Springfield-Greene County Urban Watershed Stewardship Project
19-G11NPS06

Final Report

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1.0 Project Background

The Springfield/Greene County urban area lies on a relatively flat watershed divide and is drained by headwater streams of the James River (HUC #11010002010), which flows generally to the south of the basin divide, and the Little Sac River (HUC #10290106050), which flows to the northwest from the divide. Both of these streams have in the past been classified by the state as impaired--the James River for nutrients, particularly phosphorus; and the Little Sac River for fecal bacteria. Both basins now have established Total Maximum Daily Loads (TMDLs) and both have accepted watershed management plans. Further, Wilsons Creek, its tributary Jordan Creek, and Pearson Creek, another tributary of the James River, are separately listed due to urban impacts. For the purposes of this project, three urban sub-watersheds in the James River Basin tributary to Wilsons Creek and one sub-watershed in the Little Sac Basin were chosen to targeted applications of best management practices (BMPs) designed to reduce loadings from nonpoint source pollution, especially nutrients, bacteria, and sediment, as well as to reduce the overall volume of runoff through low impact development (LID) techniques.

The Springfield urban area covers approximately 80 square miles, with a metropolitan population of 156,000. A large urbanizing area and population base extend beyond the city limits of Springfield into Greene County. Four urban sub-watersheds within this area were targeted for implementation in this project: South Creek, Fassnight Creek and Jordan Creek, tributaries of the James River, and Pea Ridge Creek, a tributary of the Little Sac River. These watersheds represent the heart of the city and are characterized in large part by older development that occurred prior to having storm water regulations in place that require BMPs. Therefore, a primary reason these sub-watersheds were targeted was to retrofit older developed areas with BMPs to improve runoff quality and reduce runoff quantity. Each of the four sub-watersheds has unique characteristics that provide additional compelling reasons for targeting them, including special water quality protection needs and partnering opportunities that provided a foundation for success.

The South Creek sub-watershed is approximately 8.5 square miles. It has a history of citizen activism for stream protection and significant portions of preserved riparian corridor through public and private property, which is enjoyed by the community via a popular greenway trail. This sub-watershed contains a mix of commercial, residential and institutional land uses as well as city parks and schools, provided opportunities for public projects, private partnerships and homeowner education and involvement. The Fassnight Creek sub-watershed is approximately 7 square miles, with Missouri State University (MSU), one of the project partners, contributing a significant development footprint in the sub-watershed. This provided an excellent opportunity to retrofit this built-out watershed with BMPs on the MSU campus, where they are also used to educate a large student population about storm water and runoff impacts. The Jordan Creek sub-watershed (containing three sub-sub-watersheds) is 17.4 square miles and contains the oldest, most highly urbanized areas of the city. It has a history of physical degradation, fish kills and pollution problems. Sections of the stream are channelized, with one-half mile of the stream flowing under downtown Springfield. However, several efforts have been made to restore the quality and integrity of the stream, including ongoing assessment and cleanup efforts under the city's Brownfields Program, a multi-year feasibility study currently underway with the U.S. Army Corps of Engineers (USACE) for flood mitigation and environmental restoration, a stream daylighting project (in urban design and urban planning, daylighting is the redirection of a stream into an above-ground channel – the goal being to restore a stream to a more natural state) on the North Branch of Jordan Creek, purchase and preservation of 32 acres of riparian corridor and floodplain property in the lower portion of the sub-watershed, and increased local regulatory efforts to address pollution. The government campuses of the City of Springfield and Greene County, also project partners, are located within this sub-watershed. BMP implementation at these locations contributed greatly toward existing water quality efforts in the sub-watershed and provided an excellent demonstration location to educate developers and the public that visit the city offices. The Pea Ridge Creek sub-watershed, approximately 8.6 square miles in size, contributes to the community drinking water supply and is an immediate urban tributary of the Little Sac River, previously listed as impaired due to bacteria. Implementation of BMPs in this sub-watershed included installation of a wetland and rain gardens at Doling Park and opportunities with schools and homeowners that will help protect the sensitive drinking water use of this sub-watershed.

