West Fork Des Moines River Targeting and Prioritizing Endeavor

Final Report

Jan Voit

July 18, 2018

Project Sponsor:
Heron Lake Watershed District

Grant Project Summary

Project title: WFDMR Targeting and Prioritizing Endeavor

Organization (Grantee): Heron Lake Watershed District

Project start date: 6/15/2015 Project end date: 6/30/2018 Report submittal date:

Grantee contact name: Jan Voit Title: District Administrator

Address: PO Box 345

City: Heron Lake State: MN Zip: 56137

Phone number: 507-793-2462 Fax: n/a E-mail: jvoit@hlwdonline.org

Basin (Red, Minnesota, St. Croix, etc.): Des Moines County: Nobles, Jackson, Murray, Cottonwood, Pipestone, Lyon, and Martin

Project type (check one):

- ☐ Clean Water Partnership (CWP) Diagnostic
- ☒ CWP Implementation
- ☐ Total Maximum Daily Load (TMDL) Development
- ☐ 319 Implementation
- ☐ 319 Demonstration, Education, Research
- ☐ TMDL Implementation

Grant Funding

Final grant amount: $21,941.37 Final total project costs: $50,980.25

Matching funds: Final cash: $21,941.38 Final in-kind: $7,097.50 Final Loan: $0.00

Contract number: 93259 MPCA project manager: Katherine Pekarek-Scott

Executive Summary of Project (300 words or less)

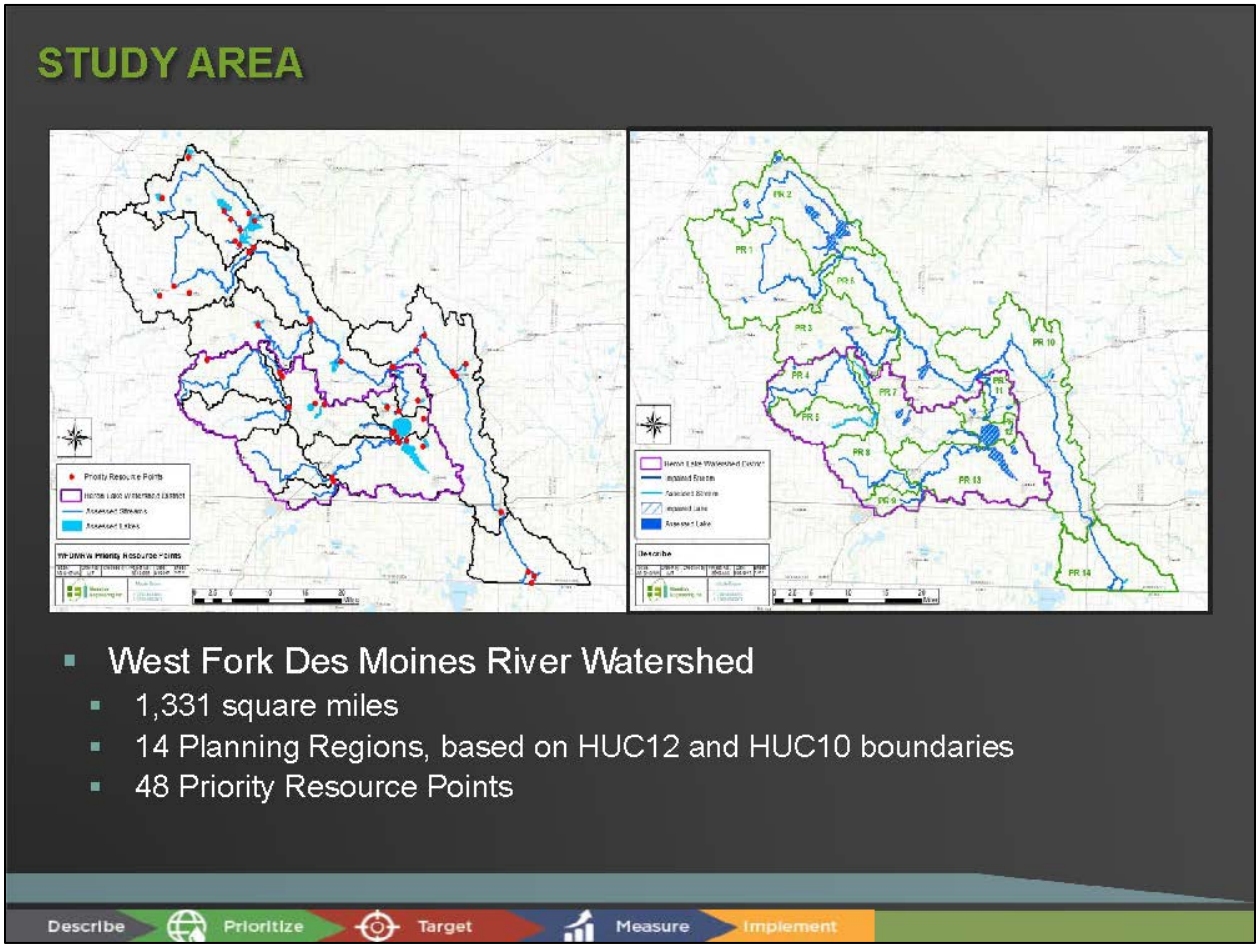
The West Fork Des Moines River (WFDMR) watershed is part of the Western Corn Belt Plains and Northern Glaciated Plains ecoregions. The watershed extends across seven counties: Murray, Cottonwood, Jackson, and Nobles and small portions of Pipestone, Lyon, and Martin. It covers an area of 1,333 square miles. Its principal source is Lake Shetek. The river flows from the Lake Shetek outlet near Currie in a southeasterly direction for 94 miles to the Minnesota/Iowa border and eventually enters the Mississippi River at Keokuk, Iowa.

