissue– Fish Consumptions Use Impairment Heptachlor epoxide in fish tissue– Fish Consumptions Use Impair. Hexachlorobenzene in fish tissue– Fish Consumptions Use Impair. Dissolved Oxygen – Aquatic Life Use Concern Ammonia – Nutrient Enrichment Concern Nitrate+Nitrite Nitrogen – Nutrient Enrichment Concern Orthophosphorus – Nutrient Enrichment Concern Total phosphorus – Nutrient Enrichment Concern Chlorophyll a – Algal Growth Concern Bacteria (Fecal coliform) –Contact Recreation Use Impairment	Medium / Partially Supporting Medium / Partially Supporting Low / Concern Low / Concern Low / Concern Low / Concern Low / Concern High / Not Supporting
2202A Impairment Map #15	Arroyo Colorado Above Tidal Upper 19 miles of segment  Mostly row crop agriculture, two medium-sized cities, five municipal and one industrial wastewater treatment plants on segment. Non point source pollution from agriculture runoff and aquaculture practices. Management practices. Donna Reservoir Entire Reservoir Mostly row crop agriculture, one medium-sized city, no wastewater treatment plants. Non point source pollution from agriculture runoff and aquaculture practices. Additionally, the segment has numerous outfalls upstream. Need to development and implement best management practices.	DDD in fish tissue – Fish Consumptions Use Impairment DDE in fish tissue – Fish Consumptions Use Impairment DDT in fish tissue – Fish Consumptions Use Impairment Chlordane in fish tissue– Fish Consumptions Use Impairment Dieldrin in fish tissue– Fish Consumptions Use Impairment Heptachlor epoxide in fish tissue– Fish Consumptions Use Impair. Hexachlorobenzene in fish tissue– Fish Consumptions Use Impair.  PCBs in fish tissue – Fish Consumption Use Impairment	Medium / Partially Supporting Medium / Partially Supporting High / Not Supporting

<b>Segment</b>	<b>Waterbody</b>	<b>Cause(s) of Concern / Impairment</b>	<b>TMDL Priority / Level of Support</b>
2203 Concern / Impairment Map #16	Petronila Creek Tidal Entire segment	Temperature – General Use Impairment Chlorophyll a – Algal Growth Concern	Medium / Partially Supporting Low / Concern
	Mostly range land, no cities, no wastewater treatment plants. The segment experienced low flow and minimal rainfall during the assessment period.		
2204 Concern / Impairment Map #17	Petronila Creek Above Tidal Lower 25 miles of segment	Chloride – General Use Impairment Sulfate – General Use Impairment Total Dissolved Solids – General Use Impairment Chlorophyll a – Algal Growth Concern	High / Not Supporting High / Not Supporting High / Not Supporting Low / Concern
	Petronila Creek Above Tidal Upper 19 miles of segment	Chloride – General Use Impairment Sulfate – General Use Impairment Total Dissolved Solids – General Use Impairment	High / Not Supporting High / Not Supporting High / Not Supporting
	Mostly row crop agriculture, one small city, six municipal wastewater treatment plants on segment. The segment experienced low flow and minimal rainfall during the assessment period. The area is known for historic brine discharges from oil and gas fields. Additional monitoring and possible investigation of specific sources are needed.		
2462 Concern / Impairment Map #18	San Antonio Bay / Hynes Bay / Guadalupe Bay	Bacteria – Oyster Waters Use Impairment	High / Not Supporting
	Guadalupe Bay, San Antonio Bay near Seadrift and ICWW San Antonio Bay / Hynes Bay / Guadalupe Bay	Bacteria – Oyster Waters Use Concern	Low / Concern
2471 Concern Map #19	San Antonio Bay / Hynes Bay / Guadalupe Bay	Nitrate+Nitrite Nitrogen – Nutrient Enrichment Concern Orthophosphorus – Nutrient Enrichment Concern Total phosphorus – Nutrient Enrichment Concern Bacteria (Enterococci) – Contact Recreation Use Concern	Low / Concern Low / Concern Low / Concern Low / Limited Data
	San Antonio Bay near Austwell		
	One small city, two municipal wastewater treatment plants. The segment experienced low inflows and minimal rainfall during the assessment period, therefore minimal flushing. Need to continue to monitor and implement best management practices.		
2472 Concern Map #20	Aransas Bay	Bacteria – Oyster Waters Use Concern	Low / Concern
	6.8 sq mi along the northern edge of the bay and near Rockport		
	No cities, one municipal wastewater treatment plant. The segment experienced low inflows and minimal rainfall during the assessment period, therefore minimal flushing. Need to continue to monitor and implement best management practices.		
	Copano Bay Area along southern shore including Port Bay, area near Bayside	Bacteria – Oyster Waters Use Impairment	High / Not Supporting

