Trinity River Basin Environmental Restoration Initiative

A Project of Tarrant Regional Water District, the Spatial Sciences Laboratory and the Texas AgriLife Research and Extension Urban Solutions Center

Project Funded by the Texas Water Development Board
Contract # 0704830646

Quarter no. 9 from 4/1/09 through 7/1/09

I. Abstract

The goal of this project is to accommodate varied activities such as growing population and urbanization as well as changing landuses without sacrificing water quality and maintaining adequate water supplies for urbanizing areas. Watershed management through water modeling and water conservation education are some the most cost-effective practices available to ensure a safe and reliable public water supply. Watershed modeling is a holistic approach defined by hydrologic boundaries and integrates water quality impacts from varying sources, runoff, stormwater, erosion and nutrient and sediment transport. Key objectives of watershed modeling include identifying contaminant sources, evaluating the costs and benefits of implementing management practices to reduce loadings, and producing useful watershed planning tools, which can then be implemented by managing authorities.

Key objectives of this project include: Texas AgriLife Research assisting the TRWD by assembling information on water quality and pollution loads for its reservoirs and their watersheds, analyzing the effectiveness and feasibility of alternative management practices and structures, providing public educational programs to educate stakeholders about efficiently utilizing water and ways in which to conserve to insure adequate supplies for continued growth.

II. Overall Progress and Results by Task

Task 1. Effects of Land Use Change on Sediment and Nutrient Delivery to Reservoirs

Assess effects of urbanization and other land use changes (past, present, and future) on sediment and nutrient delivery to all major reservoirs in the Trinity River Basin (Freestone County and above) including Bridgeport, Eagle Mountain, Ray Roberts, Lake Lavon, Lewisville Lake, Cedar Creek, Richland Chambers, Navarro Mills, Bardwell, Ray Hubbard, Benbrook, and Joe Pool Reservoirs using the Soil and Water Assessment Tool (SWAT) model. Predict the effects of urbanization and of practices designed to reduce stormwater runoff and soil and stream bank erosion, on sediment and nutrient loading to the reservoirs. The modeling activities would provide tools to help managers identify
specific projects needed to protect the watershed, maintain reservoir capacity and improvement of water quality. Once completed this could serve as a model for the remainder of the basin and the rest of the state.

**Task 1.1:** Set up eight digit watersheds for the Trinity River Basin (Freestone County and above), collect data and other necessary inputs needed to successfully run and verify the SWAT model for present and future (2000’s, 2030) landuse conditions using the last 40 years of rainfall data.

**The following actions have been completed during this reporting period:**

- **Future (2030) landuse has been projected:**
  1. Population projections for 2000 and 2030 were obtained from the North Central Texas Council of Governments (NCTCOG). These data contain population projections by district. These data were overlaid with existing landuse to develop a relationship between population density and fraction of urban within each district.
  2. These data were used to extrapolate calibrated SWAT model results to account for increases in urban areas and the associated decrease in other land use categories. Urban increases were uniform applied to all categories of urban.
  3. The increase in urban area was summarized at the subbasin level.

**The following action was completed during the previous reporting periods:**

- Data collection and SWAT model set up have been completed.

**Task 1.2:** Calibrate basin hydrology using selected stream gauges and the SWAT model. Collect and analyze water quality, nutrient and sediment data for the Trinity River Basin from such sources as the US Geological Survey, the Texas Commission on Environmental Quality, Texas Water Development Board and the Trinity River Authority for the purposes of quantifying the differences between observed and modeled water quality parameters and sediment loads.

**The following actions have been completed during this reporting period:**

- Bridgeport, Cedar Creek, and Richland Chambers Reservoirs have been calibrated and validated for hydrology and nutrients.

**The following action was completed during the previous reporting periods:**

- Calibration and validation of hydrology and nutrients for the following reservoirs based watersheds have been completed:
  Eagle Mountain, Lavon, Rockwall Forney, Ray Roberts, Lewisville, Bridgeport, Benbrook

**Task 1.3:** Estimate sediment load entering reservoirs through SWAT simulations. Identify major sources of sediment in the project area and possible BMPs to correct the problem.
The following actions have been completed during this reporting period:
- Estimates of sediment load entering Eagle Mountain, Lavon, Rockwall, Forney, Cedar Creek, and Richland Chambers reservoirs through SWAT simulations have been completed.
- Project report is under development.

Task 1.4: Using the SWAT model, identify major sources of nutrients entering the project area and possible BMPs to correct the problem.

The following actions have been completed during this reporting period:
- SWAT simulations to identify nutrient source have been performed.
- Scenarios such as no ponds, without range grazing, urban, no cultivated crops, have been simulated.