Point and non-point source pollution, intensive tillage, non-compliant septic systems, feedlots, and urban stormwater runoff are prevalent throughout the WFDMR watershed. The Prioritize, Target, and Measure Application (PTMApp) that is the result of the grant effort will be invaluable in assisting local units of government within the watershed to identify the most cost-effective best management practices (BMPs)

and the best locations for pollution reduction. This information will be used in grant applications and watershed planning efforts.

Locating the sources of sediment, phosphorus, and bacteria is integral to reducing the effect they have on a water body. Houston Engineering, Inc. (HEI) was hired to complete the WFDMR Targeting and Prioritizing Endeavor. This resulted in a set of data that is the most cost-effective for the implementation of BMPs for all identified priority resources. The results were expressed as the maximum reduction of a water quality contaminant (e.g. sediment, phosphorus) at a priority resource (e.g. an impaired stream) for a given level of investment. This optimized BMP cost-effectiveness will serve as the measuring component for project specific evaluation of BMPs. This project included measuring water quality benefits from both existing conservation efforts and future targeted opportunities to implement BMPs. It also provides an estimate of the likely reduction that can be achieved through implementation of suitable practices at priority resources.

Picture
WFDMR PTMApp Study Area



Acronyms (Name all project acronyms and their meanings.)

- WFDMR – West Fork Des Moines River
- PTMApp – Prioritize, Target, Measure Application
- BMPs – Best Management Practices
- HLWD – Heron Lake Watershed District
- HEI – Houston Engineering, Inc.
- SWPTSA – Southwest Prairie Technical Service Area
- GIS – Geographic Information Systems
- LiDAR – Light Detection and Radar
- DEM – digital elevation model
- RUSLE – Revised Universal Soil Loss Equation
- NASS – National Agricultural Statistical Service
- NLCD – National Land Cover Dataset
- QA/QC – Quality Assurance/Quality Control
- TN – Total Nitrogen
- TP – Total Phosphorus
- SSURGO – Soil Survey Geographic Database
- ESRI – Environmental Systems Research Institute
- SWCD – Soil and Water Conservation District
- WMP – Watershed Management Plan
- MPCA – Minnesota Pollution Control Agency

Partnerships (Name all partners and indicate relationship to project)

- Heron Lake Watershed District: project sponsor, project staff, project administration, and inkind contribution
- Houston Engineering, Inc.: complete PTMApp for the WFDMR Targeting and Prioritizing Endeavor

Contents

Figures

Work Plan Review

1. Work Plan Changes

1.1. Work Plan Change #1: May 15, 2018

The HLWD requested moving $27.25 from Objective 3. Task A. Develop Final Reports to Objective 3. Task C. Refining Data Products and Training.

