State of Wisconsin
Department of Natural Resources-WT/3
101 S. Webster St.
Madison, WI 53707

dnr.wi.gov

Final Report

Targeted Runoff Management Grant Program and Urban Nonpoint Source and Storm Water Management Grant Program

Form 3400-189 (R 6/08)

Notice: This final report is authorized by ss. 281.65 and 281.66, Wis. Stats., and chs. NR 153 and NR 155, Wis. Adm. Code. Personally identifiable information collected will be used for program administration and may be made available to requesters as required under Wisconsin's Open Records Law [ss. 19.31-19.39, Wis. Stats].

Instructions: Your grant agreement requires you to submit a Final Report 60 days after the end date listed in the grant agreement. This Final Report form must be used in conjunction with the "FINAL REPORT INSTRUCTIONS." The instructions detail how to complete and submit the report to DNR. The DNR prefers that Final Reports be submitted in electronic format. If, however, printed copies of Final Reports are submitted, please submit three (3) complete originals to your regional Nonpoint Coordinator.

1. Grant Type -- Please check one.

- ☐ Targeted Runoff Management Grant -- Agricultural
- ☐ Targeted Runoff Management Grant -- Urban
- ☒ Urban Nonpoint Source & Storm Water Management Grant -- Construction
- ☐ Urban Nonpoint Source & Storm Water Management Grant -- Planning

2. Grantee & Project Information

Project Name **Pheasant Branch Creek Stabilization Project**	Grant Number **USC-LR10-13255-06**
Governmental Unit Name **City of Middleton**	Primary Watershed Name and Watershed Code **Pheasant Branch Creek (LR10)**
Nearest Water Body Name	Nearest Water Body Identification Code (WBIC) (if applicable)
DNR Water Management Unit (River System) Name **Lower Rock (LR11)**	s. 303 (d) Listed Waterbody? ☒ Yes ☐ No.

What pollutant(s) were addressed by the project (e.g., nitrogen, phosphorus, sediment, thermal control, *etc.*)?

sediment

For <u>each</u> project site location provide the following: (attach additional sheets if necessary)

Location		A	B	C	D	E
Minor Civil Division Name (City, Township, Village, etc.)						
PLSS	Town	**07N**				
	Range	**08E**				
	Section	**12**				
	Quarter	**NW**				
	Quarter-Quarter	**NW**				
Latitude (degrees, minutes, seconds North of Equator; use the DNR's Surface Water Data Viewer, SWDV)		**43° 6' 13.1" N**				
Longitude (degrees, minutes, seconds W of Prime Meridian, use the SWDV)		**89° 29' 51.6" W**				
Property Owner(s)	Name	**City of Middleton**				
	Mailing address	**7426 Hubbard Avenue Middleton, WI 53562**				

Site address *(Not mailing address)*	**Pheasant Branch Conservancy between Park St and Century Ave**				

3. Summary of Results

A. Performance Standards and Prohibitions and Other Water Resources Management Priorities
For grants issued in calendar year 2006 or later, complete Tables A and B (following) consistent with the entries on your grant application.

TABLE A. PERFORMANCE STANDARDS AND PROHIBITIONS (per ch. NR 151, Wis. Adm. Code, effective October 1, 2002)

Performance Standard or Prohibition	Units of Measure	Quantity	Measurement Method Used
Sheet, rill and wind erosion	Acres meeting T		
Manure Storage Facilities: New Construction/Alterations	Number of facilities		
	Number of animal units		
Manure Storage Facilities: Closure	Number of facilities		
Manure Storage Facilities: Failing/Leaking Facilities	Number of facilities		
	Number of animal units		
Clean Water Diversions in WQMA	Pollutant load reduction		
	Number of farms with diversions		
	Number animal units		
Nutrient Management on Agricultural Land	Acres planned		
Prohibition: Manure Storage Overflow	Number of facilities		
	Number of animal units		
Prohibition: Unconfined Manure Pile in WQMA	Number of farms		
Prohibition: Direct Runoff From Feedlot/Stored Manure	Pollutant load reduction		
	Number of facilities		
	Number of animal units		
Prohibition: Unlimited Livestock Access	Feet of bank protected		
	Number of farms		
Urban: 20-40% Reduction in Total Suspended Solids (TSS)	Pounds TSS reduced		
	% TSS reduction		

