Watershed Protection Planning and Research Efforts in the Arroyo Colorado and LRGV











Jaime Flores, P.G. Jude A. Benavides, Ph.D. 7/25/2024

UTRGV The University of Texas Rio Grande Valley

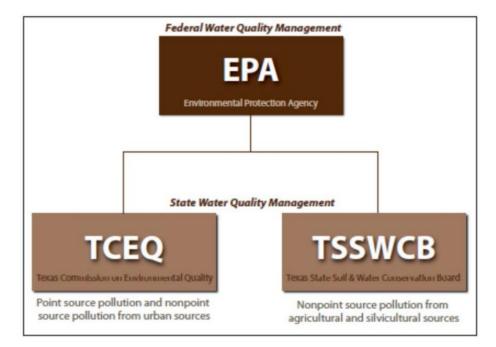






Water Quality Policy 101

- Federal Clean Water Act requires states to assess and monitor the health of waterbodies
- CWA is administered by two state agencies:
 - Texas Commision on Environmental Quality (TCEQ)
 - Texas State Soil and Water Conservation Board (TSSWCB)



Water Quality Policy 101 slide 2

- Compliance with the CWA:
 - Set water quality standards
 - Assess surface water bodies
 - Address pollution concerns for waterbodies identified as impaired

Texas Integrated Report for Clean Water Act,	Texas Integrated Report	• Describes the status of ALL surface water bodies in the state that were evaluated, tested, and monitored over the last 5 years
Sections 305(b) and 303(d)	CWA 303(d) List	 Identifies ALL "impaired" surface water bodies not meeting criteria for specified designated uses

What is "Watershed Protection Planning?"



Update to the Arroyo Colorado Watershed Protection Plan

August 2017 TWRI TR-504

- A framework for implementing water quality protection and restoration strategies:
 - Driven by environmental objectives and stakeholder participation
 - Address sources and causes of impairments and threats to surface and groundwater – identified earlier
 - Partnership effort
 - Assures the long-term health of the watershed through:
 - Strategies for protecting unimpaired waterbodies
 - Strategies to restore impaired waters
 - Watershed Partnership works together to leverage the Plan – approved by the State of Texas – to obtain external funding to accomplish the goals set out in each strategy.

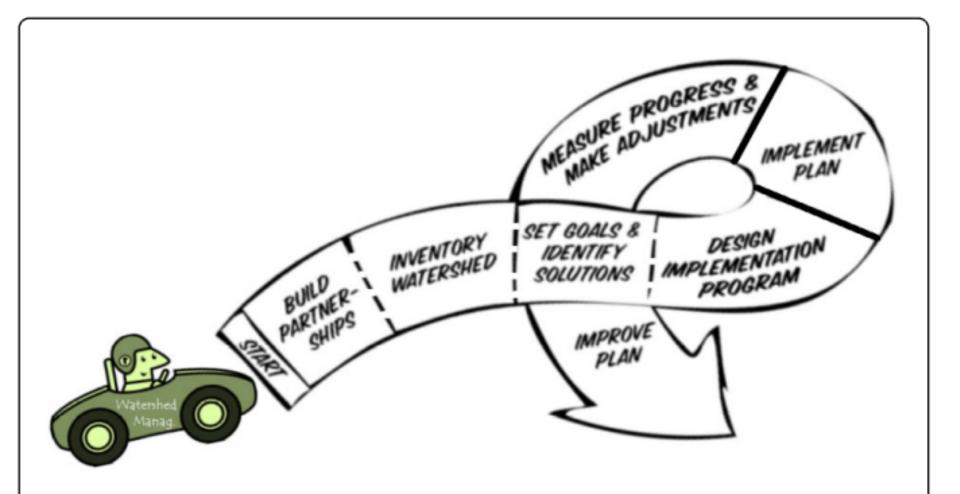


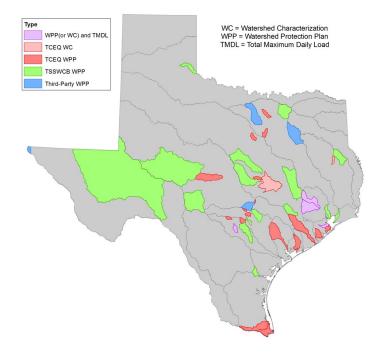
Figure 2: The cooperative and iterative watershed management steps: planning, implementation, and evaluation [5]