Segment	Waterbody	Cause(s) of Concern / Impairment	TMDL Priority / Level of Support
2472 Concern / Impairment Map #20	Copano Bay Area near FM 136, south of Bayside	Total Phosphorus – Nutrient Enrichment Concern	Low / Concern
	Copano Bay Area near FM 188, west of Rockport	Dissolved Oxygen – Aquatic Life Use Concern	Low / Concern
2473 Concern Map #21	No cities, two municipal wastewater treatment plants. The segment experienced low inflows and minimal rainfall during the assessment period, therefore minimal flushing. Need to continue to monitor and implement best management practices.		
	St. Charles Bay Bay, NE of Goose Island State Park	Bacteria (Enterococci) – Contact Recreation Use Concern	Low / Limited Data
2481 Concern Map #22	No cities, one industrial wastewater treatment plant. The segment experienced low inflows and minimal rainfall during the assessment period, therefore minimal flushing. Need to continue to monitor and implement best management practices.		
	Corpus Christi Bay 16 sq mi along shoreline near Corpus Christi and Portland	Bacteria – Oyster Waters Use Concern	Low / Concern
2482 Impairment Map #23	Two small and one large city, four municipal and four industrial wastewater treatment plants. The segment experienced low inflows and minimal rainfall during the assessment period, therefore minimal flushing. Need to continue to monitor and investigate outfall discharges.		
	Nueces Bay Entire Bay	Zinc in oyster tissue – Oyster Waters Use Impairment	High / Not Supporting
2483 Concern Map #24	Two small and one large city, two municipal and one industrial wastewater treatment plants. There were no values for stored 71938, Zinc, total in fish or animals, found in TRACS database. Therefore, the segment should be removed from the listing.		
	Redfish Bay Area near SH 361	Dissolved Oxygen – Aquatic Life Use Concern	Low / Concern
2484 Concern Map #25	Two small and one large city, three municipal and three industrial wastewater treatment plants. The segment experienced low inflows and minimal rainfall during the assessment period, therefore minimal flushing. Need to continue to monitor.		
	Corpus Christi Inner Harbor Area near Avery Turning basin	Ammonia – Nutrient Enrichment Concern	Low / Concern
	Corpus Christi Inner Harbor Area near Navigation Blvd.	Ammonia – Nutrient Enrichment Concern Nitrate+nitrite Nitrogen Concern	Low / Concern Low / Concern
	Corpus Christi Inner Harbor Area near Viola Turning basin	Ammonia – Nutrient Enrichment Concern Nitrate+nitrite Nitrogen Concern	Low / Concern Low / Concern
2485 Concern / Impairment Map #26	One large city, one municipal and 18 industrial wastewater treatment plants. Implement best management practices.		
	Oso Bay	Dissolved Oxygen – Aquatic Life Use Impairment	Medium / Partially Supporting
	Entire Bay	Bacteria (Enterococci) – Contact Recreation Use Concern Bacteria – Oyster Waters Use Concern Chlorophyll a – Algal Growth Concern	Low / Limited Data Low / Concern Low / Concern