TABLE B. OTHER WATER RESOURCES MANAGEMENT PRIORITIES

I. Agricultural Areas	Units of Measure	Quantity	Measurement Method Used
Buffers	Feet of bank protected		
	Number of farms		
Streambank	Tons of bank erosion reduced		
	Feet of bank protected		
Other (specify)			
II. Developed Urban Areas	**Units of Measure**	**Quantity**	**Measurement Method Used**
Urban: 20-40% Reduction in TSS	Pounds TSS reduced		
	% TSS reduction		
Infiltration	% Pre-development stay-on volume		
	Cubic feet stay-on volume		
Peak flow discharge	Change in cubic feet per second		
Protective areas	Feet of bank protected		
Fueling & maintenance areas	Oily sheen presence		
Streambank	Tons of bank erosion reduced	**238**	**Lateral Recession Rate Est.**
	Feet of bank protected	**460**	**Linear Feet Est.**
Other (specify)	**Feet of bank erosion prevented by design and permitting of FEMA funded stabilization project**	**110**	**Linear Feet Est.**
III. Planning	**Units of Measure**	**Quantity**	**Measurement Method Used**
Quantify how implementation of the planning project decreased storm water impacts on state waters (*i.e.*, storm water plan, I & E plan, *etc.*)	Municipalities planned for		
	Acres planned for		
Document/track progress made in implementing the	Municipalities planned for		

planning product (*i.e.*, ordinance, utility district evaluation/formation, storm water management plan information & education, *etc.*)	Acres planned for		
Other (specify)			

B. Project Results Narrative

The City of Middleton's Pheasant Branch Creek Stabilization project led to stabilization of 570 linear feet (LF) of eroding streambank. These projects provide a demonstration of multiple techniques and applications within a highly erodible and urbanized stream corridor. 130 LF were stabilized through construction of rootwad revetments, another 130 LF through a combination of stream barbs and stone toe protection, and 200 LF through rip rap stabilization. An additional 110 LF will be addressed in 2009 when a series of degraded, failing gabions that sustained significant damage during the June 2008 flood event. This existing structure will be replaced with rip rap bank protection that will provide greater fish habitat opportunity and improved streamside access for wildlife (compared to existing gabions). This project was designed through the NPS program funding and installed as part of FEMA's Public Assistance Program.

4. Satisfaction of Notice Requirements (if applicable)

If cost sharing for this project was offered under a formal notice to achieve compliance with performance standards or prohibitions, provide information for each notice in the table below.

Notice Information				Notice Satisfaction Information		
				Satisfied?		
Notice Type	Issue Date	From (Name)	To (Name)	Yes	No	Date Letter Sent
				☐	☐	
				☐	☐	
				☐	☐	
				☐	☐	

5. Summary of Project Challenges

Pheasant Branch Creek (between Parmenter St. and Century Ave.) is a flashy urban stream in a highly erodible landscape. Within this reach, the stream and its valley are situated within loamy sand. Previous work completed along the creek corridor (concrete grade controls, stabilization utilizing sheet piling and gabions) have impacted channel morphology and transferred erosive stream energy to other locations downstream. Stabilization work completed under this project needed to account for site specific geomorphic conditions and how their type and location impacted the stream channel both up and downstream from the sites addressed.

The major floods of June 2008 impacted previously installed project work. Previously installed integrated bank treatments (relying heavily on vegetation establishment for stabilization) were damaged due to lack of an adequate establishment period at the time of the record rainfall. As a result, follow up repairs installed additional stone for protection to the 100-year flow elevation in order to protect against another high flow. In a highly urbanized and highly erodible environment such as Pheasant Branch Creek, ecologically sensitive stabilization structures require a balance between added use of stone (when compared to more cohesive bank material) and ecological benefits. Where applicable, this project sought techniques that would enhance in-stream habitat (rootwads, stream barbs) through providing cover, pool development, and flow variation.

