RESTORING WATER QUALITY IN THE MARAIS DES CYGNES BASIN

FINAL REPORT

For

E.P.A. Targeted Watershed Grant
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Acronyms

ac. – Acre
APWA – American Public Works Association
BLI – Basin Leadership Institute
BMP – Best Management Practice
cu. – cubic
EPA – Environmental Protection Agency
EQIP – Environmental Quality Incentive Program
FSI – Forest stand improvement
ft. – Feet
ft^2 – Square Feet
GIS – Geographical Information System
HUC – Hydrologic Unit Code
HWQP – Hillsdale Water Quality Project, Inc.
I&E – Information and education
Kan. – Kansas
KDHE – Kansas Department of Health and Environment
KELP – Kansas Environmental Leadership Program
KFS – Kansas Forest Service
KSU – Kansas State University Research and Extension
LF – Linear Feet
MdC – Marais des Cygnes
MDC – Missouri Department of Conservation
mi^2 – Square Mile
Mo. – Missouri
MOU – Memorandum of Understanding
MU – University of Missouri
NPDES – National Pollutant Discharge Elimination System
NPS – Nonpoint Source
NRCS – Natural Resources Conservation Service
OWTS – Onsite Wastewater Treatment System
QAPP – Quality Assurance Protection Plan
RC&D – Resource Conservation and Development
RFP – Request for Proposal
SLT – Stakeholder Leadership Team
TMDL – Total Maximum Daily Load
TPA – trees per acre
TWG – Targeted Watershed Grant
USDA – United States Department of Agriculture
WRAPS – Watershed Restoration and Protection Strategy
YIG – Youth in Government
yr. – Year

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Project Summary

Background

Watershed Characteristics

The Marais des Cygnes (MdC) River Basin, located south of the Kansas City metropolitan area, is home to more than 125,000 Kansas (Kan.) and Missouri (Mo.) residents. The basin is characterized by increasing development expanding from the Kansas City area; growing recreational demands and municipal needs; robust agriculture comprised of feed grain production, grazing lands and confined animal feeding operations (primarily dairy and beef cattle) and critical wildlife habitat areas including the MdC Wildlife Area (Kan.) and MdC National Wildlife Refuge (Mo.); a natural wetlands providing habitat for migratory waterfowl.

Figure 1. The MdC, Marmaton and Little Osage Rivers are vital natural water supply and recreational resources to residents of the 17 basin counties. The map above shows those rivers, and their corresponding subwatersheds. The red lines indicate 303(d) listed streams.

The MdC Basin is in the ecological region known as the Osage Plains, a flat to gently rolling unglaciated prairie plain that extends from Kansas into Missouri. Truman Lake Reservoir, with an 11,500 mi^2 drainage area, is the outlet for 12 sub-watersheds. The lake, completed 30 years ago, is classified as eutrophic, reflecting large sediment inputs, excess nutrients, herbicides, fecal coliform bacteria and low dissolved oxygen. Water from the MdC River enters the Osage River, drains into Truman Lake Reservoir, flows eastward through the Lake of the Ozarks and finally north into the Missouri River. Annual precipitation for the basin averages 38.5 inches.

This basin also supports eleven federally listed threatened and endangered species including the American Burying Beetle, Bald Eagle, Least Tern, Mead's Milkweed, Piping Plover and Whooping Crane.

Sources of Water Quality Impairments

Identified impairments in basin streams include dissolved oxygen, nutrient loading and fecal coliform bacteria. Impairments in basin lakes include eutrophication, excessive biomass and sediment. Suspected sources of these impairments include livestock production, municipal and home wastewater treatment systems, crop production, stormwater and naturally occurring sources.

Efforts Underway

Past efforts included watershed plans that covered the entire basin. Recent Clean Water Act efforts in Kansas target subwatersheds containing impaired waters or high value waters, and in Missouri target areas containing high priority Total Maximum Daily Loads (TMDLs). This has resulted in both states rewriting plans to comply with the US Environmental Protection Agency (EPA) 9 Element Watershed Plan guidance. Prior to application, both states identified, through public input, water quality issues and local stakeholders' concerns. Similarities drove the objectives for the initial EPA MdC Targeted Watershed Grant (TWG) application.

Traditional conservation programs offered through Natural Resources Conservation Service (NRCS), conservations offices, and extension offices provide ongoing water quality cost-share and technical assistance.

Program Objectives

The MdC Basin TWG Program, hereafter referred to as TWG, focused on specific common action items identified in the two states' previous watershed planning efforts to manage the MdC River Basin TMDLs. Outcomes included reducing nutrient loading and fecal coliform bacteria while increasing dissolved oxygen levels in high priority TMDL areas.

Project partners decided early in the project to concentrate resources in the Lower MdC watershed, specifically Linn County, Kan. and Bates County, Mo., an under-served area in the basin with high priority TMDLs and with approximately equal landmass in each state. Maps below show high nitrogen, phosphorous and sediment loading in the Lower MdC.

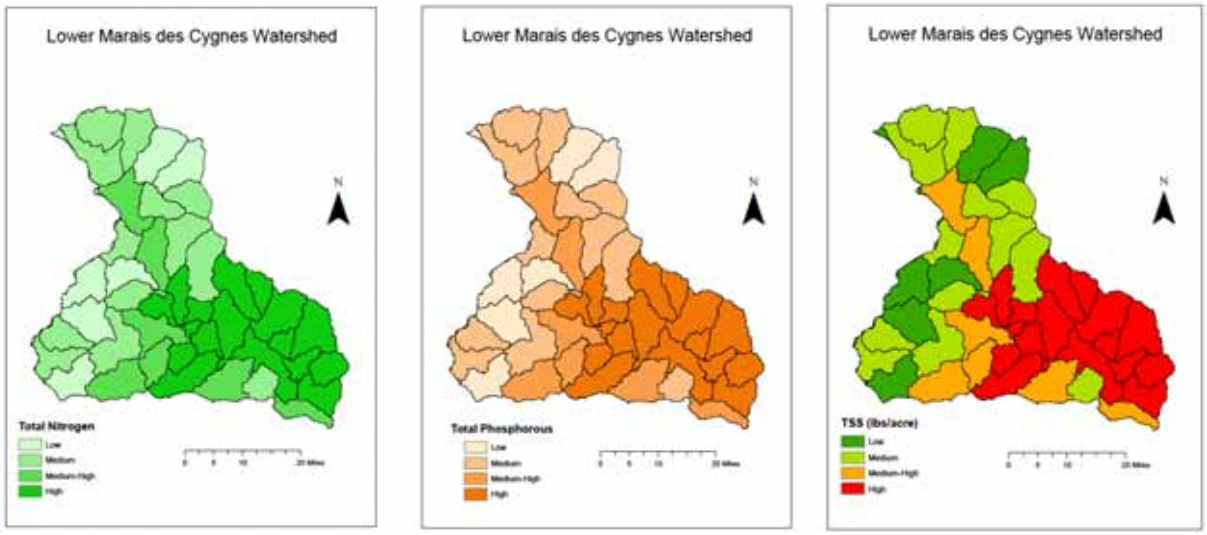


Figure 2. Maps illustrating the nitrogen, phosphorous and sediment loading in the Lower MdC.

The goal of this project was to implement the majority of identified best management practices (BMPs) within the first 36 months in the categories of livestock, forestry/streambank stabilization, septic upgrades and urban. Kansas and Missouri split evenly all BMP implementation cost-share funds. Partners recruited members for the Stakeholder Leadership Team (SLT) who, in partnership with the Administrative and Technical Support Teams, oversaw the program development and implementation.

Modeling was intended to be utilized throughout the program to identify the appropriate conservation practices to implement in the basin and assist in determining the impacts of these practices on water quality. Kansas State University Research and Extension (KSU) completed modeling to assist with identification of appropriate conservation practices in conjunction with the Livestock BMP auction design.

Students from Benedictine University in Atchison, Kan. completed bioassessments over three years to determine baseline water quality conditions, and to potentially drive the installation of BMPs.

The TWG Program included five specific objectives to improve water quality:

1. Assure Riparian Areas Produce the Best Possible Water Quality
2. Reduce Adverse Water Quality Impacts of Livestock Production
3. Reduce Adverse Water Quality Impacts from Onsite Wastewater Systems
4. Reduce Adverse Water Quality Impairments of Developed and Developing Areas in and Around Towns and Communities
5. Complete Bioassessments Along Major Stream and River Segments in the Basin

In addition to the five main objectives, the workplan identified environmental, behavioral and programmatic outcomes. The full workplan is included in Appendix 1. Environmental outcomes included specific stream health measures, such as increasing dissolved oxygen and decreasing sedimentation. Behavioral outcomes were measured by actions that landowners, governments

and others took due to having participated in TWG activities. Programmatic outcomes strove to increase partnerships and produce useful materials such as maps and data summaries.

Project Results and Evaluation

Through this project, partners anticipated that overall water quality would, at a minimum, stay consistent, if not improve through the restoration practices. Various criteria evaluated the effectiveness of grant activities throughout the grant period. Examples include the number of acres protected, cattle removed from streams and number of workshop participants. A detailed discussion on each objective is included in the main body of this report. Below, the results are summarized by objective.

Objective 1: Assure riparian areas produce the best possible water quality.

This objective included installation and maintenance of riparian forestry practices. The number of landowners participating in BMPs, number of installed practices and load reductions associated with each practice, as well as overall load reductions achieved through the riparian forestry practices indicated program success.

In the bi-state area, 25 landowners implemented 45 BMPs including timber stand improvement, tree plantings and maintenance, riparian fencing and native vegetation establishment. Two local governments each implemented a streambank stabilization project. Load reduction modeling indicated an estimated reduction of 2,457 lb/year of nitrogen, 1,684 lbs/year of phosphorus, 738 tons/year of sediment, 60,736 lb/year of total suspended solids, 3,030 lb/year of biological oxygen demand, 67 lbs/year of zinc, 32 lbs/year of lead, and 16,640 lbs/year of chemical oxygen demand.

Objective 2: Reduce adverse water quality impacts of livestock production.

This objective included installation of livestock management practices. The number of producers participating in the auction and cost-share practices, number of installed practices and load reductions achieved indicated program success.

In the bi-state area, 10 landowners implemented 13 BMPs including relocation of feeding sites away from riparian areas, riparian fencing, alternative watering systems and a livestock wastewater system. Load reduction modeling indicated an estimated reduction of 327 lbs/year of nitrogen and 5,760 lbs/year of phosphorus.

Figure 3. Linn County livestock producer, Matt Caldwell, shows participants components of a tire water tank during the May 2009 Livestock Field Day.

Objective 3: Reduce adverse water quality impacts from onsite wastewater systems.

This objective included the upgrade and replacement of failing, residential, onsite wastewater systems. As with other objectives, the number of systems replaced and load reductions achieved indicated the success of the program.

In the bi-state area, homeowners upgraded or replaced 48 failing septic systems through the TWG Program, resulting in an estimated load reduction of 2,180 lbs/year of nitrogen, 838.5 lbs/year of phosphorus, 4,304.4 lb/year of total suspended solids, 8,391.8 lbs/year of biological oxygen demand, and 1,794.3 lbs/year of ammonia nitrogen.

Objective 4: Reduce adverse water quality impairments of developed and developing areas in and around towns and communities.

This objective included educational programs such as workshops and the Basin Leadership Institute (BLI), as well as completion of one urban demonstration project such as a rain garden, swale or urban tree planting. The number of events held, number of attendees at the educational events, post-event surveys, number of urban BMPs installed and any number of ordinances enacted due to TWG educational programs all indicated program success.

Figure 4. BLI Participants toured several native plantings in and around Harrisonville, Mo during the 2009 session. Harrisonville staff emphasized the maintenance requirements of these plantings.

Including workshops and BLI, the TWG hosted a total of 21 educational events (12 workshops; 9 BLI sessions) with a total of 264 attendees (221 workshops; 43 BLI). With local support, project costs were minimized and allowed two urban areas in the bi-state region to install seven, highly-visible demonstration projects including rain gardens, vegetated swales, pet waste stations and urban tree plantings. During the grant period, and assisted by project activities, the City of Ottawa enacted a stormwater ordinance. Modeling shows the following impacts related to the installation of urban BMPS: estimated load reductions of 51.8 lbs/year of nitrogen, 15.4 lbs/year phosphorus, 1,549 lbs/year of total suspended solids, 114.3 lbs/year of biological oxygen demand, 2 lbs/year of zinc, and 636 lbs/year of chemical oxygen demand.

Objective 5: Complete bioassessments using the EPA bioassessments protocols and water chemistry analysis along major stream and river segments in the basin.

This element included implementing a basin monitoring program through bioassessments. The bioassessments were completed following the EPA approved: *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish;* Second Edition, by Michael T. Barbour, Jeroen Gerritsen, Blaine D. Snyder and James B. Stribling.

Figure 5. Benedictine students Amy Vogrin and Brandon Boesch gather fish species by electrofishing. The 70 bioassessments identified 26 fish species and assessed overall water quality.

Over three years, students conducted 70 bioassessments in the high priority area using EPA protocols. Annual summary reports were compiled and presented to SLT and project partners. Delays in the modeling and bioassessments components of the project did not allow the bioassessments results to drive the placement of BMPs so much as they provided meaningful data that could drive future BMPs and ultimately gauge the impacts of the BMPs installed through the TWG.

Outreach and Public Information

This grant included numerous public outreach elements. The following is an explanation of the activities per category.

Educational Programs

The workplan required a minimum of 10 workshops and tours held in the basin to highlight the water quality improvements, landowner and local communities' participation and needs to improve water quality throughout the watershed. Outreach activities conducted to achieve these objectives included pre-event and post-event news releases and direct media outreach; design, printing and distribution of brochures and event posters; direct mail and distribution of an e-newsletter; public presentations and displays; and maintenance of partner websites and email list serves.

Best Management Practices

Partners used similar outreach methods for BMPs as was utilized with the educational programs. In addition to using all of the methods listed above, partners utilized one-on-one visits with landowners/producers, signage designed and placed strategically during project installation and for a minimum of 90 days following completion, and radio spots, especially during the livestock auction process.

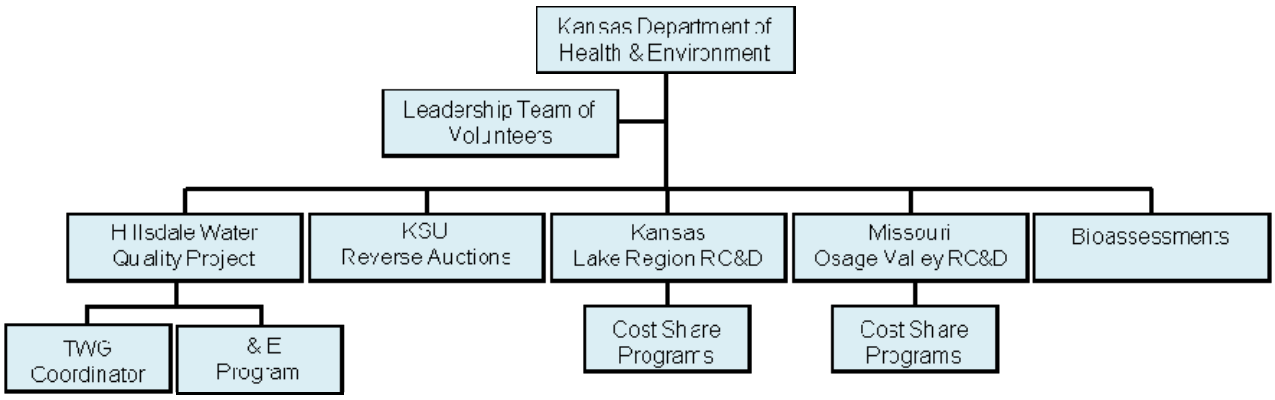
One of the main purposes of educational events was to spur BMP implementation. Following all educational events, surveys asked participants if they would be willing to install similar practices on their properties. Appropriate project staff followed up with all participants that indicated "yes". Also, the project brochure included a tear-off information request form. Brochure recipients returned 26 information request forms requesting information on BMPs and workshops.

Grant Management

The Kansas Department of Health and Environment (KDHE) sponsored the grant. Contracted local partners submitted quarterly reports to KDHE for compilation and submission to EPA. A KDHE staff member assisted the SLT, convened the Administrative Team, and served as a liaison between EPA and the project partners, the Administrative team, the Technical Team, and the SLT. Other project responsibilities included budget analysis and oversight, providing technical assistance as needed, completion of the final report and calculation of load reductions based on the BMPs installed.

The KDHE TWG project manager attended the EPA Targeted Watershed Grant Workshop *Building Capacity for Watershed Solutions Workshop* and *Funding Tools/Finance Workshop* January 28-February 1, 2008. A poster was prepared and presented during the workshop and a fact sheet providing an overview of the project was developed to share with other grantees at the workshop (Appendix 10). The fact sheet was also used extensively throughout the project to inform partners, landowners and others of the project goals and objectives.

The primary organizational structure was defined as follows:



One contractor, referred to as the TWG Coordinator, oversaw implementation and all education and information (I&E) activities throughout the bi-state region. This person was scheduled to be identified immediately upon receipt of the grant and Hillsdale Water Quality Project, Inc. (HWQP) was chosen by partners to supervise the contractor. The need to define procedures for unexpected administrative needs delayed the solicitation and contracting of this person until September 2008.

Management of the bioassessments was originally assigned to KDHE. This task was subsequently assigned to HWQP.

Passage of the 2011 budget bill on April 15, 2011, eliminated all NRCS funding for the Resource Conservation and Development (RC&D) program retroactive to October 2010. With no closeout funds available, Osage Valley RC&D and Lake Region RC&D immediately lost the full-time administrative and technical support of coordinators and the use of NRCS equipment and

supplies. The RC&D Councils were also required to vacate their respective office space and relocated to new offices. As a system was in place to approve projects, the BMP approval and completion process was able to continue uninterrupted for the remainder of the grant.

Primary Project Partners

Partners in this program were identified based on their locations, expertise in the different objectives, and experience working together to successfully complete implementation of educational and BMP activities.

The major partners contracted to complete work in the TWG Program are described below along with the major tasks assigned to each.

Hillsdale Water Quality Project, Inc.

HWQP was a non-profit, volunteer-based 501(c)3 organization working to improve water quality in the Hillsdale Lake Watershed and throughout the Kansas portion of the MdC Basin. Project staff and the Board of Directors had more than 20 years' experience overseeing EPA, KDHE, county and membership funds. The program tasks were completed by HWQP staff and the contracted TWG Coordinator.

HWQP responsibilities included planning and oversight of all I&E activities and supervision of the Coordinator. A staff member and the Coordinator served on the Administrative Team and oversaw agendas, minutes and needs for the SLT. The Coordinator also provided assistance to the Technical Team as needed. Two HWQP volunteer Board of Director Members served on the SLT; one was elected as the Chairperson. The TWG Coordinator provided updates to the Board at monthly meetings to assist in promotion of the program.

Lake Region Resource Conservation and Development

Lake Region RC&D Council, Inc. is a non-profit 501(c)3 corporation with a goal of improving water quality in the MdC Basin. The Council members are volunteers representing county commissions, county conservation districts, and members at-large of six Kansas counties. They sponsored Kansas' first basin-wide Watershed Restoration and Protection Strategy (WRAPS) for the MdC Basin. The MdC Riparian Forestry Initiative began as a result of the needs identified in the WRAPS plan.

A representative from Lake Region RC&D served on the Administrative Team and the RC&D oversaw the distribution of funds for BMPs installed in Kansas. Upon project completion and approval, the funds were released to landowners. Maintenance of the BMPs was also overseen through the RC&D Council and the SLT. A Lake Region RC&D Council member served on the SLT and as the Treasurer of the Lake Region RC&D TWG Program's financial account.

The Lake Region RC&D provided support of the council, the RC&D Coordinator and other project staff to assist with hosting and scheduling events for Kansas and provide any needed assistance to Missouri for the duration of the grant. The staff provided updates to the Council at monthly meetings to assist in promotion of the program, assisted landowners in completing all required paperwork for BMP funds and notified landowners of approval, denial, or canceled applications. They also assisted in Technical Support Team meetings as coordinators and technical advisors.

Osage Valley Resource Conservation and Development

The Osage Valley RC&D Council is a 501(c)3 not-for-profit organization. Osage Valley RC&D's service area consists of Bates and Vernon counties within the MdC Basin and eight additional counties downstream, including the Truman and Pomme de Terre Reservoirs and the Lake of the Ozarks.

Osage Valley RC&D's role in the TWG Program was to administer BMPs installed in Missouri, assist with scheduling and hosting events in Missouri and provide any necessary assistance to project partners. A representative from Osage Valley RC&D served on the Administrative Team and a representative of the Council served on the SLT. The RC&D also oversaw the distribution of funds for BMPs installed in Missouri. Upon project completion and approval, the funds were released to landowners. The staff provided updates to the Council at bimonthly meetings to assist in promotion of the program, assisted landowners in completing all required paperwork for BMP funds and notified landowners of approval, denial, or canceled applications. They also provided technical support as needed.

Kansas State University Research and Extension

KSU guided and assisted the TWG SLT with the planning and implementation of the livestock BMP auctions. KSU provided a benefit/cost presentation to the SLT to increase the understanding of TMDL issues relevant to the targeted area. KSU also completed watershed modeling to assist with BMP targeting and also the load reduction calculations used to assist with evaluating the bids received. Working with the SLT, KSU determined criteria for evaluating the bids gathered during the livestock BMP auction as well as aided in evaluating and determining adequate projects.

