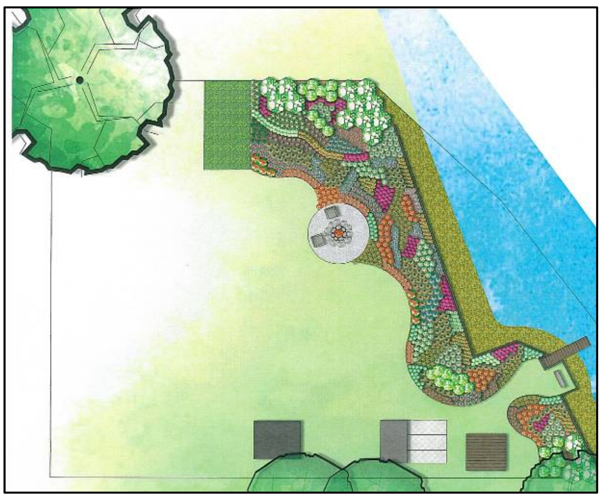
2010 Water Quality Improvement Projects

A summary of water quality projects by the Anoka Conservation District and partners in 2010



Contents

Executive Summary

The Anoka Conservation District (ACD) is a non-regulatory county level subdivision of state government. ACD provides technical and financial assistance to private landowners to manage natural resources in a way that conserves and improves soil and water resources. ACD provides assistance to landowners on all sized properties and helps other local governments plan and implement wise resource management strategies. The guiding mission and policies of the district are established by a board of five elected supervisors and implemented by a staff that ranges from seven to nine full and part time employees.

This report summarizes water quality improvement efforts by the Anoka Conservation District (ACD) and partners in 2010. Activities included completing stormwater retrofit assessments, landowner consultations, creating designs for projects, and overseeing construction. Projects varied widely in type, including pond retrofits, rain gardens, streambank stabilizations, and lakeshore restorations. All projects were targeted toward lakes, streams and rivers with known problems, and the projects are strategically located to provide the greatest benefits. The goal is to cost-effectively improve the water quality in the lakes and rivers of Anoka County.

Two stormwater retrofit assessments were completed by ACD staff in 2010. One was for the City of Cambridge in Isanti County, and the other was for Woodcrest Creek in Coon Rapids (partnering with the Coon Creek Watershed District). Partial funding for both projects was provided by the Clean Water Fund (from the Clean Water, Land and Legacy Amendment). The purpose of these assessments is to improve water quality, increase groundwater recharge and reduce stormwater runoff volumes by identifying stormwater retrofit opportunities in subwatersheds most contributing to the degradation of high priority water bodies. When opportunities are identified, cost and pollutant removal estimates are developed for each project. The result of the assessments is a list of potential projects ranked by cost-effectiveness that can be used to plan and prioritize water quality improvement efforts.

In addition to the assessments, Anoka Conservation District staff provided information and assistance with water quality improvement projects to landowners. The services provided include on-site consultations, design assistance, and construction oversight. In 2010, ACD staff conducted a total of 36 consultations and developed 22 project designs. Construction on 19 projects began, and 16 of those projects were completed. The remaining projects are expected to be completed in 2011. These efforts were done to improve and protect local waterbodies in Anoka County.

ACD Services, Staff, and Partners

About the Anoka Conservation District

The Anoka Conservation District, and other soil and water conservation districts that cover the nation, were created to control soil and water erosion caused by runoff and wind. This need emerged out of the dust-bowl era. Since that time, changing land uses have changed those responsibilities to assisting landowners with a broader spectrum of conservation and natural resource practices. The District strives to provide well-rounded conservation services to Anoka County residents.

As it has always been, our focus is working with willing landowners to improve natural resources community-wide. We are a clearinghouse for assistance with managing natural resources on private lands. That assistance includes technical knowledge, financial assistance, and equipment resources. Individual property owners often utilize these services.

We also work at the community level. Examples of this work include natural resource planning, water quality monitoring, and subwatershed-level projects to improve water quality. We frequently work on cooperative projects with other agencies or groups. Among them are cities, townships, watershed districts, watershed management organizations, lake associations, and others.

We have adopted the following mission:

Anoka Conservation District: We conserve and enhance the natural resources of Anoka County.

We do this by:

- Informing and assisting landowners and local governments in natural resource management,
- Promoting stewardship practices for soil and water conservation, and
- Conducting research and monitoring.

Guiding Principles

- Partner with both public and private sectors
- Maintain highly qualified, knowledgeable staff
- Make fair and ethical decisions
- Promote cost effective and efficient resource management
- Keep natural resource issues visible in Anoka County
- Respond to opportunities and changing needs
- Develop diverse programs, partnerships and funding sources

Anoka Conservation District Board and Staff

The Anoka Conservation District has an elected board of supervisors with a variety of expertise. Currently serving are: Mary Jo Truchon (Chair), Jim Lindahl (Vice Chair), Vici Nass (Treasurer), Karla Komec (Member), and Karl Tingelstad (Member). Board meetings are typically held on the third Monday of each month at the District office. ACD supervisors also serve on committees to analyze detailed information on issues requiring intensive review prior to full board action. Some committees are internal and others function on a metro or statewide level. Supervisors choose to participate in committee meetings to offer personal expertise in the area of discussion or to gain more knowledge of the subject matter.

The District employs six people who work county-wide to provide technical assistance to residents and local partners. The ACD staff includes:

Chris Lord, District Manager
Kathy Berkness, Administrative Assistant
Jamie Schurbon, Water Resource Specialist
Dennis Rodacker, Wetland Specialist
Nate Zwonitzer, Conservation Specialist
Mitch Haustein, Assistant Water Resource Technician

In addition to local staff, ACD hosts two employees that work with the Metro Conservation Districts (MCD). The MCD provides technical assistance to the 11-County Metropolitan Soil and Water Conservation Districts in the form of site assessment, project design, educational presentations and project oversight. More information on the MCD can be found at www.MetroCD.org. The two MCD employees are:

Shawn Tracy, Landscape Restoration Specialist
Andy Schilling, Landscape Restoration Specialist

Stormwater Retrofit Assessments

The purpose of stormwater retrofit assessments is to improve water quality, increase groundwater recharge and reduce stormwater runoff volumes in the 11 County Metro by identifying stormwater retrofit opportunities in subwatersheds most contributing to the degradation of high priority water bodies. When opportunities are identified, cost and pollutant removal estimates are developed for each project. Projects are ranked by cost-effectiveness to assist in prioritizing water quality improvement efforts. Copies of all completed assessment reports for the metro area are available online at www.MetroCD.org.

The assessment process used is modified from The Center for Watershed Protection's Urban Stormwater Retrofit Practices (2007). The basic steps are:

1. **Scoping:** Meet with local officials to refine the retrofit strategy to meet local restoration objectives.
2. **Desktop Analysis:** Search for potential retrofit sites throughout the subwatershed using GIS software and stormwater infrastructure maps.
3. **Field Reconnaissance:** Investigate retrofit sites in the field and search for additional sites
4. **Treatment Analysis/Concepts:** Create concept designs and model treatment potential of each project.
5. **Evaluation and Ranking:** Compare costs and pollutant removals of projects throughout the subwatershed.
6. **Final Report:** Create detailed report of assessment findings and recommended projects.

Two stormwater retrofit assessments were completed by ACD staff in 2010. One was for the City of Cambridge in Isanti County, and the other was for Woodcrest Creek in Coon Rapids (partnering with the Coon Creek Watershed Districts). Partial funding for both projects was provided by the Clean Water Fund (from the Clean Water, Land and Legacy Amendment). Summaries of each assessment are on the following pages.

Cambridge Stormwater Retrofit Assessment (2010)

The Cambridge Stormwater Retrofit Assessment is the result of a partnership between the Anoka Conservation District, Isanti Conservation District, and the City of Cambridge. The Anoka Conservation District provided technical assistance to complete the assessment with guidance from the City. This study provides recommendations for cost effectively improving treatment of stormwater from the City of Cambridge before it is discharged into the Rum River. The Rum River is highly regarded for its recreational qualities and scenic nature. While not all parts of the City of Cambridge discharge to the Rum River, those that do are generally older areas built before modern-day stormwater treatment requirements. Many of these areas pipe stormwater to the river with little or no treatment, and have noticeably poor water quality. The volumes of stormwater are also problematic, sometimes overwhelming the system and leading to street flooding. This stormwater assessment systematically examined areas of the City draining to the Rum River, investigated ways to improve stormwater treatment, and prioritized these opportunities by cost-effectiveness.

We dissected the western half of the City into 34 stormwater drainage areas, or "catchments." This list was narrowed to six by excluding catchments not draining to the Rum River, catchments with already-existing stormwater treatment, and catchments where little or no opportunity for stormwater retrofitting was identified. The six selected catchments included downtown business areas, schools, and several large residential neighborhoods. For each catchment, we modeled stormwater volume and pollutants using the software WinSLAMM. First, we modeled existing conditions. Then we modeled possible stormwater retrofits to estimate reductions in volume, total phosphorus (TP), and total suspended solids (TSS). Finally, we estimated the cost of each retrofit project. Projects were ranked by cost effectiveness.

