

**Arroyo Colorado Agricultural Nonpoint Source Assessment
FY 06 CWA 319(h)
TSSWCB Agreement No. 06-10-07-05**

Quarter no. 4 From 10/01/07 Through 12/31/07

I. Abstract

The Ag Monitoring QAPP was approved by EPA during this quarter, which was good news for task 4, 6 and 7. Monitoring activities will be kicked off this next quarter and significant progress was made in updating the obtained data for the land use/land cover map. In addition to these activities, this next quarter will see a meeting of the Ag Monitoring Oversight Committee (the Ag Issues Workgroup) and the Arroyo Colorado Partnership Steering Committee.

II. Overall Progress and Results by Task

TASK 1: Project Coordination and Administration

Subtask 1.1: TWRI will organize an Ag Monitoring Oversight Committee to coordinate project efforts with all project participants. This Committee will be composed of TAES, TAMUK, TCE, TCEQ, TDA, Texas Sea Grant, TSSWCB, Nueces River Authority, producer groups, irrigation districts, and drainage districts. This Committee will meet at least semi-annually to discuss project status, provide input on monitoring design, coordinate project activities, and coordinate monitoring efforts with educational activities.

The following actions have been completed during this reporting period:

- a. No communication occurred with the Arroyo Colorado Watershed Partnership Ag Issues Workgroup. A meeting is scheduled for the next quarter on January 24, 2008.

32% Complete

Subtask 1.2: TWRI will prepare electronic quarterly reports for submission to the TSSWCB. All progress reports will be provided to the Ag Monitoring Oversight Committee [Final report provided under Task 8].

The following actions have been completed during this reporting period:

- a. Submitted Year 1, Quarter 4 Report on January 15, 2008.

32% Complete

Subtask 1.3: Monitoring results will be transferred to TCE and TAES for development of educational materials and presentation to stakeholders. Based on the results of the monitoring, TCE will hold workshops demonstrating the impacts of implementing BMPs in the watershed and coordinate periodic meetings of ag producers to bring awareness

concerning the impact of the drainage ditches on the mitigation of pollutants from the fields (the educational activities are funded under a FY05 project).

The following actions have been completed during this reporting period:

- a. Nothing to report at this time.

0% Complete

Subtask 1.4: TWRI will attend meetings with the TSSWCB project manager and other meetings, as needed, to review project status, deliverables, etc. During quarters when no Ag Monitoring Oversight Committee are scheduled, TTVN meetings will be conducted with project participants to discuss project activities, project schedule, lines of responsibility, communication needs, and other requirements

The following actions have been completed during this reporting period:

- b. No meeting was held. However, email and phone communication occurred regularly to ensure activities are consistent with project workplan. A meeting is scheduled for the next quarter on January 24, 2008.

32% Complete

Subtask 1.5: TWRI will participate in Arroyo Colorado Partnership and Arroyo Colorado Agricultural Issues Work Group Meetings.

The following actions have been completed during this reporting period:

- a. TWRI presented the status of the Ag Assessment project to the Arroyo Colorado Partnership Steering Committee meeting on October 25, 2007.

32% Complete

Subtask 1.6: TWRI will submit appropriate Reimbursement Forms.

The following actions have been completed during this reporting period:

- a. TAES submitted an invoice in the amount of \$7,281.18 covering all TAES expenses to October 31, 2007.

32% Complete

Subtask 1.7: TWRI will develop (Months 1-3), host and maintain (Months 3-36) an internet website for the dissemination of information on educational, monitoring and demonstration activities taking place across the Arroyo Colorado watershed. Website delivery of information will be the most time and cost effective way to disseminate information to interested people or groups.

The following actions have been completed during this reporting period:

- a. The Arroyo Colorado Web site, <http://www.arroyocolorado.org>, is online and information on the Ag assessment project is available on the site. Reports and data from this project will also be posted to this main site for the public to access.

32% Complete

TASK 2: Compilation and Evaluation of Prior Studies and Data

Subtask 2.1: TWRI, with assistance from members of the Ag Monitoring Oversight Committee, will compile historical water quality data and information from previous studies and conduct a detailed analysis of the most significant water quality parameters to investigate the trends and the different biological and physical process taking place in the watershed that contribute to changes in water quality in the Arroyo

The following actions have been completed during this reporting period:

- a. Historical data of significant water quality parameters were compiled and graphed to determine trend, if any. These graphs will be submitted during the next quarter.