The project area lies within the Springfield Plateau sub-province of the larger Ozark physiographic province, with predominantly Mississippian-age limestone at or near the surface. The Burlington-Keokuk formation, a karst forming unit, is at the surface over most of the project area. Chert is abundant from weathering of the Burlington-Keokuk and underlying Reeds Spring, Pierson and Elsey formations. Karst development is pronounced, particularly in the southeast and northwest portions of the urban area, where sinkholes and caves are numerous. A number of large springs drain the upland portions of both the James and Little Sac Basins in the Springfield urban area, including Fulbright Spring and Sander Spring to the north, Jones Spring to the east, Sequiota Spring to the southeast, Rader Spring to the southwest, and Ritter Spring to the northwest. Sinkhole plains in the Springfield urban area have largely been developed, and some sinkholes have been filled and/or artificially drained to other sinkholes or streams.

Several soil types are represented in the project area, predominately Hepler Silt Loam, Pembroke Silt Loam (1-5% slope), Goss-Gasconade Complex (2-50%), Goss Cherty Silt Loam (5-14% slope), Cedargap Silt Loam and Sampsel Silty Clay Loam (2-5% slopes). Soil types vary from natural alluvial soils along urban streams to cherty silt loams on stream benches and terraces to cherty residuum and cherty clay soils on upland sites to compacted, often imported soils on construction sites all over the urban areas. The upper sections of the targeted Jordan Creek and Pea Ridge Creek sub-watersheds contain numerous large, usually shallow sinkholes.

Land use in the targeted sub-watersheds is high-density urban development, with high percentages (20% plus) of impervious surfaces in large portions of all four sub-watersheds. Jordan Creek, the oldest developed section of the city, also contains the greatest number of older industrial sites and brownfields and has the highest percentage of industrial and commercial land-uses of the four sub-watersheds. This sub-watershed includes large municipal developments (City/County Government plazas), institutions (Drury University, Ozarks Technical Community college), city parks (Silver Springs, Jordan Valley and Smith parks) and large industrial complexes. Pea Ridge Creek, Fassnight Creek and South Creek sub-watersheds feature predominantly high-density, single family residential neighborhoods interspersed with several large parks containing urban streams (Fassnight, Doling, Phelps Grove, Nathaniel Greene and Close parks, and Horton Smith Golf Course) and many large commercial and institutional developments (e.g., Battlefield Mall, MSU campus, Mercy Hospital).

Water quality concerns in the James River have centered on excess nutrients, which have caused massive algae blooms in the James River arm of Table Rock Lake in the past, leading to the nutrient TMDL, and efforts to reduce phosphorus loadings from point sources (e.g., requirements to reduce phosphorus loadings from wastewater treatment plants, as has been accomplished at Springfield's Southwest Wastewater Treatment Plant). The management plan for the James River calls for a wider application of BMPs designed to address the remaining nonpoint source nutrient inputs, including urban sources such as lawn fertilizer, sediment from construction sites and streambank erosion from destabilizing urban stream channels. Wilsons Creek and Pearson Creek, urban tributaries of the James River, are listed as impaired streams due to urban impacts. The Little Sac River, draining to the northwest, and Stockton Lake have been listed as impaired due to levels of bacteria exceeding state water quality standards. Monitoring in these basins by watershed organizations, the Ozarks Environmental and Water Resources Institute, the Department, United States Geological Survey (USGS), Springfield's MS4 (Municipal Separate Storm Sewer System) storm water program, and others have indicated continuing problems with channel instability in urban streams and significant contributions of fecal bacteria, sediment and nutrients from urban and urbanizing sub-watersheds. Further, toxicity testing and biological monitoring in urban streams (e.g., Pearson Creek, Wilsons Creek) have indicated significant toxicity during runoff events at some sites and loss of biological diversity has been found in all urban streams examined. In the past, there have been numerous fish kills in Jordan Creek and less frequently in Pearson Creek.

The partners in this watershed that worked together on this project agreed that all of the urban stream sub-watersheds targeted in this proposal are negatively impacted by the process and state of urbanization, particularly in the following ways: elevated nutrient levels in urban runoff from widespread turf fertilization and soil loss from construction activities and erosion; instability of urban stream channels due to dramatic changes in hydrology resulting from highly impervious sub-watersheds, leading to increased streambank erosion and sediment mobilization; increased sediment loading and downstream sedimentation in receiving waters (James and Little Sac rivers); increased toxicity in runoff sporadically due to a variety of organic and inorganic pollutants being spilled, washing, or leaching from urban sites; and increased bacterial loading in receiving water bodies from pet wastes, surcharging and/or leaking sewers, septic tanks, geese and other nonpoint sources, particularly during storm events.

