

TEXAS WATER RESOURCES INSTITUTE  
AND  
TEXAS TECH UNIVERSITY

Development of the Upper Llano River Watershed Protection Plan  
FY 2011 Workplan 11-04

Quarter no. 8 From 7/1/13 Through 9/30/13

**I. Abstract**

The 3<sup>rd</sup> Coordination Committee was held on August 1, 2013. At the meeting, the Committee voted to break into topic working groups to address issues in the Upper Llano Watershed and discussed the timeline of the development of the Watershed Protection Plan. The topic working groups included: 1) riparian protection and management, 2) invasive species (terrestrial and aquatic), 3) upland management, 4) water supply enhancement, and 5) water quality, flow, and conservation. In addition, the historical data review of the Upper Llano watershed was approved by TSSWCB and presented to the Coordination Committee.

This quarter, there were 1230 visits and 512 unique visitors to the SLWA website, primarily associated with the SLWA River Clean-up and the WPP Meeting. The SLWA Facebook Page currently has 102 'likes' and reached a daily maximum of 160 people. TTU-LRFS participated in 11 public meetings, including meetings with the SLWA Board, City of Junction water managers, service organizations, professional conferences, local festivals, and the Texas Freshwater Mussel Identification workshop. The next Coordination Committee meeting will be held after the New Year and will consist of topic working group presentations. Finally, installation of solar panels and a wind turbine at TTU-LRFS were completed. Together, these will power the administration buildings at TTU-LRFS, as well as serve as educational demonstrations for energy saving measures.

On the science side, the 5<sup>th</sup> quarterly stream and spring sampling, along with the 3<sup>rd</sup> semi-annual biological sampling, was conducted on September 16-26. EDYS Model development is now about 85% complete. Model runs will begin once remaining vegetation, rainfall, and animal date are entered. Finally, TTU-LRFS in partnership with TPWD conducted additional elephant ear herbicide spraying.

Next quarter, routine sampling will continue; the 5<sup>th</sup> Coordination Committee meeting, the joint meeting of the Texas Riparian Association and Texas Chapter of the Society for Ecological Restoration, and the Riparian Education Workshop will be held.

**II. Overall Progress and Results by Task**

**Task 1 Project Administration**

*Subtask 1.1 TWRI will prepare electronic quarterly progress reports (QPRs) for submission to the TSSWCB. QPRs shall document all activities performed within a quarter and shall be submitted by the 15th of January, April, July and October. QPRs shall be distributed to all project partners and posted on the project website.*

The following actions have been completed during this reporting period:

- a. The eighth quarterly report was prepared and submitted on October 11, 2013.

**65% Complete**

*Subtask 1.2 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. As of the July 31, 2013 invoice, \$178,770 (27%) of federal project funds had been expended.
- b. As of October 10, 2013, Progress of Allocations to each Project Partner was as follows:
  - TWRI has expended 42% of their funds.
  - ESSM has expended <1% of their funds
  - SSL has expended 28% of their funds.
  - TTU has expended 37% of their funds.

**27% Complete**

*Subtask 1.3 TWRI will host coordination meetings or conference calls, at least quarterly, with project partners to discuss project activities, project schedule, communication needs, deliverables, and other requirements. TWRI will develop lists of action items needed following each project coordination meeting and distribute to project personnel.*

The following actions have been completed during this reporting period:

- a. A coordination meeting was held on August 1, 2013 at 3:00 pm in Junction.

**65% Complete**

*Subtask 1.4 TWRI will work with project personnel from ESSM, TTU-WRC, TTU-LRFS, and SLWA to prepare the WPP incorporating input from stakeholders and findings of monitoring, modeling, and data analysis tasks.*

The following actions have been completed during this reporting period:

- a. No activity to report this quarter.

**0% Complete**

*Subtask 1.5 SLWA will continue to host and maintain a website (<http://southllano.org/>) to serve as a public clearinghouse for all project- and watershed-related information. All presentations, documents and results will be posted to this website. The website will serve as a means to disseminate information to stakeholders and the general public. TWRI and TTU-LRFS shall contribute content matter for the website as appropriate.*

The following actions have been completed during this reporting period:

- a. The SLWA website, listserv, and Facebook page continue to be a resource for stakeholders in the watershed on land and water stewardship, hydrologic and weather conditions, latest news, upcoming events, community participation, and related topics.