6. Additional Information about the Project (optional)

7. Final Product(s) -- All Projects

A. Construction Projects

☒ A.1. Checking here indicates that a printed copy of project plans and specifications was sent to your DNR Regional Nonpoint Source Coordinator.

☒ A.2. Checking here indicates that photo-documentation of the project's construction is attached.

B. Planning Projects

☐ B.1. Checking here indicates that a printed copy of the planning product (*e.g.*, plans, ordinances, analyses) was sent to your DNR Regional Nonpoint Source Coordinator.

☐ B.2. Checking here indicates that the Regional Nonpoint Source Coordinator has approved the final Planning Product(s).

☐ B.3. Checking here indicates that your governmental unit has adopted the final Planning Product(s).

Name of Planning Document(s)	Date(s) effective	Date Submitted to NPS Coordinator

8. Grantee Certification:

☐ Checking here certifies that, to the best of your knowledge, the information contained in this report is correct and true.

Type or print Name and Title of Authorized Representative certifying here.
Penni L Klein * Public Lands Mgr

Signature of Authorized Representative
Penni L Klein

Date
2/5/09

9. **FOR DEPARTMENTAL USE ONLY**

REGIONAL NONPOINT COORDINATOR -- Please complete the following:

☐ Checking here indicates that you received either planning or construction plans and specifications from the project sponsor, as appropriate. Attach a copy of the approval.

☑ Checking here indicates that you approved the final construction. Attach a copy of the final construction approval.

☐ Checking here indicates that you have approved the final Planning Product(s).

☐ Check here if two (2) signed, original copies of the Final Report and attachments have been sent to Runoff Management Section Grants Coordinator. Note: Regional Nonpoint Source Coordinator may retain one (1) copy of the signed, original Final Report.

Type or print Name of Regional Nonpoint Coordinator
Laura Madsen

Signature of Regional Nonpoint Coordinator
Laura D. Madsen

Date
March 19, 2009

Final Report Supplement

Pheasant Branch Creek Stabilization Project

City of Middleton
Urban Non-Point Source Pollution Control Grant
#USC-LR10-13255-06

The City of Middleton completed this phase of stabilization work along Pheasant Branch Creek during the final quarter of 2008. One construction project and one design were completed during this period that will stabilize an additional total of 170 linear feet of streambank. Combined, this project has led to the stabilization of 570 linear feet of streambank within Pheasant Branch Creek. New work completed since the last report included:

60 LF of New Rootwad Revetment Construction

Photo: New rootwad revement site located upstream from existing treatment prior to construction (note upstream end of stone treatment)

Heavy rains over the past year have led to additional erosion of the streambank and slope located upstream from the 2007 rootward revetment location. This site, while previously eroded, had begun to expose the stone bank key installed during the downstream project construction. JFNew constructed 60 linear feet of rootwad revetments following the specifications developed during the summer 2008 rootwad enhancement construction downstream.

This area was identified in the MSA Erosion Inventory to be contributing up to 40 tons of sediment per year to Pheasant Branch Creek.

Photo: Topsoil being applied to the newly graded slope as part of the additional rootwad installations completed in November 2008.

In addition to stabilizing a steep eroding slope and enhancement of aquatic habitat through installation of woody structure, the project removed 0.25 acres of common buckthorn (*Rhamnus cathartica*) and honeysuckle (*Lonicera tartarica*).

