



**Texas State Soil and Water Conservation Board  
 Clean Water Act §319(h) Nonpoint Source Grant Program  
 FY 2011 Workplan 11-04**

SUMMARY PAGE					
Title of Project	Development of the Upper Llano River Watershed Protection Plan				
Project Goals	Implement EPA's Healthy Watersheds Initiative by developing a Watershed Protection Plan (WPP) for the Upper Llano River watershed through 1) empowering local stakeholders, 2) characterizing historical and current water quality conditions, 3) analyzing watershed data using models, and 4) increasing education among the targeted audience.				
Project Tasks	(1) Project Administration; (2) Quality Assurance; (3) Public Participation and Stakeholder Coordination; (4) GIS Inventory and Land Use/Land Cover Analysis; (5) Water Quality Monitoring; (6) Modeling and Data Analysis; (7) Watershed Protection Plan Development; (8) Public Outreach and Education				
Measures of Success	<ul style="list-style-type: none"> <li>• Coordination and engagement of watershed stakeholders</li> <li>• Completed GIS and LULC update of the watershed</li> <li>• Collection and analysis of quality assured data for watershed assessment</li> <li>• Completed modeling of the watershed</li> <li>• Stakeholder approved WPP</li> <li>• Effective delivery of educational programs</li> </ul>				
Project Type	Implementation ( ); Education (X); Planning (X); Assessment (X); Groundwater (X)				
Status of Waterbody on 2008 Texas Water Quality Inventory and 303(d) List	<u>Segment ID</u>	<u>Parameter</u>	<u>Category</u>		
	1415_05 North Llano River	N/A	1		
	1415_06 South Llano River	N/A	1		
Project Location (Statewide or Watershed and County)	Upper Llano River watershed in Edwards, Kerr, Kimble, Menard, Real, and Sutton Counties				
Key Project Activities	Hire Staff (X); Surface Water Quality Monitoring (X); Technical Assistance ( ); Education (X); Implementation ( ); BMP Effectiveness Monitoring ( ); Demonstration ( ); Planning (X); Modeling (X); Bacterial Source Tracking ( ); Other ( )				
Texas NPS Management Program Elements	<ul style="list-style-type: none"> <li>• Element One</li> <li>• LTG Objectives 2, 5, 6, &amp; 7</li> <li>• STGs 1B, 1C, 3A, 3B, &amp; 3D</li> <li>• Elements Two &amp; Five</li> </ul>				
Project Costs	Federal	\$666,167	Non-Federal	\$447,239	Total \$1,113,406
Project Management	<ul style="list-style-type: none"> <li>• Texas Water Resources Institute</li> <li>• Texas Tech University</li> </ul>				
Project Period	November 1, 2011 – October 31, 2014				

## Part I – Applicant Information

Applicant							
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Co-Applicant							
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Co-Applicant							
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<b>Project Partners</b>	
<b>Names</b>	<b>Roles &amp; Responsibilities</b>
Texas State Soil and Water Conservation Board (TSSWCB)	Provide state oversight and management of all project activities and ensure coordination of activities with related projects and TCEQ
Texas Water Resources Institute (TWRI)	Provide project coordination and administration, QAPP development, project reporting, assistance for stakeholder relations, and support for the development of the WPP
Texas Tech University – Llano River Field Station (TTU-LRFS)	Targeted monitoring, watershed coordination, K-12 and landowner educational materials development and invasive species demonstration projects
Texas Tech University – Water Resources Center (TTU-WRC)	Conduct watershed modeling
Texas AgriLife Extension Service – Department of Ecosystem Sciences & Management (ESSM)	Provide outreach and education (Task 7.1), Assist with Invasive Species Management Plan (Task 5.4)
South Llano Watershed Alliance (SLWA)	Collaborate as critical local stakeholders and play a lead role in communicating with other local stakeholders
Texas AgriLife Extension Service – Department of Soil and Crop Sciences (SCSC)	Deliver Texas Watershed Steward Program workshop (Subtask 3.5) through TSSWCB project 11-05
Texas A&M University – Spatial Sciences Laboratory (TAMU-SSL)	Develop GIS inventory and classify land use (Task 4)

## Part II – Project Information

Project Type					
Surface Water	X	Groundwater	X		
Does the project implement recommendations made in (a) a completed WPP, (b) an adopted TMDL, (c) an approved I-Plan, or (d) a Comprehensive Conservation and Management Plan developed under CWA §320?				Yes	No
If yes, identify the document.				N/A	X
If yes, identify the agency/group that developed and/or approved the document.			N/A	Year Developed	N/A

Watershed Information				
Watershed Name(s)	Hydrologic Unit Code (8 Digit)	Segment ID	305(b) Category	Size (Acres)
North Llano River	12090202	1415_05	1	605,622
South Llano River	12090203	1415_06	1	604,228