- b. Specific topics this quarter included:
- Announcement of Riparian Workshop on October 16<sup>th</sup>
  - Announcement of Texas Riparian Association & Texas Society for Ecological Restoration Conference on November 1<sup>st</sup>-2<sup>nd</sup>
  - The SLWA winning the 2013 Lone Star Land Steward Award for the Landowner Association category mentioned in TPWD Outdoor Magazine: Mothering Nature, Land and water conservation depends on private landowners
  - Mussels-Canaries in the Water
  - Court Ruling presents new challenges to Groundwater Districts
  - Announcement of Texas Well Owner Network Training on June 1<sup>st</sup>
  - South Llano River Fall Cleanup on October 12<sup>th</sup>
- c. For the quarter Jul-Sep 2013, there were 1230 visits and 512 unique visitors to the website, with daily visits at 14/day. Program activities are at a minimum during the summer months and this activity is equal to the activity during the third quarter of 2012. The largest activity spike (70 visits/day) was associated the SLWA River Clean-up. A second spike in activity (35 visits/day) was associated with the Watershed Protection Plan meeting on August 1<sup>st</sup>.
- d. A Facebook Page (<https://www.facebook.com/pages/South-Llano-Watershed-Alliance/>) was launched by the SLWA on March 4, 2013. The page currently has 102 'likes' and reached a daily maximum of 160 people. This maximum was associated with the Paddling Trail on the South Llano River.

### **65% Complete**

*Subtask 1.6 The Director of TTU-LRFS will serve as the Upper Llano River Watershed Coordinator and be responsible for the general oversight and coordination of all project activities, reporting requirements, and educational activities, and serve as the primary conduit for interaction with landowners, citizens, and entities to facilitate the development of the WPP. The Watershed Coordinator shall successfully complete (or have already completed) the Texas Watershed Planning Short Course and participate in Texas Watershed Coordinator Roundtables.*

The following actions have been completed during this reporting period:

- a. Dr. Tom Arsuffi, Director of the TTU-LRFS and Upper Llano River Watershed Coordinator, completed the Texas Watershed Planning Short Course on November 14-18, 2011.
- b. Project partner Tyson Broad of the South Llano Watershed Alliance completed the Texas Watershed Planning Short Course on September 24-28, 2012.

### **100% Complete**

## **Task 2 Quality Assurance**

*Subtask 2.1 TWRI will develop a QAPP for water quality monitoring activities in Tasks 4 and 5 and a QAPP for watershed modeling activities in Task 6 consistent with the most recent versions of EPA Requirements for Quality Assurance project Plans (QA/R-5) and the TSSWCB Environmental Data Quality Management Plan.*

The following actions have been completed during this reporting period:

- a. QAPP for Tasks 4 and 6 – GIS & Modeling
  - Revision 0 (covering only GIS inventory & LULC) approved on July 27, 2012
  - Revision 1 (adding modeling) was approved on August 1, 2013.
- b. QAPP for Task 5, Water Quality Monitoring, was approved on September 6, 2012.

**85% Complete**

*Subtask 2.2 TWRI will implement the approved QAPPs. TWRI will submit revisions and necessary amendments to the QAPPs as needed.*

The following actions have been completed during this reporting period:

- a. QAPP for Tasks 4 and 6 – GIS & Modeling
  - No progress to report. The next update is due in August 2014.
- b. QAPP for Task 5 - Water Quality Monitoring
  - Revision 1 approved on March 5, 2013.
  - The next update is due in March 2014.

**65% Complete**

### **Task 3 Public Participation and Stakeholder Coordination**

*Subtask 3.1 TTU-LRFS, with input from TWRI, SWLA, and Texas AgriLife Extension Service, will compile (Months 1-3) and maintain (Months 4-36) a database of watershed stakeholders and affected parties for use in engaging the public in the watershed planning process. The stakeholder group will be added to based upon previous efforts of SLWA. The database and stakeholder group will represent a diverse cross section of Upper Llano River landowners, citizens, local businesses, local and regional governmental entities and elected officials, state and federal agencies, and environmental and special interest groups.*

The following actions have been completed during this reporting period:

- a. The TTU-LRFS continued work on the database of Upper Llano River watershed stakeholders providing the initial list to the TSSWCB in July 2012. The database grew by 2 members this quarter, and now consists of 437 landowners, citizens, local businesses, local and regional governmental entities and elected officials, state and federal agencies, and environmental and special interest groups.