Other Contracted Services

Additional budgeted contractual services included:

- Bioassessments to assist in establishing baseline water quality and monitor water quality throughout the grant period.
- Technical services to evaluate water quality data and provide recommendations.
- One urban BMP demonstration project.
- Modeling support, as needed.

Grant funds allocated for these services were as follows:

Bioassessments	$40,000
Technical Services for Monitoring Data	$10,000
Urban Demonstration Project	$27,500
Modeling Support	$35,000

Service providers for these contracted services were determined as needed.

Additional Partners

A wide variety of bi-state partners were anticipated to participate in this project. A complete list of agencies, organizations and others that had stated during the application process they would like to partner and/or participate in this project is included in Appendix 1. Many of the partners provided assistance by locally publicizing events and activities and participating in Technical Support Teams.

The Kansas and Missouri watershed plans represented years of public outreach, organizing stakeholders, assessing and analyzing the MdC Basin and evaluating implementation priorities. Strong partnerships developed during this process made efficient implementation of the actions presented in the TWG Program possible. These ongoing watershed planning efforts helped engage local municipalities, businesses, local leaders and volunteers to restore and improve the watersheds at the grassroots level.

Administrative Team

After receiving approval of the EPA TWG Program, the partnership organized an Administrative Team (Admin Team). The Admin Team consisted of representatives from KDHE, HWQP, Lake Region RC&D and Osage Valley RC&D. This team met three times initially following the notification of the finalists in 2007 to prepare for the program and update the Project Implementation Plan for resubmittal.

Topics the Admin Team covered during that time frame included: writing and approving the final work plan; recruiting SLT members; providing staffing needs; making high priority area decisions; contracting with other partners; and overall grant management logistics for the two states to partner cohesively.

Throughout the program, the Admin Team met 22 times on the following dates. Conference calls were utilized for these meeting whenever possible and the team also scheduled meetings immediately following the SLT meetings whenever possible.

Table 1. Administrative Team Meeting Summaries.

Date	Location	Discussion
9/10/2007	New Century, Kan.	Grant objectives, targeted areas, partner responsibilities, grant management
9/27/2007	New Century, Kan.	Budget, work plan, contracted employee position description
10/25/2007	New Century, Kan.	Project area, BMP auction, urban project, impact measurement
4/1/2008	Conference Call	Location for SLT meetings, BMP auction
4/22/2008	Conference Call	SLT time commitment concerns, define SLT responsibilities
6/26/2008	Lee's Summit, Mo.	Project organizational structure, budget, work plan. contracted employee, role of SLT
6/30/2008	Topeka, Kan.	Modeling
9/22/2008	Conference Call	Partner responsibilities. bioassessments, next SLT meeting needs
10/14/2008	Conference Call	Press releases, contributed services, modeling
11/4/2008	Lee's Summit, Mo.	Newsletter, planning for workshops, work plans, BLI, implementation of BMPs, invoice/affidavit procedures
1/7/2009	New Century, Kan.	Bioassessments
5/18/2009	Conference Call	Budget, work plan revisions
9/20/2009	New Century, Kan.	Livestock projects, bioassessments, urban BMP, BLI
4/12/2010	Conference Call	BLI, budget, status of forestry and livestock projects, load reductions
5/26/2010	New Century, Kan.	Budget, project status
6/21/2010	Conference Call	BLI, budget
8/10/2010	New Century, Kan.	Budget, potential projects for unallocated funds
1/25/2011	New Century, Kan.	Budget, funds remaining, recommendations to the next SLT meeting
2/10/2011	Conference Call	Ottawa funding request, budget, onsite maintenance workshops
9/9/2011	Butler, Mo.	Budget, project status, final report
9/22/2011	Adrian, Mo.	Budget, remaining project needs, project status
11/8/2011	Conference Call	Project completion timeline, final report, budget

The Admin Team, in conjunction with the KDHE Communications Office, assisted with the planning of the TWG award presentation ceremony held on December 3, 2007. The ceremony was held at Hillsdale Reservoir in Miami County, Kan. E-mails were sent to interested parties and newspapers throughout the basin to provide an update regarding the grant status and presentation on the check. The ceremony was held at Hillsdale Reservoir on December 3, 2007 and was attended by approximately 40 people. Presentations were given by EPA Regional Administrator John Askew; Major Michael Fitzgerald, deputy commander, Kansas City District, U.S. Army Corps of Engineers; Roderick L. Bremby, Secretary, Kansas Department of Health and Environment; and Karl Fett, director, Kansas City Office of the Missouri Department of Natural Resources. Jayhawk Marina, located at Hillsdale Reservoir, provided refreshments.

Figure 6. EPA Region VII Administrator John Askew (right) presents KDHE Secretary Roderick L. Bremby (center) and MDNR Director Karl Fett (left) with the $900,000 TWG grant check.

Stakeholder Leadership Team

Project partners recruited local volunteers to serve on the SLT. The SLT provided general project guidance and oversight for BMPs. The team also made recommendations on the work plan, work plan amendment, bioassessments site determination and cost-share program. An SLT roster is available in Appendix 1.

Technical Advisory Team

Technical Advisory Teams, for the overall project, onsite wastewater, and forestry BMPs, evaluated projects and provided technical insight and suggestions to the SLT. Throughout the program, technical service providers and partners were informed of SLT meeting dates, provided presentations and updates and assisted in the BMP specification and installation oversight and recommendations to the SLT. A complete listing of the technical advisors is included in Appendix 1.

Budget

The original estimated budget reflected an overall grant-funded project of $900,000 and a minimum of $300,000 in in-kind services and outside funding for a total project cost of $1,200,000 to complete the objectives. Project partners provided $448,946 or 33% of the total project costs. Actual amounts provided by each partner are listed in Tables 2 through 6.

Approximately six months into the project, several events occurred that resulted in an amendment request. The request and approval are included in Appendix 1. The following changes were approved by EPA.

Modeling for the Livestock Auction was completed under a separate EPA grant. Therefore the $35,000 allocated to this category was no longer needed and was reallocated to salaries. Technical support for data analysis was completed under the Bioassessment category. Therefore the $10,000 allocated under this category was reallocated to salaries. Funds for salary and fringe benefits had not been allocated for the Marais des Cygnes Watershed Forester. Shortly after the beginning for the TWG Project, the Forester left the Kansas Forest Service and began Ecotone Forestry, a subsidiary of Lake Region RC&D. Ecotone Forestry services are fee based, therefore the TWG Project funds were needed to purchase the services to ensure installation of effective riparian forestry best management practices. A request was made to allocate $31,200 for personnel funds and $14,218 for fringe benefits for the watershed forester.

A reduction in the number of bioassessments completed from 100 to 70 with no change in the allocated amount of $40,000 was requested. At the time of the submittal of the work plan, the college professor identified to complete the work had changed positions from Ottawa University to Benedictine College. Student hours were covered by Ottawa University and this option was not available through Benedictine College. A stipend for three students of $3,000 per student per year was needed to complete field and laboratory work. The mileage reimbursement rate also increased from $0.43 per hour to $0.505 per mile.

A $54,000 increase in funding for the TWG Coordinator's salary and elimination of the $24,000 amount for the contracted employee's fringe benefits was requested in order to contract a qualified coordinator to manage the field and educational activities for the project.

In addition to the amendment, the following variances in the budget were made as the project progressed.

Leading KDHE staff and partners were originally tasked to participate in a minimum of two EPA Annual National Targeted Watersheds Grant Program Conferences. Funds were allocated to provide travel and lodging costs for the conference attendees although EPA discontinued these conferences during the first year of the TWG project. These funds were reallocated to the installation of BMPs; KDHE transferred $4,000 from their travel budget to Lake Region RC&D to provide cost share for four additional onsite wastewater system upgrades.

HWQP closed their doors as of December 31, 2011. As a result of this action, $10,641 in Targeted Watershed Grant funds were released back to KDHE from HWQP. Because the project was not complete and the TWG Coordinator contracted through HWQP was an integral part of the project, KDHE requested to use these funds to hire the TWG Coordinator as a temporary KDHE employee for no more than nine weeks in order to complete the grant. This also increased KDHE's indirects from $1,750 to approximately $2,700. Authorization was received and a sole source contract was completed between the TWG Coordinator and KDHE in the amount of $8,000 (Appendix 1). After the sole source contact with the TWG Coordinator was established, she began another full time position and was unable to dedicate the time needed to complete the remaining requirements of the grant; therefore KDHE staff members were required to provide

assistance. KDHE requested and received approval to allocate $3,200 of the remaining funds for KDHE personnel costs from 1/1/2012 through the end of the project.

Table 2 KDHE Budget.

Kansas Department of Health & Environment						
	Original Budget	Amended Budget	Final Budget		Affidavit Total	
Category	Grant	Grant	Grant	Match	Grant	Match
Salaries/Wages/Fringe	$0	$0	$3,200	$0	$3,894	$0
Travel	$6,000	$6,000	$2,050	$0	$1,422	$0
Supplies	$1,750	$1,750	$1,750	$0	$1,819	$0
Equipment	$0	$0	$0	$0	$0	$0
Contractual Services	$112,500	$31,910	$0	$0	$6,402	$0
Other	$0	$0	$0	$0	$8	$0
Indirect Costs	$1,750	$1,750	$1,750	$0	$2,596	$0
Total	**$122,000**	**$41,410**	**$8,750**	**$0**	**$16,141**	**$0**

The original, amended, and final budgets for each partner are provided in the tables below with an explanation of any budget variations.

HWQP's budget had allocated $4,000 for travel to EPA conferences. As this was not needed, Hillsdale requested that the $4,000 originally allocated for travel to four EPA workshops be reallocated as follows: $2,700 for worker's comp for the contracted employees (TWG Coordinator and students conducting the bioassessment field work) and $1,300 to Hillsdale's Personnel category. The request was submitted to EPA in August 2010 and approved in September 2010. Cost savings realized in the I&E components of the HWQP budget were reallocated to a streambank and two livestock BMPs.

Table 3. Hillsdale Water Quality Project Budget.

Hillsdale Water Quality Project						
	Original Budget	Amended Budget	Current Budget		Affidavit Total	
Category	Grant	Grant	Grant	Match	Grant	Match
Salaries/Wages	$20,000	$20,000	$21,300	$0	$21,289	$33,109
Fringe Benefits	$4,000	$4,000	$6,700	$0	$4,612	$3,248
Travel	$19,000	$19,000	$13,000	$0	$10,096	$3,704
Supplies	$20,000	$20,000	$20,000	$0	$17,807	$1,170
Equipment	$0	$0	$0	$0	$0	$0
Contracted Employee	$144,000	$174,000	$174,000	$0	$173,340	$0
Contractual Services	$0	$40,000	$65,750	$114,667	$66,211	$400
Other	$67,000	$67,000	$40,000	$0	$40,005	$10,072
Indirect Costs	$0	$0	$0	$0	$0	$0
Total	**$274,000**	**$344,000**	**$340,750**	**$114,667**	**$333,360**	**$51,703**

In additional to the variations to the Lake Region RC&D budget explained above, an additional $30,512 was allocated to Lake Region RC&D for additional urban, forestry, streambank stabilization, and/or low impact BMPs. These funds were from the original amount allocated to an urban BMP and the $18,712 released back to KDHE from KSU.

Table 4. Lake Region RC&D Budget.

Lake Region RC&D						
	Original Budget	Amended Budget	Current Budget		Affidavit Total	
Category	Grant	Grant	Grant	Match	Grant	Match
Salaries/Wages	$0	$31,200	$31,200	$10,400	$31,201	$0
Fringe Benefits	$0	$14,218	$14,218	$4,739	$14,218	$0
Travel	$0	$0	$0	$0	$0	$498
Supplies	$0	$0	$0	$0	$0	$0
Equipment	$0	$0	$0	$0	$0	$0
Contractual Services	$152,000	$134,586	$169,098	$56,275	$168,007	$220,208
Other	$60,000	$60,000	$60,000	$20,000	$61,090	$50,300
Indirect Costs	$0	$0	$0	$0	$0	$0
Total	**$212,000**	**$240,004**	**$274,516**	**$91,414**	**$274,516**	**$271,006**

Osage Valley RC&D had originally planned to employ an assistant within the first year of the project. Due to the retirement of the RC&D coordinator, the time period needed to advertise for and employ a new coordinator, and the training needed for the new coordinator, an assistant was not hired until April 2010. Therefore, $11,669 that would have been used for personnel was used to install additional BMPs.

Table 5. Osage Valley RC&D Budget.

Osage Valley RC&D						
	Original Budget	Amended Budget	Current Budget		Affidavit Total	
Category	Grant	Grant	Grant	Match	Grant	Match
Salaries/Wages	$0	$0	$34,000	$0	$33,655	$0
Fringe Benefits	$0	$0	$3,000	$0	$2,829	$0
Travel	$0	$0	$3,500	$0	$3,401	$0
Supplies	$0	$0	$5,500	$0	$5,621	$90
Equipment	$0	$0	$0	$0	$0	$0
Contractual Services	$152,000	$134,586	$154,696	$51,558	$166,365	$106,053
Other	$60,000	$60,000	$14,000	$20,000	$2,825	$0
Indirect Costs	$0	$0	$0	$0	$0	$0
Total	**$212,000**	**$194,586**	**$214,696**	**$71,558**	**$214,696**	**$106,143**

KSU was allocated $80,000 to design, implement, and administer two livestock BMP auctions; one in Kansas and one in Missouri. Of the total budget $61,288 was allocated to complete these activities, holding $18, 712 in reserve in the event a third BMP auction needed to be held. After

the completion of the first two auctions, the determination was made that a third auction was not needed and KSU released $18,712 back to KDHE.

Table 6. Kansas State University Budget.

Kansas State University						
	Original Budget	Amended Budget	Final Budget		Affidavit Total	
Category	Grant	Grant	Grant	Match	Grant	Match
Salaries/Wages	$52,952	$52,952	$39,112	$4,912	$42,330	$4,214
Fringe Benefits	$16,945	$16,945	$11,477	$1,809	$12,476	$803
Travel	$1,400	$1,400	$4,200	$0	$910	$0
Supplies	$1,430	$1,430	$527	$0	$0	$0
Equipment	$0	$0	$0	$0	$0	$0
Contractual Services	$0	$0	$0	$0	$0	$0
Other	$0	$0	$400	$0	$0	$0
Indirect Costs	$7,273	$7,273	$5,572	$13,373	$5,572	$15,077
Total	**$80,000**	**$80,000**	**$61,288**	**$20,094**	**$61,288**	**$20,094**

Objective 1: Assure riparian areas produce the best possible water quality

Introduction

Workplan Objective: Assure riparian areas produce the best possible water quality by providing cost-share assistance to landowners for

- Installing up to 3,000 linear feet of riparian buffer strips;
- Restoring up to 40 forested riparian areas;
- Improving, maintaining and planting 5,000 linear feet of riparian areas;
- Planting specialty forest products in riparian areas for up to 25 landowners;
- Installing streambank stabilization practices for up to 25 landowners; and
- Providing maintenance assistance for program participants.

A variety of forestry BMPs improves or restores riparian areas. A forest stand improvement (FSI) increases the health of the forests and protects the existing riparian area. Forest buffer strips increase nutrient uptake from trees, filter sediment and improve bank stability. Tree roots increase soil permeability to allow stormwater infiltration in rural and urban settings. Forest canopy cover increases levels of dissolved oxygen in rivers and streams by shading the water and reducing temperatures. Riparian fencing reduces livestock damage to the trees and prevents soil compaction and erosion. Streambank stabilization practices reduce sediment and specialty forest products allow an economic return for protecting or expanding riparian areas.

Methods

Planning

The Forestry Technical Committee first met on September 22, 2008 to develop the application and approval procedures, practice and component rates, and outreach plans for BMPs under this objective. Present at the meeting were NRCS, RC&D coordinators for Lake Region RC&D and Osage Valley RC&D, Missouri NRCS forester, Lake Region RC&D watershed forester, Missouri Department of Conservation private land conservationist and the TWG Coordinator. The Forestry Technical Committee discussed Kansas and Missouri cost-share programs for forestry BMPs. The committee used NRCS's Environmental Quality Incentive Program (EQIP) as a model and worked together to determine possible BMPs and application forms for the program. The program was based on the previous cost-share program administered by Lake Region RC&D, the MdC Riparian Forestry Initiative. The Forestry Technical Committee also determined that the TWG should utilize existing protocol, not add additional layers of application and approval. Project staff provided brief project summaries to the SLT during their regular meetings, but standing RC&D committees considered and approved forestry projects.

Knowledge of other programs aided the committee in developing a program and forestry cost-share application (Appendix 2) that was competitive due to:

- Flexibility,
- Ease of application process,
- Generous cost-share incentive (75%).

The second Forestry Technical Committee meeting was held on June 23, 2010 to review cost-share program administration, including obligated funds, funds under application and remaining funds. The committee also discussed remaining projects and set completion targets to maintain grant timelines, reviewed and amended practice and component rates to reflect current costs, and provided an overview of the program for the new Osage Valley RC&D Coordinator and the Missouri Department of Conservation resource forester based in Henry County.

Outreach and Education

Throughout the TWG program, partners distributed information to local landowners and residents via many vehicles, ranging from program brochures, workshops and tours to e-mail list-serve notifications and one-on-one site visits with landowners.

In Kansas, landowners were also identified through geographic information systems (GIS) and then contacted, requesting their participation in the grant program. This process included identifying sites on Middle Creek in Miami and Linn counties lacking riparian area vegetation. Additional GIS analysis was completed in Linn County for specific riparian forest buffer sites along stream segments.

The sites were then conjoined with current landowner contact information. Foresters initiated site visits by mailing letters and information about TWG cost-share and field days. This targeted approach helped increase the "bang for the buck" to improve and restore water quality.

Two Forestry Field Days were held to promote forestry BMPs and cost-share available. See Objective 4 for details.

Project staff recruited presenters and created event-specific presentations to provide information about the TWG forestry program and available assistance to a variety of groups. These included:

- Presentation at the annual Kansas Fall Forestry Field Day October 16, 2008, in Lawrence, Kan.
- Two presentations to Kansas NRCS student trainees about the TWG forestry program and benefits of riparian forestry in July 2010 in the Lake Region RC&D area.

Figure 7. Tom Priesendorf giving a demonstration of the importance of riparian forestry on stream health and storm water management.

- Presentation at the TWG Livestock Field Day September 2, 2010, near Pleasanton, Kan., that provided an overview of the TWG forestry program, benefits of riparian forestry and how to incorporate within livestock operation.
- Display at the riparian buffer workshop on April 28, 2011 in Linn County, Kan., and informed landowners of TWG cost-share opportunities.

Figure 8. Participants at the Forestry Field Day learn the importance of healthy riparian areas.

HWQP TWG I&E funds also provided signs for demonstration projects and all BMP sites to increase awareness of the TWG Program and specific practices installed to restore and improve water quality.

Process

Initial one-on-one contact time consisted of a site visit to landowners' property to determine their objectives, review site conditions and provide educational information regarding the TWG Program and forestry BMPs. During this one-on-one time, foresters provided landowners technical assistance for their specific property and, if appropriate, suggestions regarding BMPs to install or proper maintenance of existing practices.

The forestry staff shared the demonstration projects through one-on-one technical assistance and follow-up contact with previous landowners to review progress on projects. Landowner follow-up visits provided the opportunity for the forester to offer additional hands-on technical expertise on improving the condition of previously completed BMPs. This maintenance provided additional assurance to landowners about the activities needed to ensure a successful practice.

Lake Region RC&D forestry staff utilized the previous five years of contacts and partnerships developed within the watershed from the MdC Riparian Forestry Initiative. A quality reputation and relationships were in place that assisted in project notifications. The MdC Riparian Forestry Initiative was on-going during the TWG Program with a different geographic focus area within the basin. Information and educational products benefited both grant projects.

The target area, along with landowner interest in the TWG cost-share program determined whether TWG funds would be utilized for project completion. From the initial one-on-one site visits, a number of landowners either did not meet the TWG cost-share requirements or they determined a different cost-share program to be a better fit for them.

In Kansas, there were 25 initial one-on-one site visits, with 12 completing multiple BMPs utilizing 27 approved cost-share applications. Some landowners submitted multiple applications for separate components that had different timeframes for completion. This allowed for verification and payment when specific portions of management plans were completed.

Qualified landowners completed a forestry application with assistance from a forester. As with other TWG cost-share programs, the application was signed and dated by both the landowner and forester and submitted to the RC&D office prior to beginning work. There, the application was reviewed for any missing information before forwarding to the cost-share committee for funding consideration. In Kansas, the Lake Region RC&D's forestry management committee also served as cost-share committee for riparian BMPs. In Missouri, a cost-share committee approved applications.

Staff then followed up with the applicant in writing as to whether the application was approved or denied. For approved applications, forestry contracts (Appendix 2) with additional requirements were signed.

Once all work was completed, the forester completed a final inspection before providing technical approval for cost-share payment.

As with all TWG cost-share programs, applicants were:

1. Informed that no work could begin prior to receipt of an approval letter.
2. Required to provide a federal tax ID for purposes of completing 1099s.
3. Responsible for making all payments to contractors and providing copies of all receipts and paid invoices to the RC&D.

Budget

Table 7. Forestry/Streambank Project Budget.