Water Quality Impairment
Describe all known causes (pollutants of concern) of water quality impairments or concerns from any of the following sources: <i>2008 Texas Water Quality Inventory and 303(d) List</i> , draft <i>2010 Texas Integrated Report</i> , Clean Rivers Program Basin Summary/Highlights Reports or other documented sources.
<p>The Llano River is a large tributary of the Colorado River, flowing into Lake LBJ. In fact, this clear spring-fed perennial river dilutes dissolved solids and suspended sediment in the Colorado (2010 LCRA Basin Highlights Report), thus improving the water quality in Lake LBJ and other Highland Lakes. The Lake LBJ watershed, and other Highland Lakes for that matter, has experienced growth in recent years. Pressure from this growing population will require rigorous stewardship of the resource to ensure its sustainability (2009 LCRA Basin Highlights Report).</p> <p>The beneficial uses of the Llano River include general use, aquatic life use, and contact recreation use. According to the 2009 LCRA Basin Highlights Report, routine biological assessments in the South Llano show that fish, insect, and 24-hour DO are rated Exceptional and habitat is rated as High. Similar conditions were observed on the main stem of the Llano further downstream at Mason. The contact recreation use was rated as impaired on the Llano River on the <i>1996 303 (d) List</i>. However, it was subsequently delisted and has remained unimpaired since then. In fact, the <i>2008 Texas Water Quality Inventory</i> continues to show that the Llano River is fully supporting its uses and no concerns have been identified. According to the May 3, 2010 Llano River Data Report prepared by Texas State University, River Systems Institute and Texas Stream Team, data collected by volunteer water quality monitors between 1996 and 2010 showed 4 exceedences of the temperature standard (of 496 measurements), 1 exceedence of the pH standard (of 487 measurements), no dissolved oxygen standard exceedences (of 491 measurements), 1 exceedence of the conductivity standard (of 429 measurements), 96% of 302 total nitrogen measurements were less than 1 mg/L, and for 222 observations of <i>E. coli</i> levels made since 1996, the geometric mean was 40.2 cfu/100 mL and only 8 exceeded the single sample maximum.</p>

## Project Narrative

### Problem/Need Statement

The South Llano River is a true gem of the Texas Hill Country. Its spring-fed flows are legendary. The South Llano River is important in that during periods of low rainfall and minimal surface runoff, spring flow from the underlying aquifers is paramount in maintaining surface flows. The river and springs that feed it support several unique plant and animal communities, and provide constant critical flows downstream to the Llano and Colorado Rivers and Lake LBJ, especially during times of drought. Stream flow data collected by USGS during the summer of 2006 showed that flow of the spring-fed Llano River accounted for roughly 75% of the water flowing into the Highland Lakes, which support Austin and other downstream Colorado River users. Limited data is available on the water quality, quantity, hydrological or biotic conditions of the North Llano River. Although located in a similar geomorphological and climatological region, it differs from the South Llano River in that much of its flows are derived from surface runoff. Because of these various factors, data collection and analysis of the North and South Llano River Watershed is warranted.

Due to the pristine nature and relatively constant flow of the springs, the South Llano River is currently a healthy ecosystem supporting a variety of aquatic and terrestrial ecosystems, as well as numerous recreational opportunities. It is the only major watershed containing a genetically pure population of Guadalupe Bass, the Texas State Fish. The South Llano River is recognized by the Texas Parks and Wildlife Department as an Ecologically Significant Stream having high water quality, exceptional aquatic life, high aesthetic value, and diverse benthic macroinvertebrate and fish communities (Bayer et al., 1992; Linam et al., 1999). Further, during the early to mid-1980s, the South Llano River was designated by TCEQ as a least disturbed ecoregion reference stream for Ecoregion 30. As such, the South Llano River represents a benchmark for which other streams are assessed throughout the ecoregion for water quality standards development and use attainment decisions. The TCEQ Surface Water Quality Monitoring Program (SWQM) is currently conducting a project to further develop and refine the methods and techniques to evaluate the condition of aquatic communities in streams throughout Texas based on these least disturbed streams. TCEQ will be revisiting the South Llano River as part of this effort. Significant and relevant findings from this TCEQ study will be incorporated into the WPP as appropriate.

According to “Land of the Living Waters: A Characterization of the South Llano River, Its Springs, and Its Watershed” prepared by the Environmental Defense Fund, the primary threat to the South Llano River is loss of spring flow. Over the past century, one third of the major spring systems of Texas have ceased flowing largely due to aquifer withdrawals. However, subtle changes due to land fragmentation, loss of riparian habitat, and encroachment of juniper species on upland habitats also have the potential to decrease the water quality and quantity of the river.

Additionally, there is potential for increased biological pollution and reduction in flows should what are now isolated pockets of invasive plants continue to spread. These plants, giant reed (*Arundo donax*) and elephant ears (*Colocasia esculenta*) are emergent hydrophytes and use vast quantities of water relative to native riparian communities. According to the U.S. Environmental Protection Agency (EPA), more than one third of all the States have waters that are listed for invasive species under §303(d) of the Clean Water Act (CWA). Physical and biological disruptions of aquatic systems caused by invasive species alter water quantity and water quality. Invasive species have a variety of negative impacts on water resources affecting recreation, irrigation, municipal, and agricultural water supply. These invasive species affect the quantity and timing of runoff, erosion, sedimentation, and other natural physical processes and may affect water availability in general. Comprehensive analyses and evaluations of these processes will provide critical evaluation tools to managers and policy makers on how best to factor invasive species into water management plans. It is far less expensive to address invasive species issues proactively than reactively. To proactively address incipient invasive species issues in the Upper Llano River Watershed, guidance from EPA’s Office of Wetlands, Oceans and Watersheds (OWOW) Invasive Species Action Plan to improve effectiveness at countering invasive species that adversely impact the nation’s aquatic systems will be used, in particular, monitoring, education and outreach and rapid response elements.