The City of Springfield and Greene County's MS4 Stormwater Programs and other efforts now address many of these negative impacts of urbanization. For example, the City implemented a comprehensive land disturbance program to address runoff from construction sites, and has strong programs in place to address illicit discharges, industrial runoff, and new development. The City has also been addressing sanitary sewer overflows for a number of years through infiltration/inflow reduction and fats, oils and grease management. However, additional efforts are needed above and beyond MS4 permit requirements and other existing local efforts and resources to fully address the impairments of these watersheds. For these reasons, the BMPs implemented during this project focused on reductions of pollutant loadings from nutrients, bacteria and sediment from a variety of sources and land-use types, as well as reduced runoff volume to mitigate the effects of hydrologic fluctuations brought about by urbanization.

1.1 Project Goals and Objectives

Primary Goal: **Improve the quality of runoff and reduce the quantity of runoff leaving the Springfield/Greene County urban area through the implementation of measures to reduce nutrients, bacteria, sediment and runoff volumes in support of the TMDLs and watershed management plans established for the James River and the Little Sac River, the two receiving water bodies draining the greater Springfield urban area.**

Objective 1:
Implement BMP and LID practices in the four targeted sub-watersheds, including rain gardens, rainwater harvesting, native landscaping, vegetative filters, infiltration trenches, streetscapes projects, riparian restoration projects, urban stream soft engineering techniques (making use of ecological principles and practices by using living structures for construction), and retrofitting of standard detention basins to improve water quality performance. *This goal was met and exceeded using match and partnerships to surpass our initial goal.*

Objective 2:
Monitor the performance of the BMPs installed with the objective of measuring pollutant removal efficiencies that can be compared with the International BMP Database, and collect performance data of a quality that can be included in that database, using the following measures of performance recommended by that database: a) how much the BMP reduces runoff volumes; b) how much runoff is treated (versus bypassed); c) whether the BMP can demonstrate a statistical difference in effluent quality compared to influent quality; d) what distribution of effluent quality is achieved; and e) how well the BMP reduces peak runoff, especially for smaller more frequent storms (which helps reduce hydro-modification effects). *This objective was met and the results are included in water quality report in the attachments.*

Objective 3:
Monitor at the sub-watershed level to establish base level and storm flow water quality conditions, using to the extent possible data from the ongoing MS4 monitoring program, in order to quantify loading reductions achieved during the project and to provide accurate data for models that will be used to estimate loading reductions expected from wider implementation of the various BMP types. *This objective was met and results are included in water quality report in attachments.*

Objective 4:
Incorporate design and performance information obtained during the project into city and county design criteria manuals and for potential use in updated policies and ordinances to address urban water quality problems. The City found great value in the water quality data collected during the project period and plans to fund the continuation of data collection in the two project detention basins. *This objective was met because the City and County are very interested in using this data for future criteria.*

Objective 5:
Developed and implemented widespread public education programs, using the Internet, public libraries, city/county, organization meetings, and targeted workshops, and using existing educational materials and printed materials as well as public radio PSA's. Educational approaches targeted civic leaders, contractors, engineers, developers, business owners and homeowners. *This objective was met and exceeded because the number of public educational presentations was surpassed.*

Objective 6:
Activate the urban citizenry to participate in watershed improvements through BMP implementation projects, volunteer events like tree planting and river cleanups, urban soil testing programs, pet waste pick-up projects, and rain barrel and rain garden implementation and education programs. *This objective*

was met and exceeded because the public response indicated that landowners will continue to implement watershed improvements.

Objective 7:
Involve local schools and urban youth in the project through Missouri Project WET (Watershed Education for Teachers) workshops for formal and non-formal educators, and through the implementation and demonstration at school sites of BMPs such as rainwater harvesting, rain gardens and native landscaping for demonstration and education purposes. *This objective was met and exceeded by working with Springfield Public Schools on three projects and having numerous educational presentations in the classroom.*

Objective 8:
Demonstrate how agencies, non-profit and educational institutions can work together to develop coordinated, cooperative programs to advance the science and application of urban watershed management and the methods of controlling and improving the quality of runoff in urban and urbanizing settings, documenting the successes and problems encountered as part of the this report. *This objective was met and exceeded because the all grant partners were cooperative and very willing to work together to overcome challenges.*

1.2 Target Audience

The target audiences identified and addressed in this project, are as follows:

Community Leaders
These individuals received status reports on the project at regular intervals, and will receive the final report. Public officials were informed and educated about the most efficient and cost-effective means to reduce nonpoint source pollution in the urban areas, so that proposed changes in ordinances and regulations will have a strong educational base and political support.