A variety of stormwater retrofit approaches were identified. In residential areas, networks of strategically-placed rain gardens that accept road runoff are often favored. In some school and church areas, existing pipe alignments and land availability lent themselves to larger infiltration basins. In other places, practices such as swales were already in place but under-utilized. Small modifications to these existing practices can yield substantially larger areas served. In commercial and downtown areas we did not favor infiltration practices because of higher toxic pollutant levels from these land use types and because much of this area is within the City's Drinking Water Supply Management Area. Instead, filtration techniques such as underground sand filters and stormwater tree pits were considered.

Stormwater tree pits (above) were a recommended treatment option for downtown areas of Cambridge.

The report provides conceptual sketches or photos of stormwater retrofitting projects that are recommended. The intent is to provide an understanding of the approach. If a project is selected, site-specific designs must be prepared. This typically occurs after committed partnerships are formed to install the project.

The table below summarizes the assessment results. Stormwater retrofit projects are grouped into tiers from most cost effective to least, using cost per pound of phosphorus removed. The benefits of each project were estimated as if that project were installed alone with no other projects upstream of it in the same catchment. Reported treatment levels are dependent upon optimal siting and sizing. More detail about each project can be found in the catchment profile pages of this report. Projects that were deemed unfeasible due to prohibitive size, number, or were too expensive to justify installation are not included in the table below.

Summary of preferred stormwater retrofit opportunities ranked by cost-effectiveness.

Tier 1 Retrofit Recommendations ($0-$500/lb TP/yr)

Catchment ID	Retrofit Type	Treatment Level (refer to catchment profile pages)	TP Reduction (lb/yr)	TSS Reduction (lb/yr)	Volume Reduction (ac-ft/yr)	Estimated Cost	Estimated cost/lb-TP/year (30-year)
Catchment 14	Residential Rain Gardens	1	8.6	4,076	8	$26,960	$157
Catchment 8*	Residential Rain Gardens	2	6.9	4,052	5.9	$26,960	$195
Catchment 19	Grandview Swale	2	3.2	1,696	3.8	$10,580	$199
Catchment 19	Residential Rain Gardens	3	11.7	5,420	10.4	$52,100	$226
Catchment 8*	Street Disconnects	1	0.9	844	2.5	$1,900	$311
Catchment 20	School Rain Garden	1	14.1	7,430	15.1	$43,520	$328
Catchment 16	Residential Rain Gardens	2	2.4	1,138	2.2	$18,580	$378
Catchment 4	Residential Rain Gardens	2	3.9	2,046	2.2	$31,150	$401
Total			51.7	26,702	50.1	$211,750	

*Pollution reduction benefits for some projects within the same catchment cannot be added together because they treat the same source areas.

Tier 2 Retrofit Recommendations ($501-$1,500/lb TP/yr)

Catchment ID	Retrofit Type	Treatment Level (refer to catchment profile pages)	TP Reduction (lb/yr)	TSS Reduction (lb/yr)	Volume Reduction (ac-ft/yr)	Estimated Cost	Estimated cost/lb-TP/year (30-year)
Catchment 20	Church Rain Garden	2	5.3	3,247	6.4	$46,720	$810
Catchment 14	Hospital Rain Garden	1	1.3	1,109	2.3	$20,255	$1,281
Total			6.6	4,356	8.7	$66,975	

Tier 3 Retrofit Recommendations (>$1,500/lb TP/yr)

Catchment ID	Retrofit Type	Treatment Level (refer to catchment profile pages)	TP Reduction (lb/yr)	TSS Reduction (lb/yr)	Volume Reduction (ac-ft/yr)	Estimated Cost	Estimated cost/lb-TP/year (30-year)
Catchment 16	Stormwater Tree Pits	3	0.7	293	0	$51,050	$3,195
Catchment 19*	Perimeter Sand Filters	2	0.9	584	0	$37,140	$3,322
Catchment 19*	Stormwater Tree Pits	1	1.1	449	0	$81,680	$3,323
Catchment 19*	Permeable Asphalt	1	0.6	491	1.1	$150,094	$8,744
Total			≥1.3*	≥742*	≥0*	≥$88,190*	

*Pollution reduction benefits for some projects within the same catchment cannot be added together because they treat the same source areas.

Woodcrest Creek Stormwater Retrofit Assessment (2010)

This study provides recommendations for cost effectively improving treatment of stormwater from the Woodcrest Creek subwatershed. Woodcrest Creek was identified as a high priority due to the deterioration of the stream channel resulting from excessive water during storms, noticeably poor water quality, and the lack of stormwater treatment. Most of the Woodcrest Creek subwatershed is older neighborhoods and commercial areas built before modern-day stormwater treatment requirements. Woodcrest Creek is one of the main tributaries of Coon Creek. Coon Creek is a major drainage way through central Anoka County and serves as stormwater conveyance for the Cities of Ham Lake, Andover, Blaine, Columbus, and Coon Rapids. Coon Creek's confluence with the Mississippi River in Coon Rapids is just upstream from drinking water intakes for the Twin Cities. The stormwater retrofits in this report will help alleviate existing water quality and hydrology problems in Woodcrest Creek, provide benefits to impaired waterbodies including Coon Creek and the Mississippi River, and improve the quality of a drinking water source that serves a large metropolitan population.

This stormwater assessment systematically examined areas of the subwatershed draining to Woodcrest Creek, investigated ways to improve stormwater treatment, and prioritized the opportunities by cost-effectiveness. The approaches in this report are often termed "stormwater retrofitting." This refers to adding stormwater treatment to an already built-up area. This process is investigative and creative. Stormwater retrofitting success is sometimes improperly judged by the number of projects installed or by comparing costs alone. That approach neglects to consider how much pollution is removed per dollar spent. In this stormwater assessment we estimated both costs and pollutant reductions, and used them to calculate cost effectiveness of each possible project.

Several neighborhoods around Woodcrest Creek were identified as candidates for rain gardens (above). Modifications to existing infrastructure, such as pond outlet modifications (below), were another cost-effective project analyzed in the report.

We dissected the subwatershed into nine stormwater drainage areas, or "catchments." One catchment was excluded from in-depth analysis due to adequate existing treatment practices. The remaining eight catchments are comprised of large residential neighborhoods, parks, and commercial business areas that lack sufficient stormwater treatment. Each catchment was modeled for stormwater volume and pollutants using the software WinSLAMM. The model included both existing conditions and possible stormwater retrofits to estimate reductions in volume, total phosphorus (TP), and total suspended solids (TSS). Finally, costs were estimated for each retrofit project. Projects were ranked by cost effectiveness based on dollars per pound pollutant removed.

A variety of stormwater retrofit approaches were identified. In residential areas, networks of strategically-placed rain gardens that accept road runoff are often favored. In some commercial and park areas, existing pipe alignments and land availability lent themselves to larger infiltration basins. In other places practices such as ponds were already in place but under-utilized. Small modifications to these practices can yield substantially improved stormwater treatment. In some commercial areas where parking space is at a premium, more expensive retrofits were considered that would provide stormwater treatment without reducing available parking.

The report provides conceptual sketches or photos of stormwater retrofitting projects that are recommended. The intent is to provide an understanding of the approach. If a project is selected, site-specific designs must be prepared. This typically occurs after committed partnerships are formed to install the project.

The table below summarizes the assessment results. Stormwater retrofit projects are grouped into tiers from most cost effective to least, using cost per pound of phosphorus removed. The benefits of each project were estimated if that project were installed alone, with no other projects upstream of it in the same catchment. Reported treatment ranges are dependent upon optimal siting and sizing. More detail about each project can be found in the catchment profile pages of this report.

Summary of stormwater retrofit opportunities ranked by cost-effectiveness

Tier 1 Retrofit Recommendations ($0-$500/lb TP/yr)

Catchment ID	Retrofit Type	Projects Identified	TP Reduction (lb/yr)	TSS Reduction (lb/yr)	Volume Reduction (ac-ft/yr)	Estimated Cost	Estimated cost/1,000lb-TSS/year (30-year)	Estimated cost/lb-TP/year (30-year)
In-Stream	New Pond	1	39.0 - 64.0	12,345 - 19,478	0.0	$105,000 - $136,500	$275 - $348	$84 - $110
WC-9*	Infiltration/Retention	1	7.9	3,594	6.7	$4,620	$240	$109
WC-1	Residential Rain Gardens	10 - 18	18.4 - 24.5	8,548 - 11,341	14.5 - 19.1	$43,720 - $77,240	$258 - $346	$120 - $160
WC-4	Residential Rain Gardens	10 - 18	16.2 - 24.1	7,503 - 11,137	12.6 - 18.8	$43,720 - $77,240	$294 - $352	$136 - $163
WC-8	Residential Rain Gardens	6 - 12	8.3 - 13.0	3,833 - 5,963	6.6 - 10.4	$26,960 - $52,100	$352 - $442	$162 - $203
WC-5	Pond Modification	1	9.4	3,821	0.0	$24,320 - $35,490	$423 - $619	$172 - $252
WC-7	Residential Rain Gardens	4 - 6	4.9 - 6.1	2,278 - 2,808	4.0 - 5.0	$18,580 - $26,960	$396 - $480	$188 - $221
WC-5	Stormwater Disconnects	4	1.3	982	2.3	$1,900	$278	$204
WC-9*	Residential Rain Gardens	3 - 5	4.4 - 5.8	2,048 - 2,701	3.5 - 4.6	$26,540 - $38,970	$542 - $620	$252 - $289
In-Stream	Pond Modification	2 - 3	11.0 - 31.0	1,972 - 7,272	0.0	$71,400 - $210,000	$1,393 - $2,746	$327 - $450