Segment	Waterbody	Cause(s) of Concern / Impairment	TMDL Priority / Level of Support
2485 Concern / Impairment Map #26	Oso Creek (unclassified water body) Lower 25 miles of water body	Bacteria (Fecal coliform) – Contact Recreation Use Impairment Bacteria (Enterococci) – Contact Recreation Use Concern Nitrate+Nitrite Nitrogen – Nutrient Enrichment Concern Orthophosphorus – Nutrient Enrichment Concern Total phosphorus – Nutrient Enrichment Concern	High / Not Supporting Low / Limited Data Low / Concern Low / Concern Low / Concern
2491 Concern Map #27	One large city, four municipal and one industrial wastewater treatment plants. Wastewater discharge dominated creek. Implement best management practices. Laguna Madre 18.1 sq mi near the Arroyo Colorado and along ICWW Laguna Madre Area around mouth of Baffin Bay	Bacteria – Oyster Waters Use Concern Chlorophyll a – Algal Growth Concern	Low / Concern Low / Concern
2492 Concern Map #28	Laguna Madre Area around mouth of Arroyo Colorado No cities, 15 municipal and two industrial wastewater treatment plants. Low flow to bay and minimal rainfall, therefore minimal flushing. Continue to monitor and implement best management practices. Baffin Bay / Alazan Bay / Cayo del Grullo / Laguna Salada Upper Baffin Bay near Los Olmos and Fernando Creek arms	Ammonia – Nutrient Enrichment Concern Nitrate+Nitrite Nitrogen – Nutrient Enrichment Concern Orthophosphorus – Nutrient Enrichment Concern Total phosphorus – Nutrient Enrichment Concern	Low / Concern Low / Concern Low / Concern Low / Concern Low / Concern
2494 Concern Map #29	Two small cities, one large city, 10 municipal and two industrial wastewater treatment plants. Large ranching operations, therefore possible non-point source pollution as well as low flow into bay creating environment for concern. Implement best management practices. Brownsville Ship Channel Turning Basin	Chlorophyll a – Algal Growth Concern Dissolved Oxygen – Aquatic Life Use Impairment	Low / Concern Low / Limited Data
2501 Impairment Map #30	One medium-sized city, six municipal and two industrial wastewater treatment plants. Low flow to bay and minimal rainfall, therefore minimal flushing. Continue to monitor and implement best management practices. Gulf of Mexico Port Aransas area Gulf of Mexico Port Isabel area Gulf of Mexico Port Mansfield area Two medium-sized cities. Implement best management practices.	Mercury in king mackerel > 43 inches Mercury in king mackerel > 43 inches Mercury in king mackerel > 43 inches	High / Not Supporting High / Not Supporting High / Not Supporting



**Figure 2. Segments with Concerns and Impairments**

## Clean Rivers Program Special Study

### Nueces River Tidal Special Study

In 1990, due to concerns about the lack of freshwater reaching the bays and estuaries of the Coastal Bend region, TNRCC issued an operating order for the Lake Corpus Christi and Choke Canyon Reservoir system. This order required the City of Corpus Christi to release freshwater from the impoundments to ensure beneficial conditions for habitats and organisms of the bay and estuary systems associated with the Nueces River. Since 1990, amendments have been made to the operating order, now known as the Agreed Order, in an effort to better mimic the natural dynamics of the region. During the past 12 years, several studies have been conducted within the Nueces Delta in an effort to better understand the effects of the freshwater inflows, with particular attention to the amount of freshwater released from the reservoirs, the timing of the releases, and the distribution of the releases throughout the Nueces Delta.

In response to the most recent amendment made to the operating order, a monitoring workgroup, including NRA, Texas Parks and Wildlife Department (TPWD), Texas A&M University - Corpus Christi - Center for Coastal Studies (CCS), Texas A&M University - Corpus Christi - Conrad Blucher Institute, University of Texas - Marine Science Institute, Coastal Bend Bays and Estuary Program (CBBEP), and TNRCC was formed to coordinate the monitoring of the Nueces Delta and document any changes, enhancements, or degradation that may occur due to the Agreed Order. The monitoring coverage of the Nueces Delta is extensive; however, it was determined that additional data on the tidal segment of the Nueces River (Segment 2101) would be useful. Under CRP, NRA is proposing a special study to provide flow, bathymetry, and field data on this segment during low flow periods and following high flow events. Monitoring is scheduled to begin during summer 2002 and continue each month through August 2003.

## **Other Studies of Interest**

### Lower Nueces River Dissolved Minerals Study

In the summer of 2001, the final phase a study of segment 2102 of the Nueces River was conducted as part of the Senate Bill 1 planning program. This final phase continued to focus on the type and source of dissolved minerals in the channel; specifically in the Calallen Pool located just upstream of the saltwater barrier dam. During the first phase of the study, field data and surface and groundwater samples were collected between August 1999 and June 2000. Samples were sent to water analysis laboratory and analyzed for arsenic, calcium, magnesium, sodium, potassium, sulfate, chloride, TDS, alkalinity, bromide and hardness. As part of the second phase of the study, seven permanent groundwater monitoring wells were installed at sites along the river bank. A total of nine surface water and seven groundwater sites were then sampled in October 2000. During the final phase of the study, sampling events were conducted at the same surface and groundwater sites. Sampling events were scheduled to capture both no flow and positive flow events over the saltwater barrier dam. Laboratory results indicated similar levels of mineral concentrations between the groundwater and surface water thus supporting results obtained from previous sampling efforts and suggesting groundwater intrusion is taking place.