**65% Complete**

*Subtask 3.2 TTU-LRFS will facilitate public participation and stakeholder involvement in the watershed planning process, specifically project meetings and activities. TTU-LRFS will coordinate meetings, secure meeting locations, prepare and disseminate meeting notices and agendas. Meeting summaries will be prepared and posted to the project website. It is anticipated that at a minimum, quarterly public meetings will be sufficient; however, if more meetings are deemed necessary, they will be scheduled accordingly. Meeting frequency may be adjusted throughout the course of the project to accomplish project goals. TSSWCB will review and approve all meeting notices, agendas, and meeting summaries prior to public dissemination.*

The following actions have been completed during this reporting period:

- a. The fifth meeting of the Coordination Committee was held on August 1, 2013. Five topic working groups were established at this meeting.
- b. The five topic working groups meet during this quarter. Meeting times were as follows:
  - Riparian Protection and Management: September 5, 2013
  - Invasive Species: Aquatic Plants and Terrestrial Animals: September 6, 2013
  - Upland Management: September 9, 2013
  - Water Supply Enhancement: September 9, 2013
  - Water Quality, Flow, and Conservation: September 10, 2013

**65% Complete**

*Subtask 3.3 TTU-LRFS will attend and participate in other public meetings as appropriate in order to communicate project goals, activities and accomplishments to affected parties. Such meetings may include, but are not limited to, city councils, county commissioners' courts, Clean Rivers Program Basin Steering Committee and Coordinated Monitoring, local soil and water conservation districts (SWCDs), groundwater conservation districts and other appropriate meetings of critical watershed stakeholder groups.*

The following actions have been completed during this reporting period:

- a. This quarter, TTU-LRFS met with/participated in the following meetings:
  - TTU-LRFS and TWRI staff met with TTU graduate student Trace Thomas to help prepare sound bites for the "Texas Water Update" and a promotional video for the Llano River Field Station
  - SLWA Board meetings on July 18, August 22, and September 19, 2013.
  - Emily Seldomridge attended the City of Junction Annual Drinking Water Quality Report meeting and toured the drinking water treatment plant on July 5, 2013.
  - Emily Seldomridge attended the Kimble County Predator Control meeting on September 9, 2013.
  - Tom Arsuffi attended the Organization of Biological Field Stations Annual Meeting in Portal, AZ from September 19-22.
  - Tom Arsuffi attended the Renewable Energy Roundup and Green Living Fair in Fredericksburg, TX on September 28, 2013.
  - Emily Seldomridge spoke about the water conservation on the South Llano River and the Upper Llano Watershed Protection Plan to the Leti Women's Study Group in Junction on September 17, 2013.
  - Emily Seldomridge attended the Texas State Comptroller Freshwater Mussel Identification Workshop from August 19-23, 2013.
  - Donn and Linda Edwards attended Bats Loco Bash in San Antonio on August 13, 2013. They tended an Upper Llano River Watershed macroinvertebrate table.
  - Emily Seldomridge participated in a kayak tour of the South Llano River and discussion of Upper Llano WPP during Texas Cooperative Unit Annual Meeting on July 15, 2013.

**65% Complete**

*Subtask 3.4 TTU-LRFS will facilitate communication with stakeholders in order to engage the public and affected entities in the watershed planning process. TTU-LRFS will utilize all appropriate communication mechanisms including direct mail, e-mail, the project website, and mass media (print, radio, television). TTU-LRFS will utilize the existing SLWA Google Group to facilitate direct discussion between stakeholders. TTU-LRFS will develop, publish, and distribute 5 semi-annual newsletters (1 in year 1 and 2 in years 2 and 3) that highlight Upper Llano River watershed activities; the newsletter shall be distributed as most appropriate to individual landowners and entities in the watershed. TSSWCB must approve all project-related content in any educational materials and publications prior to distribution.*