Tier 2 Retrofit Recommendations ($501-$1,500/lb TP/yr)

Catchment ID	Retrofit Type	Projects Identified	TP Reduction (lb/yr)	TSS Reduction (lb/yr)	Volume Reduction (ac-ft/yr)	Estimated Cost	Estimated cost/1,000lb-TSS/year (30-year)	Estimated cost/lb-TP/year (30-year)
WC-1	Apt. Rain Garden	1 - 2	2.1 - 2.9	1,462 - 1,974	2.1 - 5.2	$15,230 - $29,130	$758 - $1,100	$527 - $759
WC-3	Apt./Office Rain Gardens	2	2.3	1,078	2.3	$22,180	$1,521	$701
WC-6*	Bioretention	2 - 14	2.4 - 3.6	1,903 - 2,769	4.0 - 5.8	$33,635 - $329,690	$1,196 - $6,887	$948 - $5,297
WC-6*	Biofiltration	2 - 14	2.0 - 3.0	1,522 - 2,215	0.0	$40,758 - $404,430	$1,277 - $7,304	$1,277 - $7,304
In-Stream	Channel Stabilization	1	5.7	538,650	0.0	$210,000	$14	$1,368

Tier 3 Retrofit Recommendations (>$1,500/lb TP/yr)

Catchment ID	Retrofit Type	Projects Identified	TP Reduction (lb/yr)	TSS Reduction (lb/yr)	Volume Reduction (ac-ft/yr)	Estimated Cost	Estimated cost/1,000lb-TSS/year (30-year)	Estimated cost/lb-TP/year (30-year)
WC-7	Pond Modification	1	2.0	730	0.0	$45,030 - $67,930	$4,112 - $6,204	$1,501 - $2,264
WC-5	Sand Filter	1	0.4	252	0.0	$15,800	$4,947	$2,899
WC-6*	Sand Filter	1	2.4	1,607	0.0	$97,680	$5,013	$3,315
WC-3	Sand Filter	1	0.5 - 1.5	350 - 1,054	0.0	$22,280 - $65,680	$5,105 - $5,060	$3,463 - $3,503
WC-6*	Permeable Asphalt	1	3.8	2,769	5.8	$611,520	$7,723	$5,628

*Pollution reduction benefits and costs cannot be summed with other projects in the same catchment because they are alternative options for treating the

(yellow highlight) Project concept that can be applied to commercial properties in other catchments.

2010 Water Quality Projects

Anoka Conservation District staff meets with landowners to provide information and assistance with water quality improvement projects. The services provided include on-site consultations, design assistance, and construction oversight.

On-Site Consultations

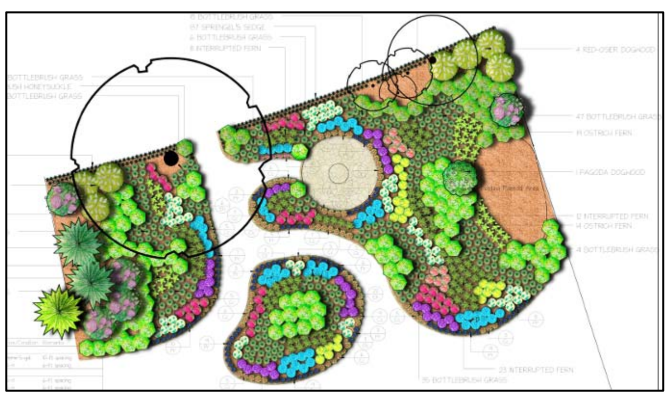
In 2010, ACD staff completed a total of 36 on-site consultations county-wide.

The ACD will meet with landowners to provide advice about water quality improvement projects. The discussion will include consideration of landowner goals, site characteristics, site limitations, and available financial assistance that may exist. Generally, the types of projects discussed include rain gardens, lakeshore restorations, and erosion correction. Most site consultations include one hour of preparation, one hour on-site, and one hour of follow-up. These consultations provide an opportunity for landowners to ask site-specific questions and for staff to provide relevant information. Some of these consultations lead to the development of designs and project construction, while others are purely informative.

ACD staff helps a landowner with rain garden design.

Design Assistance

A total of 22 project designs were completed in 2010. Full design sets are available for viewing online at www.MetroCD.org.



Following a site consultation, the ACD may work with the landowner to design and install a water quality improvement project. While planning and design components will vary by project, this service generally includes a drawing set of existing conditions, construction design plans, planting plan, and cross sections as appropriate. A detailed estimate of labor and materials is also included. The size and complexity of the project will influence assessment and design time. If project scope or complexity is beyond the capacity of ACD staff and requires the services of a professional engineer, ACD can request funding from the Metro Conservation Districts to assist with the cost.

Project types most often considered include:

- **Curb cut rain gardens** are used in residential and commercial neighborhoods with storm sewer curb and gutter, and are designed to intercept and infiltrate rain water from roadways.
- **Lakeshore restoration** involves the establishment of deep rooted native perennial grasses, sedges, wildflowers and/or trees and shrubs including the shallow aquatic zone, transitional zone and upland with little or no grading.
- **Lakeshore and streambank stabilization** includes the treatment of active erosion utilizing bioengineering and/or hard armoring often in combination with a shoreline restoration or buffer planting and typically involves some grading.

Construction Oversight

In 2010, ACD provided construction oversight on 19 projects. Sixteen of those projects were completed, and the remaining 3 are scheduled for completion in 2011. Detailed information about completed projects can be found in Appendix A.

This service includes a preconstruction meeting with the contractor, landowner and permitting authorities along with periodic inspections of the work progress and a final inspection upon completion of the project to ensure proper installation. Post construction inspections ensure the project is functioning as intended and properly maintained. The number of inspections varies greatly depending on the nature of the project and environmental condition that could influence its success such as drought or flooding.

Construction of the Crooked Lake rain gardens (left) and planting the Hawkinson/Hegge restoration on Locke Lake (right). Both projects were completed in 2010 with assistance from the ACD. More information on completed projects can be found in Appendix A.

Summary of 2010 Activities

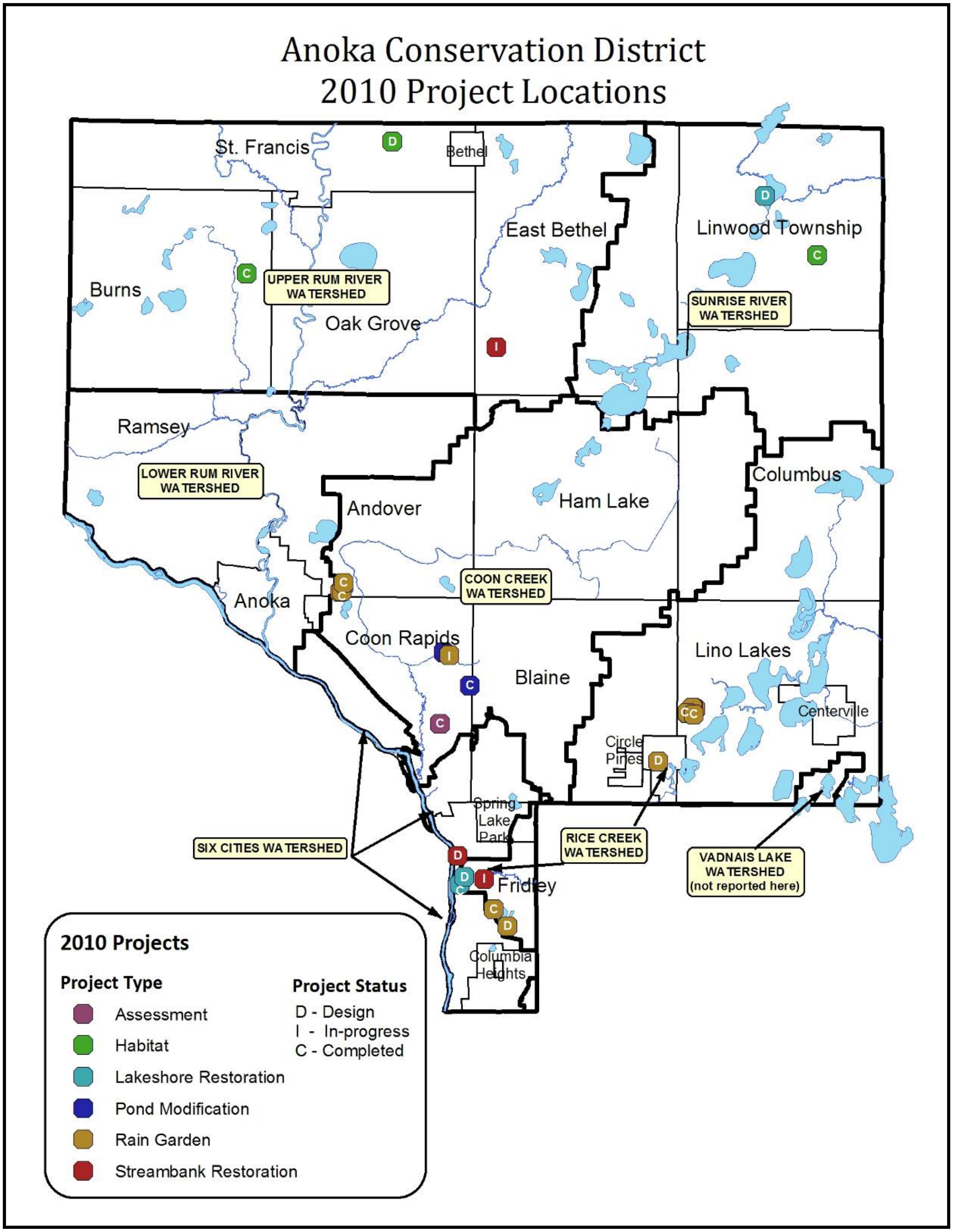
The following table summarizes the ACD's work tasks related to projects in 2010.