Gabion Removal and Bank Stabilization

Stabilization work was designed and permitted, and completed for 110-linear feet of streambank previously stabilized through gabion wall installation. After nearly 30 years, this structure has become severely damaged by recent high flows – especially those over the past year. Complete failure of this structure would result in severe erosion at this location. Construction of the project

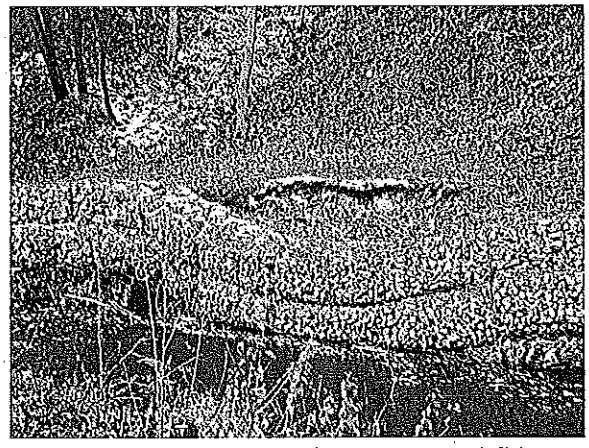


Photo: The existing gabion structure visibly undermined and beginning bank erosion.

has been approved for funding through FEMA's Public Assistance Program. However, due to time constraints and regulatory review, the project will not be constructed until 2009.

On behalf of the City of Middleton, JFNew developed a stabilization plan that incorporated removal of the degraded gabion structure and re-stabilization of the steep slope through installation of rip rap bank protection. While the high energy conditions of the site prevent use of more vegetation-based stabilization, habitat components of the project were considered. The design reduces the bank slope from near vertical to a 1:1 slope – allowing for improved streamside access for wildlife in this location. Stone in the bank toe region will be installed to create pore space, increased roughness, and pool enhancement in order to provide cover and flow variation for fish species. Riparian areas surrounding the project have already been removed of 0.15 acres of common buckthorn (*Rhamnus cathartica*) and honeysuckle (*Lonicera tartarica*) and will be replanted/seeded with a mix of native species following construction.

Pheasant Run Area Gully Stabilization

As noted earlier, the Pheasant Branch Creek valley within the City of Middleton is composed of highly erodible sandy soils. Many valley slopes along Pheasant Branch Creek have been severely eroded through individual stormwater diversions from surrounding lands. One such circumstance was noted during the design of the stream barb and stone toe protection project. While that project focused on bank stabilization, severe gully erosion was noted in two locations upslope from the project site that likely contribute a significant amount of sediment (estimated at around 2-4 tons/year).

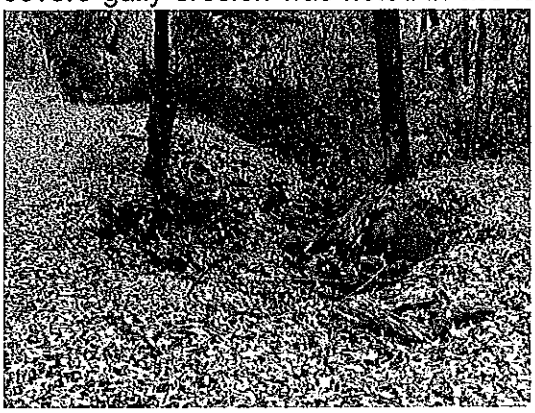


Photo: Existing stormwater runoff has created severe gully erosion along portions of Pheasant Branch Creek.

The City, under the Pheasant Branch Creek Stabilization Project, has pursued addressing this location as a pilot project to demonstrate gully stabilization in similar locations along Pheasant Branch Creek. The City has coordinated with the applicable landowners to pursue a project to address the stormwater runoff and gully erosion. JFNew was hired by the City to develop a plan that would address both the stormwater volume and slope instability located on City of Middleton property.

JFNew collected preliminary survey data and site measurements to design an integrated treatment to address both the cause (un-addressed stormwater) and resulting conditions (massive slope failure and gully erosion). A linear rain garden will redirect and infiltrate stormwater currently causing gully erosion through overland runoff. To stabilize existing slope failure, JFNew designed a combination of slope grading, tree removal (predominantly boxelders), stone check dam construction, and native herbaceous vegetation restoration to provide long-term stability.

The project construction will likely be funded through a combination of the City of Middleton and surrounding landowners. Coordination with adjacent private landowners has already begun and construction is scheduled for spring 2009.