Developers, Engineers, Architects
These individuals were provided with a better understanding of the types of urban BMPs available for reducing polluted runoff in different landscape and land-use settings. They were also introduced to new ideas and techniques for LID that can readily be incorporated into development design and construction. Professionals in this category learned how to properly design and construct BMPs which helps to reduce future maintenance costs.

Contractors
This group of individuals constructed and installed the urban BMPs. The contactors were very receptive about learning new techniques and ensuring that project details were discussed with a collaborative approach during construction. Contractors have followed up to find out about project performance and water quality data results.

Schools and Teachers

Many project sites were used for field trips and classrooms to provide an opportunity to educate the next generation about watershed science, water quality protection, and the kind of practices that can be used in the urban setting to keep streams and lakes clean.

Local Citizenry and Homeowners

Through this project the local citizenry, a very important group, was engaged through educational workshops and individual projects with homeowners, churches and businesses. It helped them understand how their individual actions, at home or at places of business, can impact water quality for the better or for the worse.

1.3 Activities Conducted to Achieve Project Goals and Objectives

The grant activities were effective in reaching our target audience and fulfilling the project's goals and objectives. The activities were important components of the project to demonstrate and educate our targeted audience on urban stormwater, water quality and LID techniques that they can do at their home, business or school. The activities and list of projects are summarized in the charts below.

Activity	# Produced	Description
Field Days	4	Students, teachers, community leaders toured demonstration projects
Workshops	6	Educational workshops for landscape professionals, residential and business property owners
Meetings	13	Steering Committee meetings
River Clean-ups	7	319 volunteers removed an estimated 4.25 tons of trash
Soil Tests	84	nutrient management plan provided to property owner
Native Plantings	9,250	Number of native trees, shrubs, forbs, grasses and seedlings planted during project
Volunteer Planting Days	6	Six planting days with 112 volunteers planting
Rainwater Harvesting	28,562 gallons	rainwater systems installed during project

Project	Partners	Description
Campbell Avenue Streetscape	WCO, City of Springfield, Missouri Master Naturalist, Missouri Department of Conservation	Three large rain gardens with native plantings were installed along the Campbell Avenue in Jordan Creek Watershed
Governmental Plaza Stormwater Retrofit	WCO, City of Springfield (Public Works, Streets, Fire Department, City Council), City Utilities, Missouri Department of Conservation	Large bioswale, rain gardens, rainwater harvesting, pervious concrete, pervious pavers and native trees and plants
Walnut Streetscape	City of Springfield	Gravel infiltration trench and native plantings
Doling Park Stormwater Improvements	WCO, City of Springfield, Springfield Greene County Park Board	Wetland and large rain garden in public park
Greenwood/Missouri State Detention Basin retrofit	Missouri State University, City of Springfield, WCO, OEWRI	Remove concrete channel, installation of gravel trench and check dam
Drury/Springfield Public Schools Detention Basin Retrofit	Drury University, City of Springfield, WCO, OEWRI, James River Basin Partnership	Remove concrete channel, installation of gravel trench and check dam, three parking lot rain gardens
Missouri State Darr School of Agriculture Rainwater Collection System	Missouri State University, Greene County, NRCS, Missouri Project WET	Collect 20,000 gallons of rainwater from roof of horse arena and use for dust suppression in arena
Public Works Pervious Concrete	City of Springfield Streets Department and Public Works	First application of pervious concrete for city staff
Greene County Bioswales	Greene County Resource Management	Native plantings in bioswales
Robberson Elementary Stormwater Improvements	Springfield Public Schools and City of Springfield	Gravel infiltration swale, rain barrels, native plantings
Boyd Elementary Stormwater Improvements	Springfield Public Schools and City of Springfield	Pervious concrete, rain barrel and native plantings
Homegrown Foods Pervious Patio	Homegrown Foods, City of Springfield and Greene County	Pervious pavers and removal of old unused parking lot
Gilardi’s Ristorante	Gilardi’s Ristorante, City of Springfield and James River	Build a Barrel 1700 gallon rainwater collection system

Rainwater Harvesting	Basin Partnership	
First Baptist Church Rain Garden	City of Springfield, First Baptist Church Advisory Committee	Removal of asphalt and installation of large rain garden
Messiah Lutheran Church Rain Garden	Messiah Lutheran Church, City of Springfield	Installation of rain garden and native plants
Floating Wetland	Watershed Center and City of Springfield	Native plantings in plastic structure floating on lake
Rain Tree Sculpture	Springfield-Greene County Public Library, Coffee Ethic, Greene County, Advanced Welding	Rain tree collects water on its branches into 400 gallon planter in downtown Springfield
Native Plantings	City of Springfield, NRCS, James River Basin Partnership	Stream corridor improvements and native plantings along Jordan Creek, South Creek and Fassnight Creek
Educational Stormwater Mural	City of Springfield, Springfield Greene County Park Board	Educational Stormwater Mural