15% Complete

Subtask 2.2: TWRI, with assistance from members of the Ag Monitoring Oversight Committee, will organize the results from the earlier non-point source pollution projects conducted in the Arroyo Colorado watershed and summarize the results and conclusions of these studies.

The following actions have been completed during this reporting period:

- a. Results and conclusions from approximately 10 studies have been compiled and summarized. Draft report is included in Appendix A.

50% Complete

Subtask 2.3: TWRI, with assistance from members of the Ag Monitoring Oversight Committee, will identify critical data gaps that should be filled.

The following actions have been completed during this reporting period:

- b. Nothing to report at this time.

0% Complete

Subtask 2.4: TWRI will transfer results to TCE to be used to develop educational material through the FY05 Arroyo Education Project.

The following actions have been completed during this reporting period:

- a. Nothing to report at this time.

0% Complete

TASK 3: Inventory Conservation Practice Implementation

Subtask 3.1: TAES-Temple, with assistance from TCE, USDA-NRCS, USDA-FSA, the TSSWCB Harlingen Regional Office, and the SWCDs, will identify all producers in the watershed.

The following actions have been completed during this reporting period:

- a. TSSWCB-Harlingen, is compiling all of the producers that adopted BMPs since 2002 as previous studies went contained data from 1999 thru 2002. TAES-Temple is still waiting on this information from TSSWCB. TAES-Temple will be traveling to Harlingen during the next quarter to attempt to obtain this information from TSSWCB.

30% Complete

Subtask 3.2: TAES-Temple, with assistance from TCE, USDA-NRCS, USDA-FSA, the TSSWCB Harlingen Regional Office, and the SWCDs, will compile information on the location and types of Conservation Practices implemented in the Arroyo Colorado Watershed since 1995. This will include, but not be limited to, practices implemented through the Environmental Quality Incentives Program (EQIP) and the Water Quality Management Plan (WQMP) Program.

The following actions have been completed during this reporting period:

- a. TSSWCB is compiling a list of the specific BMPs adopted from 2002. TAES-Temple is still waiting on this information from TSSWCB. TAES-Temple will be traveling to Harlingen during the next quarter to attempt to obtain this information from TSSWCB.

30% Complete

Subtask 3.3: TAES-Temple will assemble a geo-referenced database and develop a map (hard copy and electronic) displaying conservation practice implementation information collected in Subtask 3.2.

The following actions have been completed during this reporting period:

- a. TDA (Edinburg) will provide detailed aerial photos of the watershed that can be overlaid with the geo-referenced database of implemented BMPs. TAES-Temple will be traveling to Edinburg during the next quarter to attempt to obtain this information from TDA.

30% Complete

Subtask 3.4: TAES-Temple will transfer the information from Subtask 3.1 and Subtask 3.3 to TCE for use in targeting educational activities.

The following actions have been completed during this reporting period:

- a. Plans to coordinate this transfer will be discussed during the next quarter once all of the data and information is received.

0% Complete

Subtask 3.5: TAES-Temple will identify areas needing priority implementation work through correlation with Task 4 and the results from Tasks 6-9.

The following actions have been completed during this reporting period:

- a. Nothing to report at this time.

0% Complete

TASK 4: Update Land Use/Land Cover Data

Subtask 4.1: The Spatial Sciences Lab (SSL) will obtain 1998 LULC for the Arroyo Colorado Watershed from TCEQ and all data used to produce it. Coordinate with TPWD and the Habitat Work Group to obtain relevant recent LULC data. Identify the major changes from 1998 to 2005.

The following actions have been completed during this reporting period:

- a. Following approval of the QAPP, extensive progress has been made on updating all obtained data and SSL was able to create a preliminary draft of the LULC map.

75% Complete

Subtask 4.2: SSL will obtain 2003 LANDSAT ETM+ Data, Path 26/ Row 42 and Path 27/ Row 42. Proceed to image classification at a level equivalent to the MRLC classification to level 2.