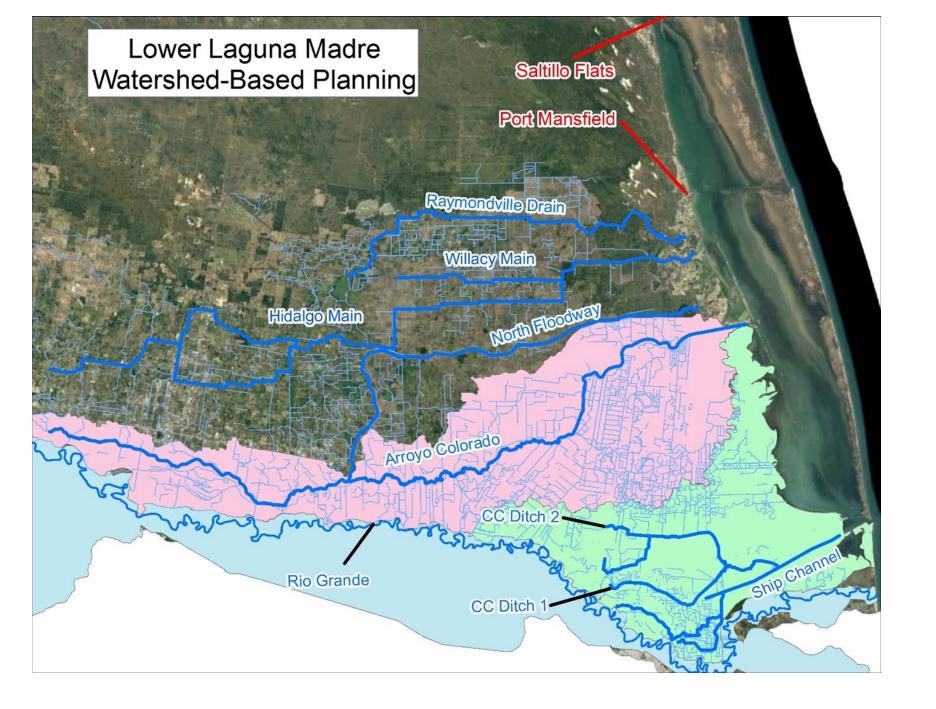
The Watershed Protection Plan for the Arroyo Colorado was approved by the State of Texas in 2017