2. Activities and Tasks

Objective 1: Generate Enhanced Water Quality Products

Task A: Generate Travel Time Grids to Priority Resources

- Compiled datasets developed by SWPTSA 5 project, utilizing raw Light Detection and Radar (LiDar) data, flow direction and accumulation digital elevation models (DEM), Revised Universal Soil Loss Equation (RUSLE), National Agricultural Statistical Service (NASS) 2011 and most recent National Land Cover Dataset (NLCD).
- Final review, process and data adjustments, Quality Assurance/Quality Control (QA/QC) and completion of generated products/data files

Obstacles and Lessons Learned

Computer processing time for the project was impaired and the performance of the computer resources was not as robust as has been experienced in other projects.

Task B: Estimate Nitrogen (TN), Total Phosphorus (TP), Sediment, and Hydrologic Loading

- Estimated TN, TP, Sediment, and Hydrologic Loading
- GIS post processing of previously prepared data completed
- Utilized Soil Survey Geographic Database (SSURGO) data layers to estimate TN, TP, sediment, and hydrologic loading
- Calculated raster cell mass sediment mobilization
- Calculated accumulated sediment and adjusted for calibration factor
- Calculated accumulated sediment at catchment outlet
- Calculated TN and TP, with calibration factor leaving the landscape
- Compiled statistics
- Final review, data adjustments, QA/QC and completion of data products

Obstacles and Lessons Learned

The technology component to this project introduced considerable delays into completion of tasks. The PTMApp process has remained very slow for processing the data in the watershed. This data set remains the slowest one that HEI has ever done, by a considerable amount. For a couple of reasons HEI approached things differently through the end of the project.

Two scenarios ran for well over 1200 hours each and both were less than 70% completed. On May 24, 2017, Environmental Systems Research Institute (ESRI) decided to make all of the current network shared Arc licenses for an older version (which is what the processes were running on) no longer valid. This meant that all of the processes that were running ceased to

operate on May 24, unless they had been started in the newer version. Because the data for this project started so long go, they were included in the older versions. HEI restarted the processing prior to the 24th to gain back whatever time they could, but this meant considerable loss of time. HEI also made some modifications to the PTMApp code to try to speed the process up and restarted the two scenarios on the updated system in order to see if these modifications could greatly improve the final delivery.

HEI also identified a work around that allowed them to provide the project report and deliverables in a slightly less detailed fashion and then supplement the report with the more detailed results once the process was completed. The process change allowed them to complete the report with the detailed PTMApp results at the same time. However, in order to make sure that they could complete the next steps in the process they used the interim products to complete tasks and get back on schedule.

Objective 2: Develop Targeted Implementation Plan

Task A: Priority Area Identification

- HEI and HLWD identified specific priority resources for targeted implementation, based on local knowledge and identified impairments, or locally significant resources.
- Performed GIS analysis of the hydrologically corrected DEM, SSURGO soils, and the 2011 NLCD to identify locations on the landscape that are suitable for BMP and conservation practices.
- Identified candidate locations were reviewed to develop a targeted implementation plan that "measures" costs and improvements in TP, TN, and sediment that would result from implementing the BMPs.
- Developed targeted implementation approach that “measures” costs and improvements in TP, TN, and sediment that would result from implementing the BMPs and a format for presenting results.
- Input and processing of GIS/Geodatabase of priority resource points in treatment train tool to develop implementation plan and provide calcuated implementation cost estimates and estimated benefits.
- Processed BMP and conservation practice suitability analysis as part of implementation cost-benefit estimates to develop implementation plan scenarios.

Task B: Data Verification

- HEI developed a field verification strategy and approach for HLWD staff.
- Site verification data was compiled.
- HEI developed and transmitted to HLWD a field verification protocol and approach for HLWD staff in a technical memo dated July 12, 2017.
- HLWD staff conducted site checks to visually verify land use, practice suitability, and any potential additional physical parameters identified in verification strategy.

Task C: BMP Truthing

- On August 1, 2017, HEI submitted the information needed to conduct field validation for the WFDMR Prioritizing and Targeting Endeavor. Catherine Wegehaupt and Jan Voit drafted letter dated August 2, 2017. It was sent to landowners who owned property in areas that were identified for field validation.
- On August 7, 2017, Jan Voit received several phone calls regarding the letter. One landowner, who was particularly angry and threatening, did not allow any explanation. The others asked a few questions and were happy to have the survey done. Because of the questions that were received, Jan Voit drafted a letter containing more details regarding the project. Another letter containing more detailed information was sent to the same landowners on August 7.
- Catherine Wegehaupt worked on field validation information throughout the month of August. The field validation information was submitted to Houston Engineering, Inc. on August 31, 2017.
- HEI conducted a review of ground truthing data collected by HLWD staff to verify that the predicted locations aligned with field data.
- Site verification information was used to adjust BMP recommendations.
- Final BMP recommendations were completed.