### Coastal Bend Bays Water Quality Monitoring Project, Phase II:

In 1999, TNRCC placed Corpus Christi Bay on the Draft 303(d) List due to elevated dissolved copper concentrations. However, during a quality assurance check of the data, a lab results anomaly was discovered and Corpus Christi Bay was subsequently removed from the final list for copper exceedances. Despite the removal, local stakeholders expressed concerns over the possibility of elevated metals concentrations within the Coastal Bend Bays system. In an effort to further investigate this issue, a partnership was formed between local, state, and federal entities and stakeholders, including CBBEP, NRA, CCS, TNRCC, Port of Corpus Christi, and the Environmental Protection Agency (EPA). From this partnership, an intensive, targeted water quality monitoring and assessment project evolved.

The principle objective of this project has been to conduct an intensive, targeted water quality monitoring study and collect sufficient water quality data to characterize the water quality of the CBBEP project area.

Due to the complexity of this project, it was organized into three phases. Phase I concentrated on gathering stakeholder input, historical research, and the development, design, and implementation of the initial water quality sample collection. Phase II focused on continuing the

quarterly monitoring of 30 stations in Corpus Christi Bay (Segment 2481), Nueces Bay (Segment 2482), Corpus Christi Inner Harbor (Segment 2484), Aransas Bay (Segment 2471), Copano Bay (Segment 2472), and Oso Bay (Segment 2485) for a full year. Phase II also consisted of bimonthly monitoring of 6 fixed-location targeted stations. Phase II monitoring was completed in April 2001. Finally, Phase III is a continuation of the same Environmental Monitoring and Assessment Program (EMAP) designed water quality monitoring, but the effort focuses on 30 stations in the Upper Laguna Madre and Baffin Bay. Phase III is currently being implemented by CBBEP and CCS.

The monitoring program integrated both the EMAP probabilistic sampling design, contributed by the EPA Office of Research and Development, and a targeted monitoring plan for both spatial and temporal data. For Phase II, the EMAP sampling design established 30 randomly selected sites per quarter (for a total of 120 random sites) within the study area. The EMAP sites were selected by placement of a hexagonal grid over the study area and sites were selected by a systematic random approach. For the targeted monitoring, six previously established TNRCC monitoring stations were selected by the local stakeholders to be analyzed for the same parameters on a bi-monthly basis. Figure 3 shows all of the sites sampled.

Routine field and conventional parameters as well as total and dissolved metals concentrations were monitored at the selected sites (Table 4).

The goal of the monitoring plan allowed for temporal and spatial characteristics of the selected sites to be considered. This was necessary to meet the project objectives of addressing the metals concerns in Corpus Christi Bay, the characterization of water quality in the bays system, and the development of a screening process for future long-term monitoring within the CBBEP project area.

All data and analysis of results of the three phases will be included in one, final comprehensive report upon the completion of Phase III. The report, to be completed by CBBEP and CCS, will analyze data based on water quality criteria, biological data, and temporal and spatial considerations. It will also include possible implications of the conditions of the study area as well as possible recommendations for future studies within the area.