Watershed	Project Type	Location	Waterbody	Landowner	2010 ACD Work Tasks			
					Consultation	Design	Construction	Completion
Coon Creek Watershed District								
Coon Creek Watershed District	Pond Modification	Coon Rapids	Sand Creek	City of Coon Rapids	x		x	x
Coon Creek Watershed District	Pond Modification	Coon Rapids	Sand Creek	Northdale Middle School	x		x	x
Coon Creek Watershed District	Rain Garden	Blaine	Coon Creek	Givand	x			
Coon Creek Watershed District	Rain Garden	Coon Rapids	Sand Creek	Ricci	x		x	
Coon Creek Watershed District	Rain Garden, water-smart landscaping	Blaine	Coon Creek	Baker	x			
Coon Creek Watershed District	Rain Gardens	Andover	Crooked Lake	Crooked Lake Rain Gardens (3)	x	x	x	x
Coon Creek Watershed District	Rain Gardens	Coon Rapids	Coon Creek	NW Passages HS	x			
Coon Creek Watershed District	Rain Gardens	Blaine	Coon Creek	Shade Tree Cove Woods development	x			
Coon Creek Watershed District	Streambank Stabilization	Coon Rapids	Coon Creek	Perkins	x			
Lower Rum Watershed Management Organization								
Lower Rum WMO	Riverbank Stabilization	Andover	Rum River	Gausman	x			
Lower Rum WMO	Riverbank Stabilization	Ramsey	Rum River	Hanson	x			
Lower Rum WMO	Riverbank Stabilization	Ramsey	Rum River	Jacobson	x			
Lower Rum WMO	Riverbank Stabilization	Ramsey	Mississippi River	Olson	x			

Watershed	Project Type	Location	Waterbody	Landowner	2010 ACD Work Tasks			
					Consultation	Design	Construction	Completion
Lower Rum WMO	Riverbank Stabilization/ Rain gardens	Ramsey	Rum River	Turner-Gable	X			
Rice Creek Watershed District								
Rice Creek Watershed District	Lakeshore Restoration	Fridley	Locke Lake	Hawkinson/Hegge	X		X	X
Rice Creek Watershed District	Lakeshore Restoration	Fridley	Locke Lake	Larson	X	X		
Rice Creek Watershed District	Rain Garden	Fridley	Rice Creek	Ricci	X			
Rice Creek Watershed District	Rain Garden	Fridley	East Moore Lake	Sabie	X	X		
Rice Creek Watershed District	Rain Garden	Circle Pines	Golden Lake	Yackel	X	X		
Rice Creek Watershed District	Rain Gardens	Fridley	Rice Creek	Fridley HRA House	X			
Rice Creek Watershed District	Rain Gardens	Fridley	West Moore Lake	Fridley Middle School	X	X	X	X
Rice Creek Watershed District	Rain Gardens	Lino Lakes	Rice Lake	Rice Lake Elementary	X	X		
Rice Creek Watershed District	Rain Gardens	Lino Lakes	Rice lake	Rice Lake Rain Gardens (8)	X	X	X	X
Rice Creek Watershed District	Streambank Restoration	Fridley	Rice Creek	Helps	X		X	
Rice Creek Watershed District	Streambank Restoration/Rain Gardens	Fridley	Rice Creek	Pehl	X			
Rice Creek Watershed District	Streambank Stabilization	Fridley	Rice Creek	Storlien	X			
Rice Creek Watershed District	Water-Smart Landscaping	Columbia Heights	Silver Lake	Swanson	X			

Watershed	Project Type	Location	Waterbody	Landowner	2010 ACD Work Tasks			
					Consultation	Design	Construction	Completion
Six Cities WMO								
Six Cities WMO	Lakeshore Restoration	Blaine	Laddie Lake	Warnke	X	X		
Six Cities WMO	Rain Gardens	Coon Rapids	Mississippi River	Anoka/Ramsey Community College	X			
Six Cities WMO	Rain Gardens	Blaine	Mississippi River	St. Timothy's Church	X			
Six Cities WMO	Riverbank Stabilization	Fridley	Mississippi River	Scott	X			
Sunrise River Watershed Management Organization								
Sunrise River WMO	Habitat Improvement	Linwood	NA	Braido	X			X
Sunrise River WMO	Lakeshore Restoration	Linwood	Martin Lake	Gregerson	X	X		
Sunrise River WMO	Lakeshore Restoration	East Bethel	Coon Lake	Swisher	X	X		
Sunrise River WMO	Rain Gardens	East Bethel	Coon Lake	Tierney	X	X		
Upper Rum Watershed Management Organization								
Upper Rum WMO	Habitat Improvement	Nowthen	NA	Gerdes	X			X
Upper Rum WMO	Habitat Improvement	St. Francis	NA	Messer	X	X	X	
Upper Rum WMO	Streambank Stabilization	East Bethel	Crooked Brook	Petro	X	X	X	

The following map shows the location and project type for projects that were designed, partially constructed, or completed in 2010. Projects are not labeled on the map if only a consultation was completed.



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Appendix A – Project Profiles

- Magnolia Pond Modification
- Northdale Middle School Pond Modification
- Crooked Lake Rain Gardens
- Hawkinson/Hegge Lakeshore Restoration
- Fridley Middle School Rain Garden
- Rice Lake Rain Gardens
- Braido Habitat Improvement
- Gerdes Habitat Improvement

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Project Profile

2010 Magnolia St./Creek Villas Pond Modification

Pond Modification

Project Summary

The Anoka Conservation District (ACD) completed a Sand Creek stormwater retrofit assessment for the Coon Creek Watershed District (CCWD) that identified cost-effective stormwater BMPs. As a result of the assessment, the existing Magnolia Street/Creek Villas dry pond was modified. The pond outlet elevation was raised by 12 inches and riprap berms were installed around the inlets to provide direct water quality benefits to Sand Creek via decreased nutrient and sediment loading. Modification of existing stormwater treatment ponds to increase their efficiencies is one of the most cost effective methods to enhance stormwater treatment. Much of the existing stormwater infrastructure was designed for rate control, and inexpensive retrofits such as this can add water quality benefits and volume reduction. Project dollars were provided by CCWD and the Clean Water Fund (CWF) from the Clean Water, Land and Legacy Amendment. Project promotion and construction oversight was conducted by CCWD.

Project Specs

Date Installed .... November 2010
Total Ponding Area .... 85,552 ft²
Total Capacity .... 265,237 ft³
Watershed Treated .... 53 acres

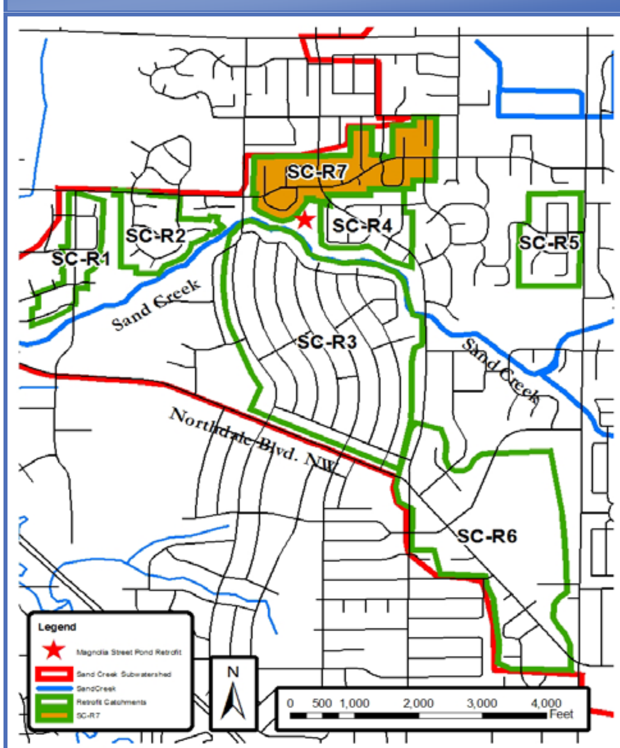
Installation Funding

CCWD $2,182.00
State of MN CWF $2,668.00
Total Project Cost $4,850.00

Other Funding

Design $1,411
Construction Oversight $1,853
Ongoing Maintenance $453/yr

SC-R7 Catchment



Within catchment SC-R7 of the Sandcreek Subwatershed Stormwater Retrofit Assessment, the Magnolia Street pond modification was identified to;

- Decrease stormwater volume,
- Decrease pollutant loads, and
- Increase infiltration to recharge groundwater.

