

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

Quarter no. 3 From 1/1/08 Through 3/31/08

I. Abstract

Significant progress was made on the SWAT model for the Arroyo Colorado Watershed. With the addition of the updated LULC map, more detailed runs and model calibration and validation began.

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 Ag Issues Workgroup and the Steering Committee meetings on January 24, 2008 to present current activities of all three ag-related projects.
- b. Dr. Narayanan Kannan presented the background and status of the SWAT modeling project to both meetings. A link to this presentation can be found at:
<http://www.arroyocolorado.org/docs/Presentations/SWATModeling-Kannan.pdf>

50% 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 3 Report on April 15, 2008.

50% 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.

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. As previously reported, TWRI participated in the Arroyo Colorado Ag Issues Workgroup and the Steering Committee meetings on January 24, 2008. Additionally, TWRI had an informal meeting with the TSSWCB Project Manager in February to discuss issues brought up at the Workgroup meeting. A followup meeting will be necessary to finalize actions that need to be taken to address these issues.

30% 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 \$1220.35 was submitted for the period of December 1, 2007 through February 29, 2008.

50% 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 updated land use / land cover map will be posted on the Arroyo Colorado Web site, <http://www.arroyocolorado.org>.

50% 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 continued including the following. Figure referenced in this text can be found in Appendix A.

Land Use Map:

The land use map was reclassified using the AVSWAT interface to get a map with broad categories of land use needed for HRU delineation. After reclassification, there were 18 major categories of land use (figure 1). The dominant land uses are agricultural land (51 %), brush and range grasses (18.5 %), urban (15 %), water bodies (6 %) and sugarcane (4.0 %).

Crop rotation and management operations

The land use map came up with the information on crop rotation, irrigation and dates of planting. However, the information was lost after reclassification. Therefore, the reclassified land use map and the original land use map were intersected (in Arc View GIS) to have all the land use related information together. After this, the crop rotation for a particular HRU is allotted using the following procedure:

- a) Every land parcel is associated with a crop rotation information
- b) More than one land parcel exist for a HRU within a sub-basin (same combination of land use and soil can occur in different parts of the sub-basin)
- c) Area of land parcels with similar crop rotation are added together to estimate the total area that comes under a particular crop rotation
- d) All the different crop rotations were sorted based on total area; the crop rotation with the maximum area was allotted to the HRU as the crop rotation for the HRU.

Dates of planting were obtained from the land use map. Dates of harvest were based on the data collected during our visit to the watershed. Presently fertilizer application and irrigation information were not included for the model setup. Instead, auto-fertilizer application (model will calculate nutrient stress; and apply fertilizer when there is stress for nutrients) and auto-irrigation (model will apply water when there is soil moisture stress) options available in SWAT model were used. As soon as the fertilizer application and irrigation information are available, they will be incorporated into the model set up.

90% 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. Using the data gathered under task 2.1, the model was set up and a preliminary model run was conducted.

Preliminary model run:

After creating the necessary input files, SWAT model was run for the period 1999-2006 using 1999 as model warm-up period. The preliminary results for flow at Mercedes are shown along with observations for the similar period (Figures 2a and 2b). It should be noted that the results presented here would change in the future after a calibration, inclusion of additional input information etc.

50% 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

- None to report at this time.

IV. Projected Work for Next Quarter

Task 1

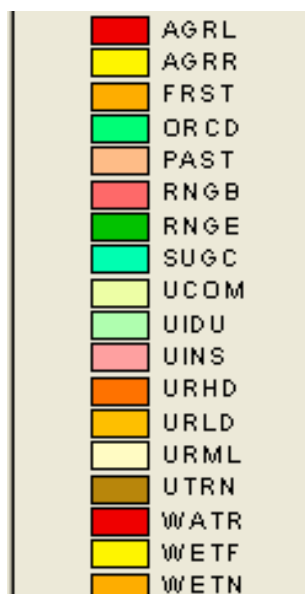
- Submit year 2, quarter 2 report

Task 2

- Conduct preliminary model runs to calibrate and validate the model per task 2.