Forestry, Riparian Area, Low Impact BMPs	Workplan Budget	Amended Budget	Actual Expenditures
Lake Region RC&D (Kansas)	$82,000	$64,856	$78,971
Osage Valley RC&D (Missouri)	$82,000	$64,586	$82,913
Hillsdale Water Quality Project (Kansas)	$0	$0	$25,000
Total	**$164,000**	**$129,172**	**$186,884**

In Missouri, a number of forestry projects were completed below budget. In addition, landowners cancelled two forestry projects, 47 acres of forest harvest slash and 0.7 acre of FSI, due to lack of time to complete the projects.

Three forestry projects in Kansas were completed below budget. This allowed remaining funds to be utilized for maintenance of 2011 tree planting practices damaged by drought. These also utilized remaining livestock BMP funds of $401. The original budget had allocated $10,000 for maintenance.

Results

Tree Plantings and Riparian Forest Buffers

Purpose: To establish a stand or buffer of trees to protect, restore and improve wetland and riparian areas to reduce sedimentation, stream bank degradation and improve water quality. Timber production, conservation, carbon storage and improved wildlife habitat are also practice objectives. Control of competing vegetation is required for up to 3 years.

Priority: High for trees planted on commercially productive ground (50 cu./ft./ac./yr.) and located within 180 feet of a water body or has a soil with frequent or very frequent flood frequency.

Figure 9. Three Osawatomie High School students, after learning proper tree planting methods, participated in a TWG community tree planting.

Table 8. Tree Plantings.

Tree Plantings	Number of Landowners Participating	Plantings	Acres	Nitrogen (lbs/yr)	Phosphorus (lbs/yr)	Sediment (tons/yr)
Kansas	10	12	81.0	549	276	211
Missouri	3	3	104.6	807	405	265
Total	**13**	**15**	**185.6**	**1,356**	**681**	**476**

Kansas: Kansas foresters helped landowners complete 12 tree planting applications including specialty crops, totaling 81 acres.

Figure 10. Pecan tree with protective cage planted as part of the Peterson project.

Missouri: Missouri foresters worked with landowners to complete three tree planting applications totaling 104.6 acres.

Combined: Across state lines, the project supported 13 landowners to complete tree plantings including specialty crops (pecans) over 185.6 acres.

Addition or installation of specialty forest products can increase the economic value of protecting riparian areas and increase participation from other landowners. The majority of specialty forest products installed were pecan trees or other improved varieties of trees that will not only provide the water quality benefits but produce nuts for economic value. One particular landowner in Kansas developed an innovative way to install

pecan and walnut trees within his livestock pastures for an agroforestry system. The pecans or walnuts when mature will provide shade for cattle along with improved micro-climate increasing grass productivity reducing need of fertilizer. The trees will uptake excess nutrients and increase infiltration. Due to the different timeframe of seed drop between walnut and pecan, he will be able to rotate his cattle in a rotational grazing system. This agroforestry system has been duplicated in other projects.

Forest Stand Improvements

Purpose: Increase tree growth and quality; and improve stand vigor and forest health. A successful FSI is determined by the stocking rate (stand density) or trees per acre (TPA). After a FSI the stocking rate should fall between 100% (overstocked) and 60% (understocked). Very dense stands grow slowly while low-density stands do not fully use the productive potential of the site.

Priority: High if located in riparian areas or where productivity equals or exceeds 50 cu. ft./ac./yr.

Table 9. Forest Stand Improvements.

Forest Stand Improvements	Number of Landowners Participating	Projects	Acres	Nitrogen	Phosphorus	Sediment
Kansas	10	13	136.3	NA*	NA*	NA*
Missouri	9	14	344.2	NA*	NA*	NA*
Total	**19**	**26**	**480.5**	**NA***	**NA***	**NA***

**Under the EPA Region 5 model, load reductions cannot be calculated for FSI's. However, as described above, the practices provide for the long-term health and vigor of the riparian plantings, providing protective and sometimes restorative water quality benefits to nearby streams and bodies of water. Forest management plans are developed for a long-term goal, usually covering multiple years to complete projects. TWG-approved applications included management areas that were scheduled to be completed within the grant timeframe. Additional forested riparian areas are likely to be completed with the continuation of implementation of management plans developed.*

Kansas: Foresters helped landowners complete 13 FSI applications, totaling 136.3 acres.

Missouri: Foresters from Kansas and Missouri worked with nine landowners to complete 14 FSI projects totaling 344.2 acres.

Combined: Across state lines 480.5 acres of forest stands, including specialty crops (mainly pecan groves), were improved utilizing TWG cost-share funds.

Livestock Exclusion Fence

Purpose: Fencing is an effective tool to protect riparian areas from livestock damage. Unrestricted access has the potential to harm seedlings, retard reestablishment and growth, compact the soil making it poorer for vegetation growth, and accelerates streambank erosion. Fences may completely exclude livestock from the riparian area or be part of an overall management system to restrict the livestock's access to times of the year they are less likely to graze and rub on the trees.

Figure 11. A Linn County, Kan. project with a combination of riparian forestry practices - tree planting with protective tubes and a livestock exclusion fence.

Table 10. Livestock Exclusion Fence.

Livestock Exclusion Fence	Number of Landowners Participating	Projects	Linear Feet	Acres Protected
Kansas	4	4	8,530	52
Missouri	0	0	0	0
Total	**4**	**4**	**8,530**	**52**

Kansas: Kansas foresters assisted landowners to complete four livestock exclusion fence applications, totaling 8,530 LF and protecting 52 acres of riparian forest areas. A FSI for portions of the protected acres were also completed and reported above.

Missouri: No fencing projects to exclude livestock were completed using TWG funds designated for forestry BMPs.

Table 11. Livestock Exclusion Load Reductions.

Livestock Exclusion Fence	Contributing Acres	Contributing or Excluded Animals	Phosphorus (lbs/yr)
Kansas	258	131	698
Missouri	0	0	0
Total	**258**	**131**	**698**

Streambank Stabilization

Streambank stabilization practices are extremely expensive per linear foot of installation. The majority of stabilization practices involve bank reshaping and rock structures like weirs installed

with heavy equipment. Cedar revetment and willow stake plantings were available within the cost-share program but also are labor intensive practices. The majority of the streams in the Lower MdC Watershed are being incised so rock structures are the recommended BMP, but funds were not sufficient to install 25 sites and most landowners are unable to afford 25% of the cost, let alone pay the full amount up front to provide paid invoices/receipts for cost-share reimbursement.

Kansas: Kansas foresters provided assistance to one landowner for a streambank stabilization project along 1,500 LF of MdC River in Linn County, Kan. The landowner decided that the anticipated total project cost was too high for him to afford, even with 75% cost-share reimbursement, so the project was not initiated.

Miami County Road and Bridge completed a rock and vegetative streambank stabilization project along 460 linear feet of Mound Creek in southern Miami County, only two miles north of the Linn County line within the high priority target area. The county's motivation was to protect a bridge affected by scour with rock and vegetation measures, and the project had an impact on nonpoint source (NPS) pollution, with estimated load reductions of 323 lbs/year of nitrogen, 161 lbs/year of phosphorus, and 161 tons/year of sediment. The total project cost was $51,269; TWG provided $25,000 cost-share.

Missouri: The City of Butler completed a rock streambank stabilization project along 80 linear feet of a severely eroding Bates County Drainage Ditch bank within the high priority target area, adjacent to a city water intake. The MDNR biologist had raised concerns about the stability of the bank and erosion prevention as proposed in the original March 2010 project proposal. Based on these concerns, Osage Valley RC&D required the city to obtain an up-to-date slope stability analysis and provide evidence of a more complete engineering study and design as additional conditions for cost-share on the project. Due to construction of a new Walmart in Butler, the City was able to acquire the huge rocks necessary for the project locally for only the hauling costs, saving enough money to complete the rock portion of the project in one year instead of four. The Mo. DNR Fisheries Biologist assisted with the evaluation of the project proposal and stated the project would potentially save tons of soil, keeping it on site for some time. Major load reductions were achieved by this project with an estimated reduction of 202 lbs/year of nitrogen, 101 lbs/year of phosphorus, and 101 tons/year of sediment. The total project cost was $38,684; TWG provided $27,152 in cost-share.

After touring the site in early September 2011, the Lake Region RC&D watershed forester provided a planting and maintenance plan for re-establishing native grasses on the bank top. The city provided Osage Valley RC&D with written assurance that the planting and maintenance plans would be implemented, along with copies of all the relevant engineering documents and letter from the U.S. Army Corps of Engineers stating that no permit was required for the project.

Native Vegetation Establishment

A Miami County, Kan. staff participant in the 2009 BLI learned of the benefits of establishing native vegetation and riparian buffers. The county submitted a proposal to establish native vegetation on a closed county landfill. Miami County is the third most-populous county in the Basin, and Paola is the largest city in the county and serves as the county seat. The landfill accepted waste from 1975 until 1994. During that time materials were not regulated; therefore, landfill contents are unknown. The county is required by the State of Kansas to have annual inspections and water monitoring. Additionally, the landfill is located 1.5 miles upstream of the newly operational MdC Water Treatment Plant, a major drinking water supplier in the basin. Replacing mowed fescue with native grasses aided the county in minimizing stormwater runoff. This is considered an alternative strategy that produces a vegetative cover that can stabilize the soil and provide erosion control, sequester more carbon, provide habitat for a wide range of birds and other wildlife, and have lower maintenance costs than fescue. Native grasses have a root biomass far exceeding fescue that allows more stormwater infiltration.

Miami County proposed two phases: first, eradicating current vegetation and correcting any settlement, grading and seeding. The proposal referenced the EPA Publication "Planting of Native Grass Species on Landfill Caps and Formerly Contaminated Waste Sites in the Mid-Atlantic.". The Miami County Conservation District approved the seed mix. The county completed a second seeding (50% the rate of the first seeding) for Phase Two. An estimated load reduction of 576 lbs/year nitrogen, 43 lbs/year phosphorus, 32 lbs/year lead, 67 lbs/year of zinc, 60,736 lbs/year of total suspended solids, 16,640 lbs/year chemical oxygen demand, and 3,030 lbs/year biological oxygen demand will be obtained through this practice.

Tree Plantings and Riparian Forest Buffers Maintenance

A typical tree planting takes three years to become established, so some maintenance is required to reach success. The summer of 2011 brought drought conditions that reduced the survival rates of trees planting in the spring. Projects in high-priority sites that were determined to have mortality due to the drought were replanted with trees in the fall planting period. This maintenance assistance was well received by participants.

Kansas: The forester assisted landowners with maintenance on three tree plantings, totaling 600 replanted trees due to drought conditions in 2011.

Missouri: Although tree planting projects suffered losses due to drought conditions, the plantings were not eligible for re-planting funds.

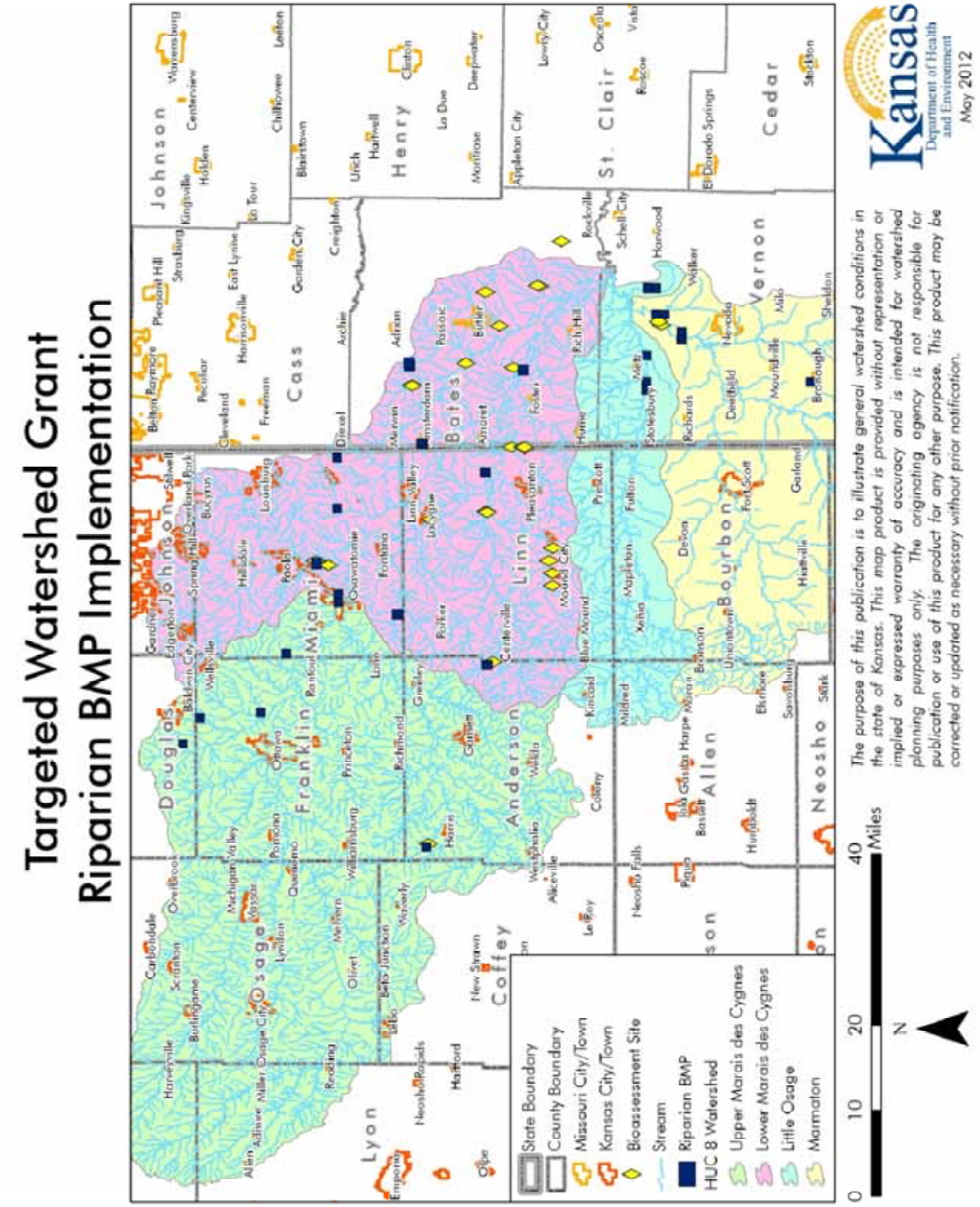


Figure 12. Riparian/Streambank BMP implementation map. BMP indicators may be comprised of various BMPs within the same location.

Discussion

Some of the work plan objectives were based on previous MdC Riparian Forestry Initiative goals that were stated as linear feet, but have changed over the years to incorporate pollutant load reductions. These load reduction numbers are based on contributing areas or acres. Load reductions are calculated for nitrogen, phosphorus, and sediment. The BMPs provide additional outcomes that are not easily calculated including increasing levels of dissolved oxygen over time with canopy cover, improved stream health with woody debris and reduction of nutrients and sediments with root development.

Lessons Learned

Lake Region RC&D: The Lake Region RC&D Forestry Management Committee began moving toward a more inclusive service provider program through a watershed-based "forestry business" in 2007. MdC Riparian Forestry Initiative interest continued to grow. This was evident in the number of landowners participating and acreage improved or restored over the fourth year of the program. During that year, the same number of acres were restored, improved or planted as the combined number of the first three years of the Initiative.

This increase in demand for technical and implementation assistance continued to be handled by the MdC watershed forester. The high demand on time, along with change from Kansas Forest Service (KFS) employee to Lake Region RC&D employee, caused assistance gaps for the TWG Program.

Due to the year-to-year funding source of the MdC Riparian Forestry Initiative, a forestry technician was not hired until October 2009. Once on board, this person had more time to promote and implement the TWG Program. However, the forestry technician's resignation, combined with the termination of the office assistant, in March and April, 2011, respectively, coincided with the loss of the NRCS RC&D coordinator, office space and funding explained in the Grant Management Section left a program knowledge gap and workload crunch in forestry.

The original work plan did not budget salary or benefits for the forestry staff, an omission that was corrected in the amended work plan. The budgeted amount covered one year of assistance, so continuation of the MdC Riparian Forestry Initiative had to be maintained to employ staff. The goal of accomplishing a majority of BMPs within the first three years could have been met if technical staff funding was included for two years to allow temporary but qualified staff to be hired.

The BMP budget for the riparian area objective was 184 percent of the BMP budget for the Onsite Wastewater Treatment System (OWTS) and livestock BMPs, so additional time was needed to locate and install BMPs. The addition of more BMP funds in 2010 increased the demand on staff time with no additional staff funding, leaving a funding gap and extended timeline of project completion. These additional funds were also focused toward urban which required staff to learn about unfamiliar BMPs.

Lake Region RC&D forestry staff attempted to generate more contacts in high priority areas using GIS to locate prime locations for BMPs. Sites were easily located and landowners determined in GIS, but a better method of persuading landowners to install BMPs is needed. Letters informing landowners of opportunities was completed on a small scale, but was unsuccessful. Additional time and funding to develop more marketing packets along with ground truthing site locations to individualize BMP options has been discussed.

The long-term timelines of forestry management created challenges with planning and installing BMPs in a short time period. Additionally, the majority of management plans cover a ten-year timeframe usually tied to a cost-share program. Some of the previous headway with MdC Riparian Forestry Initiative could not be utilized for the TWG Program because BMPs were obligated to other programs but still demanded time from the MdC watershed forester to maintain compliance. This delay in new applications caused some application deadline extensions. Some landowners utilized other programs because implementation could not meet the TWG Program deadline. Some landowners did not understand the importance of meeting the deadlines specific to this grant. This caused additional work for forestry staff to maintain compliance.

Partnerships with other technical service providers are well established, but with high demand from their respective programs, all Kansas applications were handled by Lake Region RC&D forestry staff. Partners notified landowners about the TWG Program, but all specific technical assistance was completed by Lake Region RC&D. Example: KFS staff members were informed of the available program, but due to their heavy workload referred landowners whose property was located within the basin to the Lake Region RC&D.

Osage Valley RC&D: Similar to the Kansas side, partnerships became an issue with completing the project for Osage Valley RC&D. Although partner relationships stayed on good terms throughout the project, the failure of the project to have memorandums of understanding (MOUs) in place left the RC&D with no leverage when partners wanted to move technical staff or change priorities.

For example, Missouri NRCS reassigned the Vernon County-based forester to Rolla, Mo. in September 2010, at which time only two projects totaling $2,905 in cost-share were completed. With no forester remaining in the area, the RC&D had to seek assistance from the NRCS forester assigned to the Southwest Missouri RC&D in Republic, Missouri, increase assistance from the Missouri Department of Conservation private lands conservationist and even the Lake Region RC&D forestry staff for technical assistance and follow-up.

The NRCS Osage Valley RC&D coordinator involved in the beginning of the grant retired in December 2008, and was replaced in April, 2009. A part-time project assistant was hired in April 2010 to assist with promoting and administering the cost-share programs.

Key lessons learned, from the Osage Valley RC&D point of view, include the necessity of:

- Including funding for in-house technical staff in the grant proposal.

- Developing MOUs with project partners before the project commences.
- Hiring all project staff within the first three months of the project.

Overall: The benefit of the TWG cost-share program was the flexibility and reduced paperwork compared to the United States Department of Agriculture (USDA) cost-share programs. USDA programs like EQIP usually have continuous sign-up but only approve and obligate funds once per year. Landowners can lose interest if the deadline just passed or time of year is conducive to a specific BMP but would have to wait a year to install. These annual deadlines cause high workload of technical staff to complete needed paperwork. The TWG Program allowed more approval periods and spread out the workload of staff. It was noticeable in Kansas that more landowners chose the TWG Program over EQIP for FSIs with the streamlined process. The program was tailored to the benefit of the local landowners, rather than national protocols.

Future Plans

The Lake Region RC&D will continue riparian area improvements through continuation of the MdC Riparian Forestry Initiative. This Initiative is currently on Year 7, and a Year 8 proposal has been submitted. The targeted areas are different than the TWG Program, which will leave a program gap within the Lower MdC Watershed unless a Nine-Element WRAPS is developed. Currently there are no plans to complete one.

The Lake Region RC&D is a local leader in watershed management and water quality efforts. Lake Region RC&D is always looking for opportunities to complete its mission. The continued demand for forestry assistance will keep the Forestry Management Committee moving toward a more inclusive service provider program through a watershed-based forestry business. Highly successful or innovative BMPs could be used for future demonstration sites if opportunities benefit forestry business.

In Missouri, the Osage Valley RC&D will continue to further water quality efforts through the Mound Branch 319 Program, covering a 28-square-mile Hydrologic Unit Code (HUC)-14 watershed within the MdC Basin. They are continuing to offer riparian workshops and cost-share for riparian buffers, as well as practices for cropland, livestock producers, on-site wastewater treatment systems and urban BMPs.

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Objective 2: Reduce adverse water quality impacts of livestock production

Introduction

Workplan Objective: Reduce adverse water quality impacts of livestock production by providing cost-share for producers to install fencing, alternative off-stream watering systems, portable shelters, stabilized stream watering points and other innovative practices proposed by participants. Using a reverse auction process, receive a minimum of four bids in a minimum of two auctions.

Figure 13. A bull stands deep in a mossy pond that is taking over the feedlot. TWG funds assisted the producer with removing the 'pond' from the feeding site and convert to a rotational grazing system.