The catchment land cover consists of 1/4 acre residential lots. The table below highlights important characteristics of the catchment as well as WinSLAMM model outputs of total phosphorus (TP), total suspended solids (TSS), and volume contributions prior to the pond modification. Wenck Assoc. Inc. designed the project.

Acres	53
Dominant Land Cover	Residential, 1/4 acre lots
Parcels	196
TP (lbs/yr)	22.5
TSS (lbs/yr)	10,597
Volume (acre-feet/yr)	16.3

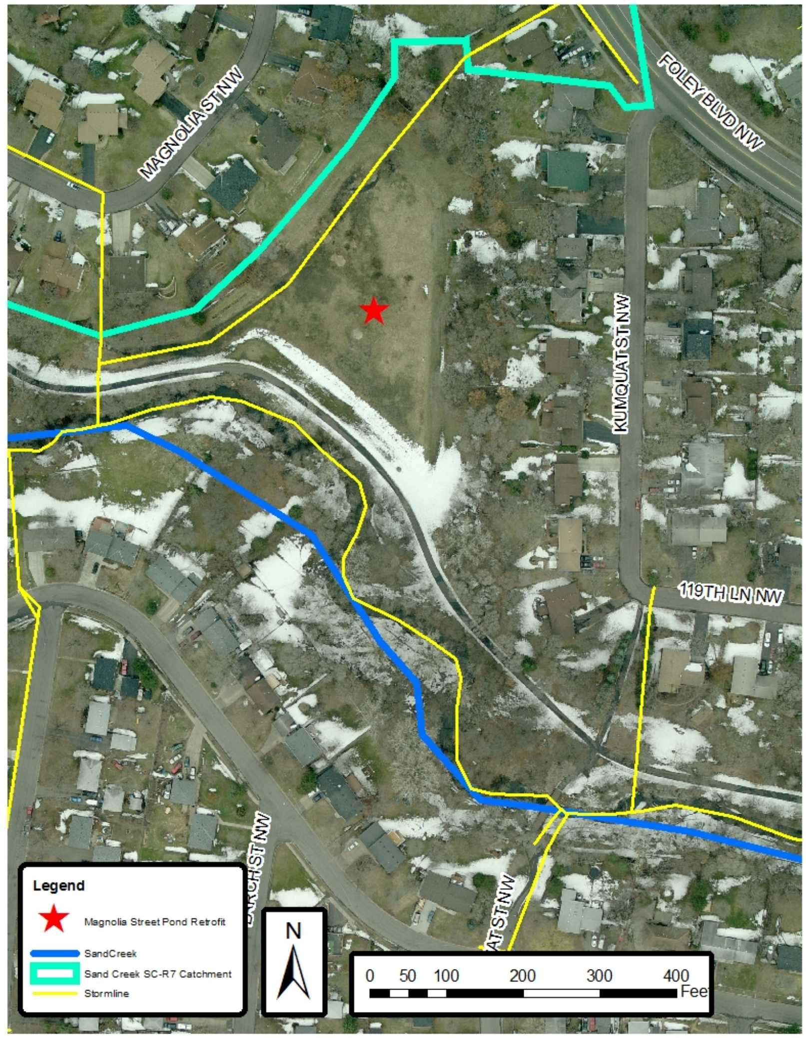
Installation

The Magnolia Street/Creek Villas dry pond was identified as a potential retrofit site. A detailed analysis by Wenck Assoc. Inc. identified the potential to improve pollutant removal efficiency of the pond by raising the outlet elevation by 12 inches. Dry ponds typically provide little water quality treatment because of frequent resuspension of settled pollutants. Therefore, the increased ponding depth will increase runoff infiltration and removal of total phosphorus and total suspended solids.

Retrofit of existing stormwater infrastructure to raise pond outlet elevation by 12 inches and increase water quality benefits to Sand Creek.

Riprap berms installed at northeast and west pond inlets to capture incoming sediments and maintain pond infiltration.

The increased outlet elevation will increase pond storage capacity, promote infiltration, and ultimately improve water quality in Sand Creek.



Location of Magnolia Street/Creek Villas pond retrofit.

Site Monitoring/Post-Project

Pond operation maintenance was calculated assuming a 30 year period prior to required maintenance. Maintenance includes excavation and disposal of accumulated sediment at a rate of \$2,000 per 10 acres of contributing watershed. An additional \$3,000 was added for mobilization and site restoration.

Modeled Pollutant Reductions and Calculated Benefits

WinSLAMM modeling conducted by ACD estimated reductions in water volume, total suspended solids (TSS), and total phosphorus (TP) following pond modification. The table to the right highlights these reductions. Water quality benefits to receiving water bodies associated with these reductions include:

- Groundwater recharge,
- Increased water clarity,
- Reduced streambank erosion and flooding, and
- Decreased nutrient, pollutant, and toxin loading.

	Volume Reduction		TSS Reduction		TP Reduction	
	ft³/yr	%	lbs/yr	%	lbs/yr	%
Annual Total	556,445	78	7,891	74	17.2	76
30 Yr Project Total	**16,693,350 ft³**		**236,730 lbs**		**516 lbs**	
Benefit / \$100 Spent* (over 30 years)	**76,914 ft³**		**1,091 lbs**		**2.38 lbs**	
30 Yr Cost* / Unit	**\$56.63/acre-ft**		**\$0.09/lb**		**\$42.06/lb**	

* Includes installation, design, oversight, administration, and 30 year maintenance costs

Project Profile

2010 Northdale Middle School Pond Modification

Pond Modification

Project Summary

The Anoka Conservation District (ACD) completed a Sand Creek stormwater retrofit assessment for the Coon Creek Watershed District (CCWD) that identified cost-effective stormwater BMPs. As a result of the assessment, the existing rate control pond at the Northdale Middle School was modified. The pond outlet elevation was raised by 18 inches to improve phosphorus removal efficiency and provide direct water quality benefits to Sand Creek via decreased nutrient and sediment loading. Modification of existing stormwater treatment ponds to increase their efficiencies is one of the most cost effective methods to enhance stormwater treatment. Much of the existing stormwater infrastructure was designed for rate control, and inexpensive retrofits such as this can add water quality benefits and volume reduction. Project dollars were provided by CCWD and the Clean Water Fund (CWF) from the Clean Water, Land and Legacy Amendment. Project promotion and construction oversight was conducted by CCWD.

Project Specs

Date Installed..........September 2010
Total Ponding Area............45,172 ft²
Total Capacity..................135,036 ft³
Watershed Treated.............158 acres

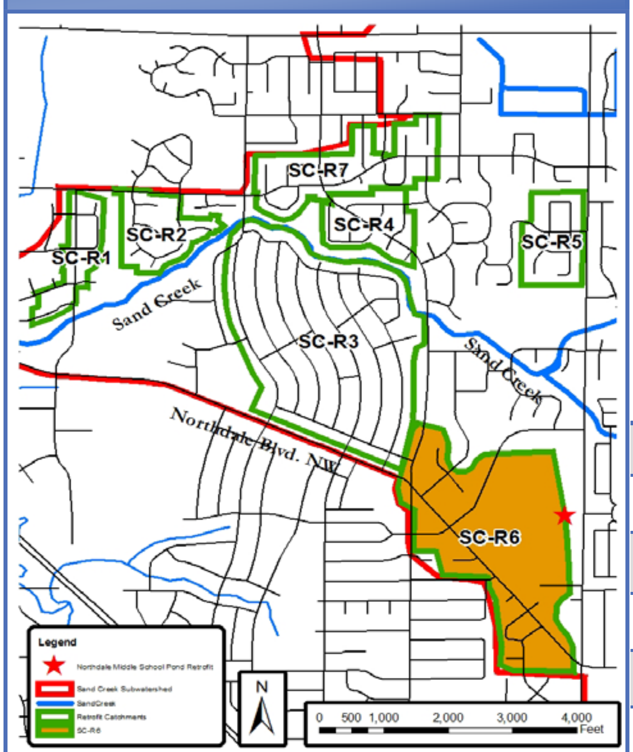
Installation Funding

CCWD................................$3,802.50
State of MN CWF $4,647.50
Total Installation Cost.......$8,450.00

Other Funding (Source)

Design (CCWD) $1,598
Const. Oversight (CCWD) $3,740
Maintenance (CCWD).......$3,340/yr

SC-R6 Catchment



Within catchment SC-R6 of the Sandcreek Subwatershed Stormwater Retrofit Assessment, the Northdale pond outlet modification was identified to;

- Decrease stormwater volume,
- Decrease pollutant loads, and
- Increase infiltration to recharge groundwater.