1.3.1 Products Produced

Product	# Produced	Number Distributed
Informational Brochures	2	4500
Press Releases	12	Sent to all media contacts
Newsletters	16	Mailed to distribution list
QAPP	1	Publicly available
Presentations	22	22
Stormwater Survey	1	188
Public Service Announcement	1	Aired on Radio 10 times
Big Urbie Website	1	Public access www.bigurbie.org

2.0 Evaluation Measures

Measuring levels of knowledge imparted during workshops and field trips were achieved through an assessment of the successes of the workshops by the organizers and by the numbers of participants who implement the practices or procedures presented. Stomwater surveys were used in public meetings to gauge the level of stormwater knowledge of the audience. The projects were assessed through feedback provided by engineers, contractors, maintenance providers, partners and landowners while also documenting performance through a photo log and water quality data.

2.1 Water Quality Monitoring Activities

All monitoring is described in detail in the Quality Assurance Project Plan (QAPP), and includes a combination of BMP and instream monitoring. The QAPP can be found in the attachments.

Stream monitoring was done at the sub-watershed level in the Fassnight and South Creek watersheds to establish base level and storm flow water quality conditions in order to quantify loading reductions achieved during the project and to provide accurate data for models that will be used to estimate loading reductions expected from wider implementation of the various BMP types.

The summary of the water quality monitoring is attached in two reports. These reports have been shared with project partners and will be publicly posted on the City of Springfield, Watershed Committee of the Ozarks, and OEWRI website.

2.1.1 Load Reduction Calculations and Summaries

Missouri Department of Natural Resources provided modeling to calculate the amount of nutrients reduced for each BMP implementation project that was constructed during the project.

OEWRI conducted the stream and detention basin water quality monitoring which used direct calculations pre/post. For the detention basin monitoring the Runoff volume (L) was calculated by multiplying the mean discharge (m3/s) of the runoff event by the duration (s) of the runoff event. Mean event discharge was the average of all discharge values collected at 5 minute intervals throughout the storm event. Runoff duration started when the recorded stage was >3 cm and ended when stage was <3 cm for the individual event. Flow weighted event mean concentrations (EMC) were calculated in two steps. First, each individual sample concentration for each event was multiplied by the sample runoff volume representing the timeframe the discrete sample was collected to get an individual sample load. The second step is to calculate the EMC by taking the sum of each individual sample load and dividing that total by the total runoff volume to get the EMC of each event (McLeod et al, 2006). The site mean concentration (SMC) is the average EMC for the entire sample period. The site mean yield (SMY) is the average load from all paired storm events divided by the upstream drainage area. Load reduction was calculated by subtracting the SMY from the pre-implementation monitoring period from SMY of the post-implementation and dividing it by the pre-implementation SMY to get percent difference.

For the stream monitoring flow-weighted loads over the monitoring period were calculated using the load duration method (USEPA 2007). This method combines the flow frequency curves from the hydrologic monitoring with load rating curves from the water quality monitoring portion of the project. Load rating curves are based on log-log linear regression equations between discharge and load. When the regression line over predicted load at the highest flows sampled, the average of the actual loads were used to better fit the trend line to the field data. Modeled daily load error was calculated by adding and subtracting the standard error from the regression line. Load at a given flow is then multiplied by the frequency of that flow during the study period in 1% intervals to create a load duration curve. Finally, duration curves for TP and TN were compared to the James River TMDL eutrophic threshold (ET) values of 0.075 mg/L TP and 1.5 mg/L TN (MDNR 2001).

Pollutant	Lbs./acre	Method Used
Nutrients	80.53	STEPL
Nitrogen	66.5	STEPL
Phosphorus	14.03	STEPL

2.2 Other Environmental Field Activities Conducted

All project sites were documented photographically, from before implementation through construction phases to final construction and monitoring. Before and after photographs were used for any public participation and volunteer projects such as riparian tree planting or rain garden installments, as well as photographs of volunteers involved in the work. Educational events and activities such as workshops were photographed for inclusion in project reports and for media distribution.