The following actions have been completed during this reporting period:

- a. TTU-LRFS emailed invitations to watershed stakeholders prior to the August coordination committee meeting. The invitation was also sent to newspapers for posting on the community calendars, and posted to the SLWA webpage. This proved effective as indicated by the participation at the meeting.
- b. TTU-LRFS disseminated the 3<sup>rd</sup> semi-annual newsletter.
- c. The SLWA Google Groups "South Llano River Project" group continues to be an effective tool for communicating with stakeholders. Those interested can sign-up for the group at the SLWA website (<http://southllano.org/>). This quarter, the Google group transmitted a variety of info as described in subtask 1.5.
- d. Media mentions this quarter included:
  - **Riparian, Stream Ecosystem Workshop set Oct. 16 in Junction**
    - AgriLife TODAY on September 11, 2013
    - Texas Riparian Association
    - High Beam on September 12, 2013
    - KMBL 1450AM radio
  - **Land and water conservation depends on private landowners**
    - Texas Parks and Wildlife Outdoor Magazine
  - **Llano River Watershed Protection progress and water news from Junction**
    - Hill Country Alliance
  - **Joint Meeting of the Texas Riparian Associate and Texas Chapter of the Society for Ecological Restoration**
    - Society of Wetland Scientists
    - Texas Riparian Association
    - Texas Chapter of the Society for Ecological Restoration
    - Native Prairies Association of Texas

**65% Complete**

*Subtask 3.5 TTU-LRFS will coordinate with SCSC to host a Texas Watershed Steward Program workshop focused on the Upper Llano River through TSSWCB project 11-05, Continued Statewide Delivery of the Texas Watershed Steward Program.*

The following actions have been completed during this reporting period:

- a. A Texas Watershed Steward Program was held on August 30, 2012. Thirty-five local stakeholders participated in this exceptional training program.

**100% Complete**

## **Task 4 GIS Inventory and Land Use/Land Cover Analysis**

*Subtask 4.1 TAMU-SSL will collaborate with project partners, local agencies and stakeholders to develop a comprehensive GIS inventory of the Upper Llano River watershed. This GIS inventory will include the most recent information available on land use, elevation, soils, stream networks, reservoirs, roads, public park lands, municipalities and satellite imagery or aerial photography. Locations of SWQM stations, USGS gages, public access points to the waterbodies, floodwater-retarding structures, wetlands, known OSSFs, TPDES permittees (including WWTFs, CAFOs and MS4s), and subdivisions will also be included. Sites permitted for land application of sewage sludge and septage should be included. Information from subtasks 5.4 and 5.5 should be included. The cumulative impact of TSSWCB-certified WQMPs on the management of agricultural and silvicultural lands should be documented. TAMU-SSL will provide watershed maps for stakeholder meetings as needed.*

The following actions have been completed during this reporting period:

- a. No activity to report this quarter.

**90% Complete**

*Subtask 4.2 TAMU-SSL will perform a combination of satellite based image (2006-2010) classification schemes and where needed "heads-up digitizing" of the 2006-2010 NAIP aerial photos of the watershed using ESRI's ArcGIS 9.x software. TAMU-SSL will identify individual LULC classes and delineate them in shapefile or ArcGIS grid format with a minimum mapping unit of 2 ac on screen. LULC classes will be comparable to NLCD. TAMU-SSL will verify LULC classification through field sampling and ground truthing information to an accuracy of 80% or greater. Ground control points used in the field sampling will be collected for at least ten locations per land use type using GPS units with an accuracy of 1-10 m.*

The following actions have been completed during this reporting period:

- a. TAMU-SSL has classified the LULC in the watershed, ground truthed the data using ground control points, and provided it to the project team.

**100% Complete**

*Subtask 4.3 TAMU-SSL will provide the GIS inventory and LULC update to the TTU-WRC for utilization in the watershed model. TAMU-SSL will also provide TTU-LRFS needed maps for the WPP.*

The following actions have been completed during this reporting period:

- a. On October 10, SSL provided the GIS inventory and LULC update to the project team.