The following actions have been completed during this reporting period:

- b. Following approval of the QAPP, extensive progress has been made on updating all obtained data and SSL was able to create a preliminary draft of the LULC map.

75% Complete

Subtask 4.3: If available, SSL will obtain applicable digital data on cropland from USDA – FSA and add up to level 2 classification.

The following actions have been completed during this reporting period:

- c. Following approval of the QAPP, extensive progress has been made on updating all obtained data and SSL was able to create a preliminary draft of the LULC map.

75% Complete

Subtask 4.4: If available, SSL will obtain digital location data on citrus production from USDA-APHIS and add up to level 2 classification.

The following actions have been completed during this reporting period:

- d. Following approval of the QAPP, extensive progress has been made on updating all obtained data and SSL was able to create a preliminary draft of the LULC map.

75% Complete

Subtask 4.5: If available, SSL will obtain digital data on locations of sugarcane fields from sugar mill and add up to level 2 classification.

The following actions have been completed during this reporting period:

- e. Following approval of the QAPP, extensive progress has been made on updating all obtained data and SSL was able to create a preliminary draft of the LULC map.

75% Complete

Subtask 4.6: SSL will obtain 2004 1m DOQ for Cameron, Hidalgo and Willacy counties. Improve the level 2 classification to a level 4 classification by manual digitalization.

The following actions have been completed during this reporting period:

- f. Following approval of the QAPP, extensive progress has been made on updating all obtained data and SSL was able to create a preliminary draft of the LULC map.

75% Complete

Subtask 4.7: SSL will obtain most recent digital data from irrigation districts and add up to level 4 classification.

The following actions have been completed during this reporting period:

- g. Following approval of the QAPP, extensive progress has been made on updating all obtained data and SSL was able to create a preliminary draft of the LULC map.

75% Complete

Subtask 4.8: SSL will obtain 1998 tile drainage data and if available, obtain updated data from TSSWCB and TCE.

The following actions have been completed during this reporting period:

- a. Tile drainage data was unavailable.

75% Complete

Subtask 4.9: SSL will obtain 1998 data on colonia and if available, obtain updated data from TWDB. Superpose colonia data to level 4 classification.

The following actions have been completed during this reporting period:

- h. Following approval of the QAPP, extensive progress has been made on updating all obtained data and SSL was able to create a preliminary draft of the LULC map.

75% Complete

Subtask 4.10: SSL will obtain 1998 data on non-colonia septic systems and if available, obtain updated data from Lower Rio Grande Valley Development Council (LRGVDC). Superpose non-colonia septic systems data to level 4 classification.

The following actions have been completed during this reporting period:

- a. Non-colonia septic systems data unavailable from the LRGVDC.

75% Complete

Subtask 4.11: SSL will obtain 1998 data on land Application and if available, obtain updated data from NPDES Permits. Superpose land application data to level 4 classification.

The following actions have been completed during this reporting period:

- i. Following approval of the QAPP, extensive progress has been made on updating all obtained data and SSL was able to create a preliminary draft of the LULC map.

75% Complete

TASK 5: Develop Quality Assurance Project Plan

Subtask 5.1: TWRI will develop a Quality Assurance Project Plan (QAPP) that will detail project goals and objectives relating to water quality monitoring activities; identify the data needed to fulfill those objectives; list field and laboratory methods; describe procedures and schedules to be followed; and specify a data management structure and the quality assurance protocols.

The following actions have been completed during this reporting period:

- a. A revised QAPP was submitted to TSSWCB along with signature pages.
- b. EPA approved the QAPP.

100% Complete

Subtask 5.2: TWRI will provide annual revisions and necessary amendments to the QAPP to the TSSWCB and EPA.

The following actions have been completed during this reporting period:

- a. Nothing to report at this time.

0% Complete

TASK 6: Perform Sub-Watershed Monitoring and Measure Pollutant Attenuation in Drainage Ditches

Subtask 6.1.1: TAMUK will perform routine monthly grab sampling at four drainage ditch sites.