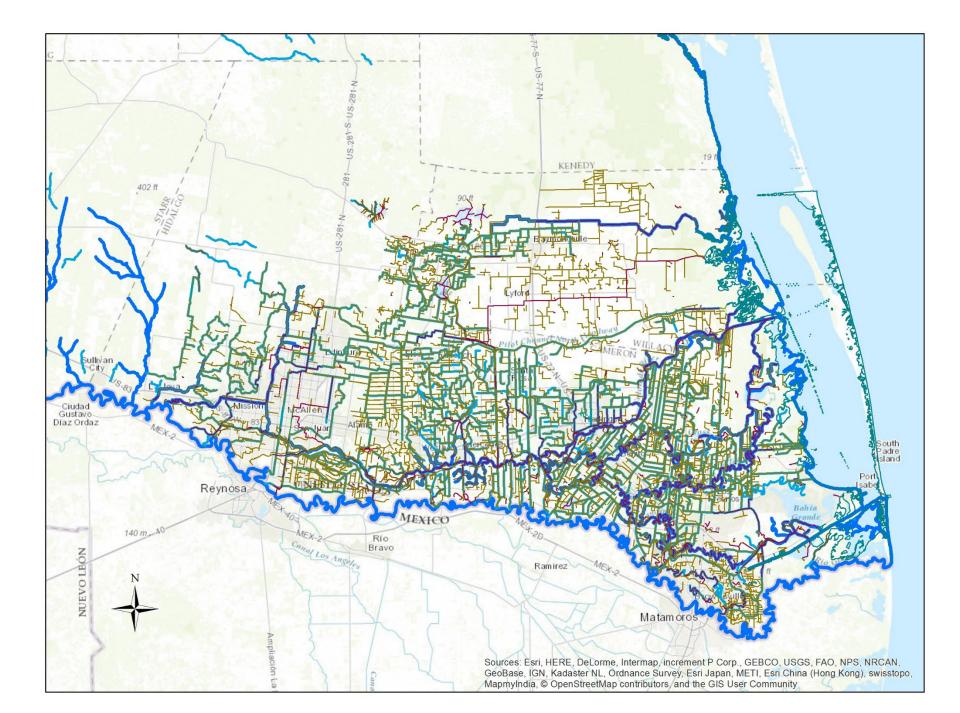


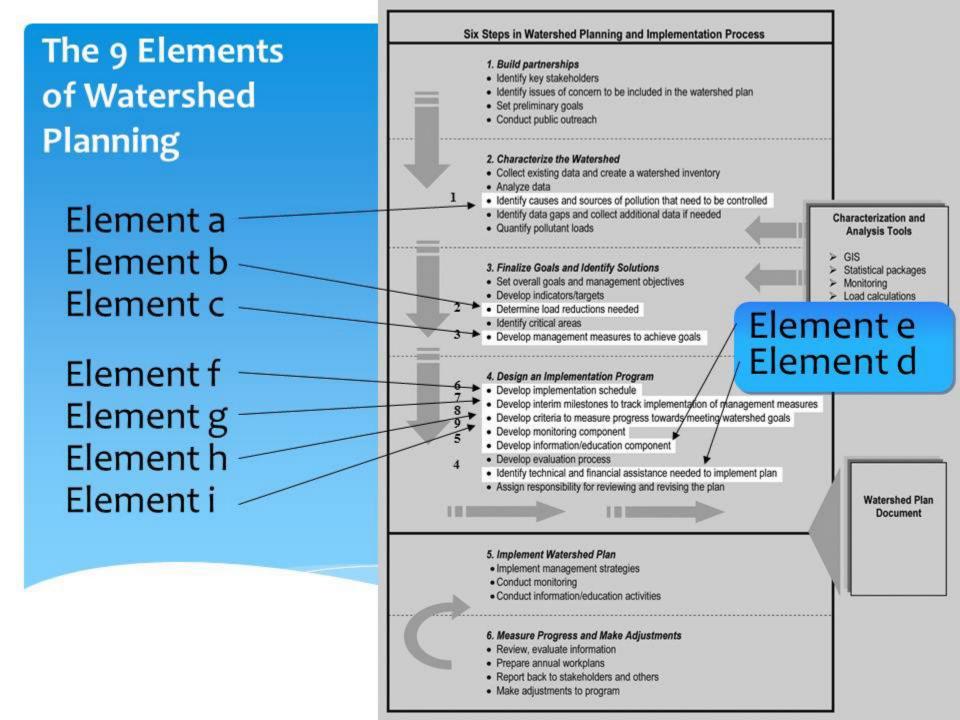
Arroyo Colorado Watershed Protection Plan www.arroyocolorado.org

- A significant accomplishment
- Long-term effort from the early 2000's
- Has enabled us to leverage Non-Point Source (Section 319) funds from TCEQ / EPA through the Clean Water Act
- Higher priority given to those watersheds that have an approved plan.









Arroyo Colorado Plan Lists Clear and Actionable Strategies to Improve Water Quality

Table 4.4. Number of days with DO below the 24-hour minimum and average criteria at the USGS station on Arroyo Colorado Tidal at FM 106, Rio Hondo, TX for March 1, 2015 – February 29, 2016

DO	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Min.	0	0	0	0	1	5	23	24	5	7	0	0	65
Avg.	0	0	0	0	0	2	16	17	2	2	0	0	39

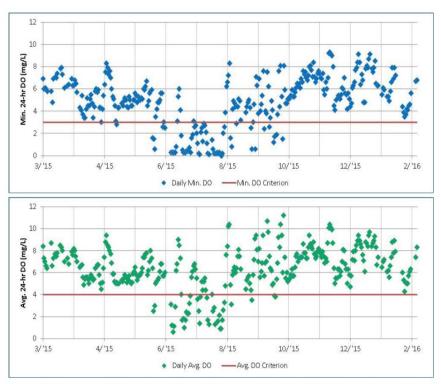


Figure 4.3. Time series of daily minimum DO and daily average DO at the USGS station on Arroyo Colorado Tidal at FM 106, Rio Hondo, TX for the period of March 1, 2015 – February 29, 2016

- Several years of dedicated work by stakeholders developed these strategies based on:
 - Sound science
 - Work groups focused on:
 - Habitat
 - Agriculture
 - Wastewater
 - Water Quality Assessment
 - Education and Outreach
 - Stormwater
 - Others



Dr. Jude Benavides (left) and students Robert Figueroa-Downing, Rachelle Maldonado, Monica Delgado and Guadalupe Garcia III collecting water quality samples within the tidal portion of the Arroyo Colorado.

Sediment

As previously shown in Table 6.2, total sediment loads (including sediment from runoff and WWTFs) were highest in subbasins 7, 8, 12 and 16. To evaluate nonpoint source (NPS) sediment contributions, upland loading coefficients were determined by subbasin. This indicated that upland NPS sediment contributions were highest in subbasins 5, 8, 14 and 16 (Figure 6.3). Although the predominant source of loading varied by subbasin, on the watershed scale, approximately 88% of the sediment loading resulted from cropland and rangeland erosion (Figure 6.2).

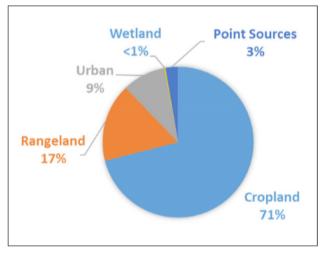


Figure 6.2. Predominant sources of sediment loads in the Arroyo Colorado watershed

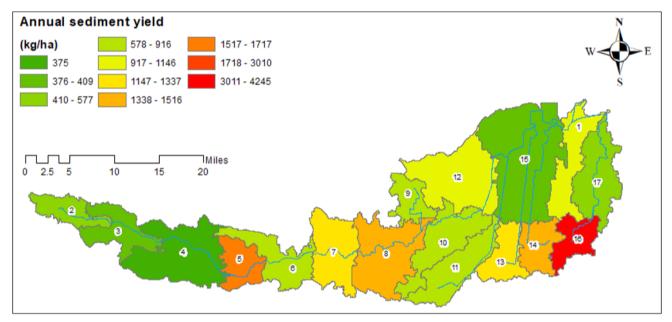


Figure 6.3. Estimated sediment export (kg/ha) from upland nonpoint sources by subbasin

E. coli

Total *E. coli* loads (including both point source and NPS contributions) were generally highest in the lower subbasins, particularly subbasins 1, 8, 15 and 17 (Table 6.2). When only upland NPS contributions are considered, however, the highest *E. coli* export were observed in subbasins 1, 7, 9-11, 12-13 and 17 (Figure 6.9) and are thus of highest priority for NPS management. Dominant *E. coli* sources vary by subbasin; however, SWAT estimates suggest that the primary source of *E. coli* (Figure 6.8) is wildlife, with smaller contributions from cattle and OSSFs.