**100% Complete**

## **Task 5 Water Quality Monitoring**

*Subtask 5.1 TTU-LRFS will conduct routine ambient monitoring at 14 mainstem sites and tributaries quarterly, collecting field parameters, conventional parameters, and flow. The QAPP, as detailed in Task 2, will precisely identify sites. The sampling period extends over 30 months. The number of samples planned for collection through this subtask is 140. Currently, routine ambient monitoring is conducted quarterly at 2 stations by LCRA and TCEQ (16701 and 17425) through the Clean Rivers Program. Sampling will be coordinated with these entities to prevent duplication of efforts and ensure*

*comparability. Flow data will be collected by gage, electric, mechanical or Doppler, and flow severity will be noted. Field parameters measured will include pH, temperature, conductivity, and dissolved oxygen. Conventional parameters measured will include total suspended solids, turbidity, sulfate, chloride, nitrate nitrogen, ammonia nitrogen, total kjeldahl nitrogen, chlorophyll a, pheophytin, total hardness, total phosphorus and E. coli (enumerated using USEPA Method 1603). The Edwards Aquifer Research & Data Center at Texas State University, a NELAC accredited laboratory, will conduct sample analysis, provide all containers and chain of custody.*

The following actions have been completed during this reporting period:

- a. The 5<sup>th</sup> quarterly sampling was conducted on September 16-26, 2013. Field parameters, conventional parameters, and flow were measured. Field parameters were measured using the Hydrolab DS5X, and flow using an Acoustic Doppler current meter. Conventional parameters were delivered to Edwards Aquifer Research and Data Center and are awaiting analysis.
- b. After QA/QC checks, data will be prepared for upload into TCEQ SWQMIS database.

**50% Complete**

*Subtask 5.2 TTU-LRFS will conduct biological monitoring (fish, macroinvertebrate, and habitat assessment) at 14 locations twice a year for 2 years to assess the cumulative impact of pollutant loading on stream health and biological communities of stream health. Biotic conditions and assessments for main stem and lower portions of the watersheds are just beginning as part of the Guadalupe Bass Restoration Project for the South Llano River with TPWD in conjunction with TTU-LRFS and Texas State University.*

The following actions have been completed during this reporting period:

- a. The first semi-annual biological sampling was conducted in September 2012.
- b. The second semi-annual biological sampling was conducted February 18-28, 2013
- c. The third semi-annual biological sampling was conducted September 16-26, 2013.
- d. The fourth and final semi-annual biological sampling is scheduled for March 2014.

**75% Complete**

*Subtask 5.3 TTU-LRFS will conduct spring sampling at 6 sites including 700 Springs, Big Paint and Tanner Springs. TTU-LRFS will work with Kimble County Groundwater Conservation District to identify other priority springs. Quarterly field, conventional, and flow parameters will be collected. Water quality parameters to be measured are defined in Subtask 5.1. The QAPP, as detailed in Task 2, will precisely identify sites. The sampling period extends over 30 months. The number of samples planned for collection through this subtask is 60. The Edwards Aquifer Research & Data Center, a NELAC Accredited Laboratory, will conduct sample analysis and provide all containers and chain of custody.*

The following actions have been completed during this reporting period:

- a. The fifth quarterly spring sampling was conducted in September 16-26, 2013.
- b. After QA/QC checks, data will be prepared for upload into TCEQ SWQMIS database.

**50% Complete**



*Subtask 5.4 TTU-LRFS will conduct surveys and map distribution and abundance of invasive emergent and aquatic plants from the headwaters (Llano Springs, 700 Springs, South Llano River and North Llano River) to Junction. TTU-LRFS and ESSM will work with the TPWD Aquatic Habitat Enhancement Program Director to determine BMPs for controlling or eradicating invasive species and develop an invasive species management plan for incorporation into the WPP.*

The following actions have been completed during this reporting period:

- a. TTU-LRFS in conjunction with Texas Parks and Wildlife Department Watershed and *Aquatic Habitat Enhancement Programs*, invasive elephant ears (*Colocasia esculenta*) have been mapped on the South Llano River and herbicide treated (Aquaneat, Clearcast) during summer and fall of 2012 (June 20-21; August 7-8 and September 13).
- b. Follow up surveys to determine effectiveness of treatments were conducted in May 2013 on the South Llano River.
- c. A survey of elephant ears on the North Llano River was conducted in April 2013 and a treatment plan is being developed based on survey results.
- d. TTU-LRFS began mapping the North and South Llano rivers in March 2013. Mapping was completed in June 2013. Google Earth maps of the invasive emergent and aquatic plants were created.
- e. In this quarter, in partnership with Texas Parks and Wildlife Department Watershed and *Aquatic Habitat Enhancement Programs*, follow up herbicide treatments were conducted on the South Llano River on July 2, 2013 and September 30, 2013.