The following actions have been completed during this reporting period:

- a. Refined analytical measurement protocols during QAPP development. Namely, all sample analysis protocols were re-structured to obtain better analytical resolution. In particular, the analysis of anions and cations will be carried out using ion-chromatographic methods instead of the spectrophotometric methods.
- b. Also during QAPP development, the CBOD5 measurement will be carried out as per the AWWA standard methods which is approved by USEPA
- c. No sampling occurred as the QAPP was not approved until late in this quarter.

5% Complete

Subtask 6.1.2: TAMUK will periodically operate automated samplers and water-level recorders at all four drainage ditch sites to characterize the effects of run-off generated by high storm flow pulses.

The following actions have been completed during this reporting period:

- a. No activity occurred as the QAPP was not approved until late in this quarter.

0% Complete

Subtask 6.1.3: Stage-discharge relationships will be developed, maintained and updated, as necessary, for all drainage ditch sites.

The following actions have been completed during this reporting period:

- a. No activity occurred as the QAPP was not approved until late in this quarter.

5% Complete

Subtask 6.1.4: TAMUK will conduct routine general maintenance of all automated sampling and water level equipment to help ensure that these instruments will operate properly during storm flow conditions.

The following actions have been completed during this reporting period:

- a. No activity occurred as the QAPP was not approved until late in this quarter.

0% Complete

Subtask 6.1.5: TAMUK will develop a report summarizing the monitoring data.

The following actions have been completed during this reporting period:

- a. Nothing to report at this time.

0% Complete

Subtask 6.2.1: In coordination with the sub-watershed monitoring sites discussed in Task 6.1, TAMUK, with assistance from TAES, will assess nitrogen and phosphorous mitigation processes in drainage ditches.

The following actions have been completed during this reporting period:

- a. No activity occurred as the QAPP was not approved until late in this quarter.

5% Complete

Subtask 6.2.2: TAMUK, with assistance from TAES, will develop a suite of suitable BMPs that incorporates the information obtained from the investigation of agricultural drainage ditches described in Subtask 6.2.1 above.

The following actions have been completed during this reporting period:

- a. Nothing to report at this time.

0% Complete

TASK 7: Evaluate BMPs to Reduce NPS Pollution at the Farm Level

Subtask 7.1: Selection of sites. Texas Cooperative Extension (TCE), Texas Agricultural Experiment Station-Weslaco (TAES-Weslaco), and Texas A&M University-Kingsville (TAMUK) will select suitable demonstration sites to assess loadings from agricultural runoff and leachate produced by different BMPs and compare traditional practices with innovative BMP for the three (3) most representative crops of the watershed. Six (6) representative sites will be characterized and physical characteristics of such as topography, soil texture, salinity and fertility levels, water quality and crops will be obtained and evaluated

The following actions have been completed during this reporting period:

- a. Six sites have been selected and included in the QAPP.

100% Complete

Subtask 7.2: Installation of sensors. Flow meters, rain gauges, piezometers, soil water sensors will be installed by TAES-Weslaco in the demonstration sites

The following actions have been completed during this reporting period:

- a. No activity occurred as the QAPP was not approved until late in this quarter.

0% Complete

Subtask 7.3: Collection and analysis of Data. Runoff and leachate samples will be collected by TAES-Weslaco for the different practices and laboratory analyses will be performed to determine agricultural loadings such as nutrients and solutes. BMPs and traditional practices will be compared economically and their relationship with nutrient loadings will be established

The following actions have been completed during this reporting period:

- a. No activity occurred as the QAPP was not approved until late in this quarter.

0% Complete

Subtask 7.4: Field Days and Result Demonstrations. TCE will conduct one field day and one result demonstration per year to demonstrate and transfer the result to farmers and interested persons. Newspaper and communications media will be used to divulge the results

The following actions have been completed during this reporting period:

- a. Nothing to report at this time.

0% Complete

TASK 8: Develop Final Report

Subtask 8.1: TWRI, with assistance from TAES and TAMUK, will prepare final report for submittal to the TSSWCB.

0% Complete

III. Related Issues/Current Problems and Favorable of Unusual Developments

- The administrative arm of the Texas Water Resources Institute has a new name. Texas Agricultural Experiment Station and Texas Cooperative Extension are now the Texas AgriLife Research and the Texas AgriLife Extension Service, respectively.