APPENDIX A

Supporting figures for Task 2:
“Reclassified Land use/Land cover map for the Arroyo Colorado”
“Daily stream flow at Mercedes for 2000-2003”
“Daily stream flow at Mercedes for 2004-2006”



AGRL and AGRR : Agricultural land

SUGC : Sugarcane

FRST : Trees/Forest

RNGE, RNGB : Range grasses and brush

UCOM, UIDU, UINS, URHD, URLD, URML, UTRN : Urban

WATR: Water body

WETF, WETN : Wetland

ORCD: Orchard/Citrus

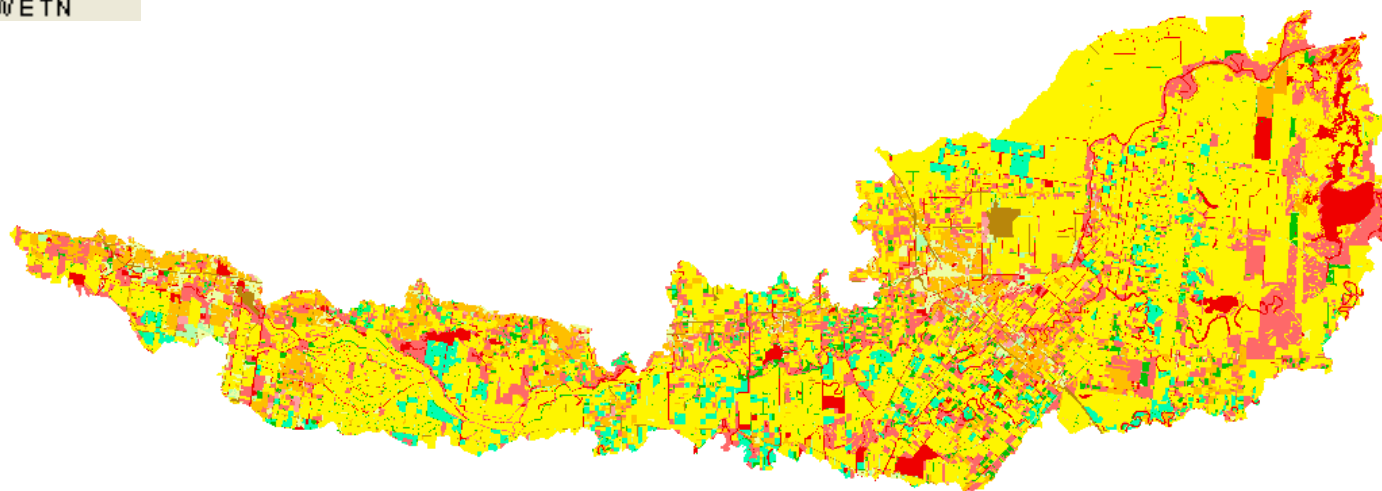


Figure 1. Reclassified land use map of Arroyo Colorado

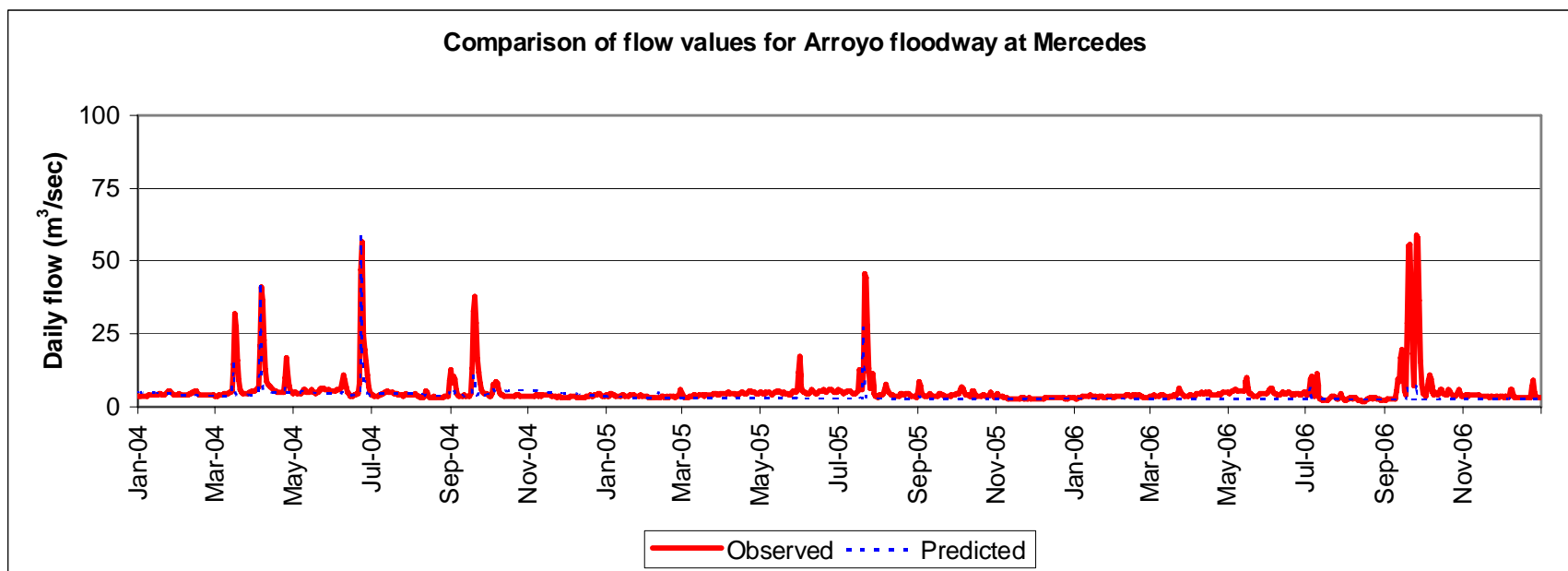


Figure 2a Daily stream flow at Mercedes for 2000-2003

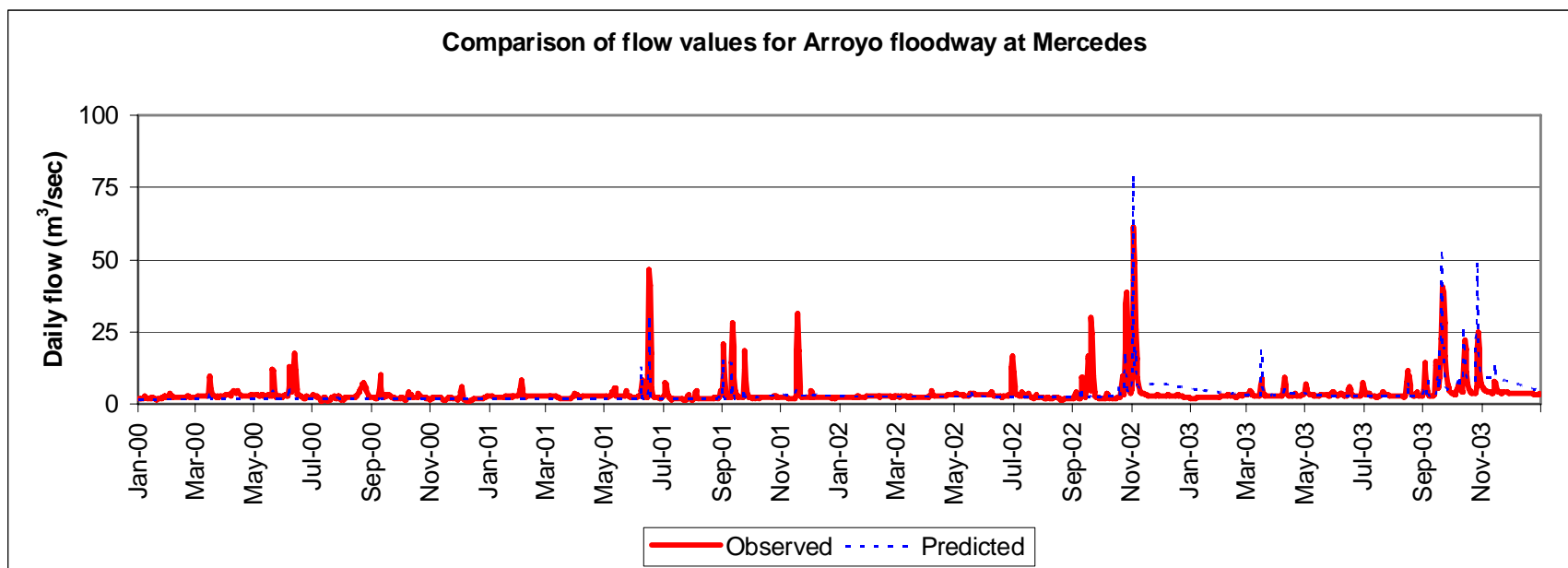


Figure 2b. Daily stream flow at Mercedes for 2004-2006