The catchment land cover consists of residential, schools, and open space. The table below highlights important characteristics of the catchment as well as WinSLAMM model outputs of total phosphorus (TP), total suspended solids (TSS), and volume contributions prior to the pond modification. Wenck Assoc. Inc. designed the project.

Acres	158
Dominant Land Cover	Residential, Schools, Open Space
Parcels	254
TP (lbs/yr)	48.6
TSS (lbs/yr)	34,657
Volume (acre-feet/yr)	79.4

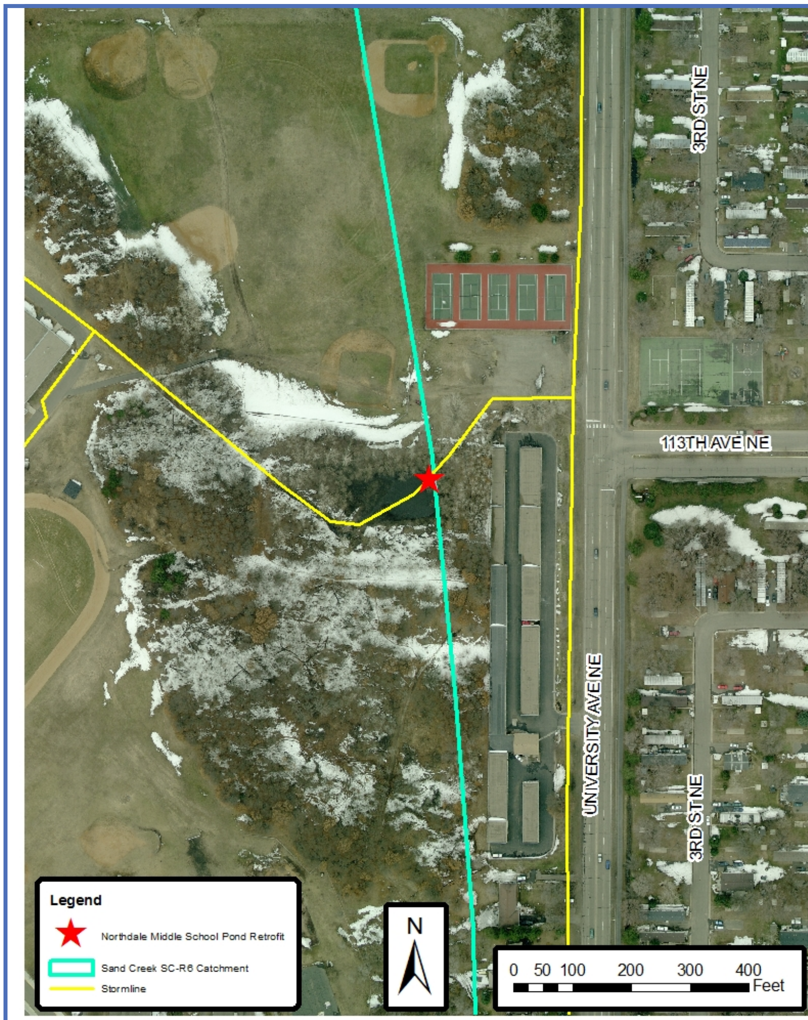
Installation

Detailed analysis of the pond by Wenck Assoc. Inc. identified the potential to improve phosphorus removal efficiency by raising the outlet elevation 18 inches. Installation of a horizontal weir Designed by Wenck provides water quality benefits without causing backwater issues in the existing stormwater infrastructure.

Placement and installation of weir to raise outlet elevation by 18" and increase downstream water quality benefits.

Retrofit of existing outlet to accommodate new weir installation and minimize project expenses.

Fully functioning modification will increase pond storage capacity, promote infiltration and sedimentation, and ultimately improve Sand Creek water quality.



Location of Northdale Middle School pond retrofit.

Site Monitoring/Post-Project

Pond operation maintenance was calculated assuming a 10 year period prior to required maintenance. Maintenance includes excavation and disposal of accumulated sediment at a rate of $2,000 per 10 acres of contributing watershed. An additional $3,000 was added for mobilization and site restoration.

Modeled Pollutant Reductions and Calculated Benefits

WinSLAMM modeling conducted by ACD estimated reductions in water volume, total suspended solids (TSS), and total phosphorus (TP) following pond modification. The table to the right highlights these reductions. Water resource benefits to receiving water bodies associated with these reductions include:

- Groundwater recharge,
- Increased water clarity,
- Reduced streambank erosion and flooding, and
- Decreased nutrient, pollutant, and toxin loading.

	Volume Reduction		TSS Reduction		TP Reduction	
	ft³/yr	%	lbs/yr	%	lbs/yr	%
Annual Total	1,562,000	45	12,494	36	19.9	41
30 Yr Project Total	**46,860,000 ft³**		**374,820 lbs**		**597 lbs**	
Benefit / $100 Spent* (over 30 years)	**41,110 ft³**		**329 lbs**		**0.52 lbs**	
30 Yr Cost* / Unit	**$105.96/acre-ft**		**$0.30/lb**		**$190.93/lb**	

* Includes installation, design, oversight, administration, and 30 year maintenance costs

Project Profile

2010 Crooked Lake Rain Gardens

Rain Gardens

Project Summary

A demonstration project by the City of Andover resulted in the installation of three curb-cut rain gardens in a neighborhood draining stormwater directly to Crooked Lake. Crooked Lake is a popular recreational lake in the cities of Andover and Coon Rapids and has relatively good water quality for this region. The goals of this demonstration project were to provide examples of modern water quality improvement practices as well as preserve the current conditions of Crooked Lake by infiltrating stormwater runoff.

The Coon Creek Watershed District (CCWD) provided a demonstration grant and project designs were completed by Anoka Conservation District (ACD). Project promotion and construction oversight were conducted by the City of Andover. Long term maintenance will be conducted by the landowners.

Project Specs

Rain Gardens Installed	3
Date Installed	June 2010
Total Planting Area	978 ft^2
Total Capacity	826 ft^3
Watershed Treated	7.69 acres

Installation Funding

CCWD	$8,400
City of Andover	$5,000
Total Installation Cost	$13,400

Other Funding (Source)

Design (Andover)	$1,200
Const. Oversight (Andover)	$3,000
Promo./Admin. (Andover)	$2,000
Yr. 1 Maint. & Mon. (ACD)	$900
Maintenance (Landowner)	$300/yr

Crooked Lake Drainage Area

The three curb-cut rain gardens were installed to treat stormwater from the participating properties, neighboring properties, and the street. Prior to installation, rain falling on impervious surfaces within the rain garden drainage areas was channeled via the curb and gutter system directly to Crooked Lake untreated. This excess runoff can cause:

- An influx of sediments, nutrients, and pollutants,
- Algae blooms and unwanted aquatic vegetation, and
- An increase in water temperatures that can harm fish and other wildlife.

Installation

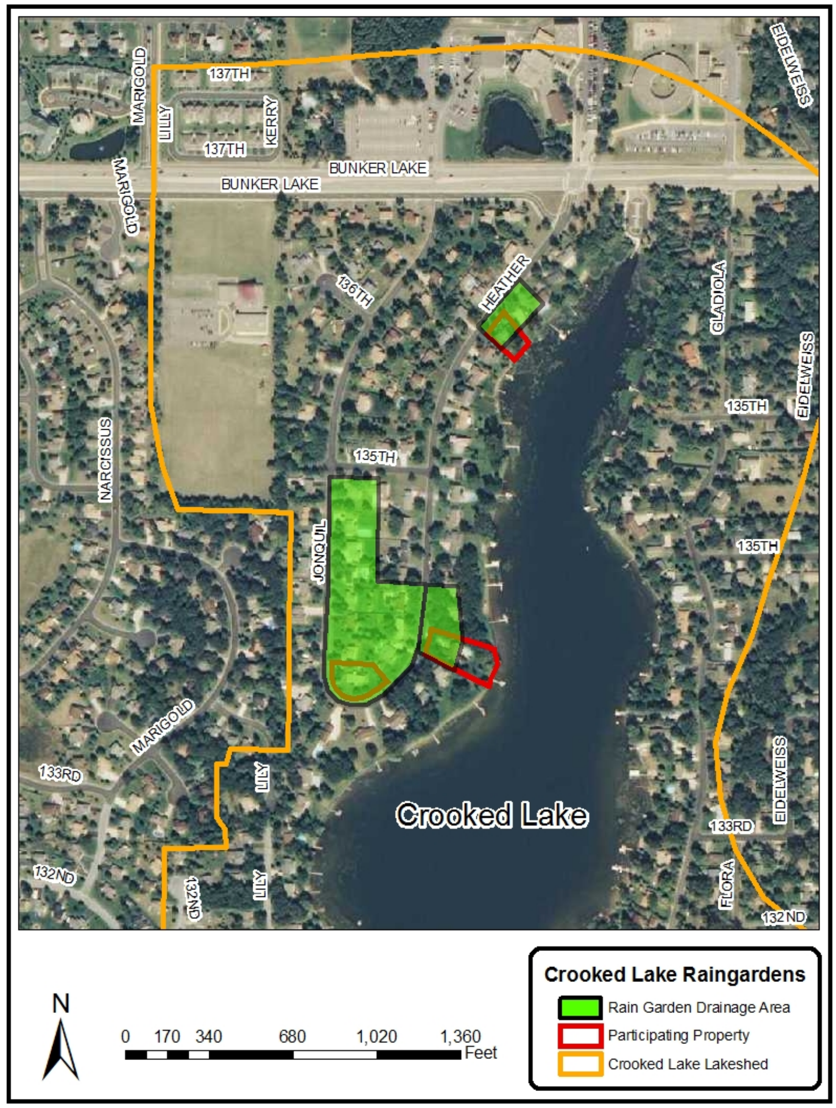
A total of three curb-cut rain gardens were installed in 2010. The figure to the right highlights the properties on which rain gardens were installed and the corresponding drainage areas.