**100% Complete**

*Subtask 5.5 TTU-LRFS will conduct surveys and map the distribution, abundance, and severity of cut and eroding banks on the South and North Llano Rivers.*

The following actions have been completed during this reporting period:

- a. Surveys and maps of the distribution, abundance, and severity of cut and eroding banks on the North and South Llano rivers began in March 2013. Surveys were completed in June 2013.

**100% Complete**

*Subtask 5.6 TTU-LRFS will conduct a historical data review for the waterbody, to be included in the WPP, in order to assess and characterize trends and variability in water quality. Historical data collection activities will concentrate on 1) ambient water quality data (including groundwater); 2) stream flow and water level data; 3) precipitation records; and 4) biological data. U.S. Geological Survey, National Weather Service, TPWD, Texas Water Development Board, GCDs, LCRA, TCEQ, EPA and others will be queried for data related to the study area.*

The following actions have been completed during this reporting period:

- a. TTU-LRFS presented the draft historical data review for the upper Llano River to TSSWCB in May 2013. A final draft of the report was approved by TSSWCB in July 2013. The final report was presented to the Coordination Committee at the August 1, 2013 meeting and posted on the SLWA website.

**100% Complete**

*Subtask 5.7 Through TSSWCB project 05-02 FY05 Statewide NPS Pollution Management Project, USGS will install and operate one new real-time streamflow gage at an appropriate location on the South Llano River as near the outlet of the assessment unit as is practical. Through this project, and contingent upon TSSWCB project 05-02, TTU-LRFS will work with USGS to provide operation and maintenance for this new real-time streamflow gage. Continuous sampling extends over 36 months. This gaging station will complement the existing gages maintained by the USGS. The USGS maintains real-time gages at 08150000 Llano River near Junction and 08148500 North Llano River near Junction and collects periodic data at gages 08149500 Seven Hundred Springs near Telegraph and 08149400 South Llano River near Telegraph. TTU-LRFS will work with USGS to ensure continued operation of these other USGS gages throughout the duration of the project.*

The following actions have been completed during this reporting period:

- a. The USGS stream gage was activated on May 16, 2012 on the South Llano River at Flatrock Crossing near the Texas Tech Campus. The SLWA website includes a link to this gage: [http://waterdata.usgs.gov/tx/nwis/uv/?site\\_no=08149900&PARAMeter\\_cd=00065,00060](http://waterdata.usgs.gov/tx/nwis/uv/?site_no=08149900&PARAMeter_cd=00065,00060)

**65% Complete**

*Subtask 5.8 TTU-LRFS will transfer monitoring data from activities in Subtask 5.1-5.3, and 5.7 to TSSWCB for inclusion in SWQMIS at least quarterly. Data will be transferred in the correct format using the TCEQ file structure, along with a completed Data Summary, as described in the most recent version of TCEQ Surface Water Quality Monitoring Data Management Reference Guide. TWRI will submit Station Location Requests to TCEQ, as needed, to obtain TCEQ station numbers for new monitoring sites. TWRI will input monitoring regime, as detailed in the QAPP, into the TCEQ CMS. Data Correction Request Forms will be submitted to TSSWCB whenever errors are discovered in data already reported. All monitoring data files, Data Summary, and Data Correction Request Forms will also be provided to LCRA. TTU-LRFS will post monitoring data from activities in Task 5 to the project website in a timely manner.*

The following actions have been completed during this reporting period:

- a. As QA/QC checks are completed, data will be prepared for upload into TCEQ SWQMIS database.
- b. A temporary student worker was hired to create Binary Large Object (BLOB) reports to accompany biological data to be uploaded into TCEQ SWQMIS. The first semi-annual biological sampling reports were completed in June 2013.