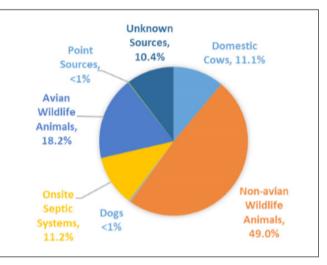


Figure 6.8. Primary E. coli sources estimated by SWAT

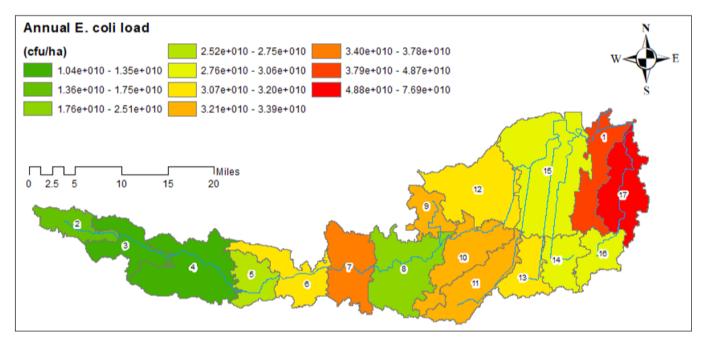


Figure 6.9. Estimated E. coli loads (cfu/ha) from upland nonpoint sources by subbasin

Bacterial Source Tracking

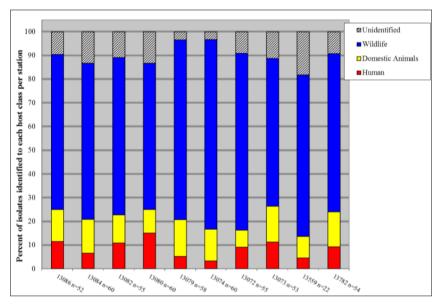


Figure 6.12. Three-way split of *E. coli* BST results for each station as percent of isolates per sampling station

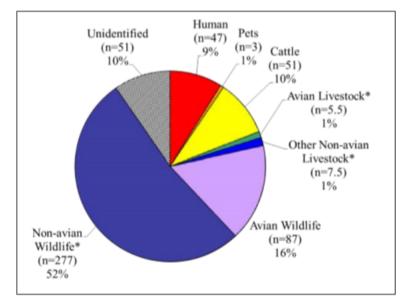


Figure 6.11. BST results for the Arroyo Colorado watershed (* indicates presence of cosmopolitan species)

Table 8.4. Goals for new and updated conservation plans for new 10-year implementation period

Land use	Total acres	Original goal (ac)	Current acres under plan	New goal acres (%)	Update plans >10 yrs old
Cropland	219,051	150,000 (est. 50%)	130,000 (59%)	165,000 (75%)	45,000
Pasture	24,805	NA	NA	10,000 (40%)	
Range	48,867	NA	NA	7,500 (15%)	
Total ac	292,723	150,000	130,000	182,500	45,000

 Agriculture Goals, Strategies, and Management Measures



Chapter 8 Management Measures

Conservation Plan Development and Implementation

Objectives:

- Work with agricultural producers/farmers and ranchers to develop WQMPs and RMS
- Provide producers with technical and financial assistance
- Implement and maintain WQMPs and RMS
- Reduce fecal loading from grazing livestock
- · Reduce nutrient and sediment loading from cropland

Critical Areas: Subbasins with highest upland NPS nutrient loadings (i.e. 5-8) and cropland in closest proximity to the impaired segments and their tributaries. Subbasins with highest upland NPS bacteria loadings (i.e. 1, 7-9, 11, 12-13 and 17) and range and pasture in closest proximity to the impaired segments and their tributaries

Goal: The voluntary implementation and maintenance of 300 additional WQMPs or RMS to bring the total number of acres under a conservation plan to 227,500 acres in the watershed

Description: WQMPs will be developed, adopted and implemented in priority subwatersheds and fields and pastures in closest proximity to the river.