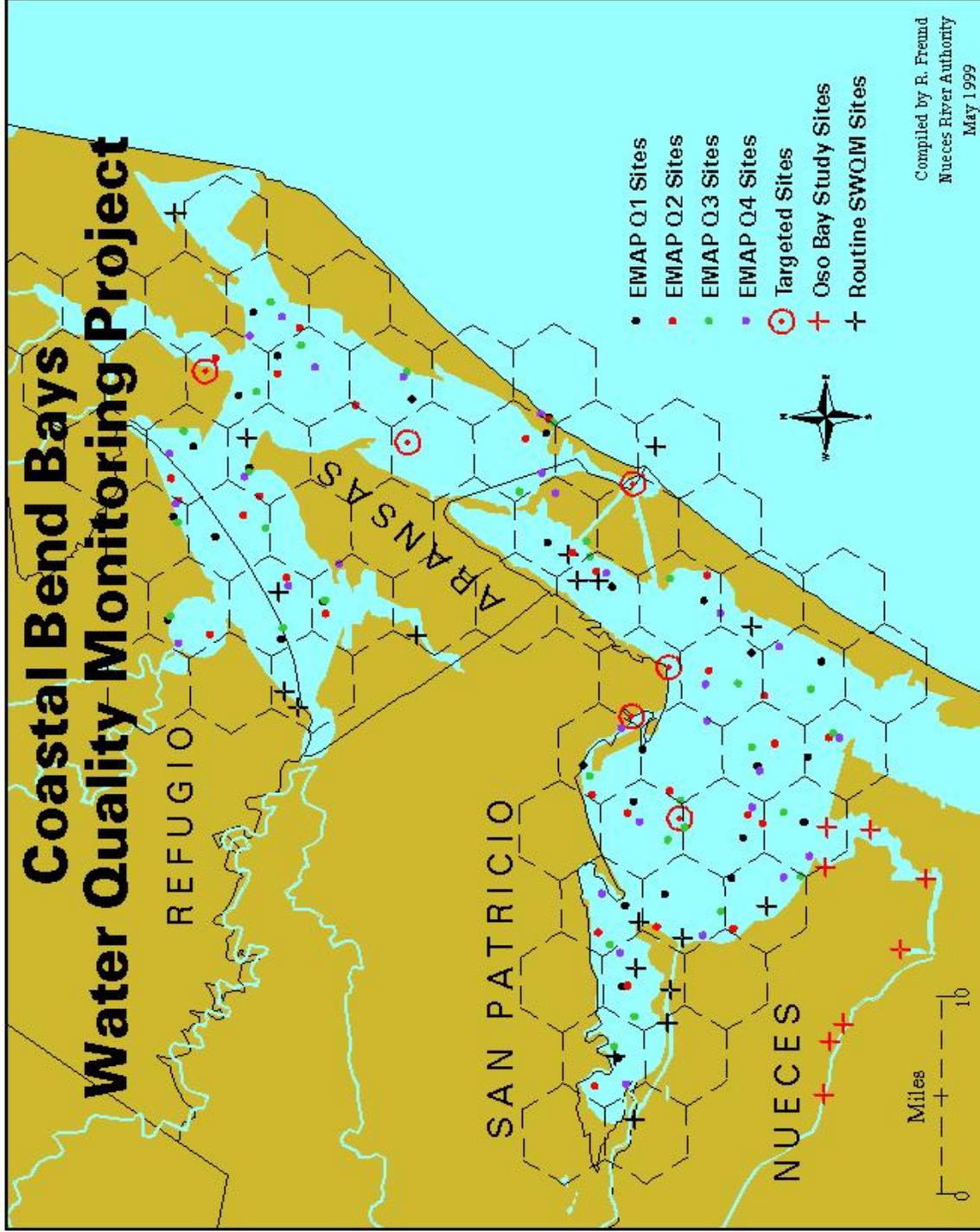


Figure 3. Coastal Bend Bays Water Quality Monitoring Project, Phase II Site Locations

**Table 4. Monitoring Parameters**

<b>Routine Field Parameters</b>	<b>Total Metals</b>
Water Temperature	Total Copper
pH	Total Mercury
Dissolved Oxygen (mg/L)	Total Selenium
Dissolved Oxygen (%)	
Conductivity	
Salinity	
<b>Routine Conventional Parameters</b>	<b>Total Dissolved Metals</b>
Total Alkalinity	Dissolved Aluminum
Ammonia – Nitrogen	Dissolved Arsenic
Chloride	Dissolved Cadmium
Chlorophyll-a	Dissolved Chromium
Nitrate+Nitrite	Dissolved Copper
Pheophytin-a	Dissolved Lead
Orthophosphorus	Dissolved Nickel
Total Kjeldahl Nitrogen	Dissolved Silver
Total Organic Carbon	Dissolved Zinc
Total Suspended Solid	
Volatile Suspended Solids	
Total Phosphorus	
Total Dissolved Solids	

### Public Outreach

NRA is continuing a public awareness campaign regarding the impacts resulting from increased public use and incidents of irresponsible behavior on the Upper Nueces River and other accessible areas in the upper basin. NRA has developed a series of presentations identifying threats to water quality and aquatic habitats in the upper basin. These presentations focus on human activities and behaviors that contribute to nonpoint source pollution. NRA has addressed civic and professional clubs, educators, and environmental organizations to help these organizations inform citizens about the value of the river and how to protect it.