**10% Complete**

*Subtask 5.9 TTU-LRFS, with assistance by TWRI, will incorporate the watershed assessment findings in the WPP developed through Task 8.*

The following actions have been completed during this reporting period:

- a. No activity to report this quarter.

**0% Complete**

## **Task 6 Modeling and Data Analysis**

*Subtask 6.1 TTU-WRC, with cooperation from project partners, will evaluate models, such as SWAT and EDYS, to simulate flow and water quality at appropriate subwatershed scales and identify BMPs and targeted locations to enhance the quality of runoff and recharge. TTU-WRC will recommend the use of a suitable candidate model. Once the most suitable model is selected by TTU-WRC, TWRI, and TSSWCB, TTU-WRC will assist TWRI in developing a modeling QAPP (Task 2). TTU-WRC will collect and evaluate relevant hydrologic data for the Upper Llano River watershed, including rainfall, stream flow, and groundwater conditions, and recent land use and vegetation distributions generated through Tasks 4-5.*

The following actions have been completed during this reporting period:

- a. Model development is about 85% complete. The model has been constructed as a linked three-unit model (one for the spatial domain in each of the three counties: Edwards, Kimble, Sutton) in order to increase the efficiency of operation. Each unit can be run separately, or linked and run as a combined model. The three model setups have been constructed and include elevation (including slope and aspect), soils, preliminary vegetation types, and major surface features.
- b. Aerial photos are being used to refine the spatial distribution of woody plant coverage and current landuse patterns.
- c. Plant parameter data files have been constructed and entered into the model.
- d. Parameter values are being reviewed and updated where appropriate.
- e. Rainfall data have been downloaded, summarized, and used to develop spatial distribution patterns across the model domain. These data are also being used to develop constructed long-term (1893-2012) rainfall data patterns for the area.
- f. Some field vegetation data, especially for the river footprint is planned, but has not yet been collected.
- g. Model test runs will begin once the remaining vegetation (spatial and plant parameter), rainfall, and animal data are entered.

### **20% Complete**

*Subtask 6.2 TTU-LRFS will employ EPA's Causal Analysis/Diagnosis Decision Information System (CADDIS) to conduct a causal evaluation of the benthic macroinvertebrate data. CADDIS, an online application, provides a pragmatic guide for determining the causes of detrimental changes and undesirable biological conditions observed in aquatic systems. CADDIS supports defensible causal analyses of the mechanisms, symptoms, and stressor-response relationships for various stressors in order to draw appropriate conclusions.*

The following actions have been completed during this reporting period:

- a. No activity to report this quarter.

### **0% Complete**

*Subtask 6.3 TTU-WRC, with cooperation from project partners, will summarize modeling findings to inform the stakeholders about the physical behavior of their watershed resulting from various implementation scenarios and work with project partners to incorporate this into the WPP.*

The following actions have been completed during this reporting period:

- a. No activity to report this quarter.

**0% Complete**

### **Task 7 Public Outreach and Education**

*Subtask 7.1 ESSM, in conjunction with the TTU-LRFS, TTU-WRC, and SLWA will provide watershed training workshops for landowners on riparian protection, land stewardship, grazing management, invasive species, brush control, conservation, wildlife and habitat plans and water resource issues. Two workshops per year are planned to provide adequate coverage of the broad range of elements associated with water and watersheds and to allow a broad coverage of stakeholder groups. Pre- and post-participant surveys will be administered at selected events to evaluate (1) changes in producer knowledge and awareness and (2) expected adoption of BMPs.*

The following actions have been completed during this reporting period:

- a. TTU-LRFS was awarded \$280,000 from the Texas Comptroller State Energy Conservation Office for "Integrated Multiple Renewable Energy Demonstration in the Texas Hill Country at TTU Llano River Field Station." The grant was used to install solar panels on the administration buildings and a wind turbine. These energy conservation practices will be highlighted on signage along the public Biodiversity Trail.
- b. A Riparian Education Workshop is scheduled for October 16, 2013.
- c. The project team continues to work on arranging delivery of the Lone Star Healthy Streams Program in the watershed.