Projects previously completed under the City of Middleton's NPS-funded Pheasant Branch Creek Stabilization Project included:

Bridge Crossing Rip-Rap Stabilizations

JFNew worked with the City of Middleton to design, permit, and install rip-rap bank protection in three portions of Pheasant Branch Creek that will soon have new pedestrian bridges installed. Some of these areas were already identified as eroded areas contributing up to one ton/year of sediment under the MSA Erosion Inventory of Pheasant Branch Creek (2006). This project stabilized approximately 200 linear feet of streambank and cleared approximately 0.5 acres of invasive, exotic species including common buckthorn (*Rhamnus cathartica*) and honeysuckle (*Lonicera tartarica*).

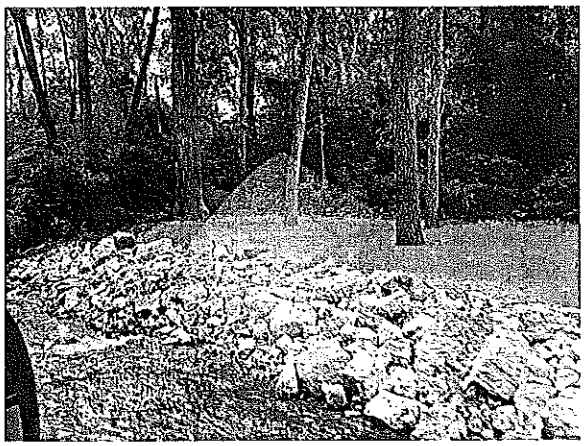


Photo: Typical view of the rip-rap stabilizations installed along 200LF of Pheasant Branch.

Rootwad Revetment Repairs and Enhancement

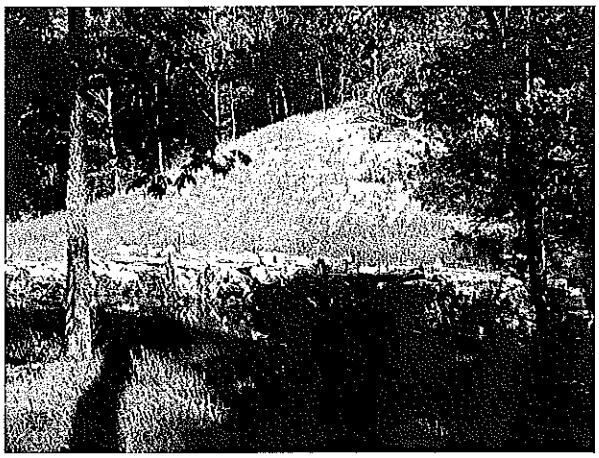


Photo: The rootwad site in early September 2008 following repairs and enhancement.

The 100-year event following the heavy rains of June 2008 damaged the rootwad revetment project completed last fall. The project protected the sandy slope during earlier high-flow events that spring. However, without the establishment of vegetation due to cool spring weather, the bank behind the rootwads suffered erosion during the flood flows that overtopped the rootwads. To repair and enhance the site, the rootwads were extended upslope to protect against the 100-year flood flow. Additional topsoil was added to the slope to enhance vegetation establishment. This project enhanced and stabilized the same 70 linear feet addressed last fall.

Pheasant Run Area Stream Barb and Stone Toe Stabilization

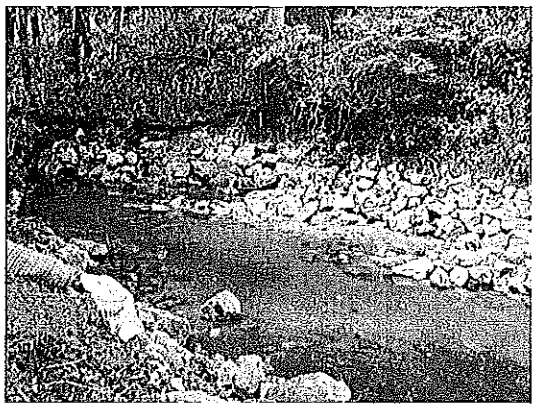
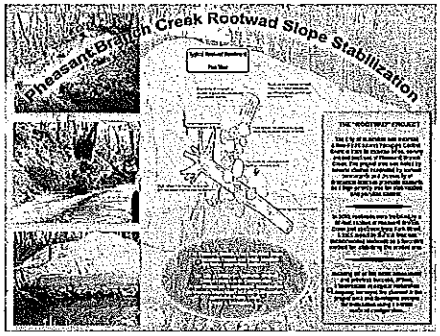


Photo: The combination of stone toe and stream barbs just following their construction.