NRA outreach efforts have included classroom visits and field trips to the rivers in support of the teachers. Realtors have been informed about the importance of preserving riparian areas and hunters informed about the need to protect riverbeds from vehicle traffic. School administrators and teachers have been directed to the student education resources and opportunities available to them from TNRCC and TPWD, including the easy to use, interactive program “Do you know how to keep our water clean?” for elementary students. This pilot program has been distributed to several schools in the upper basin, and will be made available to the entire CRP area.

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

The Texas Watch Program is an excellent way for concerned citizens to get involved in water-quality issues in the state. This program was developed to facilitate environmental stewardship

by empowering a statewide network of concerned volunteers, partners, and institutions in a collaborative effort to promote a healthy and safe environment through environmental education, data collection, and community action. NRA continues to provide guidance for Texas Watch activities throughout its basins. For more information about Texas Watch and their program, visit their website at <http://www.texaswatch.geo.swt.edu>, or call their toll-free number: 877-506-1401.

Although much of NRA's public outreach efforts have been concentrated on the Upper Nueces River, NRA also participates in the Coastal Bend Bays Foundation's Earth Day/Bay Day activities. This program takes place in April of each year. It is an all day program designed to educate the public on the importance of the environment and demonstrates how people can enjoy the outdoors without causing harm to the environment. NRA provides information about water quality and water quality sampling at the event.

### **CRP Steering Committees**

The Texas Clean Rivers Act states that a vital component of a complete watershed assessment program is the participation of citizenry, public institutions, private industry, and other interested parties in determining the direction of each basin's activities, as well as the CRP as a whole. To accomplish this, each CRP partner agency establishes and maintains a steering committee to set priorities within its basin. These committees strive to bring together the diverse interests in each basin and watershed by including representatives from the public, government, industry, business, agriculture, and environmental groups. The steering committee goal is to ensure that local concerns are addressed and regional solutions are recommended.

CRP steering committees meet publicly on at least an annual basis and promote public involvement in the meeting's agendas. The meetings are conducted for the primary purpose of reviewing and approving achievable water quality objectives and priorities for the basin that will guide work plan development. In May, 2002, NRA sent an informational letter to all steering committee members that summarizes the program and the role of the steering committee.

Beginning in 2002, NRA will conduct three separate meetings in order to better serve the diverse area and associated concerns. The three areas, and their respective meeting dates and locations, are the Upper Nueces Basin, June – Uvalde, Texas; the Lower Nueces River Basin and the Nueces Coastal Basins, July – Corpus Christi, Texas; and the Arroyo Colorado, August – Harlingen, Texas. More specific information on meeting dates and locations is available at <http://nueces-ra.tamucc.edu/crpnoces.html>. The list of the current NRA steering committee members is available at <http://nueces-ra.tamucc.edu/sclists2002.html>. For information on the NRA's CRP Steering Committee process, including how to get involved, please contact NRA via the contact information on page 20.

### **Web Site**

The NRA website is located at <http://nueces-ra.tamucc.edu>. The page contains links to information about NRA, NRA projects, contracts, and related items of interest. The link to the CRP web site, with respect to the Nueces River Basin and the Nueces Coastal Basins, is titled "Clean Rivers Program." The direct link to this page is <http://nueces-ra.tamucc.edu/nracrp.html>. This page contains links to information about CRP in general, and to specific information with respect to NRA's role in CRP including: the 2000 303(d) List, water quality database, geographic information system coverages of the area, public notices, the FY 2002 monitoring

plan, reports, the Quality Assurance Project Plan, steering committee members, wastewater discharges, and contacts.

The CRP water quality database maintained by NRA contains information about all the SWQM stations within the basins and any available sampling data. The database is updated monthly with any new data in the TNRCC's water quality database. The user is able to enter a SWQM station number directly or from a list of stations based on those sampled (1) within a given date range, (2) within a specific county, (3) within a specific basin, or (4) on a specific segment. The station page contains location information and several options for obtaining sampling data: by sampling date or by storet code.

Sampling data by date: the station page contains a list of dates for which sampling data exists for the specified station. Selecting a date returns all the sampling information and measured parameters for that date. The user can specify whether to have the information displayed as an HTML page or as an ASCII delimited text file that can be downloaded and then imported into either a spreadsheet or database.

Sampling data by storet code: the station page also provides the user with an option to select only the values a specific storet code for a given date range. The user can specify whether to have the information displayed as an HTML page, as an ASCII delimited text file that can be downloaded and then imported into either a spreadsheet or database, or as a graph.

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