

**SWAT Model Simulation of the Arroyo Colorado Watershed
CWA 319(h)
TSSWCB Agreement No. 02-021-07-09**

Quarter no. 2 From 10/1/07 Through 12/31/07

I. Abstract

The QAPP was approved by EPA this quarter and therefore, significant progress was made towards finalizing obtaining data and even conducting preliminary runs. A final LULC map will be necessary to begin more detailed runs and model calibration and validation. We expect to receive this map during the next quarter and thus, extensive progress will be made during the next quarter.

II. Overall Progress and Results by Task

TASK 1: Coordinate and Administer Project

Subtask 1.1: TWRI will coordinate project efforts with all project partners, as well as ongoing projects in the watershed. These projects include the Arroyo Colorado Ag NPS Assessment, Education of BMPs in the Arroyo Colorado Watershed, and the WQMP Implementation Assistance in the Arroyo Colorado Watershed. TWRI will participate in Arroyo Colorado Watershed Partnership meetings (steering committee and work groups) to report progress and coordinate efforts. TTVN meetings or teleconferences will be held, as appropriate, with project partners to discuss project activities, project schedule, lines of responsibility, communication needs, and other requirements.

The following actions have been completed during this reporting period:

- a. TWRI participated in the Arroyo Colorado Watershed Partnership Steering Committee meeting on October 24, 2007 and presented a background on the SWAT modeling project and its status at the meeting.

34% Complete

Subtask 1.2: TWRI will prepare electronic quarterly reports for submission to the TSSWCB. Progress reports shall document all activities performed within a quarter and shall be submitted by the 15th of January, April, July, and October. All progress reports will be provided to all project partners.

The following actions have been completed during this reporting period:

- a. Submitted Year 1, Quarter 2 Report on January 15, 2008.

34% Complete

Subtask 1.3: TWRI, with support from SSL and TAES, will develop a QAPP for activities in Task 2 consistent with EPA Requirements for Quality Assurance Project Plans (QA/R-5) and the TSSWCB Quality Management Plan.

The following actions have been completed during this reporting period:

- a. The QAPP was approved by EPA on October 24, 2007.

100% Complete

Subtask 1.4: TWRI will implement the approved QAPP and provide revisions and necessary amendments to the QAPP.

The following actions have been completed during this reporting period:

- a. Nothing to report at this time.

0% Complete

Subtask 1.5: TWRI will attend meetings with the TSSWCB project manager and other meetings, as needed, to review project status, deliverables, and other project matters.

The following actions have been completed during this reporting period:

- a. No meeting has occurred to date. TWRI will meet with TSSWCB and the Ag Monitoring Oversight Committee (Ag Issues Workgroup) during the next quarter.

0% Complete

Subtask 1.6: TWRI will perform accounting functions for project funds and will submit appropriate Reimbursement Forms to TSSWCB at least quarterly.

The following actions have been completed during this reporting period:

- a. An invoice for the amount of \$849.64 was submitted for the period of September 1, 2007 through November 30, 2007.

17% Complete

Subtask 1.7: TWRI will develop, host and maintain an internet website for the dissemination of information.

The following actions have been completed during this reporting period:

- a. The Arroyo Colorado Web site, <http://www.arroyocolorado.org>, is currently up and running on the TWRI server. Information on the SWAT modeling project as well as all other ongoing Arroyo Colorado projects was posted to the site. Project related information will continually be updated.

34% Complete

Subtask 1.8: TWRI, with assistance from SSL and TAES, will develop the final report and technical documentation of the project for submission to TSSWCB, EPA, and project partners.

0% Complete

Task 2: Watershed data compilation, analysis, and simulation using SWAT

Subtask 2.1: Various data such as land use (current and historical), soil, BMP implementation locations, topography, sub-watershed delineation (matching earlier HSPF sub-watersheds), long-term weather data, crop management practices, stream flow and water quality data (current and historical) on sediment, BOD, and nutrients, for the Arroyo Colorado Watershed will be compiled for the period of 1999-2006 from sources such as USGS, TCEQ, TWDB, TPWD, IBWC, Nueces River Authority (NRA), TAES, TCE, and NRCS.