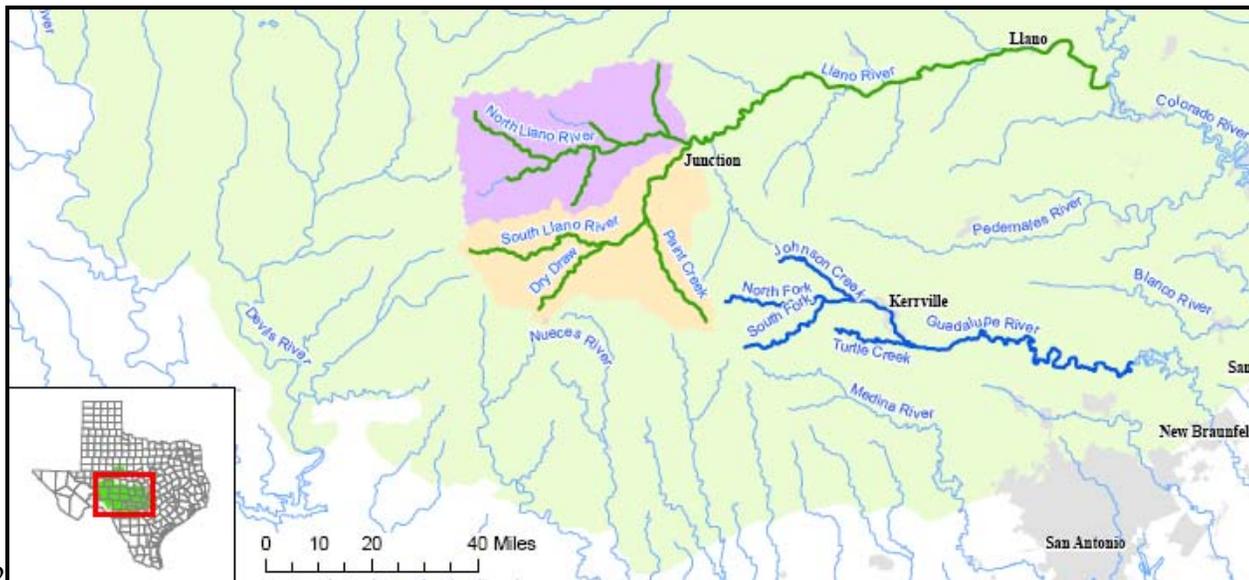
The protection and preservation of the Upper Llano River and its springs is an environmental, economic, and cultural concern. This was recognized by the local community, and in 2009 the South Llano Watershed Alliance (SLWA) was organized as a 501(c)(3) non-governmental organization. The SLWA is an organization of landowners and interested stakeholders whose mission is to preserve and enhance the South Llano River and adjoining watersheds by encouraging land and water stewardship through collaboration, education, and community participation (<http://southllano.org/>). This group is thought to be the only proactively formed stakeholder group in Texas organized to ensure flows and water quality are maintained for future generations. The group also provides a forum for natural resource management education, discussion, and coordination of efforts to address other identified land and water management issues that may impact the long-term viability of the resource.

Working with SLWA and other local and regional stakeholders, a WPP will be developed to protect and maintain the ecological integrity of this important waterbody from threats arising from land fragmentation, noxious woody vegetation, aquatic invasive species, groundwater availability, and the potential for groundwater exports and aquifer contamination. To the extent possible, the EPA Healthy Watersheds Initiative concepts, assessments, and management approaches outlined in the technical guidance document “Identifying and Protecting Healthy Watersheds” (EPA 2011) will be used to help guide the assessment and planning process.

## Project Narrative

### General Project Description (Include Project Location Map)

This project will assist the SLWA with proactive, holistic aquatic ecosystem conservation and protection through the development and future implementation of a WPP for the Upper Llano River watershed (Figure 1) consistent with the EPA Healthy Watersheds Initiative [*Identifying and Protecting Healthy Watersheds* (EPA 2011)], the EPA OWOW Invasive Species Action Plan, and satisfies the expectations of the §319 *National Program and Grants Guidelines* (2004) and the *Handbook for Developing Watershed Plans to Restore and Protect Our Waters* (2008). This plan will include information and results from all project tasks and be based on decisions made by the SLWA as a means to manage their watershed resources in the best manner that they see fit while achieving watershed goals. The WPP will also identify brush type, density, and canopy cover; geology and soils data; water needs and potential needs; hydrologic characterization; potential water yield from BMP implementation; invasive hydrophyte control and impacts, watershed education components (including programs for K-12 and adult education), wildlife concerns and compatibility to the project; economics of BMPs; landowner interest/cooperation; types of treatment measures needed/recommended; and implementation schedule. Following the Healthy Watersheds Initiative concepts, assessments, and management approaches outlined in the EPA “Identifying and Protecting Healthy Watersheds” released in March 2011, both watershed assessment and development of a strategic, systems approach to the management of the watershed will be conducted. Using the Healthy Watersheds Framework, the project will address the complexity of the watershed ecosystem through an integrated assessment of the landscape condition, biotic condition, chemical/physical parameters, and critical watershed functional attributes. Only through understanding these dynamic linkages can proactive management and protection of this healthy watershed be achieved.



Through collaboration of local governments, the SLWA, and others, this project will conserve the healthy components of the watershed; therefore, avoiding water quality impairments in the future. Public participation and stakeholder involvement will be carried out primarily through the SLWA. The Director of the TTU-LRFS, who also serves as a Director on the SLWA Board, will serve as the Watershed Coordinator. The diverse group of landowners, public officials, special interest groups and agencies participating on the SLWA will be asked to provide guidance for the direction of the project and development of the WPP. Input from stakeholders is critical to the success of all watershed planning and implementation efforts and will be sought throughout this project to provide information and assist in identifying BMPs for future implementation. Routine stakeholder meetings will be held to provide information about the project objectives, data analysis results, GIS inventory updates and the results of the project. Project information will be presented through other avenues as well (LCRA CRP meetings, Regional Water Planning meetings, Special Interest Meetings, project website, etc.). The Watershed Coordinator will be assisted throughout this effort by Texas AgriLife Extension Service, TSSWCB, SLWA, Texas Parks and Wildlife Department (TPWD) and TWRI.