An alternative, hybrid approach designed to increase adoption rates of BMPs among producers is a BMP auction. Kansas began using this approach in 2007 to increase the participation of crop producers in conservation programs. Through BMP auctions, producers submit bids to supply the watershed with water quality improvements. Once bids are collected, each is evaluated and ranked for the maximum load reduction per dollar. Producers bidding the lowest priced load reduction are contracted first. The BMP auction process is repeated until bids no longer meet a minimum specified improvement-to-price ratio target, etc. The intent of the BMP auction program is to provide producers more control over their operations and to focus funded incentives on the most cost-effective water quality improvements.

Methods

Planning

KSU guided and assisted with two BMP auctions (one in each state) in the Lower MdC watershed. The program was a joint effort between Kansas and Missouri partners, technical staff and the TWG Coordinator. Similar BMP auctions had been previously used for cropland; however, this was the first livestock BMP auction attempted in Kansas and Missouri. KSU provided guidance and assistance with design, organization, execution, and evaluation of the Livestock BMP auctions.

Various methods were used to assist in the planning and implementation of the BMP auctions, including presentations to the SLT, producers and landowners. They provided benefit/cost information and information on which BMPs needed to be promoted and helped the SLT

understand TMDL issues relevant to the Lower MdC watershed. Watershed modeling guided BMP targeting by focusing efforts on critical areas that would yield the greatest load reductions. Modeling was also used to calculate sediment delivery ratios. This information was used in evaluating the bids submitted by producers. A group of BMP specialists established water quality improvement assumptions associated with alternative TMDL-related BMPs and developed an application/bid sheet (see Appendix 4). This group included KSU staff and the TWG Coordinator. Bids were ranked according to the maximum amount of phosphorus load reduction that could be achieved per dollar until funds were exhausted.

Outreach and Education

Given the amount of funds allocated for implementation of livestock projects, the group determined that a minimum of four bids was needed for a successful auction. Therefore, a major outreach effort was conducted that included mailings - an introductory letter and reminder postcard (see Appendix 4) - to 600 livestock producers in the target counties. Project partners spoke at livestock field days and hosted two informational workshops with potential bidders. Radio interviews, ads in local newspapers and fliers advertising the workshops helped to spread the word about the auction program.

Figure 14. KSU Watershed Specialist Herschel George visits with livestock producer Fran Baker following the completion of her BMPs that included a feeding site diversion.

In addition to the targeting efforts of the outreach in the targeted areas, the SLT expanded the outreach to additional counties surrounding the Lower MdC watershed in order to reach more of the public within the basin. The landowners were encouraged to submit bids during the auctions for BMP implementation. The Lake Region RC&D NRCS Coordinator worked with the local NRCS and Conservation District field offices to locate potential livestock producers. The KSU Watershed Specialist also contacted local producers, which yielded the greatest number of applicants.

Process

Producer bids for the BMP auctions were evaluated and ranked by the SLT with the assistance of KSU. Bid-ranking software was developed by KSU based on ranking criteria. An example of the KSU Livestock BMP Auction Ranking Tool can be found at http://www.bae.ksu.edu/watershed.

The following BMPs were available through the BMP auction:

- Vegetative buffer strips
- Sediment basins
- Wastewater lagoons
- Feeding/watering site relocation
- Off-stream watering systems
- Rotational grazing
- Riparian fencing
- Stream crossings

Definitions of the above BMPs were provided with the bid sheets. In order to be considered for acceptance, proposed BMPs were required to be created in accordance with recognized specifications such as, but not limited to NRCS, KSU or University of Missouri (MU) Extension specifications.

In Kansas, a Livestock Management Incentive Program Contract (see Appendix 4) was developed to cover additional requirements not stated on the application forms. These included signage, potentially using the BMP as a tour site or bioassessment site and life of contract. Landowners and Lake Region RC&D signed the contract prior to project installation and technical staff signed off after project completion.

Additional livestock cost share became available due to projects finishing under budget and one approved project withdrawing from the program. The following strategies were developed by the Technical Team and approved by the SLT to identity appropriate projects to utilize these funds.

The Linn County NRCS District Conservationist developed conservation plans for two producers for cross fencing for rotational grazing systems. They provided a packet of information in a request for funding to the SLT. This included a cover letter stating the water quality benefits and overall project goals, maps of the project area and fencing location, a schedule of implementation and a cost estimate. NRCS provided the producer with specifications on fencing and completed a field sheet along with signing off on the program contract. The field sheet detailed the NRCS specifications that were followed.

The KSU Watershed Specialist assisted a local dairy with plans to install a lagoon system for their dairy and creamery. Application forms developed by the Marais des Cygnes Livestock WRAPS project were utilized to submit this project to the SLT for approval. The KDHE Livestock Section provided assistance with the approval and permitting process to comply with Kansas statutes and regulations addressing prevention of surface and ground water pollution. This process was also utilized to submit an application for a non-confined feeding site

Figure 15. KSU Watershed Specialist Herschel George provided an overview of the lagoon system for the Noffke dairy and creamery to Watershed Forester Ryan Neises.

project.

The Osage Valley RC&D coordinator worked with the Bates County NRCS office to identify eligible producers who were on waiting lists for eligible cost-share practices. One project in the target area to install a grade stabilization structure and related fencing in a highly eroded location to improve the water quality impact of the producers' grazing rotation system was identified and completed.

Budget

Originally, each state had $35,000 to implement livestock BMPs, with an auction administration cost of $80,000, for a total livestock budget of $150,000. Technical staff to assist producers during the application process, implementation and reimbursement request was provided in part through the TWG and in part through a separate livestock program in the area. Throughout the program, a common concern expressed by SLT members, TWG staff and EPA was the ratio of administration to projects in the livestock program. In reality, KSU performed the auction under budget, completed modeling and returned nearly $20,000 in grant funds to the program that were subsequently allocated to urban BMPs.

Table 12. Livestock Program Budget.

Activity	Work-plan Budget	Amended Budget	Actual Expenditures
BMP Installation (Kansas)	$35,000	$35,000	$49,642
BMP Installation (Missouri)	$35,000	$35,000	$33,950
Auction Administration	$80,000	$80,000	$61,288
Total	**$150,000**	**$150,000**	**$144,880**

The initial bid received for Kansas Weickert project for $28,100 was modified and completed utilizing $9,160. Additional projects were reviewed and approved by the SLT. Due to high demand for livestock cost-share, HWQP made additional funds available for cost share; $2,000 was transferred to Lake Region RC&D and $1200 was paid directly to a producer. These funds were reallocated from I&E activities, where cost-savings resulted in unexpended funds. Some livestock funds left over due to projects completed under budget were transferred to forestry maintenance during the last months of the project.

Results

Modeling began August 2008, and outreach was conducted April-June 2009 with a bid submission deadline of June 30, 2009.

The preliminary results of the BMP auction are listed in Table 8 below.

Table 13. Livestock Auctions.

	Number of Bids	Total Amount
Kansas	8	$ 49,700
Missouri	2	$45,156
Total	**10**	**$ 94,856**

Through the preliminary results of the Kansas and Missouri BMP auctions, producers submitted ten bids for a total of $94,856 in requested cost share. KSU evaluated BMPs impacting 578 cattle, 1,458 acres, and two feedlots. Figure 3 shows the distribution of the nine submitted bids.

The bids requested cost-share reimbursement for three pond fences, two alternative waterers/fences, one alternative waterer, one riparian fence, one feedlot diversion, and one feedlot relocation/filter installation. Table 14 below gives the results of both the Kansas and Missouri auctions.

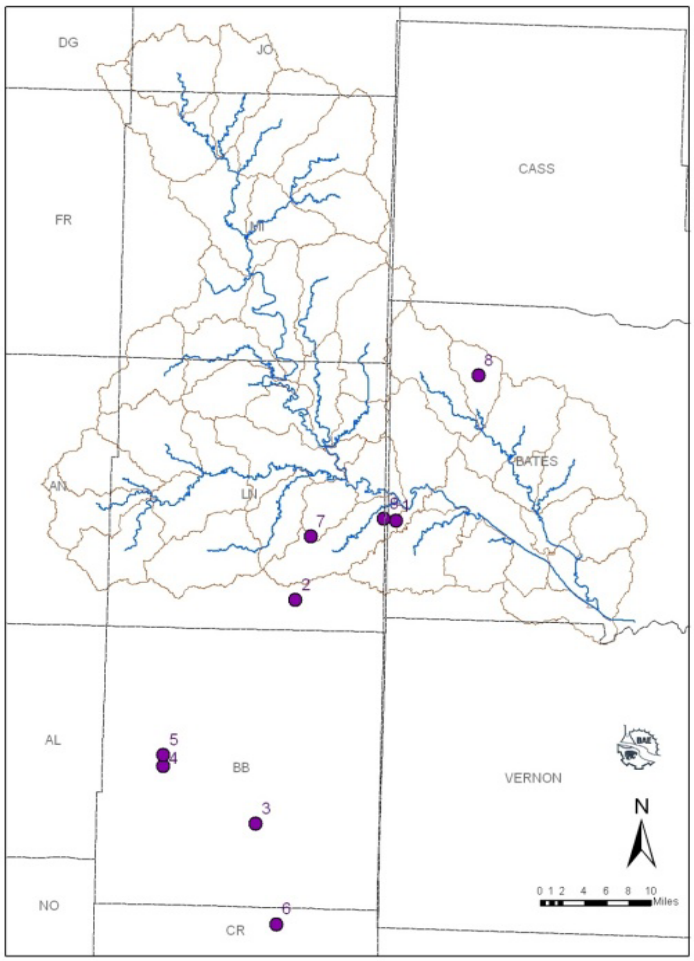

Figure 16. Geographic Distribution of Livestock Auction Bids.

Table 14. Livestock Auction Results.

Name	State	Requested Amount	BMP
Hocket	Mo.	$23,056	Off-stream watering system, rotational grazing, fence off stream, stream crossing(s)
Weickert	Mo.	$22,100	Off stream watering system
Weickert	Kan.	$28,100	Relocated feedlot/feeding pens
Neil	Kan.	$1,500	Removal of sediment pile, remove trees from dam, fence off pond
Baker	Kan.	$2,900	Off-stream watering system, fence off stream/pond
George	Kan.	$2,200	Fence off pond
Blythe	Kan.	$6,000	Relocate feeding site within pasture/winterfeeding, off-stream watering system, rotational grazing, stream crossing(s)
Johnson	Kan.	$9,000	Fence off stream, riparian fence

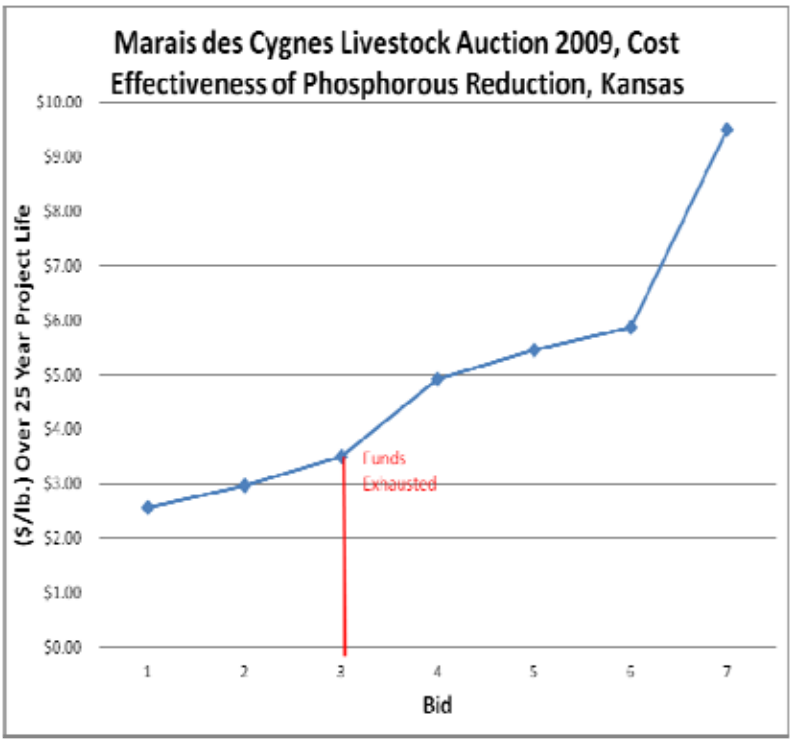

Figure 17. Phosphorous Analysis for the BMP Auction.

For the Kansas BMP auction, three bids were initially awarded for a combined total project cost of $40,000. Figure 4 shows the price per pound of phosphorus reduction of the initially accepted bids. The final project costs ($10,420), shown in Table 15 varied significantly from the original approved amounts. Reasons for the discrepancy were that the Baker project costs came in lower than estimated. The Weickert project originally included relocation of a confined feeding site, but upon removal of the site and the pond drain and fill, the producer opted to pursue a more intensive grazing practice rather than build a new feeding site. The Johnson project withdrew due to the landowner's

unwillingness to approve the project. The tenant was enthusiastic about the project but was concerned about losing the lease by pushing the idea on the landowner.

Table 15. Kansas Auction Actual Costs.

Project (County)	BMP	Original Bid Amount	Cost-Share Amount	Final Project Cost*
Baker (Linn)	Feedlot diversion, pond dam repair	$2,900	$1,260	$1,679
Weickert (Linn)	Feedlot removal, pond drain and fill	$28,100	$9,160	$20,880
Johnson (Bourbon)	Riparian fence	$9,000	$0	0
Total		**$40,000**	**$10,420**	**$22,559**

**Includes local match amount.*

For the Missouri Livestock BMP auction, the top bid of the two submitted bids was awarded. The project exceeded estimated project costs due to the necessity of installing electric transmission to power the pump.

Table 16. Missouri Auction Actual Costs.

Project	BMP	Original Bid Amount	Cost-Share Amount	Final Project Cost*
Weickert (Bates)	Off-stream watering system, cross-fencing for rotational grazing and stream crossing	$22,100	$22,100	$38,106
Total		**$22,100**	**$22,100**	**$38,106**

**Includes local match amount.*

Implementation of the top project would yield an annual phosphorus reduction of 187.2 lbs and a total of 4,680 lbs over the project's life. The top project for Missouri cost $8.00-$8.50 per pound of phosphorus reduction. Although more costly per pound of phosphorus reduction than the Kansas projects, the Missouri project exceeded all expectations of the goals of the BMP auction. After the initial BMP was completed, the producer utilized EQIP funds to expand the project to three more watering systems to increase rotational grazing area. The producer has become an advocate of rotational grazing in the community and shares pertinent information with fellow livestock owners.

Figure 18. TWG representatives view an established watering system, installed in addition to a previously completed TWG livestock project. This producer became one of the project's biggest advocates.

Due to several projects completing under budget and the withdrawal of the Johnson project, six additional livestock projects were solicited through traditional means. Technical staff worked with producers to access funds and partners solicited applicants from NRCS area offices. All remaining projects were located in the high priority area. The Blythe project was chosen based on the original livestock auction bid. This proposal was ranked closely to the original three accepted bids.

Table 17. Post-Auction Livestock Projects.

Project (County)	BMP	Cost-Share Amt	Total Cost
Noffke (Linn)	Dairy wastewater lagoon	$2880	$3608
Umphenour (Linn)	Cross fencing for rotational grazing	$3516	$5079
Lanham (Linn)	Cross fencing for rotational grazing	$12,537	$20,800
Nelson (Miami)	Feeding Site	$1239	$1652
Elliot (Miami)	Alternative watering system	$1200	$1200
Blythe (Linn)	Watering system/ pond fencing	$6000	$12,355
Hess (Bates)	Grade stabilization, alternate watering site, fencing	$11,850	$19,185

Table 18 provides an overview of the implemented BMPs from the efforts of Objective 2. Figure 18 illustrates these BMPs in map form. Estimated load reductions from the 10 livestock projects are 327 lbs/year of nitrogen and 5760 lbs/year of phosphorus.

Table 18. Livestock BMP Overview.

Project	BMP
Noffke	A waste treatment lagoon was installed. The lagoon will treat the waste accumulated from the daily discharge from the dairy and the Cheese making process. Both cows and goats are milked at the facility
Baker	A pond that had an eroding primary spillway was repaired with a new 6 inch PVC primary spillway pipe. A diversion terrace was installed to reduce the amount of extraneous water entered a beef cattle winter feeding site. An area of hedge trees were treated and controlled in a grazing area.
Lanham	Cross fencing for a rotational grazing system was installed to create multiple paddocks along with fencing out one pond.
Umphenour	Cross fencing for a rotational grazing system was installed to create two pastures along with fencing out old feeding site for recovery.
Weickert (Kan.)	A cattle confinement area which sometimes had stagnate water from a small pond in about ½ of the area was removed and the stagnant pond area drained.
Weickert (Mo.)	A water intake system was developed from a mine strip area. The concrete pump house was installed with electricity, pressure tank, valves and pump to make the system usable. Four tire tanks were installed to utilize the pasture system. The cattle used the mine strip pits as their water supply before the project. This system has developed in conjunction with the Missouri NRCS. The producer has now developed 4 or 5 additional paddocks with tire tanks in each served from the same pump system developed in this program
Nelson	A non-confined feeding site was developed at a good site in a pasture area.
Blythe	A water retention structure was built to serve the concrete alternate water supply tank for the cattle operation that would otherwise utilize a small stream for water. About 300 ft of pipeline was used to get the water from the water retention structure to the water tank.
Elliot	A water intake system was installed into a pond with a good amount of water. A concrete alternate water supply was connected to the water line for wintering a cow herd. The pond was the only supply of water for the livestock before the project.
Hess	A grade stabilization structure was installed where cattle crossing created severe erosion. An alternate watering site and fencing were installed.

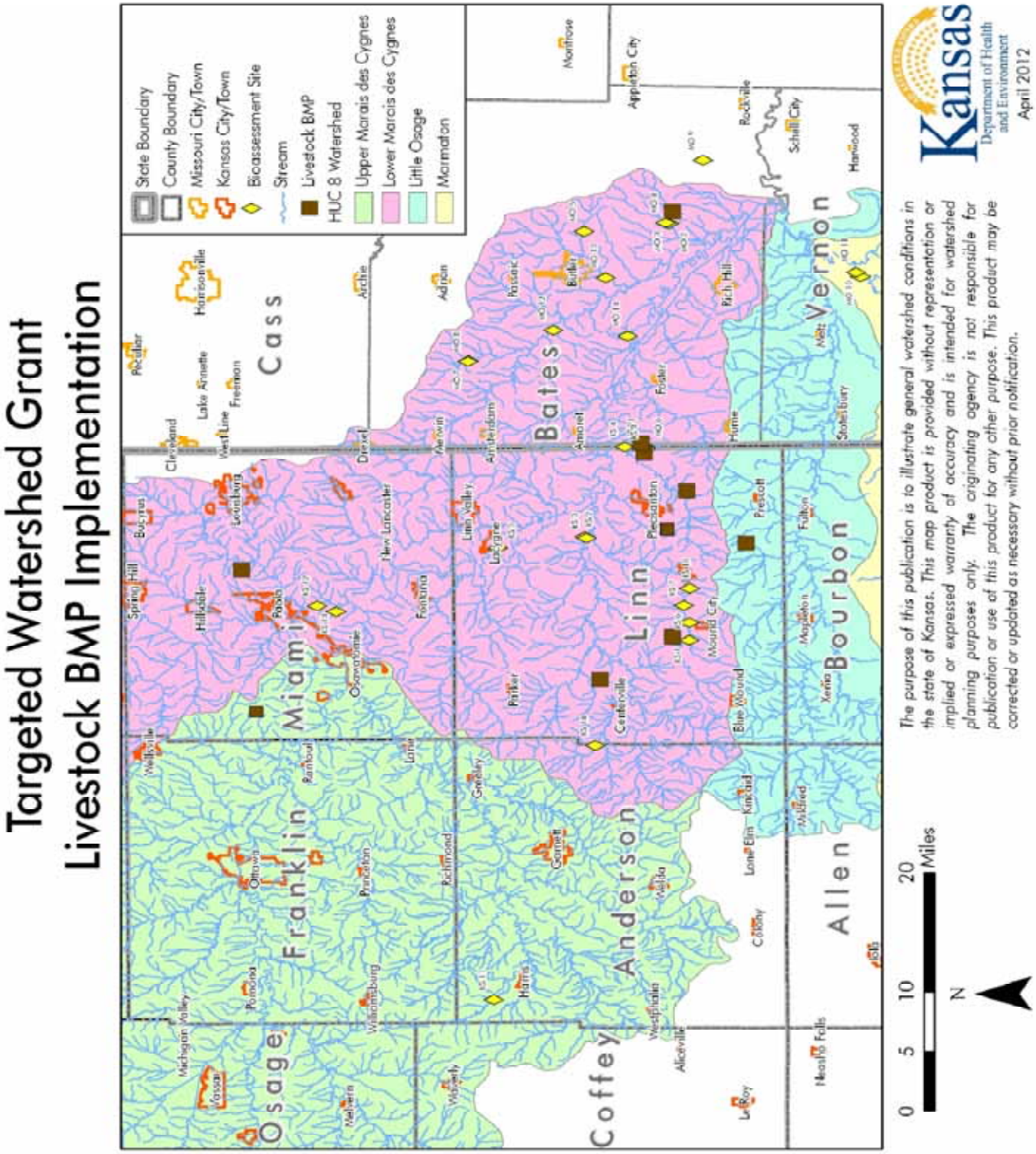

Figure 19. Livestock BMP implementation map. BMP indicators may be comprised of various BMPs within the same location.

