

Texas Water Resources Institute

Watershed Assistance to Improve Water Quality in North Central Texas

USDA-NRCS Contract # 985

Agreement # 68-7442-10-496

Quarter # 4

Reporting dates of April 1, 2011 through June 31, 2011

I. Abstract

Work conducted this quarter consisted primarily of completing the Economic task. Dr. Jason Johnson participated in an Ag Producers Meeting that was held on April 13, 2011 in Decatur, TX where BMP adoption scenarios were vetted by representatives of local USDA-NRCS, TSSWCB, and AgriLife Extension. These responses were recorded and later fed into an economic performance model where results were presented at a June 24, 2011 stakeholder meeting in Azle, TX. The input of the scenarios from the economic results is anticipated to be completed early August. Educational activities progressed as a total of 5 stakeholder meetings have been held for the Eagle Mountain Watershed Plan and more will be scheduled upon the completion of the SWAT modeling. In addition, several other educational activities were conducted and are listed later in the report. Lastly, monthly project coordination with all project partners has been moving along as meetings continue to ensure project activities are getting completed. Work next quarter will consist of completing the SWAT and WASP models, completing the factsheets and holding a final stakeholder meeting to present all results.

II. Overall Progress and Results by Task

TASK 1: SWAT Modeling

Months 1-12:

A team of water quality modelers at the Texas A & M Spatial Sciences Laboratory will work with Tarrant Regional Water District and the economics team to develop and assess site specific conservation practices and locations within the Eagle Mountain and Cedar Creek watersheds. The SWAT model will be utilized to characterize and evaluate the loading potential of sediment and nutrients from small acreage lands by modeling NRCS land management practices and other BMPs that control erosion and prevent non point sources of pollution in the Eagle Mountain watershed. (Dr. R. Srinivasan)

Deliverables:

- *Development of site specific conservation practices (Month 1 – 8)*
- *SWAT modeling results of BMPs (Month 1 – 12)*

The following actions have been completed:

- a. The calibrated and validated SWAT model was presented to stakeholders at a June 24 stakeholder meeting. In addition, SWAT runs were presented showing how they fit into WASP so that stakeholders have a clear understanding of how loading reductions are determined.
- b. The Modeling Final Reports are being drafted that will include the calibration, validation and simulations that have been run.
- c. Cost-effective scenarios for Eagle Mountain will be simulated during the next quarter as the economic analysis is now completed.

85% Complete

TASK 2: Economic Analysis

Months 1-12:

The economics team will utilize the economic model developed for Cedar Creek to finalize cost estimates to implement watershed best management practices in the Eagle Mountain watershed. They will cooperate with the modeling and educational teams to develop watershed protection plans and provide input on the cost associated with reaching water quality goals through economic analysis. Participate in briefings with TRWD and stakeholders as needed. They will also look at the cost of BMP implementation on small acreage lands in comparison to large tracts of agricultural lands. An economic final report will be written displaying these findings. (Dr. Jason Johnson & Dr. Ron Lacewell)

Deliverables:

- *Data identification, assimilation reviewed by stakeholders (Month 1 – 8)*
- *Economic model development (Month 1 – 8)*
- *Economic Analysis (Month 1 – 6)*
- *Economic Report*
 - *Draft (Month 1 – 6)*
 - *Final (Month 6 - 12)*

The following actions detail the activities and information obtained from the economic assessment:

1. All data has been collected and economic model has been completed.
2. Preliminary economic estimates associated with a 50 year project period for 24 individual best management practices has been completed.
3. A summary of the activities and initial estimates follows:

On April 13, 2011, a meeting was held with landowners, stakeholders and local/regional NRCS personnel to discuss the alternative BMPs and identify the current level of adoption for a set of 24 Best Management Practices (BMPs). Additionally, participants were asked to identify the most likely adoption rates for each practice as well as the feasible adoption rate that could be expected should sufficient cost-share programs and/or incentives be provided. The current adoption rate represents the best estimate by the expert panel of the current level of adoption for

each BMP within the Eagle Mountain watershed. The most likely adoption rate represents an adoption rate that participants identified as a realistic adoption rate with a typical level of promotion and education. The feasible adoption rate represents the maximum expected adoption rate with a maximum amount of promotional and educational effort; recognizing that convincing all stakeholders would never be possible for many of the land management practices. For the sake of the initial analysis, the marginal adoption rate was used and considers the additional implementation of each BMP between the current and most likely adoption rates. The table that follows provides a summary of the adoption rates determined by the stakeholders.