To assist with the planning process, a comprehensive GIS inventory of the watershed will be developed by the SSL that illustrates waterbodies, roadways, land use/land cover, soils, geology, and points of concern. These data will be provided to TTU-WRC for inclusion in the model analysis. Targeted monitoring and analysis of historic data will be employed, led by TTU-LRFS to assess ecological conditions, invasive species populations, bank erosion, and other indicators of watershed condition. Additionally, TTU-WRC will develop a watershed model to evaluate historic data. The complex hydrologic conditions in the South Llano River reflect the contribution of dozens of springs in the Edwards-Trinity (Plateau) karstic aquifer, wide variations in rainfall intensity and distribution, and changes in vegetation and land use (Broad, 2008). Limited streamflow, precipitation, and groundwater level data are available to quantify these interactions, and such data are needed to precisely calibrate numerical hydrologic models to simulate the watershed's behavior. Of particular interest are hydrologic models that can simulate changes in streamflow and groundwater recharge caused by land use and vegetation manipulation, such as removal of invasive vegetation. Ashe juniper is of concern for its ability to intercept precipitation and reduce recharge and runoff. TTU-WRC will review available data and recommend additional monitoring instrumentation and data collection. TTU-WRC will use existing hydrologic data, as well as land use and vegetation distributions, to prepare preliminary models of important subwatersheds within the Upper Llano basin. Existing models such as SWAT and EDYS will be considered for application. Modeling results will be used to inform stakeholders about the physical behavior of their watershed resulting from various implementation scenarios.

Finally, extensive education and outreach will be provided. One outreach objective of this project is to organize a Texas Water Symposium topic and panel devoted to WPPs and their role in maintaining Healthy Watersheds. The Symposium: <http://www.schreiner.edu/water/index.htm> is a unique and innovative approach to educating the public about water in Texas. The Symposium series provides perspectives from key stakeholders and illustrates the complexity and challenges in providing water for Texans in this century. The Symposium venue alternates among cities in the Hill Country and San Antonio and Texas Public Radio records and archives each program for subsequent broadcast over KSTX (San Antonio) and KTXI (Ingram). The Symposium is working with Texas Public Radio to expand to Austin and Lubbock markets [http://issuu.com/schreineru/docs/schreiner\\_university\\_scene\\_spring\\_2009](http://issuu.com/schreineru/docs/schreiner_university_scene_spring_2009). Workshops and programs for children (K-12) will also be offered at TTU-LRFS addressing topics ranging from water resources education to land stewardship. Land stewardship programs will include such topics as grazing management, riparian protection, invasive species management, brush control, wildlife management, and other natural resource management topics. An ecologically literate public with knowledge and sense of a water and land ethic will be needed to make informed decisions on a variety of issues as resources become limited. Water resources education is needed at many levels to shed light on overall changing conditions of water scarcity, use, and competition and to inform discussions about potential changes in water-resource policies in relation to economic growth and quality of life. The majority of tomorrow's decision-makers and potential leaders in Texas are today's urban youths, with increasing minority composition, who have little real contact with natural resources and agriculture and little understanding of why soil and water need to be conserved. They also are future voters who can dramatically affect agricultural and environmental legislation in the next decade. Through watershed education and programs at TTU-LRFS, students, their teachers, parents and land managers will be introduced to ecology, nature, watersheds, and land stewardship. TTU-LRFS Outdoor School is a twice recognized Texas High School Project Exemplar Program: it is a STEM TEKS transdisciplinary, inquiry-based, innovative curriculum (12 content areas) that incorporates multiple best learning practices to improve instruction for at-risk students and provide training for teachers. The teachers and students receiving the watershed curriculum developed in this project will be able to learn how to teach science based on TEKS. They will also be able to observe educational theory and best pedagogical practices implemented in an outdoor classroom setting with diverse student learners, learn critical STEM content and use of scientific equipment, and learn scientific method and hypothesis testing best practices. The Outdoor School incorporates GLOBE (Global Learning and Observations to Benefit the Environment - <http://classic.globe.gov/>) training and protocols into the STEM curricular units, which is a federal K-12 environmental education program instituted by NASA, NOAA, and NSF.

Tasks, Objectives and Schedules						
Task 1	Project Administration					
Costs	Federal	\$46,167	Non-Federal	\$34,489	Total	\$80,656
Objective	To effectively administer, coordinate and monitor all work performed under this project including technical and financial supervision and preparation of status reports.					
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 15 <sup>th</sup> of January, April, July and October. QPRs shall be distributed to all project partners and posted on the project website.					
	Start Date	Month 1		Completion Date	Month 36	
Subtask 1.2	TWRI will perform accounting functions for project funds and will submit appropriate Reimbursement Forms to TSSWCB at least quarterly.					
	Start Date	Month 1		Completion Date	Month 36	
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.					
	Start Date	Month 1		Completion Date	Month 36	
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.					
	Start Date	Month 1		Completion Date	Month 36	
Subtask 1.5	SLWA will continue to host and maintain a website ( <a href="http://southllano.org/">http://southllano.org/</a> ) 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.					
	Start Date	Month 1		Completion Date	Month 36	
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.					
	Start Date	Month 1		Completion Date	Month 36	
Deliverables	<ul style="list-style-type: none"> <li>• Quarterly progress reports in electronic format</li> <li>• Reimbursement Forms and necessary documentation in hard copy format</li> <li>• Lists of Action Items from Project Coordination meetings</li> <li>• Project website</li> </ul>					