Discussion

Lessons Learned

The Livestock BMP auction was a new concept to both Kansas and Missouri watershed partners; previous BMP auctions in Kansas focused on cropland. Livestock BMPs have more benefit variance than cropland BMPs and small changes in landscape, management techniques, and the number of livestock affected can greatly change the magnitude of the cost effectiveness of a BMP. This understanding underscores the need for involvement by competent and cooperative local technical assistance providers, and will help in planning for future auctions involving livestock BMPs.

One lesson learned through the Livestock BMP auction was the necessity of adequate time to market the program and solicit bids. Time became a factor when determining the evaluation and ranking of bids, the modeling of the watershed and load reduction calculations, and the overall implementation time of the project. Many land owners need a one-on-one approach to realize project success. Along with time, other considerations have surfaced to give insight on building a more efficient livestock BMP auction.

A second important lesson related to the future use of watershed modeling is to be cautious about sharing relatively technical information with local SLT groups. A presentation on the technical derivations of Epic and Apex models was provided to the SLT and members left the presentation with less interest in the BMP auction as a whole because they were confused by the vast amount of technical information presented to them. In the future the technical team needs to clearly define the modeling approach and share very basic, broad points with the SLT so that their interest in the project does not wane.

The original Johnson project, not funded through the TWG, was later considered a success when the tenant decided to address the need to install a fence to keep livestock out of the stream and riparian area on their own. This independent decision gives insight to the success of educating landowners in the MdC watershed of the importance of appropriate BMPs to address NPS pollution.

The SLT and other grant partners question the overall usefulness of the auction concept. In hindsight, perhaps the funds used for the sophisticated, and costly, modeling and ranking system would have had a greater impact putting more projects on the ground. Technical staff often has established relationships with area producers and, with a simplified and flexible application process such as the TWG strove to offer, many of the barriers mentioned previously could be addressed. Management roles were not clearly defined before the auction so inefficiencies formed in notifying applicants of their status and various other administrative duties were unclear.

The auction focus was on best pollutant load reduction per dollar, not on total number of projects able to complete. This caused higher cost projects being approved which limited the potential to reach goal of 40 landowners.

Due to remaining funds, the SLT sought out additional proposals for livestock BMPs on a one-on-one basis. There were no established guidelines for this process or formal application process. This became an issue with comparing various types of applications.

Suggestions on how to increase effectiveness and efficiency include a wider range of BMP cost-share ideas, determining a baseline maximum for cost-share dollar per unit of nutrient reduction, and also only utilizing funds for the best possible load reductions even if all funds are not exhausted. To utilize the funds, multiple auctions may need to be performed throughout the watershed.

For future Livestock BMP auctions to be successful, various factors must be addressed. The application time of accepting bids needs to consider the required technical assistance needed by the landowners. Applicants need to work with technicians in building the bid to assure acceptable and detailed practices are given on the bid sheet. The bid sheets were user friendly for applicants; however, the simplicity caused administrative issues. The sheets need to require specifications and detailed information pertaining to the practices proposed. By working with technicians and an adequate time period, landowners should have no issues with supplying additional details.

Even with the use of the alternative Livestock BMP auction, landowners continue to avoid cost-share due to mistrust and skepticism regarding the governmental control and concern regarding unintended consequences and strings attached to accepting federal aid. Continued improvement and development of flexible programs, along with the need of cost-share education to the public is needed to insure the success of BMP cost-share programs in the future.

Future Plans

The Lake Region RC&D will utilize some form of livestock cost-share in future Nine Element Plan Middle MdC WRAPS. Portions of the process could be adapted to best fit available technical staff and landowner needs. This watershed is upstream and is a different targeted watershed; no plans are being developed for the same watershed. Relationships built through TWG in the targeted area will not be able to continue unless another funding source is discovered.

In Missouri, the Osage Valley RC&D is continuing water quality efforts through the Mound Branch 319 Program, covering a 28-square-mile HUC-14 watershed within the MdC Basin. They are continuing to offer grazing schools and best management practice cost-share incentives for livestock producers.

Objective 3: Reduce adverse water quality impacts from on-site wastewater systems

Introduction

Workplan Objective: Reduce adverse water quality impacts from onsite wastewater systems by providing cost-share funding opportunities for a minimum of eight septic system improvements.

Through a partnership with local conservation districts, cost-share funds were provided to landowners located within the MdC River Basin to assist with upgrade or replacement of failing on-site wastewater systems such as septic systems and lagoons.

Failing systems contribute to NPS pollution by releasing bacteria, nitrates, viruses, detergents, household chemicals, and trace amounts of metals to surface and groundwater. When runoff carries these pollutants into nearby streams and other bodies of water, they can cause extreme plant and/or algae growth, contributing to low levels of dissolved oxygen needed by fish and other aquatic species.

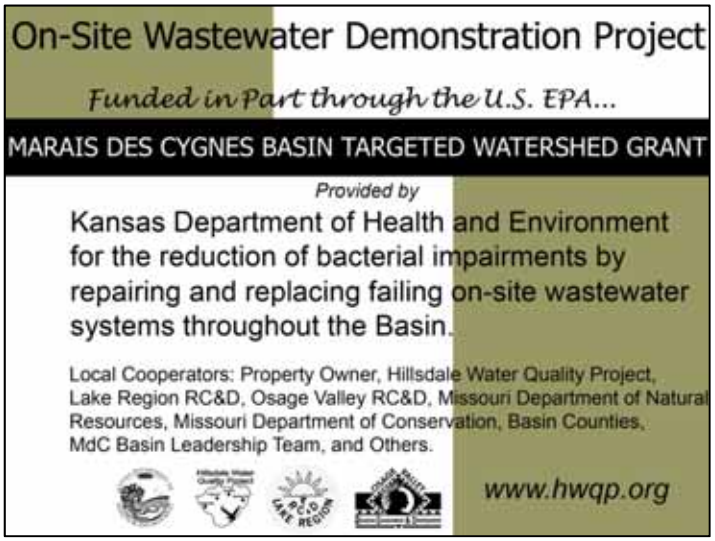

Figure 20. Signage placed at each BMP site helped explain and promote TWG activities to neighbors and passersby.

These concerns increase with new development in rural areas as the population shifts from urbanized areas utilizing sanitary sewers to rural areas relying primarily on private onsite wastewater treatment systems (OWTS). The average homeowner has little knowledge of how an OWTS operates, the maintenance methods that can be used to prolong the life of the system, and ways to identify if the system is failing. Cost-share and education programs provided through this objective to repair or replace failing systems, provide information on how onsite wastewater systems function, and educate homeowners on proper maintenance.

Methods

Planning

The TWG Program provided homeowners with education on proper onsite wastewater maintenance and cost-share funding and technical assistance for onsite wastewater system upgrades and maintenance.

In the third quarter of 2008, OWTS Technical Support Teams were established to set the guidelines for the cost-share program for OWTS. The teams consisted of the NRCS Lake Region and Osage Valley RC&D coordinators, the TWG Coordinator and sanitarians from nine counties in the basin, seven in Kansas and two in Missouri. The teams discussed the priority area, cost-share programs and maximum cost-share amounts that would be granted to homeowners; identified the types of systems and eligible for cost share; and planned how the public would be informed of the OWTS cost-share program.

The grant program offered maximum cost-share of 75 percent of the total BMP cost. The SLT approved that the maximum cost-share amount was limited to $1,000 for Kansas projects and $3,500 for Missouri projects. The two reasons for a higher incentive in Missouri were:

- Local conservation districts offered additional cost-share funding in Kansas, but not Missouri; and
- Missouri statute exempts any landowners with more than two acres from the OWTS permitting requirements.

The SLT approved the eligibility criteria for BMPs on both sides of the state line as developed by the OWTS Technical Support Teams:

- Property must be located within the MdC Basin;
- Sanitarian / environmental health official must determine that system is failing according to state or county codes;
- Property must be owner occupied; and
- BMP must not be part of a real estate transaction.

The SLT also required that the county sanitarian inspect and approve each completed project prior to cost-share payment.

With guidance from Kansas conservation districts that have conducted similar cost-share programs for such BMPs, the TWG Coordinator developed a user-friendly application for RC&Ds to use in both states (see Appendix 5).

Outreach and Education

In December 2008, partners held two public workshops, one in Butler, Mo. and one in Mound City, Kan. to inform septic system installers and homeowners about permitting requirements and the cost-share program. The TWG Coordinator wrote and distributed press releases (see Appendix 5) to local newspapers and e-mail distribution lists describing the requirements and inviting basin residents to the workshops. Anderson and Lyon County sanitarians sent out mass mailings to all residents of their counties. In Bates County, Mo. the county commission sent a mass mailing summarizing all the cost-share opportunities available through the TWG. Additionally, the TWG Coordinator made presentations at contractor continuing education events and with conservation districts in target counties.

With licensed installers, county sanitarians and Kansas conservation districts aware of the program and its requirements, word-of-mouth also helped to garner sufficient applications to allocate the budgeted cost-share funds.

HWQP also provided signs for all OWTS BMPs to highlight the water quality aspect of the improvement and TWG's role in helping to fund the BMP.

In 2011, the TWG Program partners hosted three educational workshops to explain to homeowners how onsite wastewater treatment systems function and reinforce the importance of regular maintenance as a method to prevent system failure. Licensed installers also were invited to participate in the workshops.

As noted under Objective 4, homeowners within the basin were eligible to receive a $75 voucher to be used toward pumping (or other pre-approved maintenance for septic or lagoon systems), an incentive that provided a good draw for attendance, although only 10 were redeemed by the cutoff date. Individuals were also contacted one-on one as the deadline for completion neared to encourage participation.

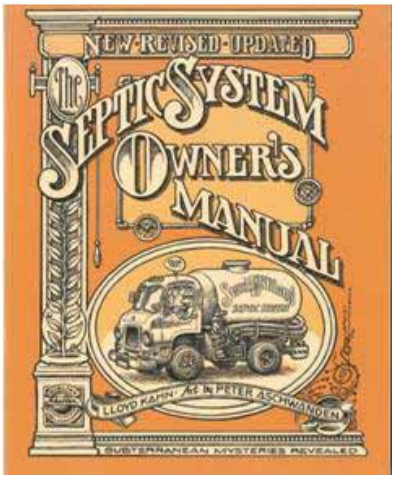

Figure 21. *Septic System Owner's Manual* provided to septic system maintenance workshop participants and homeowners who participated in the OWTS cost share program.

Table 19. Septic Workshop Attendance and Voucher Distribution.

Septic Maintenance Workshops	Number of Participants	Participants Requesting Vouchers	Percent Requesting Vouchers	Vouchers Redeemed
Butler, Mo. 4-17-11	32	17	53%	6
Mound City, Kan. 4-12-11	12	5	42%	2
Lyndon, Kan. 6-1-11	19	9	47%	2
Total	**63**	**31**	**49%**	**10**

Process

Due to state requirements for licensed installers in Kansas, any potential client for an OWTS upgrade or replacement would have to make an appointment with the county sanitarian for a preliminary site visit. In Missouri, projects on less than two acres had the same requirement but those on larger acreage did not. This program required that all participants, regardless of acreage, consult with the sanitarian before beginning and after completing the BMP, ensuring long-term usefulness of the systems. Since all participants were required to work with county sanitarians during the process, they were the logical choice to explain and initiate the cost-share application process with homeowners.

If the sanitarian found the system to be failing, s/he assisted the homeowner in completing a cost-share application, then wrote his/her recommendations and submitted the signed application to the appropriate RC&D office. The application was then reviewed for any missing information before forwarding to the appropriate cost-share committee for review, typically via conference call in Kansas and via e-mail in Missouri. In Kansas, the cost-share committee consisted of the county sanitarians, with administrative support from the Lake Region RC&D coordinator and the TWG Coordinator. In Missouri, the cost-share committee consisted of Osage Valley RC&D board members who relied on technical information and recommendations provided by the Bates/Vernon County environmental public health specialist with the application form.

Staff then followed up with the applicant in writing as to whether the application was approved or denied. For approved applications, the homeowner received instructions and requirements for receiving cost-share reimbursement.

Once all work was completed, the sanitarian completed a final inspection before providing technical approval for cost-share payment. Regarding administrative approval, as with all TWG cost-share programs, applicants were:

1. Informed that no work could begin prior to receipt of an approval letter.
2. Required to provide a federal tax ID for purposes of completing 1099s.
3. Responsible for making all payments to contractors and providing copies of all receipts and paid invoices to the respective RC&D.

Budget

As shown in the table below, actual expenditures for septic upgrade cost-share payments totaled $72,619.

Table 20. OWTS Cost Share Budget.

OWTS Upgrades/Replacements	Workplan Budget	Amended Budget	Actual Expenditures
Kansas	$35,000	$35,000	$38,000
Missouri	$35,000	$35,000	$34,619
Total	**$70,000**	**$70,000**	**$72,619**

KDHE had originally budgeted travel funds to attend an annual TWG workshop. After discussions with EPA, clarification was received that a KDHE representative was required to only attend the initial workshop held in January 2008. Lake Region RC&D had requested additional funding for the onsite wastewater system category due to the high demand for cost share funds in Kansas. EPA authorized transferring $4,000 from KDHE's travel budget to Lake Region RC&D in order to fund additional onsite wastewater system projects. One application was received at the end of the grant and approved, but the applicant later determined he would

not be able to complete before the end of the year, which led to $1,000 of the $4,000 transfer from KDHE not being spent on an OWTS BMP.

In Missouri, the total project cost for one BMP was only $4,226. Therefore, the 75% cost-share was $331 less than the $3,500 maximum. These funds were applied to forestry/streambank BMPs.

Results

The project provided cost-share funding to replace or upgrade 48 failing systems; 38 in Kansas and 10 in Missouri, as detailed in Table 21. The project also provided septic maintenance training via three workshops to 58 homeowners and provided *The Septic System Owner's Manual* by Loyd Kahn and *The Homeowner's Septic System Guide and Maintenance Folder*, both from Shelter Publications, to 106 homeowners (workshop attendees and cost-share participants).

Table 21. Summary of OWTS Applications Received.

OWTS Upgrades / Replacements	Applications	Denied	Canceled	Incomplete	Completed
Kansas	51	2	4	7	38
Missouri	18	3	0	5	10
Total	**69**	**5**	**4**	**12**	**48**

Of the 51 applications received in Kansas:

- Two applications were denied: one for a lagoon fence that was denied because it was not a water quality issue and one because the applicant did not follow the process.
- Four applications were canceled because they were part of a real estate transaction.
- Seven applications were approved, but did not follow through with the upgrade.

Of the 18 applications received in Missouri:

- Three applications were denied: one due to the project being part of a real estate transaction and two because the project locations were just east of the basin's boundary in Bates County.
- Five applications were approved but did not follow through with the upgrade, including the final application, where the current system emptied directly into a stream. The homeowner stated he could not afford the costs of installing a pressure distribution system that included a jacketed pipe buried underneath the stream. The SLT considered waiving the $3,500 cost-share maximum for the project, but decided against it, citing fairness to earlier applicants.

The 48 projects completed consisted of a variety of specific practices, dictated by the nature of the problem and the site itself. Figure 21 displays the OWTS systems installed in map form. More than 70 percent (35 out of 48) involved a basic septic tank and lateral line installation. Table 22 lists how many of each type of upgrades/replacements were completed.

Table 22. Number of Each Type of OWTS Installed.

OWTS Upgrades / Replacements	Kansas	Missouri	Total
Lagoon / Lagoon repair	5	1	6
Basic tank and lateral lines	28	7	35
Aerobic tank	1	0	1
Low-pressure pipe with pumps and filters	0	1	1
Drip irrigation system	3	1	4
Mound system	1	0	1
Total	**38**	**10**	**48**

The formula to calculate load reductions for OWTS upgrades/replacement is based on the number of bedrooms in the house, as systems are sized based on the number of bedrooms, rather than the current number of occupants.

Table 23. Load Reductions for OWTS Installed with TWG Cost Share.

OWTS Upgrades/ Replacements	Number Complete	Total Load Reductions (lb. / yr.)				
		Total Suspended Solids (TSS)	Biological Oxygen Demand 5-Day (BOD5)	Total Phosphorus (TP)	Total Nitrogen (TN)	Ammonia Nitrogen (NH3-N)
Kansas	38	3351.7	6534.1	640.0	1,656.0	1397.4
Missouri	10	952.7	1,857.7	198.5	524.0	396.9
Total	**48**	**4304.4**	**8391.8**	**838.5**	**2,180.0**	**1794.3**

Additional, but not measurable, load reductions may have been achieved via the education program that offered vouchers for septic system maintenance (i.e., tank pumping). Regularly maintained systems are far less likely to fail and allow contaminants to surface.

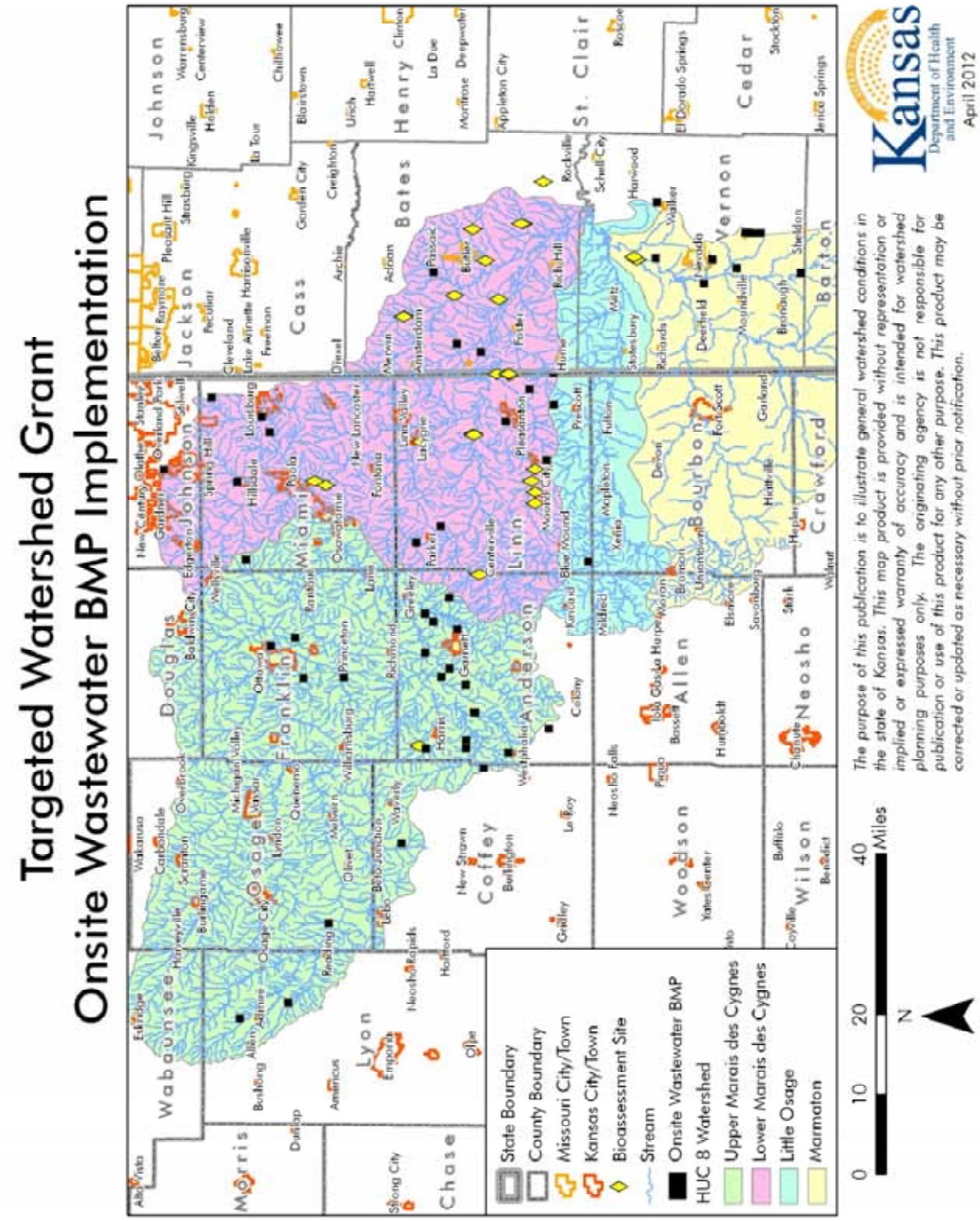

Figure 22. Onsite Wastewater BMP Implementation locations

Discussion

The program was well received by homeowners, residents and property owners, with the number of applications exceeding the funds available. Septic education and repair are in high demand, particularly when made more affordable by cost-share or other funding programs. Table 24 shows the median and range of costs for OWTS BMPs installed under the project. With the current economy and housing market, many homeowners opt not to complete needed maintenance or repairs in a timely fashion without some form of funding assistance.

Table 24. Average Costs of OWTS Installed.

OWTS Upgrades / Replacements	Kansas	Missouri
Total BMP Cost - Low	$1,460	$4,226
Total BMP Cost - Median	$5,202	$5,254
Total BMP Cost - High	$18,000	$12,900

Although most Kansas county conservation districts offer OWTS cost-share, their programs have highly restrictive eligibility requirements regarding maximum distance from a stream or drinking water source. The TWG Program's more flexible eligibility requirement regarding location (i.e., within the basin) was seen as a great benefit by homeowners.

An additional water quality benefit of the cost-share program was ensuring that every TWG Program OWTS BMP installed on a Missouri property larger than two acres had to go through the same technical review and approval process as required on smaller properties.