BMP	Description	Adoption Rates of BMPs			
		Current	Feasible	Most Likely	Marginal
1	Conversion of Cropland to Grass/Hay	0%	50%	25%	25%
2	Fert. Mgt. - 25% reduced P application	90%	100%	100%	10%
3	Establish Filter Strips	0%	50%	25%	25%
4	Establish Grassed Waterways	20%	60%	30%	10%
5	Terracing	20%	60%	30%	10%
6	Prescribed Grazing	10%	50%	30%	20%
7	Pasture Planting - reseeding	5%	20%	10%	5%
8	Critical Pasture Planting - shaping	30%	75%	40%	10%
9	Grade Stabilization - gully plugs	25%	75%	50%	25%
10	Prescribed Burning	1%	15%	5%	4%
11	Brush Management	10%	60%	30%	20%
12	Phase II Urban Stormwater BMPs	0%	100%	50%	50%
13	Voluntary Urban Nutrient Mgt.	10%	25%	15%	5%
14	Required Urban Nutrient Mgt.	10%	80%	70%	60%
15	Herbicide Application - Riparian corridor	0%	10%	5%	5%
16	Riparian Buffer Strips - Med Erosion Areas	5%	50%	10%	5%
17	Riparian Buffer Strips - Critical Areas	0%	10%	10%	10%
18	Wetland Development - West Fork Trinity	0%	100%	100%	100%
19	Wetland Development - Walnut Creek	0%	100%	100%	100%
20	Hypolimnetic Aeration	0%	100%	100%	100%
21	P Inactivation with Alum	0%	100%	100%	100%
22	WWTP - Level I to Level II	0%	100%	100%	100%
23	WWTP - Level I to Level III	0%	100%	100%	100%
24	FP Sites - Big Sandy/Salt Creek	0%	100%	100%	100%

Details related to activities needed to implement each BMP were assessed from an economic perspective for a projected 50 year project period. The previously completed Cedar Creek watershed project provided a guideline for the costs and timeframe associated with several of the BMPs, however all cost estimates and investment timing assumptions were reviewed and updated as necessary to provide estimates of a 50 year project period beginning in 2011 for the Eagle Mountain watershed. For those BMPs not considered in the Cedar Creek project, the costs and investment timing were identified and incorporated for analysis in a consistent framework.

On June 15, 2011, Dr. Johnson met by teleconference with several members of the local/regional NRCS field staff that administers similar and identical programs for crop and pasture/range lands in the region. Each cost figure and investment timeline assumption was reviewed and adjusted (item by item). Additional details associated with urban, channel, reservoir, and flood protection

(FP) sites were obtained through a review of cost/investment details associated with the Cedar Creek project and consultation with Tarrant Regional Water District personnel to modify this data to conform to the specific attributes of the Eagle Mountain watershed. Waste Water Treatment Plant (WWTP) data were obtained from a October 2008 Alan Plummer Associates report titled, "Eagle Mountain Wastewater Treatment Facilities Report." This resulted in a set of cost estimates and investment timing considerations that was determined to be an accurate representation of the costs and investment timing needed to implement each BMP over the 50 year project period. A detailed itemization of these costs will be provided in the Final Report.

The cost estimates for each BMP were combined with the initial estimates of Phosphorous reduction resulting from the water modeling efforts to arrive at a initial economic ranking of BMPs that combines the cost of their implementation with their respective efficiency in addressing Phosphorous reductions in the watershed. The following table provides these rankings.