Tasks, Objectives and Schedules						
Task 2	Quality Assurance					
Costs	Federal	\$9,000	Non-Federal	\$6,000	Total	\$15,000
Objective	To develop data quality objectives (DQOs) and quality assurance/control (QA/QC) activities to ensure data of known and acceptable quality are generated through this project.					
Subtask 2.1	<p>TWRI will develop a QAPP for water quality monitoring activities in Tasks 4 and a QAPP for watershed modeling activities in Task 5 and 6 consistent with the most recent versions of <i>EPA Requirements for Quality Assurance project Plans (QA/R-5)</i> and the <i>TSSWCB Environmental Data Quality Management Plan</i>.</p> <p>Consistency with Title 30, Chapter 25 of the Texas Administrative Code, <i>Environmental Testing Laboratory Accreditation and Certification</i>, which describes Texas' approach to implementing the National Environmental Laboratory Accreditation Conference standards, shall be required.</p> <p>All monitoring procedures and methods prescribed in the QAPP shall be consistent with the guidelines detailed in the <i>TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods for Water, Sediment, and Tissue (RG-415)</i> and <i>Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data (RG- 416)</i>.</p>					
	Start Date	Month 1		Completion Date	Month 3	
	Subtask 2.2	<p>TWRI will implement the approved QAPPs. TWRI will submit revisions and necessary amendments to the QAPPs as needed.</p>				
	Start Date	Month 3		Completion Date	Month 36	
Deliverables	<ul style="list-style-type: none"> <li>• QAPP for Tasks 4 and 5 approved by TSSWCB in both electronic and hard copy formats</li> <li>• QAPP for Task 6 approved by TSSWCB in both electronic and hard copy formats</li> <li>• Approved revisions and amendments to these QAPPs, as needed</li> <li>• Data of known and acceptable quality as reported through Tasks 4, 5, and 6</li> </ul>					

Tasks, Objectives and Schedules						
Task 3	Public Participation and Stakeholder Coordination					
Costs	Federal	\$40,000	Non-Federal	\$24,000	Total	\$64,000
Objective	To coordinate and facilitate public involvement in a local watershed stakeholder group that will provide local input into the decision making process for the Upper Llano River watershed.					
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.					
	Start Date	Month 1	Completion Date	Month 36		
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.					
	Start Date	Month 1	Completion Date	Month 36		
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.					
	Start Date	Month 1	Completion Date	Month 36		
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 SWLA 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.					
	Start Date	Month 1	Completion Date	Month 36		
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, <i>Continued Statewide Delivery of the Texas Watershed Steward Program</i> .					
	Start Date	Month 1	Completion Date	Month 12		
Deliverables	<ul style="list-style-type: none"> <li>Stakeholder database, updated as needed</li> <li>Stakeholder Google Group</li> <li>5 semi-annual Newsletters, as developed and distributed</li> <li>Meeting notices, materials, agendas, attendance lists, and summaries</li> </ul>					

Tasks, Objectives and Schedules						
Task 4	GIS Inventory and Land Use/Land Cover Analysis					
Costs	Federal	\$54,000	Non-Federal	\$36,000	Total	\$90,000
Objective	To develop a comprehensive GIS inventory of the watershed. To classify current land use for the watershed through a combination of satellite based image classification schemes and where needed “heads-up digitizing” of NAIP aerial photos of the area.					
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.					
	Start Date	Month 4		Completion Date	Month 21	
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.					
Subtask 4.3	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.					
	Start Date	Month 4		Completion Date	Month 21	
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.					
	Start Date	Month 4		Completion Date	Month 21	
Deliverables	<ul style="list-style-type: none"> <li>• Comprehensive GIS inventory of watershed</li> <li>• LULC for the watershed in shapefile or ArcGIS grid format</li> <li>• Assorted maps of watershed, as needed by Project Partners</li> </ul>					

Tasks, Objectives and Schedules						
Task 5	Water Quality Monitoring					
Costs	Federal	\$311,500	Non-Federal	\$207,000	Total	\$518,500
Objective	To provide sufficient data to characterize historical and current water quality and biological conditions throughout the Upper Llano River watershed.					
Subtask 5.1	<p>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.</p> <p>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 <i>E. coli</i> (enumerated using USEPA Method 1603). The Edwards Aquifer Research &amp; Data Center at Texas State University, a NELAC accredited laboratory, will conduct sample analysis, provide all containers and chain of custody.</p>					
	Start Date	Month 7		Completion Date	Month 36	
Subtask 5.2	<p>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. 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.</p>					
	Start Date	Month 7		Completion Date	Month 36	
Subtask 5.3	<p>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 &amp; Data Center, a NELAC Accredited Laboratory, will conduct sample analysis and provide all containers and chain of custody.</p>					
	Start Date	Month 7		Completion Date	Month 36	
Subtask 5.4	<p>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.</p>					
	Start Date	Month 7		Completion Date	Month 24	
Subtask 5.5	<p>TTU-LRFS will conduct surveys and map the distribution, abundance, and severity of cut and eroding banks on the South and North Llano Rivers.</p>					
	Start Date	Month 7		Completion Date	Month 24	
Subtask 5.6	<p>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, Texas Stream Team, TCEQ, EPA and others will be queried for data related to the study area.</p>					
	Start Date	Month 1		Completion Date	Month 6	

Subtask 5.7	<p>Through TSSWCB project 05-02 <i>FY05 Statewide NPS Pollution Management Project</i>, 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.</p>			
	Start Date	Month 1	Completion Date	Month 36
Subtask 5.8	<p>TTU-LRFS will transfer monitoring data from activities in Subtask 5.1-5.3 and 5.7 to TSSWCB for inclusion in the TCEQ 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 <i>TCEQ Surface Water Quality Monitoring Data Management Reference Guide</i>.</p> <p>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.</p>			
	Start Date	Month 7	Completion Date	Month 36
Subtask 5.9	<p>TTU-LRFS, with assistance by TWRI, will incorporate the watershed assessment findings in the WPP developed through Task 8.</p>			
	Start Date	Month 24	Completion Date	Month 30
Deliverables	<ul style="list-style-type: none"> <li>• Station Location Request Forms (as needed) in electronic format</li> <li>• Monitoring data files and Data Summary in electronic format</li> <li>• Data Correction Request Forms (as needed) in electronic format</li> <li>• Monitoring data updates posted to the project website</li> <li>• Aquatic invasive species and cut/eroding banks distribution</li> <li>• Invasive species management plan for inclusion in the WPP</li> </ul>			