Stabilization work was designed, permitted, and completed for a 130 linear foot section of streambank downstream from the rootwad revetment site and cleared another 0.5 acres of invasive, exotic species including common buckthorn (*Rhamnus cathartica*) and honeysuckle (*Lonicera tartarica*). This project contained a combination of stone toe protection as well as two stream barbs and minimal slope disturbance. This area was identified in the MSA Erosion Inventory to be contributing up to 60 tons of sediment per year to Pheasant Branch Creek. Aerial photo review documented lateral recession rates over the past ten years of about 1.0 feet/year.

Project Public Awareness

Multiple approaches were taken to increase public understanding of the work completed under NPS funding. In November 2007, a full-page article was published in the Middleton Times describing the efforts taken under the grant to stabilize these areas through use of ecologically sensitive techniques. In early 2008, a 24"x32" trailside sign was installed to describe the background and design configuration used for the rootwad stabilization project completed.



Signage explaining the benefits of rootwads and bioengineering installed along the trail at Pheasant Branch Conservancy.

Presentations were given at the Conservancy Lands Commission meeting in early 2008. Another follow up presentation is scheduled for February 2009. All presentations provided to the City are also posted on their website for access by the general public (http://www.ci.middleton.wi.us/City/Departments/Lands/Plans_Studies_Grants.htm). The high visibility of these projects within the Pheasant Branch Conservancy has resulted in much interest from park users, conservancy land neighbors, and interested public.

Cost/Benefit Breakdown By Overall Project

Rootwad Revetment Construction – Fall 2008
Result: 60LF of streambank stabilized; 40T of sediment prevented from erosion

Design	*$ 0.00*	*(project utilized prior project design and configuration)*
Installation	*$ 13,766.66*	
TOTAL	*$ 13,766.66*	

Gabion Removal and Bank Stabilization
Result: 110LF of streambank stabilized; 70T of sediment prevented from erosion

Design	*$ 6,500.00*	*(includes data collection, design, permitting)*
Installation	*$ 0.00*	*(Construction funding dedicated by FEMA)*
TOTAL	*$ 6,500.00*	

Bridge Crossing Rip-Rap Stabilizations
Result: 200LF of streambank stabilized; 5T of sediment prevented from erosion

Design	*$ 280.00*
Installation	*$ 17,012.98*
TOTAL	*$ 17,292.98*

Rootwad Revetment Repairs and Enhancement – October 2007 and Summer 2008 Repair/Enhancement
Result: 70LF of streambank stabilized; 63T of sediment prevented from erosion

Design	*$ 4,559.09*	*(original completed July 2007; updated July 2008)*
Installation	*$ 42,327.09*	*($ 50,408.24 minus $ 8,081.15 portion paid by FEMA)*
TOTAL	*$ 46,886.18*	

Pheasant Run Area Stream and Gully Erosion Stabilization
Result: 130LF of streambank stabilized; 60T of sediment prevented from erosion

Design	*$ 11,290.29*
Installation	*$ 22,525.43*
TOTAL	*$ 33,815.72*

Linear Feet of Streambank Stabilized	*= 570 LF*
Tons of Sediment Prevented from Entering Pheasant Branch Creek	*= 238 Tons*
OVERALL TOTAL COST	*= $ 118,261.54*

Questions/Comments

If you have questions or comments regarding the stabilization work at Pheasant Branch Creek, please contact Dan Salas, Ecologist, JFNew at 848-1789 or dsalas@jfnew.com or Penni Klein, Director of Public Lands, City of Middleton at 827-1044 or pklein@ci.middleton.wi.us.