IV. Projected Work for Next Quarter

Task 1

- Year 1, Quarter 5 Report will be submitted.
- Host a meeting with the Ag Monitoring Oversight Committee.
- Participate in an AC Steering Committee Meeting and provide a project update to the Steering Committee.

Task 2

- A summary of prior studies will be provided to the Ag Monitoring Oversight Committee.
- Work will begin on identifying critical data gaps next quarter.
- Graphs of data and trends will be submitted to TSSWCB.

Task 3

- TAES-Temple personnel will travel to project area to finalize receipt of all data. Information will be compiled and shared with TCE and other project personnel.

Task 4

- Review the preliminary draft of the LULC map, metadata and report.

Task 5

- Revisions, if necessary, to the QAPP will be submitted

Task 6

- Sub-watershed monitoring will commence.

Task 7

- BMP evaluation will commence.

APPENDIX A

Arroyo Colorado: A Compilation and Evaluation of Prior Studies and Data

DRAFT 1-15-08

This report was compiled per TSSWCB Agreement No. 06-10-07-05. This project, “Arroyo Colorado Agricultural Nonpoint Source Assessment” funded by the TSSWCB through the FY 06 CWA 319(h) Grant Program. Under this project, TWRI was tasked to (1) compile historical water quality data and information from previous studies and conduct a detailed analysis of the most significant water quality parameters to investigate the trends and the different biological and physical process taking place in the watershed that contribute to changes in water quality in the Arroyo and (2) organize the results from the earlier non-point source pollution projects conducted in the Arroyo Colorado watershed and summarize the results and conclusions of these studies.

Only water quality data related to agricultural or listed as unclassified was included

Historical Water Quality Data

University of Texas – Pan American. 1995. Report of Literature Review on Discharges from the Rio Grande and Arroyo Colorado and their Impacts. Available online at: www.utpa.edu/csl/ Acrobat/litrev.pdf

“Bryan (1971) reported on salinity, dissolved oxygen, pH, and temperature in the Arroyo Colorado from 1966 through 1969 (dates of initiation and ending not given). Hurricane Beulah (September 1967) occurred during the study, and rainfall resulting from the storm caused widespread flooding and many changes in the Arroyo. The water became more saline at all levels as it progressed downstream, and salinity increased with depth at all five stations (Bryan, 1971). During the study period, dissolved oxygen ranged from zero at the bottom (4.2 m) to 11 ppm at the surface (0.6 m). But in August 1967, surface dissolved oxygen values ranged from 1.4 to 3.4 ppm and the bottom contained no oxygen (Bryan, 1971). There was a significant inverse relationship between salinity and dissolved oxygen (Bryan, 1971). Bryan (1971) reported that eight fish kills occurred during his study in 1966-69 of the lower reach of the Arroyo Colorado. Most of these occurred between June and September. No direct sources of pollution were found in any of the cases, but in two kills that were investigated while in progress there was no oxygen at any level of the water column. The majority of fish found dead were menhaden, but other species were usually included.

White et al. (1983) found elevated levels of DDE and toxaphene in freshwater fishes at all sites where they occurred along the Arroyo, above the Port of Harlingen. Based on analysis of tissue samples obtained from the Arroyo Colorado in December 1987, Davis (1989) concluded that long-term human health risks may be associated with consumption of fish from the Arroyo Colorado due to elevated concentrations of chlordane, dieldrin, p, p' dde, and dacthal. In the Arroyo Colorado, toxic chemicals identified in screening as “of interest” included chlorine, ammonia, copper, nickel,

selenium, zinc, methylene chloride, chloride, chlordane, dacthal, dieldrin, and p, p' dde. Potential sources of input were identified as urban runoff, municipal effluents, and agricultural runoff and return flows.”

Texas State Soil and Water Conservation Board. 1998. Arroyo Colorado Watershed Nonpoint Source Pollution Project

“Agricultural applications of pesticides and fertilizers, in conjunction with the irrigation and drainage systems of the area, have been implicated by various studies as contributing to water quality problems. Urban runoff and effluent from 26 wastewater treatment facilities in Segment 2202 and 6 facilities in Segment 2201 have also been cited as contributing to lower water quality in the Arroyo Colorado. The tidal segment experiences the expected saltwater intrusion and concomitant lower dissolved oxygen and higher salt content (Twidwell, 1978).