Site preparation and soil excavation to achieve desired side slopes and 1 ft. maximum ponding depth.

Retaining wall construction, as well as soil amendment with rain garden soils to promote treatment and infiltration.

Placement and installation of pretreatment chamber and plant positioning.

Curb-cut construction to accept offsite runoff from curb and gutter system.



Properties with rain gardens and corresponding drainage areas.

Fully functioning curb-cut rain garden. Note the properly installed pretreatment chamber that filters incoming runoff and also prevents debris and sediment from entering or exiting the rain garden when filled to capacity.

Site Monitoring/Post-Project

Post-project monitoring by ACD verified acceptable rain garden infiltration rates and proper pretreatment chamber function following storm events. Monitoring will continue during the 2011 growing season to ensure proper garden function and successful plant establishment.

Project Profile

Hawkinson & Hegge Lakeshore Restoration

Lakeshore Restoration

Project Summary

A lakeshore restoration project was completed on the Hawkinson and Hegge property adjacent to Locke Lake in Fridley, MN. Neglect and unpermitted excavating by previous landowners had created a steep and unstable bank along the lakeshore. The yard had collapsed into the lake in several places and the shoreline was dominated by weedy species. The restoration project consisted of invasive species removal, grading, erosion control, and planting of native species to create a buffer zone. In addition, bioengineering techniques were used to repair and prevent erosion, improve the quality of runoff reaching Locke Lake, and create additional wildlife habitat.

Project Specs

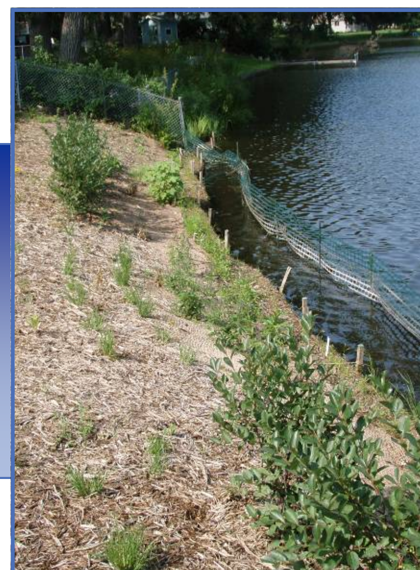
Date Installed .... July 2010
Total Planting Area .... 1,100 ft^2
Shoreline Stretch Restored ....65 ft

Installation Funding

RCWD Cost-Share $3,766.66
Landowner $3,766.66
Total Installation Cost $7,533.32

Previous conditions consisted of a lakeshore collapsing into Lock Lake and a plant community dominated by weedy species.

Bioengineering practices like this biolog provide water quality benefits, shoreline stability, and increased wildlife habitat.



The buffer area was planted with deep rooted vegetation consisting of native species to aid in filtration/infiltration, stabilization, and wildlife habitat.

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Project Profile

Fridley Middle School Rain Garden

Rain Garden

Project Summary

A curb-cut rain garden was installed at the Fridley Middle School to treat stormwater runoff that enters West Moore Lake. Prior to installation, rain falling on impervious surfaces within the rain garden drainage area was channeled through the curb and gutter system without any form of treatment. The project improved the quality and reduced the volume of stormwater reaching the lake by capturing and infiltrating runoff from the nearby streets and parking lots. The close proximity of the curb-cut rain garden to both Fridley Middle School and High School will also provide unique educational opportunities for students about stormwater best management practices.

Project Specs

Date Installed .... September 2010

Total Garden Area .... 2,317 ft^2

Storage Capacity .... 2,700 ft^3

Installation Funding

RCWD Cost-Share $5,000.00

Landowner $11,902.69

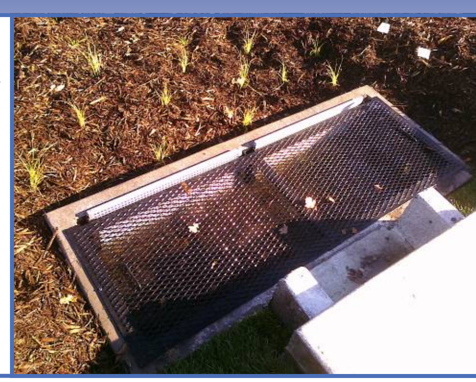
Total Installation Cost $16,902.69

Existing conditions consisted of an open area of turf grass that provided little benefits to water quality or habitat for wildlife.

A concrete swale and pretreatment chamber were installed to connect the rain garden with the existing cub and gutter system.

The rain garden was planted with native species to aid in filtration/ infiltration and provide wildlife habitat.

The pretreatment chamber will capture sediment and debris prior to entering the garden and reduce future maintenance efforts.



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Project Profile

2010 Rice Lake Rain Gardens

Rain Gardens

Project Summary

The Anoka Conservation District (ACD) completed a Rice Lake stormwater retrofit assessment for the Rice Creek Watershed District (RCWD) that identified cost-effective stormwater BMPs. As a result of the assessment, six curb-cut rain gardens were installed in a residential neighborhood within the RL-5 catchment that drained untreated to Rice Lake through a curb and gutter system. The rain gardens will reduce the degradation of Rice Lake by infiltrating stormwater runoff.

Project promotion and construction oversight was conducted by ACD staff with funding from RCWD. Project designs were completed by Metro Landscape Restoration Program staff with project dollars provided by ACD and the Clean Water Fund (CWF) from the Clean Water, Land and Legacy Amendment. Long term maintenance will be conducted by the landowners under an agreement with the RCWD.

Project Specs

Rain Gardens Installed ... 6
Date Installed ... October 2010
Total Planting Area ... 1,691 ft^2
Total Capacity ... 1,297 ft^3
Watershed Treated ... 12.31 acres

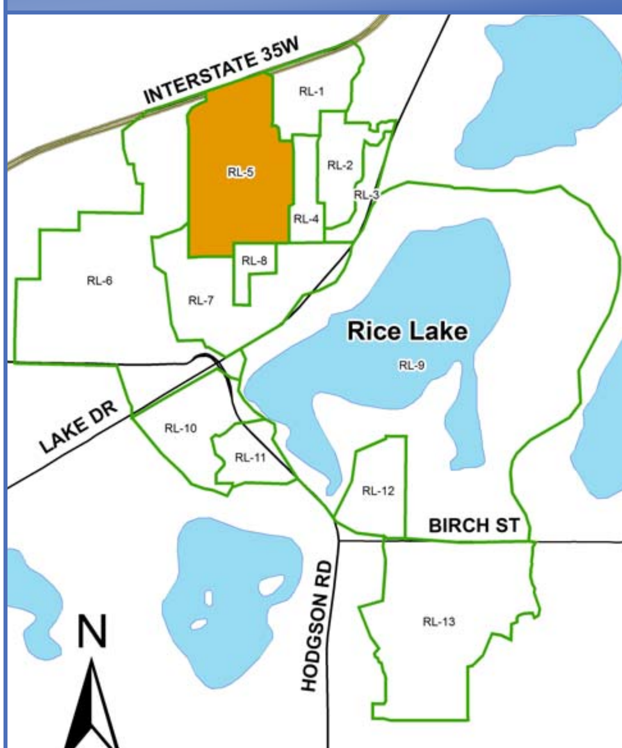
Installation Funding

RCWD ... $11,421.00
Landowners ... $3,935.00
State of MN CWF ... $1,889.75
MN State Cost Share ... $5,596.25
Total Project Cost ... $22,842.00

Other Funding

Design ... $5,040
Construction Oversight ... $2,835
Promotion/Administration ... $4,960
Ongoing Maintenance ... $525/yr

RL-5 Catchment



Within the subwatershed assessment, catchment RL-5, located in the north-central portion was identified for several retrofit projects intended to;

- Decrease stormwater volume,
- Decrease pollutant loads, and
- Increase infiltration to recharge groundwater.

The catchment consists of medium density residential housing, a church, and a townhome complex. The table below highlights important characteristics of the catchment as well as WinSLAMM model outputs of total phosphorus (TP), total suspended solids (TSS), and volume contributions prior to rain garden installations.