Tasks, Objectives and Schedules						
Task 6	Modeling and Data Analysis					
Costs	Federal	\$102,000	Non-Federal	\$68,000	Total	\$170,000
Objective	To analyze watershed data using models to assess recommended measures to achieve environmental goals established by stakeholders in the WPP.					
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, as well as recent land use and vegetation distributions generated through Tasks 4-5.					
	Start Date	Month 13		Completion Date	Month 28	
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.					
	Start Date	Month 13		Completion Date	Month 28	
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.					
	Start Date	Month 28		Completion Date	Month 32	
Deliverables	<ul style="list-style-type: none"> <li>Incorporation of the results of modeling analyses and CADDIS into WPP</li> </ul>					

Tasks, Objectives and Schedules						
Task 7	Public Outreach and Education					
Costs	Federal	\$45,000	Non-Federal	\$30,000	Total	\$75,000
Objective	To provide Landowner/Stakeholder Training Workshops on riparian protection, land stewardship, grazing management, invasive species, brush control, conservation, wildlife and habitat plans and water resource issues. To deliver a water and watershed K-12 Texas Essential Knowledge Skills based curriculum at the TTU-LRFS's Outdoor School					
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 participant knowledge and awareness and (2) expected adoption of BMPs.					
	Start Date	Month 1		Completion Date	Month 36	
Subtask 7.2	TTU-LRFS will develop and offer a K-12 TEKS based water and watershed curriculum unit. Students will understand the concepts of river basins and watersheds and be able to identify their river basin and local watershed. It is anticipated that about 90 ISDS and 7,500 K-12 students and teachers will receive watershed education and training over the 3 years of the project. TTU-LRFS will expand existing curriculum developed by the LRFS Outdoor School ( <a href="http://www.depts.ttu.edu/hillcountry/OLC/index.php">http://www.depts.ttu.edu/hillcountry/OLC/index.php</a> ), an award winning, Texas High School Project recognized Exemplar Program. This program is a STEM No Child Left Behind standards-based transdisciplinary, inquiry-based, innovative curriculum that incorporates multiple best learning practices to improve instruction for at-risk students and provide training for teachers. The Outdoor School incorporates GLOBE (Global Learning and Observations to Benefit the Environment, <a href="http://globe.gov/">http://globe.gov/</a> ) training and protocols into the STEM curricular units. GLOBE is a federal K-12 environmental education program instituted by NASA, NOAA, and NSF. For this new curriculum unit we will use GLOBE Watershed Dynamics to enable students to investigate their own watershed in order to understand the flow of water through the watershed, how human activities within the watershed both depend on and impact its hydrology, and how land use changes can affect the plant and animal communities in the watershed. TTU-LRFS Outdoor School will also work with the TWDB Conservation Education Specialist to implement Major Rivers: A Texas Water Education Program. The curricular resources to develop this unit are free from GLOBE and TWDB.					
	Start Date	Month 1		Completion Date	Month 36	
Subtask 7.3	TTU-LRFS will organize a Texas Water Symposium ( <a href="http://www.schreiner.edu/water/index.htm">http://www.schreiner.edu/water/index.htm</a> ) 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 Symposium will be held at TTU- LRFS in front of a live audience and taped for broadcast during Texas Public Radio's Newsmaker Hour. TWS will include panelists from key stakeholder groups and cover the importance, process and benefits of WPPs.					
	Start Date	Month 24		Completion Date	Month 36	
Deliverables	<ul style="list-style-type: none"> <li>• Agendas, attendance lists, and materials for workshops and trainings</li> <li>• News releases or other promotional materials, as developed and disseminated</li> <li>• Advanced education and training components</li> <li>• Number of ISDs and students receiving watershed curriculum education</li> <li>• Texas Water Symposium live public event and Texas Public Radio Broadcast and archive</li> <li>• Results from pre and post evaluation surveys conducted at selected meetings</li> </ul>					

Tasks, Objectives and Schedules						
Task 8	Watershed Protection Plan Development					
Costs	Federal	\$58,500	Non-Federal	\$41,750	Total	\$100,250
Objective	TTU-LRFS will facilitate the development of a WPP for the Upper Llano River watershed through a stakeholder driven process. The WPP will include all elements of EPA’s Healthy Watersheds framework and be consistent with §319 National Program and Grants Guidelines (2004) and the Handbook for Developing Watershed Plans to Restore and Protect Our Waters (2008).					
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 §319 National Program and Grants Guidelines (2004) and the Handbook for Developing Watershed Plans to Restore and Protect Our Waters (2008) and incorporates the elements of EPA’s Healthy Watersheds Framework as described in the technical guidance document <i>Identifying and Protecting Healthy Watersheds</i> (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.					
	Start Date	Month 1		Completion Date	Month 36	
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.					
	Start Date	Month 34		Completion Date	Month 36	
Subtask 8.3	After EPA has completed a satisfactory consistency review of the WPP, TWRI will publish, print, and distribute to stakeholders the WPP and “executive summary” style document.					
	Start Date	Month 36		Completion Date	Month 36	
Deliverables	<ul style="list-style-type: none"> <li>• Draft WPP to TSSWCB (Month 32)</li> <li>• Final stakeholder-approved WPP to EPA (Month 36)</li> <li>• “Executive Summary” style public outreach document based on WPP</li> </ul>					

### **Project Goals (Expand from Summary Page)**

Implement EPA's Healthy Watersheds Initiative by developing a WPP for the Upper Llano River watershed through:

- Empowering local stakeholders to take leadership roles involving community and watershed level water resource issues
- Characterizing historical and current water quality and biological conditions
- Analyzing watershed data using models to provide indicators of health of the river and its watershed and allow impact and assessment of flow rates, spring flows, and groundwater levels associated with invasive vegetation
- Development of a WPP to guide watershed implementation efforts aimed at preserving the Upper Llano for future generations
- Increasing education among students, teachers, citizens and stakeholders to build awareness, understanding and appreciation of the structure and function of watersheds, sources that impact water quality, potential impairments, conservation and proactive management and protection strategies.