Working with the local sanitarians as Technical Support Team built new and lasting partnerships that will be beneficial for future water quality projects.

Figure 23. Evidence of a failing septic system in Franklin County – BEFORE TWG.

Figure 24. New lateral lines complement the newly-installed septic system to solve the problem at left – AFTER TWG.

Lessons Learned

Partners determined that OWTS maintenance training through additional educational workshops should have been a requirement for all cost-share recipients, because of the importance of proper maintenance in preventing system failures.

In Missouri, the Osage Valley RC&D cost-share approval letter to the homeowner provided a 60-day deadline for work to be complete, with the opportunity for extensions due to weather or contractor related delays. Lake Region RC&D, however, did not impose a deadline on Kansas homeowners, which caused difficulty in releasing cost-share funds to other homeowners on the waiting list in a timely manner during the final year.

As the application form was developed, a section should have been included to capture the information needed to calculate load reductions. Although the type of information needed for the calculations was discussed very early in the project, changes in personnel and communication issues led to the RC&D staff at project closure not learning what was required until just a few months before the final report was due. Thus, additional administrative time was needed at the end of the grant period to gather information, such as number of bedrooms, which could easily have been collected on the application form.

Future Plans

Due to the success of the onsite wastewater cost-share program the Lake Region RC&D will incorporate a similar program in future water quality improvement activities in the MdC River Basin. Osage Valley RC&D continues to offer cost-share within the MdC Basin's Mound Branch subwatershed through a 319 grant program.

Also related to the program's success, Missouri's regional planning commissions, including the Kaysinger Basin Regional Planning Commission which serves Bates, Vernon and five additional counties, applied to the state to set up a revolving loan fund to help homeowners better manage cash flow to afford OWTS upgrades and replacements.

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Objective 4: Reduce adverse water quality impairments of developed and developing areas in and around towns and communities

Introduction

Workplan Objective: Reduce adverse water quality impairments of developed and developing areas in and around towns and communities by providing cost-share to install one urban BMP, by offering 10 educational workshops to 150 people, and by developing a basin-wide training program for 75 participants.

This objective sought to involve local leaders, agencies and landowners in the project to ensure high levels of participation in BMPs and to develop more water resource stewards. Offering quality educational programs on a variety of water quality issues relevant to the area, and interesting participants in installing BMPs of their own, contributed to the TWG Program's success in utilizing cost-share funds on high impact projects in the basin.

Methods

Planning

The work plan indicated that all or most of the project planning would take place in Year 1, with activities completed in Years 2 and 3 and reporting completed in Year 4. However, due to plan revisions and unanticipated administrative procedures that needed to be developed, the project was not able to contract a coordinator until September 2008, nine months into Year 1. This created a challenge for other staff to complete some of the objectives within the first year as scheduled. Volunteers, project partners, SLT, technical staff and the TWG Coordinator participated in many meetings and work sessions to accomplish project planning. The planning and implementation phases of the project, by necessity, became much more integrated. For example, planning for a forestry field day was completed within weeks rather than months in order to provide information to landowners before the fall planting season. Plan outreach for the livestock auction was completed weeks before the deadline, rather than a year ahead as was originally anticipated. The teamwork exhibited during this time, with little regard for state lines and a willingness by all to make this project a top priority, was integral to the success of this and all other objectives.

Urban BMPs - Partners requested that EPA remove the installation of an Urban BMP demonstration site removed as a separate line item in the final project implementation plan and include this as a part of Objective 1. As this activity was included in the final approved workplan, EPA stated this would be kept as a separate item and also clarified the definition of "urban" for the purpose of this objective to mean a community experiencing rapid urban growth. Most basin communities were deemed ineligible since they did not meet the criteria for "rapidly

urbanizing." The SLT identified six cities that had experienced recent population growth; Louisburg, Paola, Ottawa, Gardner and Spring Hill in Kansas and Butler in Missouri. Those cities were chosen for targeted outreach and technical assistance for implementing an Urban BMP.

The SLT opted to issue a Request for Proposals (RFP) (See Appendix 6) January 2010 to close March 1, 2010, to publicize the availability of funds and to provide equal access to urban BMP funds. A second round RFP was issued September 2010 and closed October 2010 after KDHE provided additional funding for urban projects. See the Results section for awarded projects.

Education - Partners used an event planning checklist (See Appendix 6) developed by HWQP for workshops and public events. Agendas and promotional materials were complete at least six weeks prior to the event, which allowed adequate time for registration. The TWG Coordinator was primarily responsible for planning, promoting and hosting the events and technical staff and project partners made themselves available to assist with logistics and often served as presenters/speakers. Participants received and completed surveys to determine a measure of success for events, workshops and other educational activities. These results assisted partners to follow up and target interested landowners for installing voluntary BMPs.

Basin Leadership Institute - Interested volunteers, technical staff and project partners participated in the planning for the BLI. Modeling the program loosely from the Kansas Environmental Leadership Program (KELP) and incorporating a BMP tour provided a starting point for the group.

Outreach and Education

Materials – Consistently-designed print and electronic marketing materials (See Appendix 6) helped to promote all grant objectives. The general brochure circulated to all reaches of the basin via direct-mailings to cities, counties, extensions, conservation districts, schools and other potentially-interested organizations. They were included in every subsequent mailing and provided to attendees at many meetings where project partners presented and spoke. SLT members and project partners also kept supplies of brochures on hand to distribute in other situations.

Event fliers and invitations, BMP announcements, project signage, newspaper ads, an electronic newsletter, displays and BLI brochures all contained similar design elements ensuring that the TWG activities were perceived as connected and recognizable.

Efforts – Media releases prior to events were provided to media outlets, including radio stations, newspapers and television stations. Many news outlets, both print and radio, chose to run regular stories featuring TWG events and cost-share opportunities. Project partners were invited to participate in local radio shows to discuss and promote the livestock auction, urban BMP funding and BLI. Specifically, *The Ottawa Herald* and KOFO Radio, an Ottawa station, ran numerous stories on TWG Program activities. Their support throughout the project led to high rates of participation in Ottawa. An electronic newsletter, with a distribution of 171, and regular web

communications through HWQP and the RC&D websites aided in outreach as well. The RC&Ds included information on the TWG in their annual reports that were presented to local County Commissions, Conservation Districts, and State and National NRCS officials. Examples are included in Appendix 6.

The most effective mode of outreach was person-to-person communication despite the strong efforts to put forth quality materials and to reach out through media and other mass means. Most BLI participants heard of the series from the TWG Coordinator and other project partners. Many of the BMP participants learned of the cost-share funding individually from the SLT, technical staff and partners. Cost-share applications were far easier to solicit compared to other BMP objectives due to the existing relationships and systems of technical staff that were already in place and services were previously promoted through other programs.

Other Education Opportunities

HWQP, Lake Region RC&D and Osage Valley RC&D staff attended the March 2008 Southwest States Resource Conservation and Development Conference in St. Louis. A presentation outlining the Targeted Watershed Grant information and other water quality efforts in the MdC Basin was given (Appendix 9). A booth was also set up that include the TWG poster presentation developed for the January 2008 EPA workshop, copies of the presentation, and project fact sheets.

In response to inquiries from other RC&D councils about projects crossing state lines or other jurisdictional boundaries, the Admin Team submitted a concept for a presentation on the TWG project for the Southwest States RC&D Conference in March 2011. The Osage Valley RC&D Project Assistant delivered the presentation. The presentation provided an overview of the project, how a seamless team was developed across state lines, partnerships, successes, overcoming challenges and lessons learned. Three Osage Valley RC&D Council volunteer leaders also attended the four-day conference in Dodge City, Kan., which included an entire track devoted to natural resource improvement and forestry. In addition to the TWG presentation, sessions featured the Kansas WRAPS program and success stories related to streambank stabilization, onsite wastewater treatment system projects and other projects designed to prevent and/or remediate NPS pollution.

A request was made to Lake Region RC&D personnel to provide a presentation on the MdC TWG project to a northwest Kansas group preparing to apply for a multi-state project. With the assistance of the project coordinator a presentation was developed that provided an overview of development of the project, successes, and challenges faced (Appendix 9). This presentation was modified and used for a watershed modeling workshop held at the Haskell Indian Nations University in Lawrence, KS.

Budget

Table 25. Educational Events/Urban BMP Budget.

Budget Item	Workplan Budget	Amended Budget	Actual Expenditures
Workshops/BLI	$60,000	$60,000	$11,482*
General Outreach/Project Signage	$7,000	$7,000	$22,146*
Urban Demonstration	$27,500	$27,500	$18,239

**HWQP's accounting combined all advertising, printing, and postage costs. Therefore, the General Outreach/Project signage Actual Expenditures amount includes the costs for the BLI, all workshops, and general outreach. The Workshops/BLI total under Actual Expenditures includes the BLI speakers' fee and general costs associated with all workshops and the BLI.*

Results

Urban BMPs

The TWG solicited proposals for urban BMPs in two parts, as funds became available. The following table shows successful applicants, BMPs installed and final project costs totaling $80,576. Load reductions of 51.8 lbs/year of nitrogen, 15.4 lbs/year phosphorus, 1,549 lbs/year of total suspended solids, 114.3 lbs/year of biological oxygen demand, 2 lbs/year of zinc, and 636 lbs/year of chemical oxygen demand are estimated to be achieved.

Table 26. Urban BMP Cost Share Summary.

Project	BMP	Original Request	Cost-Share Amount	Final Project Cost*
City of Ottawa, Kan.	Rain Garden and Rain Barrels	$2,829	$2,710	$5,037
City of Ottawa, Kan.	Bank Stabilization	$2,282	$2,282	$11,719
City of Ottawa, Kan.	Vegetated Swale	$415	$415	$3,218
City of Ottawa, Kan.	Pet Waste Stations	$3,436	$3,120	$4,631
City of Ottawa, Kan.	Urban Tree Planting	$8,000	$8,000	$42,565
Butler, Mo. School District	Bioretention Cell/ Rain Garden	$10,875	$8,052	$11,090
City of Butler, Mo.	Rain Barrels	$1,170	$1,712	$2,316
Totals		**$29,007**	**$26,291**	**$80,576**

**Includes local match amount.*

Urban BMPs installed in Ottawa, Kan. are shown on the map in Figure 31 and those installed in Butler, Mo. are shown on the map in Figure 32.

Round One: During the first round of Urban BMP solicitation, the project received and awarded the following proposal:

1. The City of Ottawa, Kan. – Youth in Government (YIG) Rain Garden and Rain Barrel Project

Figure 25. Ottawa Youth-in-Government members carefully lay out and plant Kanza Park rain garden.

The City of Ottawa, Kan., with a population of 11,700, is one of the largest cities in the basin. A history of major flooding and close proximity to industry and agriculture have made water quality and quantity important issues to residents, business and government. The city recently adopted the American Public Works Association (APWA) BMP Manual, which includes specifications for both rain gardens and rain barrels. In addition, the city is drafting a local stormwater ordinance that includes a development fee to fund and incentivize future stormwater BMPs. The TWG Program cost-share funding offered the city an opportunity to promote stormwater management and NPS pollution reduction in the community.

The City of Ottawa, in partnership with YIG, a nationally recognized youth volunteer and leadership group, submitted a two part proposal. The first project component included purchasing supplies for 50 rain barrels and hosting a free design-build workshop for city residents. The proposal stated that several YIG members attended training on rain barrel construction, but that previous attempts to distribute rain barrels for a fee had not been successful for the group. YIG members determined that the use of rain barrels was relatively unknown in Ottawa and to encourage use, the workshop and rain barrels should be offered to residents at no charge. They hosted the workshop, and due to rain barrel equipment cost-savings and increased outreach efforts, YIG successfully distributed 100 rain barrels.

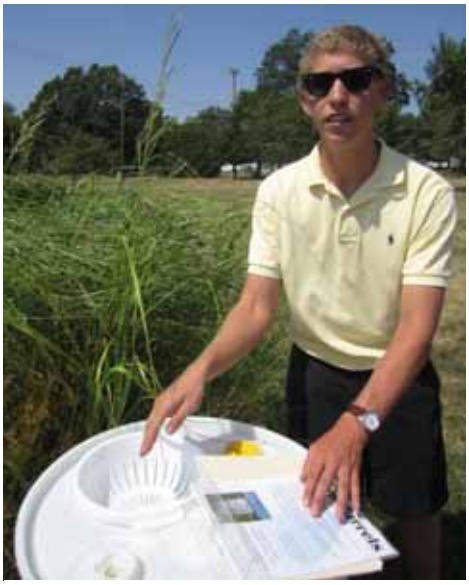

Figure 26. YIG member demonstrates how rain barrels work and shares the success of the TWG Urban BMP projects in Ottawa with the 2011 BLI class.

The second component of this project was the creation of a 100 ft² rain garden adjacent to a heavily used bike/walking trail in Kanza Park. As stated in the proposal, a small depression in this area often collected standing water. A rain garden converted the space from a mosquito-harboring eyesore to a valuable, highly visible demonstration site. City parks staff created a kidney bean shape for the garden and lined it with rock, sand, mulch and dirt. A native plant palette was selected to provide multiple levels of interest and to withstand extreme wet and dry conditions common in the Basin.

The local newspaper, *The Ottawa Herald*, and the local radio station, KOFO, supported the activities with pre- and post-event articles and interviews with the TWG Coordinator and YIG members. City staff reported a notable increase in citizen phone calls asking about the rain garden and how to have rain barrels installed.

Additional Round 1 Proposal:

Miami County, Kan. Landfill – Native Vegetation Establishment on Closed Landfill

A Miami County staff person attending the 2009 BLI learned of the benefits of establishing native vegetation and riparian buffers. The county submitted a proposal to establish native vegetation on a closed county landfill.

This project, originally solicited and approved through the Urban BMP category, was later reclassified as a riparian/low-impact development project. Please see Objective 1 section for more project details.

Round Two: A second RFP was issued September 2010 and closed October 2010. During that solicitation, the project received five proposals and awarded the following three:

1. The City of Ottawa, Kan. – Bank Stabilization at 17th and Main Street

A one-acre space separating Main Street and a city park, Roadside Park, receives overwhelming stormwater during flow events from 16 acres of contributing area. Serious erosion occurred at the site and regular flooding deteriorated at least five area trees that are not tolerant of wet soils. Two of the trees provided additional shade that prevented grass vegetation to consist along the drainage ditch. The city proposed re-grading the drainage ditch and installing a series of wash checks to slow the flow of stormwater. After installation, the success of the wash checks was evident from the silt accumulated and reestablished vegetation. They also requested funds to replace the dying trees with tolerant species – specifically River Birch, Bald Cypress and Lyndon. The trees were planted in areas that would allow for understory vegetation to be maintained and increase infiltration of stormwater with root development.

2. The City of Ottawa, Kan. – Vegetated Swale at Fairgrounds

The City of Ottawa partnered with the Franklin County 4-H clubs to create a vegetated swale to address polluted stormwater (manure runoff) in a highly visible park area. The swale is 100ft by 6ft, in a trapezoidal shape to facilitate water flow, and includes a variety of native plants strategically situated from top to bottom. Located in a highly visible area between a corral

facility and a parking lot for the county fairgrounds and Prairie State Rail Trail, the swale has an estimated one acre of contributing area; the majority consisting of compacted crushed limestone. A vegetated swale is a soil filter system that temporarily stores and then filters the desired treatment volume. Vegetated swales rely on a premixed soil media filter below the channel that is similar to that used for bioretention. The native plants increase infiltration and pollutant uptake.

Figure 27. 4-H members with the completed vegetated swale at the fairgrounds in Ottawa, Kan.

3. The City of Ottawa, Kan. – Pet Waste Stations

In additional to being unsightly, pet waste in urban parks is a real water quality issue and is addressed in the City of Ottawa environmental ordinances. Pet waste is generally ignored without citizen education of the pollution potential and without the promotion and enforcement of established ordinances. The City of Ottawa falls within a high TMDL for bacteria and pet waste could be a contributing factor. The city installed pet waste stations placed in heavy pedestrian-traffic areas with accompanying signage to promote pet-owner responsibility and the practice of picking up and properly disposing of pet waste. The city purchased and installed seven stations and purchased a two-year supply of bags. In July 2011, two months following installation, parks staff reported regular usage of bags.

Figure 28. One of seven pet waste stations funded through the TWG. Two months after installation, parks staff noticed regular use by dog owners.

4. The City of Ottawa, Kan. – Urban Tree Planting

Many trees in Ottawa parks were dying or dead due to disease, especially pine wilt, which was threatening to infect greater numbers of pine trees in the parks. The city did not have the funds to purchase all of the replacement trees and political resistance to removing trees without replacing them further threatened the pine population in the parks. The city proposed planting 25 trees in Roadside and Forest parks to replace trees needing removal. The Roadside Park tree planting increased tree diversity and infiltration in addition to previous project benefits in high stormwater flow area. Forest Park has many impervious surfaces and stormwater flows into the main MdC River. The park also had a number of pooling water areas where the trees helped increase infiltration.

Figure 29. Trees planted in the City of Ottawa parks.

5. Butler School District, Butler, Mo. – Bioretention Cell at Butler High School

The school district was planning to blacktop the gravel student parking lot at the high school. The TWG proposal consisted of earthwork and plantings to mitigate nonpoint source pollution from stormwater runoff.

The initial earthwork was completed over the 2010-11 winter, with a partial planting in April 2011. However, due to a lack of clear technical direction, exacerbated by the sudden loss of RC&D coordinator and support, heavy clay soil in the rain garden was not properly amended before planting, and rock had been applied as a mulch, rather than underneath amended soils, necessitating some retrofitting to make the project function as intended.

Osage Valley RC&D staff facilitated getting retrofit technical direction from a stormwater specialist from the City of Lenexa, Kan., and an NRCS urban conservationist from the Southwest Missouri Water Quality Project. Plans were made for an additional work day to re-grade and remove some of the clay and replace with a mixture of compost from the city yard waste collection program and purchased topsoil, incorporating a heavy-duty weed barrier. Fortunately, most of the initial planting had survived the summer drought in good shape for a fall retrofit that removed all plants, completed the necessary work, and then replanted. High school Ecology students, Lake Region and Osage Valley RC&D staff, city of Butler staff and volunteers completed the work day, under the urban conservationist's direction, including fully planting the total area of the rain garden.

Figure 30. The completed Butler R-V bioretention cell.

A final work day was scheduled to lay an additional layer of mulch, install a border to prevent fescue encroachment, help keep mulch inside the garden and provide clear definition for mowing and maintenance and install an elbow in the outlet pipe to maximize infiltration and prevent loose mulch from washing out.

With additional urban project funding available, the City of Butler later submitted an additional project that was awarded by the SLT:

1. City of Butler, Mo. – Rain Barrel Distribution Project

The scope of the original proposal was to assemble and distribute 50 rain barrels to Butler residents; the SLT approved a maximum cost-share of $2,000, almost double the request, so that

the city could increase the number of rain barrels and/or complete a second distribution. The city increased the quantity of barrels from 50 to 70, providing 14 barrels from its water treatment plant.

The proposal initially called for soliciting downtown merchants to install decorative rain barrels to increase public awareness before the distribution. However, concerns about potential issues with overflow onto sidewalks, winterization, vandalism, and how many fewer barrels would be available to residents led the city to re-focus the project strictly on homeowners. Residents were required to show a City of Butler utility bill to be eligible to receive a rain barrel, ensuring that all barrels would be installed within the basin boundaries.

The distribution was promoted via news releases to the local newspaper, radio station and online county news web site, as well as on Osage Valley RC&D's web site and with fliers and posters around town.

City staff drilled inlet, outlet and overflow holes using a design provided by Mound Branch 319 project staff. Volunteers recruited by Osage Valley RC&D assembled the rain barrels the day before distribution, discovering that the parts provided by the city would only make 63 barrels. Since promotions had said 70 rain barrels would be distributed, the decision was made to compile a waiting list for the remaining seven barrels.

A two-hour Saturday morning (June 11, 2011) distribution was planned, but all 63 barrels were distributed on a first-come, first-served, limit one basis in about 30 minutes. Each resident who received a rain barrel also received printed instructions for installing and maintaining the barrel, courtesy of the Missouri Mound Branch 319 project.

Within a few days, calls to City Hall provided a waiting list of five, and the city agreed to let Osage Valley RC&D distribute the final two rain barrels via drawings conducted at the Osage Valley RC&D / TWG / Mound Branch Project booths at the Bates County Fair in July 2011 and the Bates County Watershed Festival in August 2011. The Mound Branch 319 project identified local artists who donated their expertise to decorate both rain barrels in a garden theme, and conducted a "how to build your own rain barrel" mini workshop during the watershed festival.

Figure 31. Winner of Bates County Fair Rain Barrel Drawing.

With just a few months until the end of the TWG Program, the city decided to consider the project a success and not attempt to build and distribute another 10 to 12 rain barrels to use up the remaining $260 in cost-share available under the TWG's not-to-exceed $2,000 maximum.