**65% Complete**

*Subtask 7.2 TTU-LRFS will develop and offer a K-12 TEKS based water and watershed curriculum unit.*

The following actions have been completed during this reporting period:

- a. TTU-LRFS rewrote the established curriculums: Aquatic Biology Units, The Understanding Watersheds, and the Soils/Pedology revisions are almost complete.
- b. The updated curriculum was unveiled this summer and received positive feedback from a group of teachers attending a Professional Development event at TTU-LRFS.
- c. TTU-LRFS received a GLOBE Discover Air Quality grant that was used in the updated watershed curriculum unit. Two workshops were held, one in Houston and one in Junction, to discuss GLOBE protocol. The GLOBE Discover Air Quality mission happened in Houston throughout the month of September.

**50% Complete**

*Subtask 7.3 TTU-LRFS will organize a Texas Water Symposium in partnership with Texas Public Radio, Schreiner University, Hill Country Alliance, SLWA, and TWRI on EPA's Healthy Watersheds Initiative with this project as a case study for Texas.*

The following actions have been completed during this reporting period:

- a. TTU-LRFS hosted a Texas Water Symposium on Healthy Watersheds and Upper Llano WPP efforts on March 22, 2011. The Symposium was held at TTU- LRFS in front of a live audience and taped for broadcast during Texas Public Radio's Newsmaker Hour. The TWS included panelists from TPWD, TSSWCB, Hill Country Alliance, TTU-LRFS, and TWRI.
- b. A second Texas Water Symposium on Texas Springs: Making Connections between Groundwater, Surface Water, Science, and Stewardship was held on March 8, 2013. The TWS discussed the connection between groundwater and surface water and included a panel of local ranchers, TTU-LRFS, and Texas Water Development Board.

**100% Complete**

### **Task 8 Watershed Protection Plan Development**

*Subtask 8.1 TTU-LRFS, in collaboration with project partners, will develop a WPP for the Upper Llano River watershed that is consistent with and satisfies the expectations of the nine elements fundamental to watershed-based plans as described in EPA's 2004 Nonpoint Source Program and Grants Guidelines for States and Territories [68 Fed. Reg. 60653-60674 (October 23, 2003)] and incorporates the elements of EPA's Healthy Watersheds Framework as described in the technical guidance document Identifying and Protecting Healthy Watersheds (EPA 2011). The WPP shall be founded on decisions made by stakeholders through the watershed planning process (Task 3) and incorporate findings from project Tasks 4-7. TTU-LRFS will facilitate public review and stakeholder approval of the WPP.*

The following actions have been completed during this reporting period:

- a. No activity to report this quarter.

**0% Complete**

*Subtask 8.2 TTU-LRFS will develop an "executive summary" style document, based on the WPP, which will serve as a public outreach tool to garner support for the implementation of the WPP and achieve long term sustainability.*

The following actions have been completed during this reporting period:

- a. No activity to report this quarter.

**0% Complete**

*Subtask 8.3 After EPA has completed a satisfactory nine element consistency review of the WPP, TWRI will publish, print, and distribute the WPP and "executive summary" document to stakeholders.*

The following actions have been completed during this reporting period:

- a. No activity to report this quarter.

**0% Complete**

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

- a. Flooding occurred on the North Llano River during the semi-annual biological monitoring. Although conditions were drastically different from the beginning to the end of field sampling, field work was delayed by only a day.
- b. A temporary part-time worker was hired to aid in macroinvertebrate sorting and identification.

**IV. Projected Work for Next Quarter**

- All quarterly sampling data will be uploaded into TCEQ SWQMIS database
- Sixth quarterly routine sampling will be completed
- October 4: Hill Country Alliance Leadership Summit in Fredericksburg, TX
- October 7-10: Engagement Scholarship Consortium Conference in Lubbock, TX
- October 12: South Llano Watershed Alliance Fall River Cleanup in Junction, TX
- October 16: Riparian Education Workshop in Junction, TX
- October 24: Texas Water Symposium: A conversation about private property rights in Kerrville, TX
- Begin volunteer program with Texas Master Naturalists to help maintain the TTU-LRFS Lantana Lab native garden
- November 1-2: Texas Riparian Association and Texas Chapter of Society for Ecological Restoration conference in Junction, TX