### **Measures of Success (Expand from Summary Page)**

- Coordination and engagement of watershed stakeholders via the SLWA; this existing group will provide local stakeholders a platform for decision making regarding management of the Upper Llano watershed
- Completed GIS and LULC update of the watershed: this information will provide the most up-to-date source of watershed characteristics to be utilized in watershed modeling, assessment of needed management strategies and WPP development
- Collection and analysis of quality assured data for watershed assessment
- Completed modeling of the watershed to be used to develop management strategies and aid in identifying key areas in the watershed where management should be focused
- Stakeholder-approved WPP; the WPP will outline the voluntary management approach desired by Upper Llano River watershed landowners and stakeholders
- Effective delivery of educational programs as indicated by the number of landowners, citizens, and other stakeholders participating in workshops; numbers of ISDs and students receiving water and watershed curriculum; numbers of citizens participating in TWS; and increased knowledge and understanding of watershed management by students, stakeholders and individuals participating in the program, as measured by surveys and/or pre/post evaluations.

**2005 Texas Nonpoint Source Management Program Reference (Expand from Summary Page)**

**Goals and/or Milestone(s)**

Element One – Explicit short- and long-term goals, objectives and strategies that protect surface and groundwater.

LTG Objectives

- 2 – Support the implementation of state, regional and local programs to prevent NPS pollution through assessment... and education.
- 5 – Develop partnerships, relationships... to facilitate collective, cooperative approaches to manage NPS pollution.
- 6 – Increase overall public awareness of NPS issues and prevention activities.
- 7 – Enhance public participation and outreach by providing forums for citizens and industry to contribute their ideas and concerns about the water quality management process.

Short-term Goals

Goal One – Data Collection and Assessment: target CWA §319(h) grant funds toward water quality assessment activities in high priority, ...watersheds, vulnerable...aquifers, or areas where additional information is needed.

- Objective B – Conduct special studies to ... gain information to target ... BMP implementation activities.
- Objective C – Develop and adopt at the state level, ... WPPs ....

Goal Three – Education: Conduct education... activities to help increase awareness of NPS pollution and prevent activities contributing to the degradation of waterbodies, including aquifers....

- Objective A – Enhance existing outreach programs at the state, regional, and local levels to maximize the effectiveness of NPS education.
- Objective B – Administer programs to educate citizens about water quality and their potential role in causing NPS pollution.
- Objective D – Conduct outreach through CRP, Extension, SWCDs and others to facilitate broader participation and partnerships [that] enable stakeholders and the public to participate in decision-making and provide a more complete understanding of water quality issues and how they relate to each citizen.

Element Two – Working partnerships and linkages with appropriate state, ... regional, and local entities, private sector groups and Federal agencies.

Element Five – The state...identifies important unimpaired waters that are threatened or otherwise at risk. Further, the state establishes a process to progressively address these identified waters by conducting more detailed watershed assessments and developing watershed implementation plans...

**Part III – Financial Information**

<b>Budget Summary</b>				
Federal	\$	666,167	% of total project	60%
Non-Federal	\$	447,239	% of total project (≥ 40%)	40%
Total	\$	1,113,406	Total	100%
Category		Federal	Non-Federal	Total
Personnel	\$	66,329	\$ 53,784	\$ 120,113
Fringe Benefits	\$	18,989	\$ 14,086	\$ 33,075
Travel	\$	9,796	\$ 0	\$ 9,796
Equipment	\$	0	\$ 0	\$ 0
Supplies	\$	10,500	\$ 0	\$ 10,500
Contractual	\$	526,553	\$ 346,085	\$ 872,638
Construction	\$	0	\$ 0	\$ 0
Other	\$	11,550	\$ 0	\$ 11,550
Total Direct Costs	\$	643,717	\$ 413,955	\$ 1,057,672
Indirect Costs (15%)	\$	22,450	\$ 17,646	\$ 40,096
Unrecovered IDC	\$	0	\$ 15,638	\$ 15,638
Total Project Costs	\$	666,167	\$ 447,239	\$ 1,113,406

<b>Budget Justification (Federal)</b>		
Category	Total Amount	Justification
Personnel	\$ 66,329	<ul style="list-style-type: none"> <li>• TWRI Project Manager (25% effort in years 1-3)</li> <li>• SSL Technician (23% effort in yrs 1-2)</li> </ul>
Fringe Benefits	\$ 18,989	17.1% of personnel plus group health of \$526/month prorated per FTE
Travel	\$ 9,796	<ul style="list-style-type: none"> <li>• TWRI @ \$1,449/yr in years 1-3 for travel to Junction ~3 times annually (\$327/trip) and Temple bi-monthly (\$78/trip)</li> <li>• ESSM @ \$1,000/yr in years 1-3 for travel to College Station annually (\$400/trip) and meetings/programs in watershed bi-monthly (\$100/trip)</li> <li>• SSL @ \$1,225/yr in yrs 1-2 for travel from College Station to watershed ~3 times/year to collect ground truthing data (\$408/trip)</li> </ul>
Equipment	\$ 0	NA
Supplies	\$ 10,500	<ul style="list-style-type: none"> <li>• TWRI Supplies @ \$500/yr for office supplies including computer software, paper, printing supplies, and other needed supplies</li> <li>• 1 SSL Computer @ \$4,000 in year 1</li> <li>• SSL Supplies @ \$2,500/yr in yrs. 1-2 for general office supplies (paper, printing supplies, and memory backup devices)</li> </ul>
Contractual	\$ 526,553	<ul style="list-style-type: none"> <li>• SLWA @ \$2,500/yr for website maintenance</li> <li>• TTU @ \$136,762 in yr. 1; \$186,536 in yr. 2; and \$195,755 in yr 3</li> </ul>
Construction	\$ 0	NA
Other	\$ 11,550	<ul style="list-style-type: none"> <li>• ESSM Educational Publications @ \$350/yr</li> <li>• SSL: 2006-2010 NAIP aerial photos of Llano watershed; ESRI ArcGIS 9.x software license; and other data/images/software @ \$3,000 in yr 1</li> <li>• Printing WPPs in year 3 (\$7,500)</li> </ul>
Indirect	\$ 22,450	15% of Total Direct Federal minus Contractual >\$25,000