The following actions have been completed during this reporting period:

- a. Data assembly continues including the following. Figures referenced in this text can be found in Appendix A.

Watershed delineation

AVSWAT-X (Arc View SWAT interface for SWAT-Extended version) is used for preparing the SWAT model setup of Arroyo Colorado. For delineation of watershed boundary, 30-m USGS DEM was used. The 10 m resampled DEM did not bring any significant advantage over the 30 m DEM in terms of watershed boundary or stream network. Therefore, the 30-m DEM is eventually used for watershed delineation. A digitized stream network and a watershed boundary (from the previous HSPF modeling study) were used as supporting information for the delineation of watershed and stream network for the present Arroyo SWAT modeling setup. A threshold of 1600 ha is used for the delineation of stream. The watershed boundary and stream network obtained from AVSWAT is shown in figure 1.

Sub-watershed delineation:

Most of the default sub-basin outlets produced by the AVSWAT interface were removed. Efforts were made to have the sub-watershed delineation similar to the previous HSPF modeling study (This will help to make any comparison of results in the future). To do this, some additional sub-basin outlets were added. This resulted in 17 sub-basins in the Arroyo Colorado watershed (figure 2).

Land Use Map:

Following approval of the QAPP for the Arroyo Ag Assessment project (TSSWCB No. 06-10-07-05), a preliminary draft of the land use map, prepared by Spatial Sciences Lab, was provided to TAES-Temple. The draft map incorporates the present land use conditions (2004-2007). Crop rotation, irrigation, and dates of planting are also available with the land use map on a farm/field basis.

Soil Map:

The SSURGO soil map was downloaded from USDA-NRCS for Cameron, Willacy and Hidalgo counties. Similar to land use map, the soil map was also reclassified as required for HRU delineation. The reclassified soil map is shown in figure 3. The soil properties associated with a particular soil type is derived using the SSURGO soil database tool available with the AVSWAT-X interface.

HRU delineation:

HRU is a unique combination of soil and land use in the watershed. To delineate the HRUs the thresholds used were 2 % for land use and 6 % for soil. Although there were more categories in the soil map than the draft land use map, a smaller threshold (will favor a more detailed representation in the model setup) was used for the draft land use map because it is very important to capture the variations in land use. Using the above-mentioned thresholds, the watershed is discretized to 475 HRUs. Areas as small as 22.5 acres are represented a HRU. After the HRU delineation, various input files required for running the SWAT model were created using the interface.

Management Data:

A majority of the management data has been received, but TAES-Temple is still without some of the key input data such as fertilizer input and irrigation information to various crops. Therefore, TAES-Temple plan to travel to the watershed during the next quarter to gather additional data.

60% Complete

Subtask 2.2: The SWAT model will be set up and calibrated to measured flow and in-stream measurements of sediment, BOD, and nutrient concentrations for the period of 1999-2003 (with 1999 as warm-up period) using monitoring data available from USGS and IBWC stream gages, as well as data from the TWDB, TCEQ, and NRA. Model parameters related to (sub) watershed/landscape processes will be adjusted to match the measured and simulated flow, sediment, BOD and nutrient loading at key locations in each subwatershed.

The following actions have been completed during this reporting period:

- a. Following QAPP approval, TAES Temple set up a preliminary run for the Arroyo Colorado for flow.

5% Complete

Subtask 2.3: Subsequent to calibration, the model will be validated using measured flow and in-stream measurements of sediment, BOD, and nutrient concentrations for the period of 2004-2006.

The following actions have been completed during this reporting period:

- a. No action to report at this time.

0% Complete

Subtask 2.4: Simulate load reduction scenarios for a suite of management measures specified by the TSSWCB.

The following actions have been completed during this reporting period:

- a. No action to report at this time.