Acres	177
Dominant Land Cover	Residential, 1/4 acre lots
Parcels	290
TP (lbs/yr)	74.88
TSS (lbs/yr)	34,165
Volume (acre-feet/yr)	57.35

Installation

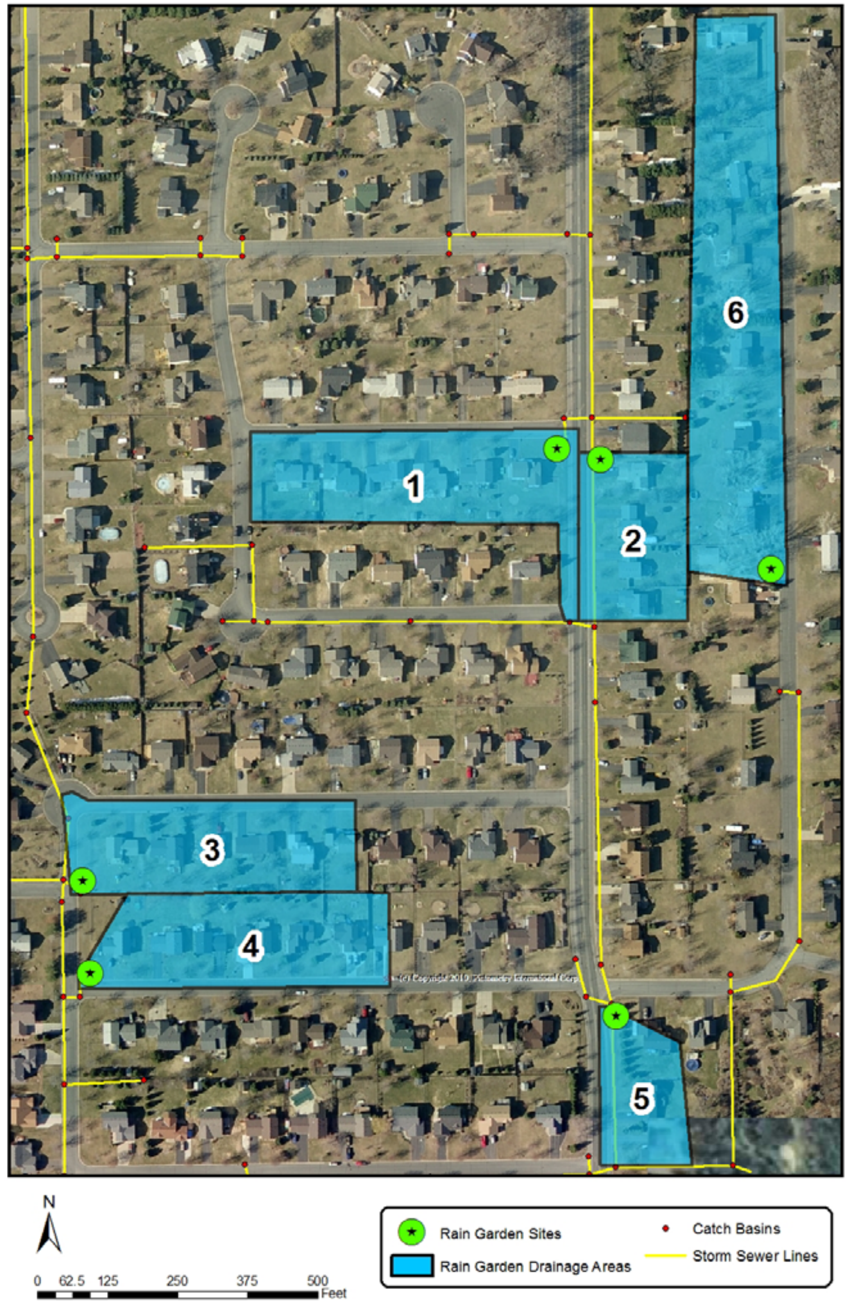
Detailed analysis of the RL-5 catchment resulted in the identification of high priority properties for rain garden placement. These locations were identified to maximize the effectiveness of the installed rain gardens by ensuring close proximity to existing catch basins and large drainage areas. Property owners at high priority locations were then contacted for potential rain garden installation. A total of six curb-cut rain gardens were installed in 2010. The figure to the right highlights the rain garden locations and resulting drainage areas for each garden.

Site preparation and soil excavation to achieve desired side slopes and 1 ft. maximum ponding depth.

Retaining wall construction, as well as soil amendment with rain garden soils to promote treatment and infiltration.

Placement and installation of pretreatment chamber and plant positioning.

Curb-cut construction to accept offsite runoff from curb and gutter system.



Installed rain garden sites and corresponding drainage areas.

Fully functioning curb-cut rain garden within RL-5. Note the properly installed pretreatment chamber that filters incoming runoff and also prevents debris and sediment from entering or exiting the rain garden when filled to capacity.

Modeled Pollutant Reductions

WinSLAMM modeling was used to estimate reductions in water volume, total suspended solids (TSS), and total phosphorus (TP) following rain garden installation. The table to the right highlights these reductions for each of the six drainage areas within RL-5 in which a rain garden was installed. Water quality benefits to receiving water bodies associated with these reductions include:

- Groundwater recharge,
- Increased water clarity,
- Decreased pollutant and toxin loading, and
- Decreased nutrient loading that stimulates nuisance algae blooms.

* Includes install., design, oversight, admin. and 30 yr. maint. cost

Drainage Area	Volume Reductions		TSS Reductions		TP Reductions	
	ft³/yr	%	lbs/yr	%	lbs/yr	%
Area 1 (2.35 acres)	21,522	50	242.9	41	0.569	44
Area 2 (1.34 acres)	15,933	65	186.8	55	0.431	58
Area 3 (1.98 acres)	21,099	58	238.0	48	0.557	51
Area 4 (2.01 acres)	22,181	60	252.5	50	0.589	53
Area 5 (0.90 acres)	13,170	79	157.0	69	0.359	72
Area 6 (3.73 acres)	33,882	49	385.4	41	0.900	44
Annual Project Total	**127,787 ft³**		**1,462.6 lbs**		**3.405 lbs**	
30 Yr Project Total	**3,833,610 ft³**		**43,878.0 lbs**		**102.150 lbs**	
Benefit / $100 Spent* (over 30 years)	**7,454 ft³**		**85.3 lbs**		**0.199 lbs**	
30 Yr Cost* / Unit	**$584.35/acre-ft**		**$1.17/lb**		**$503.45/lb**	

Site Monitoring/Post-Project

Post-project monitoring verified acceptable rain garden infiltration rates and proper pretreatment chamber function following storm events. Monitoring will continue during the 2011 growing season to ensure proper garden function and successful plant establishment.

Rain garden upstream of catch basin (Area 3).

Rain garden near capacity (Area 4).

Double-cut rain garden preventing runoff from entering corner catch basin (Area 1).

Pretreatment chamber prevents leaf litter and sediment entry into garden (Area 2).

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Project Profile

Braido Ecological Restoration

Ecological Restoration

Project Summary

The Braido ecological restoration project focused on restoring the ecological integrity of a 5.1 acre residential property. Practices implemented include the installation of a rain garden, native prairie plantings, and removal of invasive woodland species. The benefits associated with this ecological restoration include water quality improvement and increased biodiversity from the native prairie plantings. The restoration of the woodland community consisted of removing invasive species and replacing them with native species that will provide food and habitat for wildlife..

Project Specs

Rain Garden Planting Area .... 137 ft^2

Native Planting Area .... 0.36 acres

Buckthorn Removal Area ..... 3 acres

Installation Funding

ACD Cost Share $1,685.00

Landowner Contribution ... $3,320.00

Total Project Cost $5,005.00

Buckthorn, an invasive species, was removed from the property via herbicide application to increase habitat quality.

Native plantings in place of traditional turf grass provide aesthetic value as well as habitat for wildlife.

The rain garden provides water quality benefits by infiltrating runoff from impervious surfaces on the property.

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Project Profile

Ecological Restoration

Gerdes Ecological Restoration

Anoka Conservation District

Project Summary

The Gerdes ecological restoration project focused on restoring native grasses and flowers over approximately 1.2 acres of degraded prairie (red shaded polygons). Extensive site preparation to eradicate existing seed banks of undesirable and invasive species included a site burn, herbicide applications, and tilling. The site was then seeded with native grass species and an oat cover crop. Following establishment of the native grasses, native flowers will be seeded to increase biodiversity. Restoration of the degraded prairie will result in multiple ecological benefits including increased biodiversity of native plant species and habitat for wildlife.

Project Specs

Date Completed.................May 2010

Prairie Restoration Area .....1.2 acres

Project Funding

ACD Cost Share $672.84

Landowner Contribution $1322.83

Total Project Cost $1995.67

Site preparation removed undesirable species and created an ideal environment for native grass establishment.

Native grass seed establishment along with the oat cover crop to minimize competition from undesirable species.

Native species like Little Bluestem will provide a high quality and diverse habitat for wildlife.