Potential Funding Sources:

WQMPs: TSSWCB WQMP program, CWA §319(h) grant program

RMS: NRCS EQIP program

Education: CWA §319(h) grant program

Implementation Strategies

Implementation Stategies					
Participation	Recommended Strategies				
SWCDs, NRCS, TSSWCB, Landowners	WQMPs - Develop, implement and provide financial assistance for 300 WQMPs and RMS at an estimated average cost of \$30,000 per plan for a total cost of \$9,000,000				
Texas A&M AgriLife Extension Service	Education - Deliver education programs to producers throughout the water- shed on BMPs and cost share programs available				
Texas A&M AgriLife Extension Service	Lone Star Healthy Streams - Deliver Lone Star Healthy Streams programming to watershed landowners				

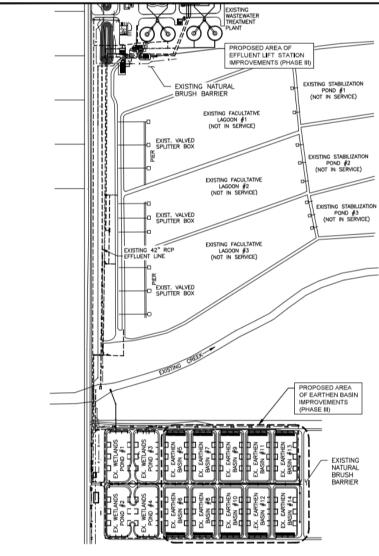
Municipal Permit Changes

Table 8.5. Summary of municipal permit changes (Source: Arroyo Colorado PRP)

Facility Name	TPDES Permit No.	2000 Flow and Effluent Set*	2005 Flow and Effluent Set*	2016 Flow and Effluent Set	
City of Mission	WQ0010484-001	(4.6) 10/15/3	(9) 10/15/2	(9) 7/15/2	
City of McAllen WWF #2	WQ0010633-003			(10) 10/15/2	
City of Hidalgo	WQ0011080-001	(0.41) 30/90/NA	(1.2) 10/15/3	(1.2) 10/15/3	
Military Hwy WSC (Balli Rd.)	WQ0013462-006			(0.51) 20/20/NA	
City of Pharr	WQ0010596-001		(5.0) 10/15/3	(8.0) 7/15/2	
City of San Juan	WQ0011512-001	(1.15) 20/20/NA	(4.0) 10/15/3	(4.0) 10/15/3	
City of Alamo	WQ0013633-001		(2.0) 30/90/NA	(2.0) 30/90/NA	
City of Donna	WQ0010504-001		(2.7) 20/20/NA	(1.8) 10/15/3	
City of Weslaco	WQ0010619-005	(2.0) 10/15/3	(2.5) 10/15/3	(2.5) 10/15/3	
Military Hwy WSC (Progreso)	WQ0013462-001		(0.4) 30/90/NA	(0.75) 10/15/3	
City of Mercedes	WQ0010347-001		(2.3) 10/15/3	(5) 7/15/2	
City of La Feria	WQ0010697-001/2		(0.5) 30/90/NA	(1.25) 10/15/3	
Harlingen Water Works WWF #2	WQ0010490-003		(3.1) 20/20/NA	(7.25) 10/15/3	
City of San Benito	WQ0010473-002 WQ0014454-001	(2.16) 30/30/NA	(2.5) 10/15/3	(3.75) 10/15/3	
Military Hwy WSC (Lago)	WQ0013462-008	No permit	(0.5) 20/20/3	(0.5) 20/20/3	
City of Rio Hondo	WQ0010475-002		(0.4) 20/20/NA	(0.4) 20/20/NA	
East Rio Hondo WSC	WQ0014558-001	No permit	(0.16) 10/15/3	(0.08) 10/15/3	

* Flow is mgd and effluent set is BOD₅/TSS/NH₃-N reported in mg/L.

Wetland Polishing Ponds for WWTF



CONSTRUCTION SITE POLLUTION PLAN REQUIREMENTS:

THE PROJECT IS LOCATED WITHIN THE SAN BENITO CITY LIMITS, THE PROJECT IS LOCATED ALONG MAYFLOWER ROAD, IT CAN BE ACCESSED OFF OF OSCAR WILLIAMS ROAD.

LATITUDE: 26'10'34" N LONGITUDE: 97'37'37" W

PROJECT SITE LOCATION

PROJECT SITE DESCRIPTION:

THE PROJECT CONSISTS OF UPGRADING PUMPS AT AN EXISTING EFFLUENT LIFT STATION INSIDE THE WASTEWATER TREATMENT PLANT FACILITY AND AN 8-INCH EFFLUENT FORCE MAIN EXTENSION FROM AN EXISTING 6-INCH CAP TO THE EXISTING EARTHEN BASIN #14. IMPROVEMENTS INCLUDE EARTHWORK, INFLOW AND OUTFALL STRUCTURES, ETC.

DISTURBED AREA:

THE AREA ON THE SITE EXPECTED TO BE DISTURBED IS APPROXIMATELY 10 ACRES OF EXISTING EARTHEN BASINS.

WEIGHTED RUNOFF COEFFICIENT:

THE WEIGHTED RUNOFF COEFFICIENT OF THE PROJECT SITE AFTER ALL IMPROVEMENTS ARE COMPLETE IS ESTIMATED AT 0.30 TYPICAL FOR GRASSED AREAS.