Data collected from Segment 2201 by the Texas Department of Water Resources in 1976 indicated eutrophic conditions and the presence of pesticides in sediments (Twidwell, 1978). In 1980, the Texas Department of Health issued an advisory recommending restricted consumption of all fish from the Arroyo Colorado above Port Harlingen. Intensive surveys of Segment 2201, conducted by the Texas Department of Water Resources in the early to mid 1980s, consistently found evidence of eutrophication and pesticides. National Oceanic and Atmospheric Administration has reported that the Lower Laguna Madre watershed, which consists primarily of the Arroyo Colorado watershed, has the most intensively applied herbicides and insecticides of any watershed in Texas (TNRCC, 1994a). In addition, soil loss from cropland in the Lower Laguna Madre watershed exceeds that of the U.S. side of the Rio Grande Watershed, a decidedly larger area (TNRCC, 1994a).

Human activities frequently increase the amount of accumulated rainfall remaining on the land for extended periods. Standing water can cause a subsequent rise in the water table which ultimately increases soil salinity, leading to non-productive soils. (USACE, 1990a).

TAEX, as part of this project, has assembled a database of available water quality data on the Arroyo Colorado (Fipps, 1996). The database, available through internet access, contains data from 48 stations for the period of record from 1982 through 1994.”

Results of Prior Studies

Texas State Soil and Water Conservation Board. 1998. Arroyo Colorado Watershed Nonpoint Source Pollution Project Final Report

“Corps engineers analyzed a full array of plans to provide flood damage reduction for the urban watersheds and agricultural watersheds, but determined that Federal participation would not be economically justified at that time (USACE, 1990a). The study found that

...pesticide contamination has been identified as a widespread problem of inland waters of the project area. The quality is also influenced by sewage effluent, cannery and food processing wastes, canal seepage

and storm run-off. Increased runoff associated with any flood control or drainage project has the potential to increase these problems if proper planning efforts are not accomplished. Proper drainage design of agricultural land and implementation of various farming practices could significantly improve water quality of the area (USACE, 1990a).

The Corps recommends water conservation techniques and farming practices which could reduce the level of pesticides and improve water quality.

An analysis of long-term trends for seven water quality indicators including dissolved oxygen, sulfate, nitrate, fecal coliform, dissolved phosphorus, total phosphorus, and chloride was conducted for the North Floodway (Segment 2200), Arroyo Colorado, tidal (Segment 2201) and Arroyo Colorado, above tidal (Segment 2202). Results indicated that nitrate, dissolved phosphorus, total phosphorus and sulfate were potential water quality problems in all three of the designated segments (Fipps, 1996).”

Arroyo Colorado Watershed Protection Plan: Phase I. 2007. Available online at: arroyocolorado.org.

“As required by federal law, the Texas Commission on Environmental Quality (TCEQ) established TMDLs for four legacy pesticides in 2001 and added eight additional TMDLs for toxic organic compounds in 2003. In addition to these TMDLs, the TCEQ also completed a TMDL study to address low dissolved oxygen (DO) in 2002. The TMDL study showed that extensive physical modifications (i.e. dredging and channelization for navigational purposes) and excessive nutrient concentrations were the cause of periodic, but occasionally severe, oxygen depletion in the boundary between the fresh water and tidally influenced portions of the stream.”

Rosenthal, Wes. 1999. Final Report For the WQMP Implementation Assistance In the Arroyo Colorado Watershed Management Project FY 99, Clean Water Act, Section 319(h) Nonpoint Source Grant Contract No. 99-104. Blackland Research Center. Available online at: arroyocolorado.org.

“From 1999-2000 and in 2001-2002, the TSSWCB obtained information on individual farmers/ranchers that implemented nutrient, irrigation, and residue management BMP’s within the watershed.....SWAT simulation results indicate both tillage practices are not expected to degrade the ambient water quality on average below EPA drinking water quality for nitrate-N levels. Both conventional and conservation tillage and nutrient management resulted in less than 5 ppm of nitrate-N concentrations. Total P concentrations were even less, below 0.8 ppm....Low nutrient losses were probably attributed to the fact that this watershed area has a very flat topography, which minimizes runoff and sediment losses.....Major (SWAT) model output components include surface runoff percolation, groundwater contribution to stream flow, and sediment, pesticide and nutrient loadings.”