Initial Ranking of BMPs by Lowest Estimated Cost		
BMP	Description	Annual Cost per kg. of P reduced
9	Grade Stabilization - gully plugs	\$ 5.55
3	Establish Filter Strips	\$ 6.39
4	Establish Grassed Waterways	\$ 9.65
15	Herbicide Application - Riparian corridor	\$ 15.37
14	Required Urban Nutrient Mgt.	\$ 27.06
5	Terracing	\$ 53.39
1	Conversion of Cropland to Grass/Hay	\$ 55.31
20	Hypolimnetic Aeration	\$ 62.43
10	Prescribed Burning	\$ 72.62
21	P Inactivation with Alum	\$ 110.92
24	FP Sites - Big Sandy/Salt Creek	\$ 204.82
7	Pasture Planting - reseeding	\$ 209.35
6	Prescribed Grazing	\$ 215.65
11	Brush Management	\$ 285.78
18	Wetland Development - West Fork Trinity	\$ 298.97
13	Voluntary Urban Nutrient Mgt.	\$ 389.18
22	WWTP - Level I to Level II	\$ 416.69
12	Phase II Urban Stormwater BMPs	\$ 421.33
2	Fert. Mgt. - 25% reduced P application	\$ 441.45
19	Wetland Development - Walnut Creek	\$ 538.23
17	Riparian Buffer Strips - Critical Areas	\$ 998.83
8	Critical Pasture Planting - shaping	\$1,005.37
23	WWTP - Level I to Level III	\$1,153.13
16	Riparian Buffer Strips - Med Erosion Areas	\$1,431.70

Taking into account the fact that BMP 20 (Hypolimnetic Aeration) and BMP 21 (P Inactivation with Alum) are mutually exclusive, the initial assessment indicates that even with all BMPs adopted at the most likely adoption rate (i.e. defining the marginal adoption rate as the difference between most likely and current level of adoption), the 30 percent P reduction target will not be achieved. This conclusion is subject to revision as impacts from the sequential implementation of BMPs in the water modeling framework are completed. However, initial estimates put the annual expense of adopting all BMPs at approximately \$10 million an P reduction levels falling

below the 30 percent target. In order to reach the 30 percent P reduction target, it may be necessary for BMP adoption rates to reach the feasible level of adoption, rather than the most likely level of adoption. If a higher adoption level can be achieved (for the most cost-efficient and effective BMPs on the list), preliminary analysis suggests that the P reduction target might be achieved at an annual cost of approximately \$3.3 to \$3.8 million. Higher adoption of more efficient BMPs would also eliminate the need to implement - at any level - a number of the higher cost/less efficient BMPs. These tradeoffs and implications will continue to be examined and refined as the watershed modeling work is completed.

95% Complete

TASK 3: Education

Months 1-12:

Working with the Texas AgriLife Research and Extension Urban Solutions Center in Dallas the education/outreach team will continue to conduct stakeholder meetings in the Cedar Creek and Eagle Mountain Watersheds. The purpose of these meetings will be to gather stakeholder input for implementation of watershed management plans. (Justin Mechell & Clint Wolfe)

Deliverables:

- 4 stakeholder meetings in Eagle Mountain watershed (Month 1 – 12)
- 4 advisory committee meetings in Eagle Mountain watershed (Month 1 – 12)

The following actions have been completed:

- a. Thus far, a total of 14 Stakeholder meetings for the development of the Cedar Creek Watershed Protection Plan have taken place.
- b. A total of 5 stakeholder meetings for the development of the Eagle Mountain Watershed have taken place and more will be scheduled upon the completion of the economic analysis of proposed best management practices and subsequent computer modeling of forecasted implementation.
- c. Texas AgriLife Research and Extension conducted an active Spring season of youth and adult outreach emphasizing stormwater education, stream processes, and overall watershed stewardship. AgriLife officials accepted invitations to present at numerous school events, weekend environmental festivals, corporate events, lake clean-up events, and summer camps.
- d. Texas AgriLife Research officials from the Dallas Research and Extension Center participated as the primary stormwater and watershed instructors at the Trinity River Audubon Society's River Institute workshop for local high school teachers on day one of a three day workshop.
- e. The following educational activities were also conducted this quarter:

Tarrant County Earth Day	4/14/2011	Rainfall simulator, enviroscape, and stream trailer. Stormwater and Eagle Mountain Watershed.
PlanoLiveGreen	4/16/2011	Stream Trailer, rainwater harvesting. Watersheds and