2.3 Measuring Knowledge and/or Behavior Changes

The number of participants in all events were recorded and used in reports. 188 stormwater surveys were taken by workshop and meeting attendants. The survey results yielded that many people were familiar with water quality and rain gardens. However there was misunderstanding on the terminology stormwater and nonpoint source. All survey results can be found in attachments. The goals for project were exceeded by increasing knowledge in the watershed but there still remains more work to be done. The project was well received by many community members and landowners that participated in the project. Some contractors and landowners said they were skeptical about some of the water quality BMPs. After the completion of the project they changed their perspective and saw that the water quality improvements working effectively.

3.0 Partners and Roles

Partner	Role
The City of Springfield Storm Water Services Division	Funding support for project administrative services and data for modeling through the use of MS4 storm water quality monitoring and the city-wide rain gauging network. Storm water engineers and staff for the City and County will donate design, engineering and project management support as well as cost-share funding for implementation of BMPs in the targeted sub-watersheds.
Missouri State University: Ozarks Environmental and Water Resources Institute (OEWRI)	Planning, monitoring, BMP installation oversight, modeling and educational services, primarily through staff of the Ozark Environmental and Water Resources Institute, including the donation of a graduate assistant position for the four years of the project.
Ozark Greenways	Assist to develop and implement aggressive, widespread public education using educational materials and workshops. Activate urban citizenry to participate in BMP implementation projects such as rain garden/tree planting and stream restoration projects. Support in planning and organization for volunteer projects or work days. Provide planning and assessment of urban stream corridors for potential greenway establishment and riparian improvements. Provide guidance and assistance for stormwater mural project.
James River Basin Partnership	Shared responsibility with the WCO for education/outreach components of the project.
Greene County Resource Management	Storm water engineers and staff for the County will provide technical oversight and donate design, engineering and project

	management support for implementation of BMPs in the targeted sub-watersheds. Assist in the development and distribution of educational materials and participate in the steering committee.
Project WET	Statewide Project WET coordinator will develop and conduct workshops and programs targeted to teachers and non-formal educators in urban settings.

3.1 Committees Formed

The Project Steering Committee was formed for this project. Their function helped provided guidance on project structure, details and coordination. The committee included individuals from a diverse professional and technical group. Below is the list of steering committee members.

- Barbara Lucks, Carrie Lamb and Olivia Hough, City of Springfield
- Terry Whaley and Lori Tack, Ozark Greenways
- Mike Kromrey, Stacey Armstrong, Kelly Guenther, and Rob Hunt, WCO
- Bob Pavlowsky and Marc Owen, OEWRI
- Tiffany Frey, Joe Pitts and Melissa Bettes, James River Basin Partnership
- Kevin Barnes and Vanessa Brandon, Greene County
- Eric Cox, Project WET
- DeDe Vest, NRCS

4.0 Project Overview

The project started off slowly due to the numerous grant partners and organizations involved. The first year was focused primarily on creating MOU's with partners, writing the QAPP for monitoring, and structuring communication and project steps for implementation. Due to the long project name the grant quickly developed a nickname 'Big Urbie' which represented its large community coordination and the urban stream focus. The Big Urbie nickname became known by water resource professionals and landowners in our community.

Big Urbie was unique due to the numerous grant partners applying together and all reporting to WCO. Communication with partners and landowners was a very important component of the grant. Working with large organizations, businesses or universities often started with one local contact as the project design would progress more individuals with different area of expertise would be brought in the communications. Having a diverse professional group of individuals work on projects made the process slower at times however the benefit of knowledge gained and project improvements during the design made for a much more successful project. The project far exceeded the original goals by completing more demonstration projects and educational components due to the support of local matching funds, skilled coordination, and multiple partnerships.

4.1 Department of Natural Resources Role

DNR helped provide the modeling calculations for the implemented BMP projects during the project. DNR grant managers also provided project guidance and assistance for questions related to the project. The degree of involvement was beneficial and the correct amount of guidance and support needed for the project.

4.2 Suggested Changes to Project Efforts

This project was a wonderful community exercise in watershed and community coordination. Lessons learned included allowing ample amount of planning and coordination time when working with multiple partners. Multiple disciplines during the design process will produce a better project, attention to detail during design and construction are important, great community partners equal great projects and communication is key to successful projects.

5.0 Attachments

- **QAPP**
- **Water Quality Reports and Data**
- **Press Releases**
- **Photo Journal**
- **Brochures and Flyers**
- **Landowner Application**
- **Stormwater Survey and Results**