NAME OF RECEIVING WATERS:

THE RECEIVING WATERS FOR THE STORM WATER RUNOFF FROM THIS PROJECT IS THE ARRYN'D COLOMADO, ABOVE TIDAL, SEGMENT 2202, THE TEED HAS NOT CLASSIFIED THE AURATIC LIFE USE FOR THE ARRYN'D COLOMADO ADAVE TIDAL, BUT IT IS RECONSEED AS AN ENVIRONMENTALL'SENSITIVE AREA. THE ARRYN'D COLOMADO ADAVE TIDAL, FORS DERCIT WITO THE ARRYN'D COLMONO OTAW. THE TEED HAS CLASSIFED THE ADAVITIC LIFE USE FOR THE ARRYN'D COLOMADO ADAVE, AN STOLETHOUST, AND O'STEIN WATERS' AND CATEGORIZED THE RECEIVING WATER AS "CONTACT RECREATION" (ISE

SOIL TYPE:

ACCORDING TO THE USDA WEB SOIL SURVEY; THIS SOIL IS CLASSIFIED АССОРОНИИ ТО ТНЕ USBA WHE SOLE SUMVEY; THIS SOLE IS CLASSINED. AS "BU" (BRUTO-UNBAN LAND COMPLEX), CALARGUS CLAVETY ALLIVIUM SOLES. THE HYDROLOGIC SOLE OROUP FOR THIS AREA IS RATING "D', SOL HAWNG A SLOW INFLITATION RATE (HGIR HUNGF FOTETHIL), WHEN THOROUGHLY WET, THESE CLAYE'SOLES HAVE POOR DRAIN AND VERY HIGH SHRWL-SWELL FOTETHILS SOL IS ARREY. FOLODED BUT COCASIONALLY PONDED

EXISTING CONDITION OF SOIL AND VEGETATION COVER:

THE SOIL CONDITION WAS PREVIOUSLY DEVELOPED AS OLD WASTEWATER TREATMENT PLANT AREA.

INSPECTION:

AN INSPECTION WILL BE PERFORMED BY PERSONNEL DESIGNATED BY THE ENGINEER EVERY WEEK AS WELL AS AFTER EVERY HALF INCH OR MORE OF RECORDED ON A RAIN GAUGE TO BE LOCATED AT THE PROJECT STE). AN INSPECTION AND MAINTENANCE REPORT WILL BE MADE PER EACH INSPECTION, AND CONTROLS SHALL BE REVISED AS INDICATED BY THIS INSPECTION. REPORT.

MATERIAL WASTE:

ALL MEASURES SHALL BE TAKEN TO PROTECT THE SURROUNDING AREA FROM CONTAMINATION. ALL WASTE MATERIAL SHALL BE COLLECTED AND SECURELY STORED UNTIL REMOVED FROM JOBSITE. NO CONSTRUCTION WASTE MATERIAL SHALL BE BURED ON STE.

HAZARDOUS WASTE (INCLUDING SPILL REPORTING):

AT A MINNUM, ANY PRODUCTS IN THE FOLLOWING CATEGORIES ARE CONSIDERED TO BE HAZAROJUS: PAINTS, ADHESIVES, PETROLEUM PRODUCTS, CLANING SOLVERTS, ASPHALT PRODUCTS, OR CONCERTE CURRIS COMPANIES AND ADDITNES. IN THE EVENT OF A SPELL WHICH MAY BE HAZARODUS, THE SHILL CORRINATOR SHALL BE CONTARLED IMEEMATE!, ALL PRODUCTS USED SHILL OB TORED IN PROPERTY LABELED CONTARLES, AND REMOVED FROM THE JOSTIC HIM NO LONGER THAD IN CONTARTS.

LEGEND: LIMITS OF IMPROVEMENTS

SILT FENCES BALED HAY

EROSION AND SEDIMENT CONTROLS

STRUCTURAL PRACTICES:

- SOIL STABILIZATION PRACTICES: ✓ TEMPORARY SEEDING
- ✓ PRESERVATION OF NATURAL RESOURCES

OFFSITE VEHICLE TRACKING:

- HAUL ROADS DAMPENED FOR DUST CONTROL
- W\TARPAULIN ▲ EXCESS DIRT ON ROAD REMOVED DAILY
- ____ STABILIZED CONSTRUCTION ENTRANCE

REMARKS:

CONTRACTOR SHALL TAKE NECESSARY MEASURES TO CONTROL AND LIMIT DUST DURING PLANNING OPERATIONS.

CRGE PROJECT N

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UF SAN BENITO I LIFT STATION, FORCEMAIN S PHASE 11 IMPROVEMENTS

Ь EFFLUENT I WETLANDS I CITY

VMG

LECTRONIC FILE NAME

ET 13 OF 16

STORM WATER POLLUTION PREVENTION PLAN

AUGUST 15, 201

AS BHOM

C226

NARRATIVE - SEQUENCE OF CONSTRUCTION: (STORM WATER MANAGEMENT) ACTIVITIES:

THE ORDER OF ACTIVITIES WILL BE AS FOLLOWS: (PRIOR TO BEGINNING WORK AT ANY PHASE, AREA FOR PRESERVATION OF NATURAL RESOURCES SHALL BE IDENTIFIED.)