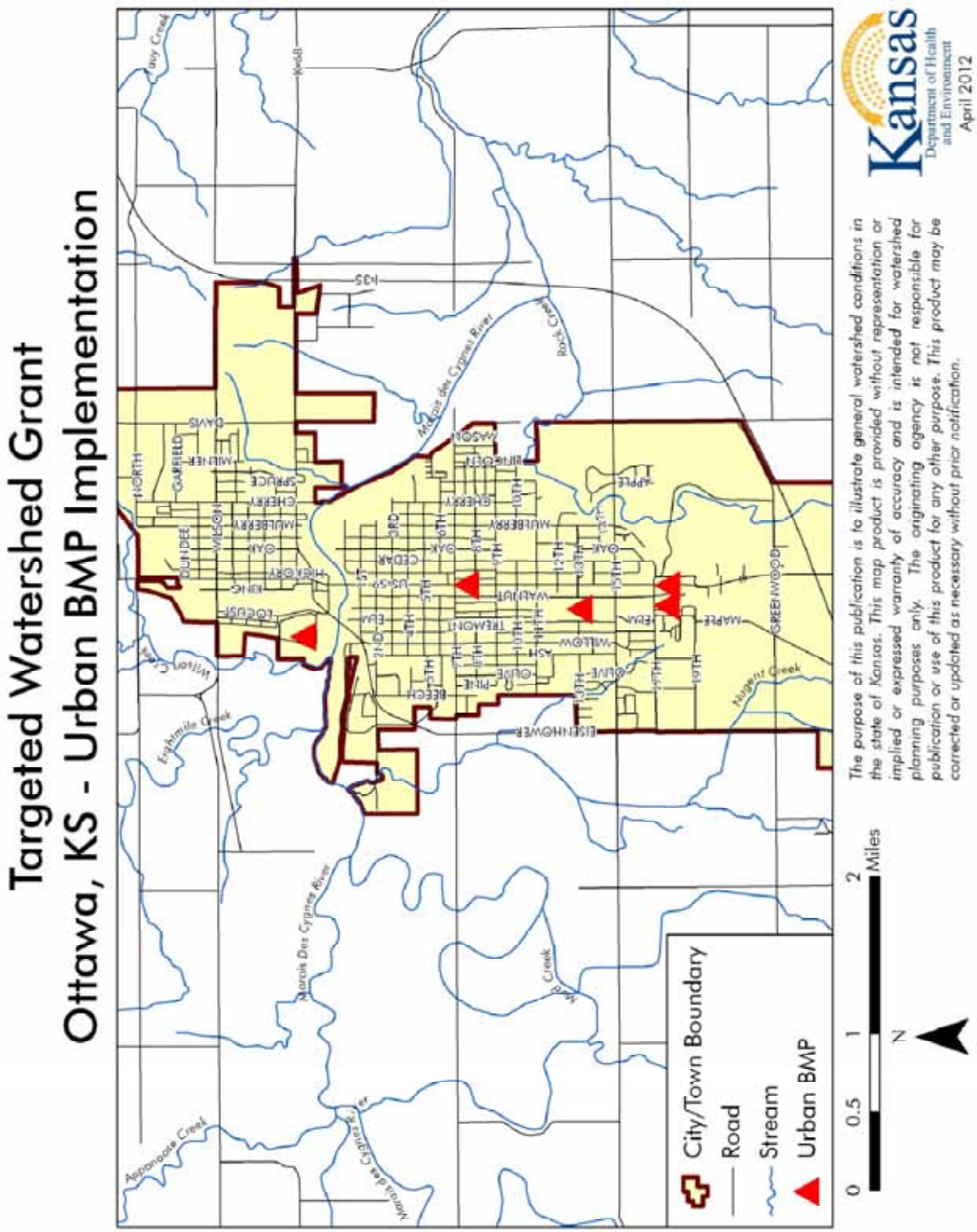

Figure 32. Urban BMP locations in the city of Ottawa, KS.

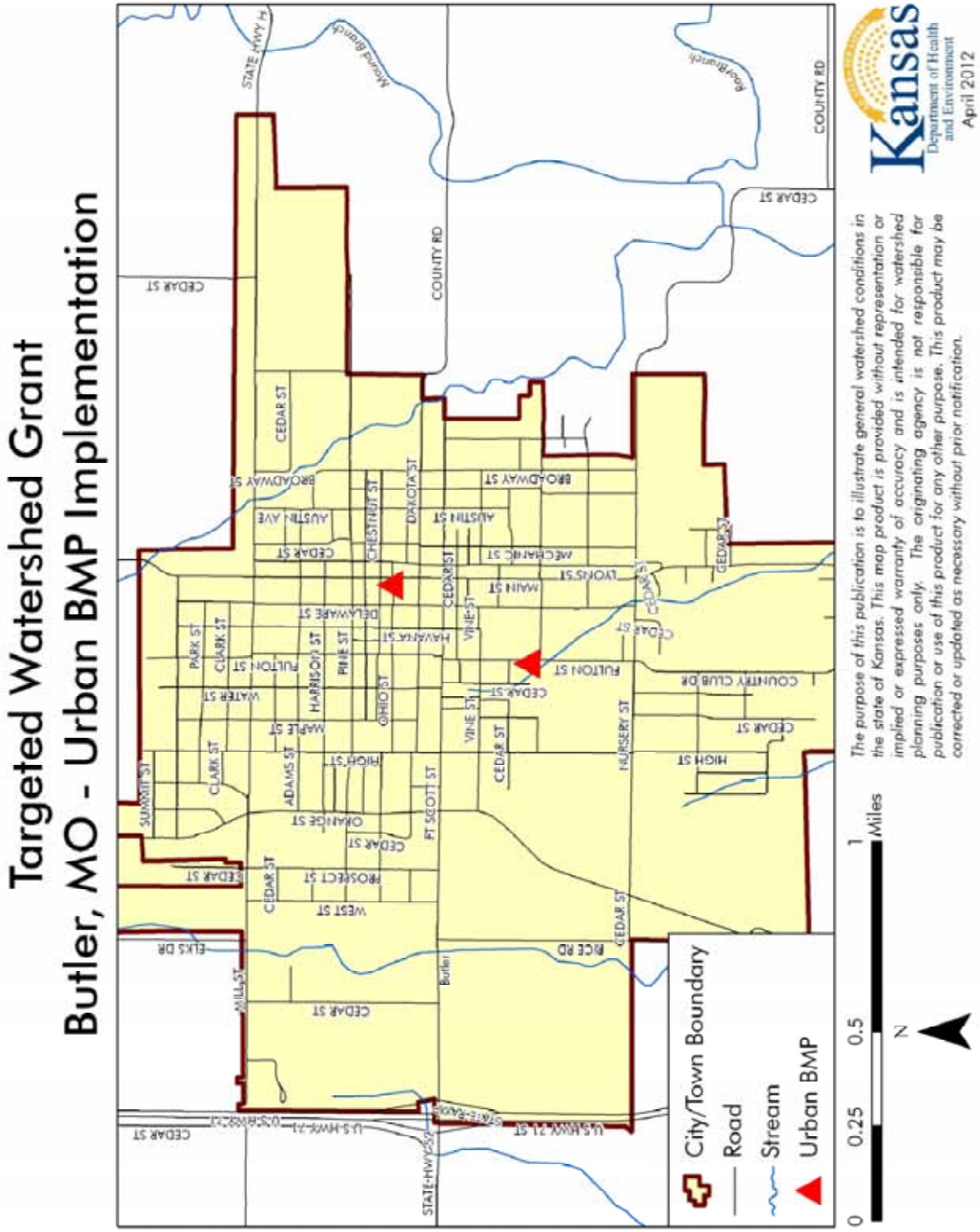

Figure 33. Urban BMP locations in city of Butler, MO.

The following projects were denied:

1. Miami County, Kan. – Bank Stabilization at Lake Miola - $8,000 requested.

The county submitted the proposal to use rock to stabilize a section of bank at Lake Miola. The SLT denied the project due to the lack of impact on overall water quality in the watershed. The project would likely only impact the near-shore erosion in the lake, which is mainly a recreational lake, and would not address the source of sediment. Additionally, the SLT would have supported a stabilization project that included vegetation as a buffer to pollutant sources, as opposed to a rock-only solution that did not address those known issues. The county declined the suggestion to redesign the project to include buffers.

2. City of Butler, Mo. – Sewer Infrastructure Project - $14,000 requested.

The city requested funds to replace failing sewage lines in a neighborhood. The lines ran from individual houses to a main sewer line. This project was favorable to SLT members; however, EPA and KDHE determined the project was not eligible for TWG cost-share due to the fact that this project fell under the city's National Pollutant Discharge Elimination System (NPDES) permit.

Education

The calendar of events and workshops hosted by the TWG are listed below, with years separated with shading.

Table 27. Calendar of TWG Information and Education Events.

Date	Event
Dec. 12, 2007	TWG Kick Off Event- Hillsdale Lake, Kan.
Mar. 4, 2009	Presentation at the Southwest States RC&D Conference – St Louis, Mo.
Nov. 13, 2008	Forestry Field Day – Pleasanton, Kan.
Dec. 2, 2008	Septic Program Workshops (2) – Mound City, Kan. and Butler, Mo.
May 14, 2009	Livestock Field Day – Mound City, Kan.
May 20, 2009	BLI – Year 1, Day 1 – Mound City, Kan.
June 4, 2009	Livestock Program Workshops (2) – Mound City, Kan. and Butler, Mo.
Sept. 16, 2009	BLI – Year 1, Day 2 – Butler, Mo.
Nov. 12, 2009	Forestry Field Day – Amsterdam, Mo.
Dec. 16, 2009	BLI – Year 1, Day 3 – Paola, Kan.
July 27, 2010	Rain Garden Demonstration – Ottawa, Kan.
July 29, 2010	BLI – Year 2, Day 1 – Spring Hill, Kan.
July 30, 2010	BLI – Year 2, Day 2 – Spring Hill, Kan.
Aug. 31, 2010	BLI – Year 2, Day 3 – Butler, Mo.
Sept. 2, 2010	Livestock Field Day – Pleasanton, Kan.
March 14, 2011	Presentation at Southwest States RC&D Conference – Dodge City, KS
April 7, 2011	Septic Maintenance Workshop – Butler, Mo.
April 12, 2011	Septic Maintenance Workshop – Mound City, Kan.
June 1, 2011	Septic Maintenance Workshop – Lyndon, Kan.
July 11-14, 2011	Exhibit at Bates County Fair – Butler, Mo. (OVRCD sponsored)
July 27, 2011	BLI – Year 3, Day 1 – Ottawa, Kan.
July 28, 2011	BLI – Year 3, Day 2 – Ottawa, Kan.
Aug. 4, 2011	BLI – Year 3, Day 3 – Butler, Mo.
Aug. 27, 2011	Bates County Watershed Festival – Butler, Mo. (OVRCD sponsored)

Figure 34. Lake Region RC&D Forester Cody Campbell demonstrates methods of timber stand improvement at a forestry field day in Amsterdam, Mo.

Two of the 10 required educational field days were forestry field days. The first field day, in November 2008 prior to any BMP installations, showcased a 700-acre tree planting at the MdC National Wildlife Refuge. Twenty-eight attendees heard presentations on the TWG Program and cost-share funding available, tree planting methods, benefits of healthy riparian areas for streams and timber stand improvement. Promotional activities included: news releases to all local media, a targeted mailing to nearby landowners, limited newspaper advertisements, e-mail invitations to all project partners and stakeholders, fliers and brochures distributed to basin conservation districts, NRCS and extension offices, libraries, farm stores, schools, restaurants, etc. During and upon completion of BMPs, signs were placed in prominent locations to encourage neighboring landowner participation. Examples of outreach materials are available in Appendix 6.

The second forestry field day, in November 2009, drew 30 people to a ranch in Amsterdam, Mo. Presenters used a stream trailer to demonstrate the need for healthy riparian areas; a mechanical tree planter to show how large plantings are done; and attendees hiked a portion of the ranch where a TWG timber stand improvement project was underway and discussed a potential BMP for cattle observed standing in a stream.

The two forestry field days accounted for 58 of the required 150 attendees for educational events. Both field days received high marks on post-event surveys (see Appendix 6 for event survey example).

Four cost-share informational workshops, meant to educate technical staff and potential applicants about eligible practices and the sign-up process, were held in the high priority areas. In December, 2008 10 participants attended two septic program workshops and in June, 2009 10 participants attended two livestock program workshops. During septic workshops, sanitarians spoke to installers and applicants about permitting requirements and project partners explained the cost-share process. Similarly, the livestock workshops featured technical staff, KSU and project partners speaking with potential applicants about eligible practices, design specifications and the livestock auction process. The TWG Coordinator provided an informational display, brochures and spoke about the need for livestock and septic BMPs in the area. The livestock workshops were especially successful, with several attendees submitting bids to the auction.

Two livestock field days, in Linn County, Kan., and Bates County, Mo. showcased livestock BMPs. On May 14, 2009, in partnership with the Linn County Conservation District and NRCS office, more than 30 attendees participated in a field day at the Caldwell Farm just outside of Mound City, Kan. Herschel George, KSU Watershed Specialist presented alternative watering systems – tire tanks with a fenced pond and a solar water pump system. The producer spoke to participants about improvements in forage and animal health due to intensive grazing, made possible with electric cross-fencing. All of the practices featured at this field day were eligible for funding through the TWG livestock auction.

The second livestock field day, showcasing a TWG-funded project in Bates County, took place September 2, 2010. Twenty-two participants toured the Weickert operation that included a concrete pump house, riparian fencing and cross-fencing for rotational grazing. They also pitched in to help construct the final tire tank to complete the Weickert project. Ryan Neises, Watershed Forester, also spoke about the importance of managing riparian areas for water quality benefits.

Figure 35. Installation of the final Weikert tire tank waterer at the September 2, 2010 field day.

The TWG Program hosted one urban BMP event at the newly-established Kanza Park Rain Garden. The TWG Coordinator provided attendees, mainly YIG members and Ottawa residents, with an overview of the TWG project and thanked YIG and the City of Ottawa for participating. YIG members and city staff presented the process of installing the rain garden including before and after descriptions, the design and species selection.

Nearing the end of the grant period, $8,000 in unexpended educational funds remained. The TWG Coordinator sought direction from partners and the SLT on additional workshops that might be beneficial. They considered a grazing school, an urban stormwater workshop and septic maintenance; all very popular subjects throughout the project. The decision was made and approved by KDHE and EPA to host two septic maintenance workshops in the high priority area and to provide useful materials to document maintenance and $75 vouchers to offset maintenance costs, to be redeemed by the end of July. Typical maintenance activities included pumping septic systems and repairing lagoons. The Butler, Mo. workshop, April 7, 2011, was well-attended by 32 participants, 17 of whom requested vouchers. Bob Broz, MU Research and Extension, gave a presentation (Appendix 9) on proper maintenance and the TWG coordinator explained how the vouchers could be redeemed. Several contractors were also present and there was lively discussion about proper maintenance. Five days later, April 12, 2011, a similar program was offered in Mound City, Kan. Similar outreach techniques that were successful in recruiting participants for the first septic workshop, yielded only 12 participants requesting five vouchers. Guy Crabill, Franklin County Sanitarian and John Maloney, Linn County Sanitarian provided presentations based on Bob Broz's presentation. A third workshop, held in Lyndon,

Kan., on June 1, 2011 at the request of the KDHE Northeast District Office and Osage County, drew 19 participants who requested 9 vouchers. Osage County was facing some sanitation challenges. They had no sanitarian, their sanitation codes were being reviewed and there were sanitation complaints registered with the KDHE. Ann Mayo and Keena Privat, with the Lyon County, Kan. Health Department presented maintenance of septic systems and lagoons.

Basin Leadership Institute

Figure 36. 2009 BLI Participants view a native planting in Harrisonville, Mo.

The TWG Program provided training for 43 participants through the BLI, a three-day training covering community leadership, watershed conditions, BMPs, water quality conditions and NPS pollution. Each year included a BMP tour of urban and rural BMPs for water quality. The commencement of the BLI coincided with an economic downturn that impacted a large section of the target audience for this objective. Cities and counties in the basin were not only contending with budget freezes that did not allow for training expenses of this nature, but staffing shortages did not allow for three full-day absences. Participation at the two 4 hour workshops was much easier to garner, and post-event surveys indicated the program was well-organized and worthwhile. (See Appendix 7 for BLI materials.)

Year 1-2009 – BLI content was modeled after KELP, a state of Kansas program held in three-day sessions over several weeks throughout a year, although greatly condensed. Several planning meetings, attended by project partners and technical staff, resulted in diverse agendas. A massive outreach effort included mailing invitations and brochures to every elected official in the basin, every city/county manager and planning director in the basin and to all conservation-oriented organizations and boards in the basin. Advertisements (Appendix 7) in major basin newspapers ran for several weeks leading up to each of the BLI classes. Brochures were placed at conservation districts and extension offices and grant partners attended city and county commission meetings to personally invite officials to attend. E-mail invitations circulated widely in both states and an electronic newsletter promoted the event. The attendees enrolled after being personally invited and encouraged to attend, despite the outreach effort.

The first class presenters included: Terry Woodberry of Public Square Communities, Inc., who facilitated a community leadership and principles of convening session; and several high-level agency staff who presented information on conservation and grant programs available to communities and individuals. Participants left with the task of using the Community Interview Format (see Appendix 7), provided by Woodberry, to engage acquaintances in a discussion about water quality; to shift mundane "coffee shop" conversations to a more positive discourse about how to improve the environment.

Figure 37. BLI Participants from Anderson and Linn Counties discuss potential solutions to water quality issues in the basin.

The second class in the BLI Year 1 was BMP-focused, with presentations by Nikki Guillot, City of Lenexa BMP Inspector, and Ted Martin, City of Harrisonville Engineer. Later, the group toured BMPs with varying levels of success in Harrisonvillle, Mo.; native plantings, a sediment basin and a riparian planting. They also discussed a potential BMP at the city lake.

By the third class, three participants had success stories using their own variation of the interview format to present to the group. One farmer used TWG Program brochures to spark conversation at the coffee shop and several regulars requested additional information on BMPs; one county employee shared information she learned on the tour about the benefits of native plants with her department head, who later submitted a successful cost-share proposal; and a citizen shared his experience with shifting an anti-government conversation at his church to a more positive conversation about environmental responsibility. Surveys indicated the series was useful and well-organized.

Year 2-2010 – BLI agendas (see Appendix 7) offered much of the same topics and format due to the positive feedback from the previous year, and as indicated in the work plan. An exception was to hold the first and second days contiguously. The first and second classes were held in Spring Hill, Kan., and again featured a speaker from Public Square Communities, Inc., a panel of local water quality experts, and followed with a BMP intensive activity where participants learned about BMPs and then applied their knowledge to real local scenarios to cooperatively arrive at potential solutions.

Figure 38. Kim Bomberger, Kansas Forest Service, provided information on the importance of healthy trees in watersheds to the 2010 BLI.

The hands-on BMP session was the most popular of the series.

Figure 39. 2010 BLI Participants visit a bioretention cell installed at the edge of a parking lot in the City of Lenexa.

A tour of the Hillsdale Lake and Lenexa, Kan., area featured a wide range of urban and rural BMPs including constructed wetlands, riparian tree plantings, livestock watering systems, bioretention cells and native plantings. The intent of the planning committee was to show a range of BMPs from rural to urban and discuss how they all connect and work together to improve water quality. Given the 100-degree temperatures and the 20-mile separation of BMPs, the tour schedule was determined by surveys and organizers to be less than ideal. Organizers agreed that future tours should be more concentrated and have fewer stops to allow for more discussion and less drive-time.

The third class took place in Butler, Mo., and featured speakers on funding stormwater BMPs and organizing for stormwater efforts. All three classes were held within a month, and attendance was higher than in the previous year.

Organizers agreed to keep a similar schedule for the final year, and there was some discussion of offering concurrent urban and rural sessions for participants interested in more detailed presentations on one or the other. Some planners felt this would encourage more people to enroll while others felt it was beneficial for participants to learn about urban and rural BMPs and how they work together. The concurrent sessions were determined to be ideal, but impractical, for the scope of the BLI. Future projects could potentially accommodate these preferences.

Year 3-2011 – A planning session was held with members of the 2010 BLI class and partners to determine ways the 2011 session could be improved. Meeting notes from this session are included in Appendix 7. BLI agendas accounted for lessons learned during the first two years. Participants suggested offering breakout sessions for future programs, with urban and rural tracks. There was still quite a lot of resistance to considering a holistic, watershed approach to addressing water quality. County participants were not so interested in learning about urban practices and participants who lived and worked in urban areas failed to see much value in studying rural practices. One goal of this session was to educate each group of the importance of all BMPs.

The first two classes were held on consecutive days in Ottawa, Kan., with the first day spent in the classroom learning about natural resources in the basin and about more rural-focused practices such as livestock, septic and farming BMPs. Participants engaged in discussion pertaining to the need for BMPs; basin impairments and potential causes.

The second day focused on urban issues and participants toured five TWG-funded BMPs in Ottawa. It was the first year that the tour was able to feature all TWG-funded BMPs. The group began at Forest Park and learned proper tree planting and maintenance from the KFS. Next, they visited the Kanza Park rain garden and heard a presentation from YIG members who planned and planted the garden. The final stop showcased three BMPs, vegetative swale, pet waste station and a series of rock checks at Roadside Park. A BMP inspector with the City of Lenexa, Kan. led on-site and classroom discussions about the strengths and weaknesses of the Ottawa BMPs and then presented ways to share with the public information on BMPs.

Figure 40. Kim Bomberger of the Kansas Forest Service demonstrates the proper care of new tree plantings in the summer heat.

The third class, held in Butler, Mo. offered participants a hands-on stream monitoring and bioassessments session. They also heard a presentation about the Mound Branch sub-watershed in the basin, as well as water quality activities happening there as part of a 319 grant project.