0% Complete

Subtask 2.5: Provide TSSWCB the flow and watershed loadings to the Arroyo Colorado, as determined by SWAT, for input by TCEQ into the EFDC model. SWAT output will include 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).

The following actions have been completed during this reporting period:

- a. No action to report at this time.

0% Complete

III. Related Issues/Current Problems and Favorable or 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

- Submit year 1, quarter 3 report
- Attend the Ag Monitoring Oversight Committee (Ag Issues Workgroup) and the Arroyo Colorado Partnership Steering Committee meeting during the next quarter and provide an update on the Arroyo SWAT project at both meetings.

Task 2

- Work with SSL to obtain a final copy of the LULC map.
- Add additional information such as management and cropping practices to the LULC map.
- Conduct preliminary model runs to calibrate and validate the model per task 2.

APPENDIX A

**Supporting figures for Task 2,
“Watershed data compilation, analysis, and simulation using SWAT”**

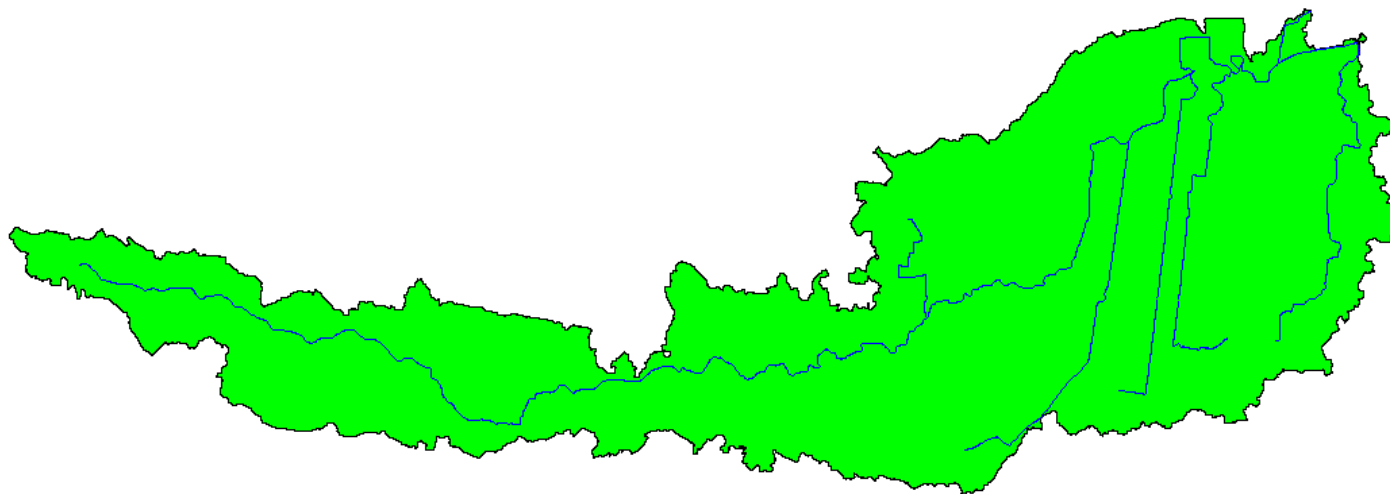


Figure 1 Watershed boundary and stream network of Arroyo Colorado

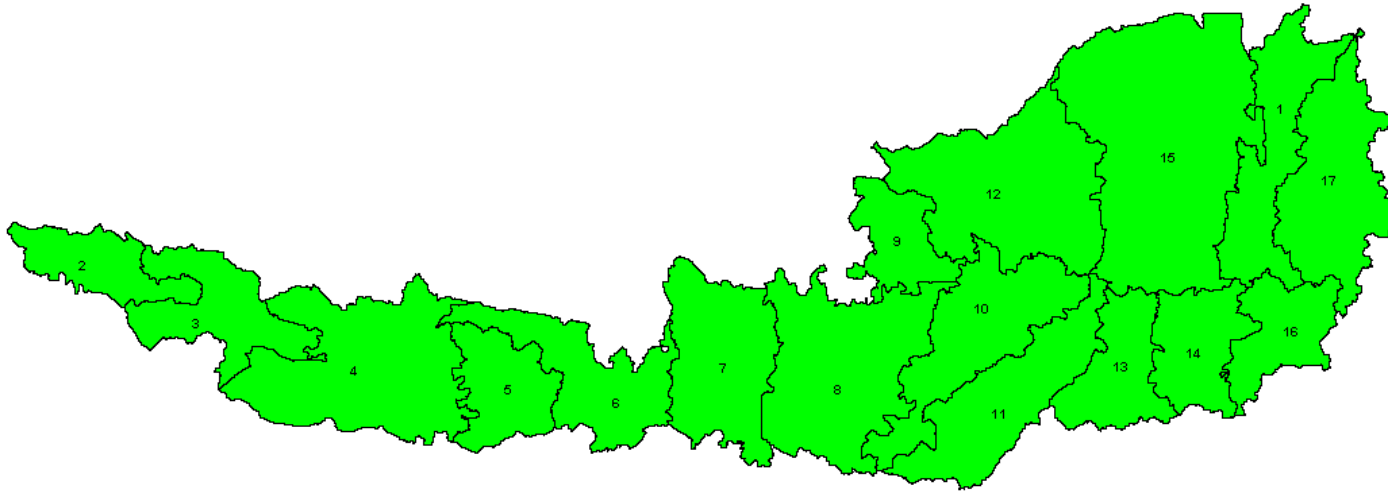


Figure 2 Sub-watersheds of Arroyo Colorado

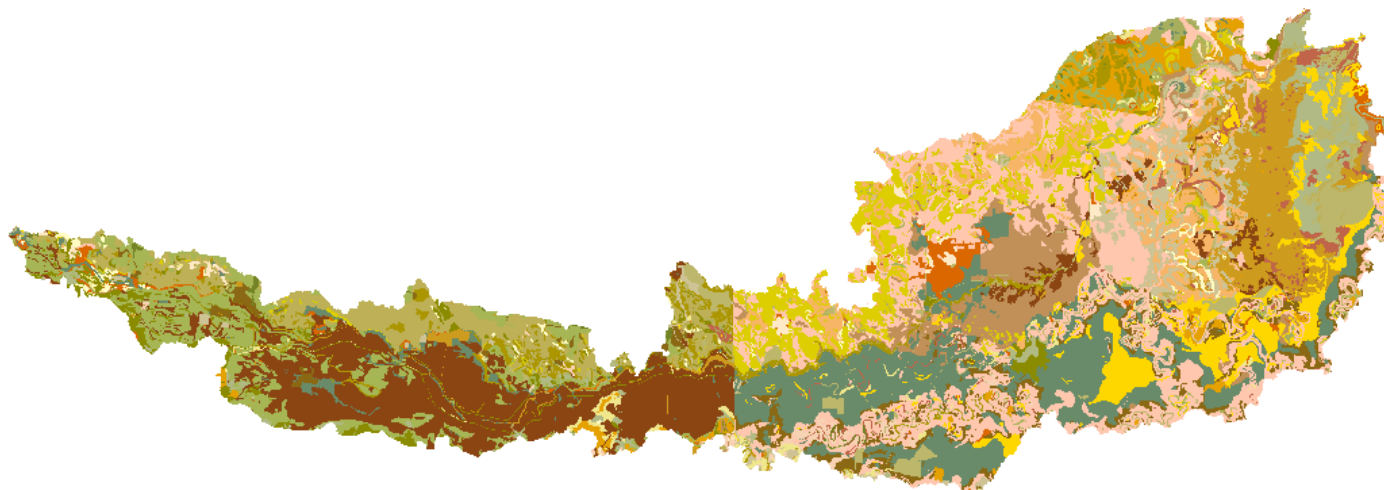


Figure 3 Reclassified soil map of Arroyo Colorado