		urban stream processes. Trinity River Basin.
DFW Airport Environmental Festival	4/22/2011	Stream trailer, watersheds, urban stream erosion. Trinity River Basin.
City of Richardson Trash Bash	4/23/2011	Stream trailer, rainwater harvesting. Watersheds, urban stormwater, urban stream erosion. Trinity River Basin
St. Monica's Catholic School- Dallas	4/27/2011	Stream trailer, watersheds, stream erosion. Trinity River Basin
John Bunker Sands Wetlands Mudbug Festival	5/9/2011	Stream Trailer, Cedar Creek Watershed, stream erosion.
City of Forney Fit Fest	5/9/2011	Stream Trailer, Cedar Creek Watershed, stream erosion.
Hunt County Youth Ag Day	5/12/2011-5/13/2011	Stream trailer, watersheds, stream erosion.
Robert E. Lee Elementary School- Dallas	5/12/2011	Stream Trailer, watersheds, stream erosion.
Eagle Mountain Lake Cleanup	May 14, 2011	Stream trailer , Eagle Mountain Watershed, stream erosion.
Lake Dallas ISD- Upper Trinity Regional Water District	5/16/2011	Stream Trailer, enviroscape. Watersheds, stream erosion, stormwater
City of Fort Worth Waterama	5/17/2011-5/18/2011	Stream trailer, Eagle Mountain Watershed.
Boyd Middle School	5/20/2011	Stream trailer, Eagle Mountain Watershed.
City of Grand Prairie Mayfest	5/21/2011	Stream trailer, watershed, Trinity River Basin
Stream Processes Workshop	June 1, 2011	Stream Processes, erosion, watersheds, best management practices
Trinity River Institute- Trinity River Audubon Center, Dallas	6/8/2011	Stream Trailer, enviroscape, Rainfall Simulator, Incredible Water Journey. Stormwater, watersheds, Water cycle, Trinity River Basin.

95% Complete

Task 3.1: Educational Programming
Months 1-12:

Texas AgriLife Extension Service working with local county offices will continue conducting educational activities in the watersheds managed by TRWD. The goal of these programs is to increase the water literacy of local residents and change attitudes and behaviors in order to protect and improve water quality a major focus of these efforts will be on educating and conducting demonstrations for small acreage landowners. Educational materials will also be developed and delivered relating to management of small acreage lands in the Cedar Creek and Eagle Mountain Reservoir Watersheds. (Justin Mechell)

Deliverables:

- *Cedar Creek watershed Implementation fact sheet (Month 1 – 6)*
- *Eagle Mountain watershed characterization fact sheet (Month 1 – 6)*
- *Water quality fact sheet (Month 1 – 6)*
- *Grassed waterways fact sheet (Month 1 – 6)*
- *Vegetative filter strip fact sheet (Month 1 – 6)*
- *Stream processes fact sheet (Month 1 – 6)*

The following actions have been completed:

- a. The draft Eagle Mountain watershed characterization fact sheet is being updated to include the information from stakeholder input and economic study results discussed during the June 24, 2011 Eagle Mountain stakeholder meeting. The finalized document will be submitted to AgriLife Communication
- b. The Water Quality fact sheet is complete and is at AgriLife Communications being published.
- c. The Grassed Waterways fact sheet is completed and has been submitted to AgriLife Communications.
- d. The Vegetative filter strip fact sheet is complete and will be submitted to AgriLife Communications for publishing.
- e. The Stream Processes fact sheet is complete and will be submitted to AgriLife Communications for publishing.

95% Complete

TASK 4: Administration.

Months 1-12:

Provide administrative support for Tasks 1-3, including coordination among organizations and tasks, and submission of quarterly and annual reports. The Institute will also maintain the project Web site. The Web site will house all reports, educational materials and general information on the project and water quality. (Dr. Bill Harris & Allen Berthold)

Deliverables:

- *Quarterly Progress Reports (June 15, September 15, December 15, March 15)*
- *Annual report (March 15, 2011)*
- *Update and maintain website (Month 1 – 12)*

The following actions have been completed:

- a. Monthly conference calls have been held on the second Tuesday of every month where all project partners discussed the work that has been ongoing for their respective task as well as how the project will move forward. These calls were very effective as substantial progress in the project has been made.
- b. The project website continues to be updated as activities are conducted.
- c. Quarterly Report 4 was turned in to NRCS on July 15, 2011.

95% Complete

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

- N/A

IV. Planned Activities for the future

- Continued educational programs
- Finalizing and printing fact sheets
- Completion of SWAT modeling

V. Budget

FY 10 Funded Project

	Current Balance (as of 6/30/11)
Texas Water Resources Institute	\$0
Texas AgriLife Research and Extension Center - Dallas	\$13,338
Spatial Sciences Lab - TAMU	\$28,372
Texas AgriLife Extension – BAEN and AGECE	\$47,949
TOTAL	\$89,659