Arroyo Colorado Agricultural Nonpoint Source Assessment. FY 2006 TSSWCB 319(h) Project 06-10. In Progress.

Updated land use/land cover data; database and map showing location and types of conservation practices implemented since 1995; monitoring of drainage ditches; evaluation of BMP effectiveness on reducing agricultural NPS loadings.

SWAT Model Simulation of the Arroyo Colorado Watershed. FY 2007 TSSWCB 319(h) Project 02-021-07-09. In Progress.

GIS maps related to soil, land use, and topography of the watershed; compile water quality data for 1999-2006; time series of average daily flow (in CMS) and sediment, BOD, NH₃-N, NO₂+NO₃, TN, OP and TP loadings (in metric units of mass) at the Port of Harlingen and for each sub-basin (10-14) downstream of the Port of Harlingen (flow to be reported as flow volume for the sub-basins) formatted for input into EFDC; and predictions based on model's results.

Data Gaps

Texas State Soil and Water Conservation Board. 1998. Arroyo Colorado Watershed Nonpoint Source Pollution Project Final Report

“We were not able to do statistical tests and trend analysis of the monitoring data due to the limited amount and inconsistency of the data, and experimental errors in the establishments of the sites.”

Rosenthal, Wes. 1999. Final Report For the WQMP Implementation Assistance In the Arroyo Colorado Watershed Management Project FY 99, Clean Water Act, Section 319(h) Nonpoint Source Grant Contract No. 99-104. Blackland Research Center. Available online at: arroyocolorado.org.

“This study is limited by the scarcity of validation data (crop yields and in-stream monitoring) for sedimentation and in-stream flow measurements of runoff (Rosenthal 1999). Additionally, the low N and P losses may be due to the fact that simulations were based on the simplified land use/cover conditions, i.e., all urban land was treated as unfertilized Bermuda grass. In the event that such simplifications were removed, using the actual urban land will probably simulate higher magnitudes of N and P losses.”

Arroyo Colorado Watershed Protection Plan: Phase I. 2007. Available online at: arroyocolorado.org.

“Uncertainty (of watershed loading estimates) associated with the DO TMDL analysis by TCEQ in 2002...

Characterization of watershed loadings, in-stream rates and constants, and DO dynamics in the Arroyo Colorado should be improved to enhance understanding of the cause-and-effect relationships between flow, loadings, biochemical interactions and physical setting. Studies should include edge-of-field measurements of flow and constituent concentrations resulting from runoff and irrigation events, measurements of irrigation return flow volumes, direct monitoring of nutrient loading from municipal wastewater facilities, measurements of SOD in the upper portion of Segment 2201, measurements of nutrient cycling and algal productivity, measurements of particulate organic matter loadings from various sources in the watershed and measurement of the deposition and accumulation rates of particulate organic matter in the upper portion of Segment 2201.

The results of the data collection efforts described above would be used to enhance the sophistication of modeling efforts and to refine the overall TMDL analysis of the Arroyo Colorado. More detailed hydrodynamic modeling should be conducted on the tidal segment of the Arroyo Colorado in order to better characterize the effects of the complex hydraulic environment that exists in Segment 2201. Additional data collection should be conducted to document kinetic rates, productivity parameters and nutrient cycling parameters for use in the hydrodynamic model.”

University of Texas – Pan American. 1995. Report of Literature Review on Discharges from the Rio Grande and Arroyo Colorado and their Impacts. Available online at: www.utpa.edu/csl/Acrobat/litrev.pdf

“Insufficient monitoring data are available to assess non-point-source pollution and toxic material loadings. A comprehensive study to identify and quantify the inputs for point and non-point sources and toxic materials loading should be initiated. Existing sampling programs should be expanded to provide for multi-depth quantification of nutrient concentration. Irrigation return flow, runoff and rainfall inputs are not monitored and there is no flow gauge near the mouth of the Arroyo Colorado to quantify discharge volumes to the lower Laguna Madre. Need to monitor shrimp farm effluent and runoff from shallow ponds.”