Deliverables for Task 1

<table>
<thead>
<tr>
<th>Item</th>
<th>Due Date</th>
<th>% Complete</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delineated SWAT watershed model Trinity River Basin (Freestone County and above).</td>
<td>7/1/09</td>
<td>100</td>
</tr>
<tr>
<td>SWAT model calibrated for hydrology and compared to available water quality, nutrient and sediment data where available.</td>
<td>9/1/09</td>
<td>90</td>
</tr>
<tr>
<td>Technical memo with listing of reservoirs and modeled sediment loadings, and listing of plausible BMPs and their locations.</td>
<td>12/1/09</td>
<td>60</td>
</tr>
<tr>
<td>Technical memo to include major sources of nutrients, and listing of plausible BMPs with their locations.</td>
<td>12/1/09</td>
<td>30</td>
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Task 2  Urban Water Conservation Education

Work with cooperating State, Federal and local agencies and stakeholder groups to educate the public to conserve water supplies in the Dallas-Fort Worth Metroplex. Focus of the program is to educate a broad section of youth and adults in the DFW Metroplex about the importance of urban landscape management to increase conservation, improve water quality and improve the quality of life.

The program will work with cooperating groups like the North Central Texas Council of Governments (NCTCOG), Texas AgriLife Extension Service, Texas AgriLife Research, Master Gardeners, University of Texas – Arlington, Botanical Research Institute of Texas, TSSWCB eLife project, etc. as well as Regional Water Planning Groups. These institutions will work together to educate a broad cross section of the general public in the Dallas-Fort Worth Metroplex about the importance of urban landscape management and environmental infrastructure for water conservation (1-24 months).
Task 2.1 Develop and provide two workshops directed to landscape architects and designers, engineers, grounds managers, nursery owners, neighborhood developers, builders, and planners on the need and the how of designing and installing landscapes that not only conserve water but prevent non-point source pollution. Topics could include soils, irrigation systems, and plant material. Resources will include the Texas Nursery and Landscape Association, The WaterWise Council of Texas, and available data such as the Urban Landscape Guide and Texas Smartscape. The goal of the workshops will be to provide certification and be available for continuing education credits.

The following action was completed during the previous reporting period:

- Task Complete

Task 2.2 Compile information and develop a program to provide youth and adults information on water efficient landscape techniques and plants that will conserve water. Utilize, as a demonstration site, a water conservation garden that includes water conserving or native or adaptable plants. Conduct at a minimum five workshops at the site for youth and adults. Utilize pre-existing educational materials to deliver general water conservation programs.

The following actions have been completed during this reporting period:

- The design and installation of the demonstration garden at the Arlington Southwest Branch Library is complete. The project converts a conventional landscape design into one that integrates native and adapted plants and efficient irrigation systems to illustrate an aesthetically appealing approach to low water use landscaping.

- Five landscape and/or garden related events were conducted in spring 2009.
  - April 1: Steve Cheney, horticulturalist with Texas AgriLife Extension in Tarrant County, conducted a workshop in EarthKind landscaping principles.
  - April 8: Randy Weston with Weston Gardens in Bloom spoke to an audience of more than three dozen folks about landscaping through the seasons with perennials and ornamental grasses.
  - April 18: Dotty Woodson with the Texas AgriLife Research and Extension Urban Solutions Center presented information on EarthKind landscaping at a dedication event. The presentation was followed by a tour of the Smartscape garden.
  - April 18: A Learn and Grow fair for children ages 8+ was held in conjunction with the dedication. The fair featured hands-on activities and information about urban wildscapes, water conservation and composting for the youngsters.
April 21: Staff at the Arlington Southwest Branch Library hosted a reading hour for school-age children and their parents. Dozens of families enjoyed some story-telling, crafts and an introduction environmentally friendly gardening.

- These workshops and the establishment of the water conservation landscape at the Southwest Branch Library are the beginning of what will become a series of fall and spring water efficient gardening seminars.

**Deliverables for Task 2**

<table>
<thead>
<tr>
<th>Item</th>
<th>Due Date</th>
<th>% Complete</th>
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<tbody>
<tr>
<td>Develop and present a workshop for landscape professionals that emphasizes landscape design, plant material selection and ordinance compliance</td>
<td>11/1/08</td>
<td>100%</td>
</tr>
<tr>
<td>Develop and present a workshop for landscape professionals that emphasizes efficient irrigation practices and maintenance</td>
<td>11/1/08</td>
<td>100%</td>
</tr>
<tr>
<td>Develop and deliver a series of five workshops or events for the general public on efficient irrigation systems, plant material selection, etc. that conserve water</td>
<td>11/1/09</td>
<td>100%</td>
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<tr>
<td>Construct a water efficient landscape for educational purposes</td>
<td>11/1/09</td>
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**III. Related Issues/Current Problems and Favorable or Unusual Developments**

The Texas AgriLife Research and Extension Urban Solutions Center is working to obtain data from the North Central Texas Council of Government on urban growth patterns for the Metroplex. This data will be used to predict urban sprawl and population estimates for forecast modeling.

**IV. Projected Work for the Next Quarter**

Task 1: The Spatial Sciences Laboratory will continue SWAT model calibration for hydrology and compare it to available water quality, nutrient and sediment data.

Task 2: Work Complete