Several participants expressed anger and frustration towards the EPA, so this class also featured a clip from the BBC documentary *Our Poisoned Waters*, to provide a historical context for the establishment of EPA. This resulted in a lively and productive discussion about the need for regulation and personal responsibility in protecting water in the region and throughout the world.

Bates County Watershed Festival

Figure 41. Water Bottles distributed at the Osage Valley RC&D water festival and the Bates County Fair.

Osage Valley RC&D planned and executed a watershed festival, “Be a Solution to Water Pollution,” in August 2011 at the city park in Butler, Mo. The event, which featured 10 exhibits, numerous water-quality-related demonstrations, two presentations by The Fishin’ Magicians using comedy and magic to teach about protecting water quality, and water games, drew more than 250 participants.

Osage Valley RC&D distributed free water bottles with the TWG logo at both the watershed festival and the TWG exhibit at the Bates County Fair, held a month earlier. The “chameleon” water bottles each held a slip of paper that said, “This water bottle changes color when cold to remind you that you can make changes to help reduce nonpoint source pollution and improve water quality.”.

Discussion

Lessons Learned

In hindsight, to improve overall project effectiveness, the project should have adopted a set of specifications for urban BMPs, such as the APWA BMP Manual. The project also should have identified and developed technical partnerships to assist with designing and checking urban BMPs in both states, and developed MOUs with the partner organizations to ensure that changes in their staffing would not impact the TWG Program's ability to install BMPs three or four years down the road.

For the sake of simplicity, it might have been better if urban BMPs on both sides of the state line had been managed and paid by HWQP. The RC&D councils, cost-share committees and staffs were not already familiar with these cost-share practices or technical experts in such areas, and then were made largely irrelevant by the SLT's RFP process for selecting BMP projects, until payment was due.

The education components benefitted from existing partnerships. However, difficulties recruiting participants for the BLI might be addressed by future efforts by strengthening those partnerships further and working directly with a city, county or stormwater consortium to tailor sessions specifically relevant to them. The intent to spread classes and recruit participants from throughout the basin was good, but given the economic constraints present during the grant period, it proved too broad to attract great numbers.

Future Plans

There are no plans for future BLI sessions, although lessons learned will be shared with organizations providing similar programs; mainly KELP and Extension Offices.

The Lake Region RC&D is a local leader in watershed management and water quality efforts. Lake Region RC&D is always looking for opportunities to complete its mission. One generated by the TWG Program is to develop a regional stormwater program in partnership with growing communities and counties.

The Lake Region RC&D will utilize some form of urban cost-share in future Nine Element Plan Middle MdC WRAPS. Portions of the process could be adapted to best fit available technical staff and community needs. The City of Ottawa falls within this watershed so installed BMPs will continue to be demonstration projects. The Middle MdC WRAPS will also include educational activities including field days and workshops for water quality.

Some lessons learned regarding urban BMPs will be applied within the basin through Osage Valley RC&D's Mound Branch 319 project in and around Butler, Mo. Final success of the Butler R-V school project has generated interest in the city administration for installing rain gardens in the city park and at the Bates County fairgrounds, as well as among homeowners. The Mound Branch 319 project has a goal of installing 10 rain gardens before that project's 2013

completion. The experience at the Southwest States RC&D Conference provided the RC&D's volunteer leadership with ideas and resources for additional types of pollution prevention projects that could be implemented within the council's 10-county area.

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Objective 5: Complete bioassessments along major stream and river segments in the basin using the EPA bioassessment protocols

Introduction

Workplan Objective: Complete 75 bioassessments along major stream and river segments in the basin using the EPA bioassessment protocols at 25 sites per year to determine baseline stream health conditions and to target areas in immediate need of BMPs.

EPA funds of the TWG Program were used in the implementation of a bi-state biological assessment (bioassessments) program from 2009 to 2011. The bioassessments allowed for the evaluation of the chemical, physical, visual and biological factors in given stream and river segments. Bioassessments serve as a tool to detect and characterize the source and cause of water quality impairments as well as an overall evaluation of waterbody health.

Figure 42. Fish species are collected by electrofishing and other methods.

Three major outcomes came from the results of the bioassessments performed in the MdC basin. Environmental outcomes allow for the improvement of stream health in localized areas to increase overall waterbody health downstream. Behavior outcomes will aid in informing local leaders and communities of baseline stream health information in the basin and aid the communities in indentifying stream and rivers in need of immediate restoration and protection projects. Programmatic outcomes provide training of higher education students participating in the bioassessment and will result in a map of bioassessment locations through GPS and GIS.

Methods

Planning

The TWG SLT requested proposals from college professors from Benedictine College in Kansas and Central Missouri State University in Missouri for completion of the bioassessment objective. The professors were evaluated by the TWG Coordinator, KDHE, and HWQP. Benedictine College was awarded the proposal and contracted under HWQP. The initial goal of 25 bioassessments per year was decreased due to the determination that cost requirements had increased. A new goal of 20 sites per year was determined to be an effective change to the objective. Benedictine College would utilize the aid of 5 students in the sampling and analysis of the bioassessment.

To ensure consistency and accuracy of sampling and analysis of the biocriteria obtained throughout the bioassessments, a Quality Assurance and Protection Plan (QAPP) was developed (See Appendix 8) by Benedictine College and HWQP. The QAPP approved by KDHE on June 24, 2009 and updated on April 8, 2011to include protocols in the event a threatened or endangered species is collected.

The majority of locations of the bioassessment sites were determined based on the implementation of BMPs contracted through the TWG. The locations offered a variety of land use, urban and rural locations and a variety of stream flow, width and habitat - all of which reflects the variety found on a larger scale throughout the MdC River Basin.

Delays of BMP installation prevented some bioassessment sites to be determined at the beginning of the assessment. Landowner willingness and locations of previously installed BMPs in the MdC River basin allowed for additional bioassessment sites to be chosen. The amount of flow, both lack of and increased amount were taken into account in the determination of all sites.

Figure 17 below, identifies the dates and locations of the sites sampled over the three-year period include the following:

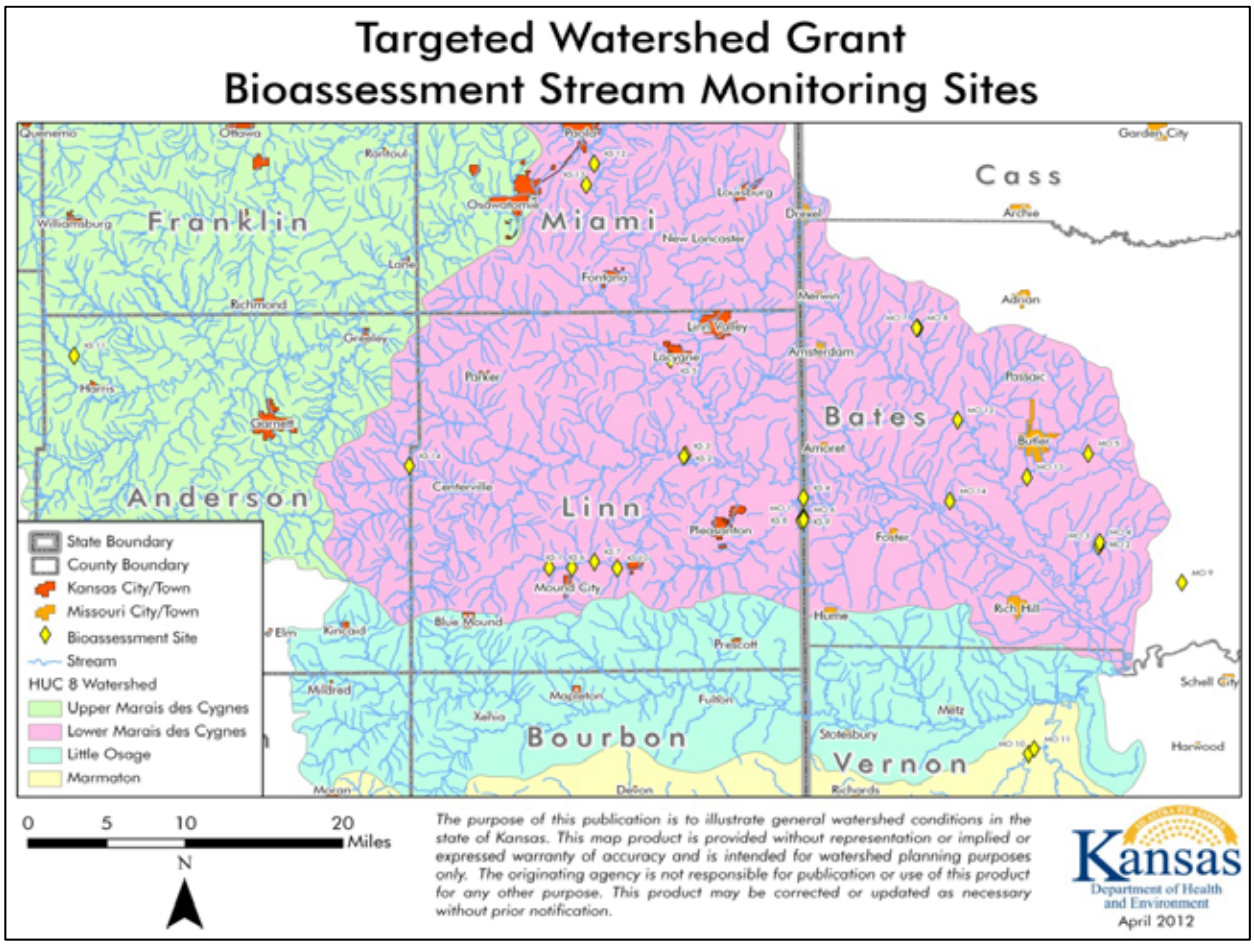

Figure 43. Bioassessment locations.

Outreach and Education

The utilization of the Benedictine College for the bioassessment allowed for students to gain beneficial firsthand experience. The students were trained on proper sampling and analysis techniques that aided in the completion of the project objective. The objective allowed for valuable learning experiences and education outside of a classroom setting for the students.

An annual bioassessment overview documented findings, and was completed after each sampling round. Excerpts from these documents provide an overview of the sampling criteria and are included in Appendix 8. The overview documents served as a user friendly tool for SLT members. Participating landowners were also notified of the presentations and offered the ability to attend the meetings.

Process

Before the sampling periods were implemented, Benedictine College trained students each year on bioassessment procedures and protocols. After a site was chosen, 100-meter stretches were marked off for biocriteria collection. All bioassessment data was collected and analyzed under the supervision of Benedictine College.

Water quality parameters were taken immediately upon arrival to the site in attempt to avoid disturbances associated with the collection of macroinvertebrate and fish. Both benthic macroinvertebrates and fishes were collected at each site. Seining was conducted for the collection of fishes and macroinvertebrateson a 10-meter area. Adjustments were made with the presence of woody debris, rocks, or lack of water and resulted in less area seined in the 100-meter stretch.

Fishes unable to be collected with seining were obtained using an electrofishing unit. Electrofishing was performed on a variety of habitats present at the site including pools, runs, riffles, cut-banks, and woody debris areas. All fishes collected were preserved in a 10% formalin solution and returned to the lab for analysis. After one week in solution, the fishes were moved to water to leach out the formalin and then placed in a 50% solution of isopropanol for permanent storage. Frank Cross' *Fishes in Kansas* and Benedictine College were used for identification of fish species.

Figure 44. Students identify tiny macro-invertebrates and take them back to the lab for further analysis.

Macroinvertebrates were identified using Huggins et al's *Guide to the Freshwater Invertebrates of the Midwest*, Pennack's *Freshwater Invertebrates of the United States*, and Thorp and Covich's *Ecology and Classification of North American Freshwater Invertebrates*.

A visual assessment of each site was taken and included a 20 point scale: available cover, pool variability, sediment deposition, channel flow status, channel alteration, channel sinuosity, bank stability, vegetation protection, riparian zone width. To allow for a complete survey of the site, scores were always assigned after collection of water quality data, macroinvertebrates, and fishes. Scores were totaled and reported to HWQP as site specific habitat scores.

Budget

Funds allocated to the bioassessments included completion of all field and laboratory work, travel to and from the sites, and a small stipend for each participating student.

Table 28. Bioassessments Budget.

Budget Item	Workplan Budget	Amended Budget	Actual Expenditures
Bioassessments	$40,000	$40,000	$40,000

Results

A total of 70 collections were obtained in the bi-state MdC basin during the bioassessment periods. The data allowed for baseline information to be reported and will aid in future assessments of the water quality and determination of the effectiveness of restoration and protection methods. Assessments of BMP effectiveness and efficiencies can only be speculative with the small time period of sampling. Continual sampling information will aid in this analysis. General water quality evaluations were determined with the biocriteria obtained during the bioassessments. KDHE Environmental Field Services aided in ranking the bioassessment sites on general water quality and assisted with data interpretation. The sites were ranked according to the sampling parameters and divided into three groups; high, medium, and low water quality. Table 19 gives the results of bioassessment ranking. This data does not reflect what BMPs have been implemented in the various bioassessments sites, but is a preliminary assessment of the baseline data as a whole.

Table 29. Ranking of all bioassessment sites.

Site	Location	Score	Rating
KS-1	Ingrahm	26	Highest
KS-7	Lane Road/Peterson	25	Highest
KS-9	Weickert Big KS Creek	25	Highest
MO-3	Double Branch	24	Highest
KS-10	Bollinger	23	Highest
KS-12	Peckman 1	23	Highest
MO-1	Weickert State Line Road	23	Highest
KS-13	Peckman 2 (Hospital Road)	22	Middle
KS-6	Jennison	22	Middle
MO-5	Obannon Road	22	Middle
KS-14	Stanley	21	Middle
KS-11	Larson	20	Middle
MO-13	Butler Mound Branch	20	Middle
MO-4	North Branch	20	Middle
MO-6	Weickert Property	20	Middle
KS-3	Little Sugar Creek Down	19	Middle
MO-14	Bates County Drainage Ditch	19	Middle
KS-2	Little Sugar Creek Up	18	Middle
KS-4	State Line Road	18	Middle
KS-8	Weickert Cow Pie Creek	18	Middle
MO-12	Butler City Lake	18	Middle
MO-2	South Branch	18	Middle
MO-8	Hocket (Harlan)	18	Middle
KS-5	LaCygne City Park	17	Lowest
MO-7	Hockett (Orange Gate/Buford)	16	Lowest
MO-9	Breckenridge	14	Lowest

Discussion

The collected bioassessments data from the three-year time period provided baseline information for future projects in the area. This data will allow insight on determining the overall effectiveness and efficiency of BMPs within the MdC Basin. Collection of the bioassessments data from the TWG sites can potentially be collected indefinitely and continue to assess the water quality and functions of BMPs.

The sites for the bioassessment were based on landowner acceptance and implemented BMP sites. For future bioassessments to be utilized in a more efficient manner, gathering data prior to any BMP implementation would be beneficial. By determining the locations of the most

impaired waters and implementing BMPs in those locations, the watershed will see more restoration effects. In addition to working with land owners one-on-one, creating an outreach and educational program on bioassessments may allow for greater land owner participation. Many landowners did not realize the purpose of a bioassessment and how the data is used. Fear of government retaliation for impaired waters is a common misconception among the public. Project partners attempted to allay those fears with language in the landowner permission form (see Appendix 8).

Unforeseen acts of nature can cause variations in any bioassessments plan, with the TWG Program being no exception. On a few occasions, students were unable to obtain collections on time due to cold weather, flooding and preliminary administrative delays. EPA granted permission for the bioassessments sites to be decreased from 25 to 20 per year. Early freezing temperatures in 2009 caused only 18 sites to be assessed. In the following year, 2010, a total of 27 sites had bioassessments collected including repeating the initial 2009 sites, five new sites, and repeat samples of two of the initial sites that were not able to be collected in the first round. For the third collection in 2011, students collected from three new sites that were identified due to one of the previous sites being determined as slightly outside of the basin and two of the others as too deep to be collected from. Three of the sites were removed from the list for the final year.

In some cases, data became inconsistent from year-to-year. Inconsistencies included time of sampling and different weather conditions. In obtaining biocriteria, weather conditions from year-to-year can be sporadic and ultimately an uncontrollable variable; however, time of sampling can be controlled in future collections. Additional data was determined to be needed after the completion of the first bioassessment including the time of day sampling was taken. The time of sampling in a day can be a major variable on water chemistry parameters such as dissolved oxygen.

Lessons Learned

Through the TWG bioassessment project, various lessons were learned. At the beginning of the bioassessment period, project management was not fully established. The duties were eventually determined to be under HWQP. The time taken to determine management needs delayed the start of the bioassessment work. An organized management framework will need to be completed before bioassessment proposals are taken in future assessments. The determination of assessment sites before contracting will also increase the effectiveness and efficiency of future bioassessment work.

The bioassessment allowed for experience for undergraduate students; however, the lack of knowledge, skills, and abilities at the undergraduate level causes more oversight needed by instructors. Additional bioassessments accomplished by undergraduate students will need to incorporate more direction and clearly stated goals. Undergraduate students are easily

overcommitted during the school year. Bioassessment work should be scheduled from May to October to insure proper time commitment.

Various other agencies and organizations such as The University Kansas and Kansas Department of Parks, Wildlife and Tourism, have performed monitoring over the years in and around the MdC Basin. Future efforts should be used to gather and assess the available data. Efforts were made by the TWG Program to acquire the information prior to starting the bioassessments; however, minimal time allocations made this action difficult. Future partnerships will allow for greater use of all biocriteria data and the placement of BMPs.

Future Plans

This program and other monitoring activities should be included in future programs within the basin to provide actual lab data of the local streams and water bodies' health. This will provide actual reflection of current status of the streams more than currently collected monitoring data.

Using data basin-wide to create a baseline inventory will allow for focus on needed areas lacking in data. The basin-wide approach, coupled with a GIS database that incorporates land use, streamflow, and other variables will aid in predictions on site conditions.

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Project Conclusion

In conclusion, through this project, more than 100 BMPs are in place in high priority areas of the basin. Landowner participants have gained a much deeper understanding of managing land for water quality and many of them have become very vocal community leaders. More than 150 basin residents improved their understanding of watershed protection and management at TWG workshops and classes. The results are far-reaching and will continue to benefit the basin for years to come.

Within the last few years, previously impaired waters located in the MdC Basin have been removed from Section 303(d) of the Clean Water Act. MdC Basin 303(d) impairments that have been delisted included lead, zinc, ammonia, dissolved oxygen, atrazine, copper, E. coli, total suspended solids, fecal coli, and eutrophication. Although the TWG Program is unable to take full credit for the improved waters, actions taken through the grant have aided and contributed to the success. BMP implementation as well as public education will allow for future successes and can potentially lead to increased delisting of impaired waters in the MdC basin.

The bi-state effort was not without challenges. Staffing turnover, the elimination of RC&D Coordinators and the loss of office space and, at times, overburdened technical staff threatened to stall or derail the project. Workplan and budget amendments occurred due to cost changes and other considerations, and with so many diverse partners came a fair number of misunderstandings and communication challenges. However, the results from the TWG show that these challenges were overcome.

Consistent and clear communication throughout all phases of any project is a key component to a successful project. Many of the challenges encountered throughout this project may have been minimized had proper communication practices been followed. The SLT also voiced concern that the EPA project officer was unable to attend the SLT meetings during the final two years of the project due to time conflicts. This resulted in the inability of the SLT to discuss questions, issues, and challenges immediately as they were presented at the meetings.

The TWG coordinator should have been contracted by the agency receiving the grant. Delays were encountered throughout the project, including the initial contracting procedure, due to the need to follow the proper chain of command between the grantee, the subgrant recipient, and the TWG Coordinator.

The SLT expressed appreciation that consistency in KDHE and EPA personnel was maintained throughout the project. This allowed the project to progress without the need to educate new project officers on the goals and objectives of the project and to become acquainted with the numerous partners, staff, and technical advisors.

Appendices

1.	Work Plan, Work Plan Amendment, List of Project Partners, Stakeholder Leadership Team, Administrative Team and Technical Support Team Membership
2.	BMPs: Load Reduction Table
3.	Forestry: Field Day Notification, Adrian Journal Article, Cost-Share Documents: Application, Cost-Share Rates and Contract
4.	Livestock: Auction and Cost-Share Documents: Bid Sheet, Eligible Practices and Contract; September 2010 Livestock Field Day Invitation
5.	Septic System Cost-Share Documents: Application, Press Release, Septic Maintenance Voucher
6.	Information and Education and Urban BMP: Urban RFP, Event Planning Checklist, TWG Brochure, BLI Newspaper Ad, BMP Signage, Event Survey Example
7.	Basin Leadership Institute Documentation: Brochure, Newspaper Ad, Sample Agenda, Community Interview Format, 2010 Participant Survey Results Summary, 2011 BLI Planning Meeting Notes
8.	Bioassessment Documentation: QAPP, Bioassessment Sampling Parameters, Landowner Permission Form
9.	Presentations: Southwest States RC&D Conference – St. Louis, Mo., Livestock Auction Overview, Osage Valley RC&D Annual Meeting Presentation, MdC Project Presentation, Lake Region RC&D Annual Meeting Overview, Excerpt from the Lake Region RC&D 2010 Annual Report, Excerpt from the Osage Valley RC&D Annual Report, Onsite Wastewater Maintenance Workshop
10.	Other Educational Materials: TWG Workshop Poster Presentation, TWG Workshop Fact Sheet, e-newsletter, TWG Tabletop Display, Newsletter Article

Please contact the

Kansas Department of Health and Environment-Watershed Management Section

for the Appendices