<b>Budget Justification (Non-Federal)</b>		
Category	Total Amount	Justification
Personnel	\$ 53,784	<ul style="list-style-type: none"> <li>• TWRI Assoc Director (10.5% effort/yr in yrs 1-3)</li> <li>• ESSM Prof &amp; Ext. Range Spec. (2.65% effort/yr in yrs 1-3)</li> <li>• SSL Systems Analyst (19% effort/yr in yrs 1-2)</li> </ul>
Fringe Benefits	\$ 14,086	17.1% of personnel plus group health of \$526/month prorated per FTE
Travel	\$ 0	NA
Equipment	\$ 0	NA
Supplies	\$ 0	NA
Contractual	\$ 346,085	Texas Tech @ \$105,712 in yr 1; \$119,036 in yr 2; and \$121,337 in yr 3
Construction	\$ 0	NA
Other	\$ 0	NA
Indirect	\$ 17,646	26% of Total Direct Non-Federal Costs minus Contractual >\$25,000
Unrecovered IDC	\$ 15,638	11% of Total Direct Federal minus Contractual >\$25,000 per contract

<b>Contractual Budget Justification (Federal) – TTU</b>		
Category	Total Amount	Justification
Personnel	\$ 281,552	<ul style="list-style-type: none"> <li>• Director, LRFS (8.3% effort/yr in yrs 1-3)</li> <li>• Director, WRC (4.2% effort/yr in yrs 2-3)</li> <li>• WRC Grad Student (100% effort in yrs 2-3)</li> <li>• LRFS Post-doc (100% effort/yr in yrs 1-3)</li> <li>• LRFS Grad Student (100% effort/yr in yrs 1-3)</li> <li>• Student Worker (20 hrs per week in yrs 1-3)</li> </ul>
Fringe Benefits	\$ 78,715	\$20,584 in yr 1, \$28,028 in yr 2, and \$30,103 in yr 3 as follows: <ul style="list-style-type: none"> <li>• 18% of personnel (Directors &amp; Post-doc) plus \$611/mo faculty insurance rate prorated per FTE (in yrs 2-3, assumed 10% increase in insurance costs annually)</li> <li>• 1% of personnel (graduate students) fringe rate plus \$611/mo faculty insurance rate and \$328/mo graduate student insurance rate prorated per FTE (in yrs 2-3, assumed 10% increase in insurance costs annually)</li> <li>• 1% of personnel (student worker)</li> </ul>
Travel	\$ 18,000	<ul style="list-style-type: none"> <li>• 3 days for each of 10 quarterly sample dates @ 250 miles/day @ \$.51/mile to collect water quality, fish and macroinvertebrate samples.</li> <li>• Monthly travel for TTU–WRC team to travel to Junction (550 mile RT).</li> <li>• Miscellaneous travel for field reconnaissance sites, mapping activities, invasive species mapping, inventory and management.</li> <li>• Other travel by project team members to appropriate meetings of critical watershed stakeholder groups, planning sessions, etc.</li> <li>• In years 2 &amp; 3 travel for 4 members of TTU Project Team to attend a regional/national conference to present results of project</li> </ul>
Equipment	\$ 0	NA
Supplies	\$ 12,300	General field collecting equipment, nets, vials, preservatives, storage, office supplies, sample containers, sensors, stage gages, newsletters and publication costs of materials and papers submitted to journals, long distance phone charges, postage and FedEx charges
Contractual	\$ 0	NA
Construction	\$ 0	NA
Other	\$ 65,176	Tuition and Fees (\$6,348 in yr 1, \$13,331 in yr 2, and \$13,997 in yr 3) NELAC certified lab analysis (\$10,500/yr in yrs 1-3)
Indirect	\$ 63,310	15% of Total Direct Federal minus Tuition

<b>Contractual Budget Justification (Non-Federal) – TTU</b>		
Category	Total Amount	Justification
Personnel	\$ 111,747	<ul style="list-style-type: none"> <li>• Director, LRFS (6.25% in yr 1, 6.08% in yr 2, 5.08% in yr 3)</li> <li>• Director, WRC (4.2% effort in yrs 1-3)</li> <li>• LRFS Doctoral student (100% effort in yrs 1-3)</li> </ul>
Fringe Benefits	\$ 20,033	<ul style="list-style-type: none"> <li>• 18% of personnel (Directors) plus \$611/mo faculty insurance rate prorated per FTE (in yrs 2-3, assumed 10% increase in insurance costs annually)</li> <li>• 1% of personnel (doctoral student) rate plus \$328/mo graduate student insurance rate prorated per FTE (in yrs 2-3, assumed 10% increase in insurance costs annually)</li> </ul>
Travel	\$ 0	
Equipment	\$ 0	
Supplies	\$ 0	

Contractual	\$ 0	
Construction	\$ 0	
Other	\$ 17,307	Tuition and Fees for LRFS Doctoral student for yrs 1-3
Indirect	\$ 61,937	47% of Total Direct Non-Federal Costs minus Tuition
Unrecovered IDC	\$ 135,061	32% of Total Direct Federal minus Tuition