THE CONTRACTOR IS RESPONSIBLE FOR PREPARATION OF A SWPPP AND FILING A NOTICE OF INTENT WITH THE TEXAS SMATPY AND FILING A NOTICE OF INTENT MITH THE LEADANNING COMMISSION ON ENVIRONMENTAL QUALITY (TCEG) AND OBTAINING A TEXAS POLLUTANT DISCHARGE ELIMINATION SYSTEM (TPDES) PERMIT. THE CONTRACTOR SHALL MAINTAIN A COPY OF THE TPDES PERMIT ON THE SITE AT ALL TIMES DURING CONSTRUCTION.

THE CONTRACTOR SHALL ABIDE BY THE PROVISIONS OF TCEQ STORM WATER POLLUTANT DISCHARCE ELMINATION SYSTEM REGULATIONS CONCERNING PERMITS FOR CONSTRUCTION ACTIVITIES, INCLUDING IMPLEMENTATION OF THE POLLUTION PREVENTION PLAN AND BEST MANAGEMENT PRACTICES.

SEQUENCE OF CONSTRUCTION:

ERECT ALL PROJECT BARRICADES AND SIGNS.

INSTALL STORM WATER POLLUTION PREVENTION STRUCTURES

REMOVE EXISTING 6-INCH CAP ON EXISTING FORCE MAIN AND TE-IN PROPOSED 8-INCH FORCE MAIN THROUGH 6"x8" ECCENTRIC REDUCER (D.I.M.J.).

CONSTRUCT REMAINDER OF NEW 8-INCH EFFLUENT FORCE MAIN SECTION TO EARTHEN BASIN #14.

CONSTRUCT SITEWORK IMPROVEMENTS AT THE EARTHEN BASINS SITE. THE WORK INCLUDES GRADING, 12-INCH PVC PIPE INSTALLATION, ETC.

CONSTRUCT EXISTING EFFLUENT LIFT STATION PUMP STATION UPGRADES AND RELATED SITEWORK IMPROVEMENTS.

COMPLETE ELECTRICAL, CONTROLS AND METERING WORK FOR EFFLUENT LIFT STATION AND PREPARE FOR START-UP.

CLEAN UP ENTIRE WORK SITE.

PLACE EFFLUENT LIFT STATION AND EFFLUENT FORCE MAIN INTO SERVICE.

CONDUCT WARRANTY INSPECTION 11 MONTHS AFTER PROJECT IS ACCEPTED BY THE CITY.

CORRECT DEFECTS ENCOUNTERED DURING WARRANTY INSPECTION. CLOSE OUT PROJECT

REMOVE STORM WATER POLLUTION PREVENTION STRUCTURES

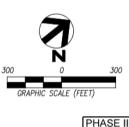
REMOVE CONSTRUCTION SIGNS & PROJECT BARRICADES.

OTHER EROSION AND SEDIMENT CONTROLS MAINTENANCE:

ALL EROSION AND SEDIMENT CONTROLS WILL BE MAINTAINED IN GOOD WORKING ORDER, IF A REPAIR IS NECESSARY, IT WILL BE DONE AT THE EARLIEST DATE POSSIBLE.

SANITARY WASTE:

ALL SANITARY WASTE WILL BE COLLECTED FROM PORTABLE UNITS AS NECESSARY; OR AS REQUIRED BY LOCAL REGULATION, BY A LICENSED SANITARY WASTE MANAGEMENT CONTRACTOR.



Education and Outreach



Brownie troop member installing storm drain marker



Watershed Coordinator Jaime Flores installing an Arroyo Colorado Watershed Boundary sign



Arroyo Colorado watershed model on display at the Coastal Expo

Arroyo Colorado Watershed Protection Plan

Physical Models – Total of 4 available for use by schools

- Our two physical models have been used for many years and are showing some wear and tear.
- Completed repair of the models in June 2020
- Two new physical models constructed (2022)
 - Enhanced outreach
 - Very popular with local schools and environmental events
- Physical Model:
 - Robust
 - Real (not virtual)
 - This means something to kids
 - Our Rivers and Streams are not virtual.... They are real.



Model Repairs







Water Quality Monitoring – Are We Making Progress?

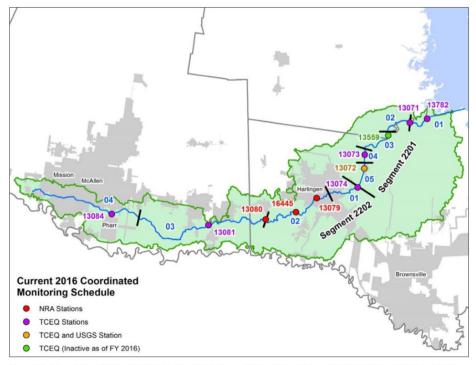


Figure 11.1. Location of water quality monitoring stations on the Arroyo Colorado currently monitored routinely by TCEQ and NRA

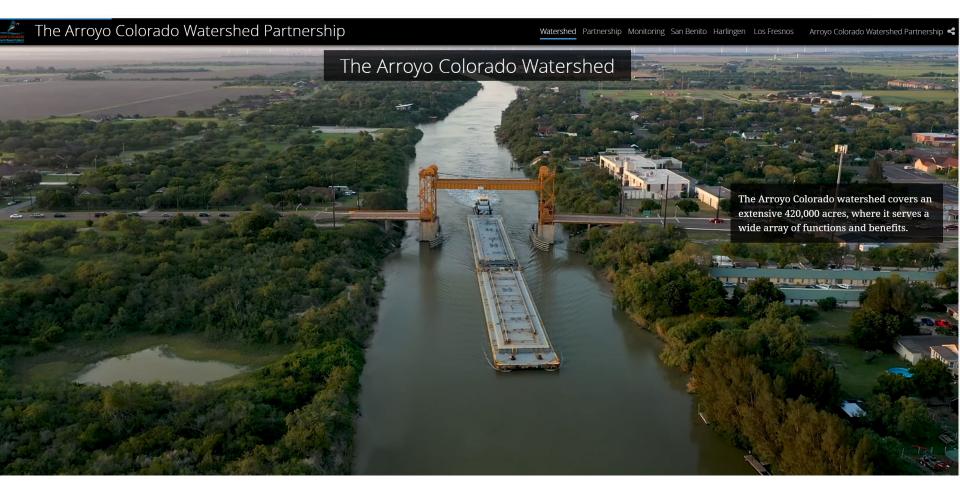


A UTB/UTRGV student deploys a continuous sampling water quality sonde near the Rio Hondo bridge in the Arroyo Colorado.

Arroyo Colorado Website

The Arroyo Colorado Watershed Partnership

A Lower Rio Grande Valley Story Map



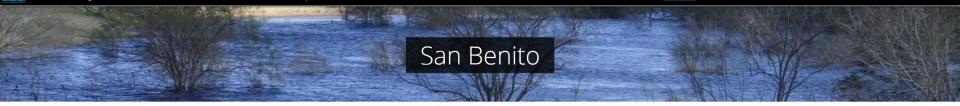
Letter The Arroyo Colorado Watershed Partnership

Watershed Partnership Monitoring San Benito Harlingen Los Fresnos 🛛 Arroyo Colorado Watershed Partnership 🗲



The Arroyo Colorado Watershed Partnership

Watershed Partnership Monitoring San Benito Harlingen Los Fresnos 🛛 Arroyo Colorado Watershed Partnership 式



The Arroyo Colorado WPP identifies treatment wetlands and water reuse as important management strategies to reduce pollutant loading into the arroyo.



A "Keep San Benito Beautiful" sign posted in San Benito's wetlands.

Through collaborative efforts between the partnership and the city of San Benito, old abandoned ponds were transformed into a 64-acre treatment wetland system.

Letter The Arroyo Colorado Watershed Partnership

Watershed Partnership Monitoring San Benito Harlingen Los Fresnos 🛛 Arroyo Colorado Watershed Partnership 🗲



City staff and volunteers help plant native plants into the bio-retention basin.

Once the bio-retention basin and parking lot were complete, attention shifted towards the expansion of Ramsey park's wetland system. Clearing and grubbing, installing liners and pipes, and digging out ponds were some of the many hard tasks performed in order to expand and interconnect the wetlands.



The expansion of wetlands involved clearing brushes, installing liners and pipes, and digging out ponds.

New Arroyo Colorado Website

🖕 The Arroyo Colorado Watershed Partnership

Watershed Partnership Monitoring San Benito Harlingen Los Fresnos 🛛 Arroyo Colorado Watershed Partnership 🔩



Volunteers break off into groups during the final wetland planting phase of the project

Approximately 180 volunteers from Texas State Technical College showed up and planted over 6,000 wetland plants and trees around the perimeter of the newly expanded wetland ponds.

The Arroyo Colorado Watershed Partnership

Watershed Partnership Monitoring San Benito Harlingen Los Fresnos 🛛 Arroyo Colorado Watershed Partnership 🔩

The Arroyo Colorado Partnership partnered with the City of Los Fresnos to develop a 20-acre nature park directly south of Los Fresnos High School.

This provided an unique opportunity to implement stormwater Best Management Practices (BMPs) for the city of Los Fresnos.





The Arroyo Colorado Watershed Partnership

Watershed Partnership Monitoring San Benito Harlingen Los Fresnos Arroyo Colorado Watershed Partnership 🔩

Los Fresnos Nature Park Bio-swales, bio-retention ponds, pervious - AT THE SE walking trails, and rainwater collection systems were installed to help divert, slow down, and treat stormwater. Rainwater collection systems help store stormwater while nutrients. Seed a

For More Information:

www.arroyocolorado.org



ARROYO COLORADO

Know it. Respect it. Enjoy it. Conócelo. Respétalo. Disfrútalo.









Questions?