Obstacles and Lessons Learned

For BMP truthing, a letter was mailed to landowners that were going to be evaluated. These letters were not received well by some. A lesson learned was to provide landowners with the information using more general terms and language. This could help more of the general public to better understand the project details and hopefully be more supportive in projects.

The BMP truthing was a useful endeavor. Some locations were already in some type of conservation program, so identifying those areas was necessary to focus on areas that have not had BMPs in place.

There were no significant obstacles to developing the targeted implementation plans. However, this project reaffirmed that local participation and guidance in establishing targeted plans for implementing conservation is a critical component of Minnesota's conservation delivery supply chain.

Objective 3: Knowledge and Technology Transfer

Task A: Develop Final Reports

- Developed layout for components of data delivery in formats that assist in outreach and education.
- HEI submitted the interim report to the HLWD on October 29, 2017. Jan Voit reviewed the report and made comments and corrections. The report was returned to HEI for revisions on November 14, 2017.
- HEI incorporated interim report comments, compiled completed implementation scenarios into report format, assembled full draft report on December 22, 2017.

- HLWD reviewed full draft report and provided final comments to HEI on December 22, 2017. Edited final report was completed and transmitted on December 28, 2017.

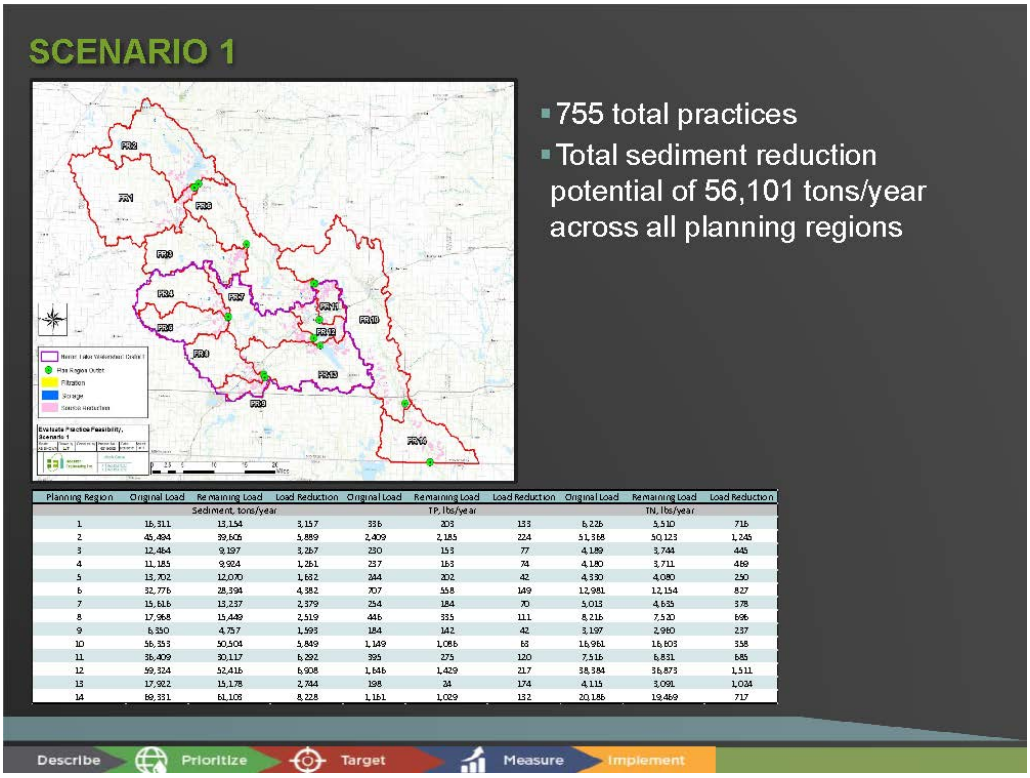
Obstacles and Lessons Learned

The development and delivery of the final report went well. The HLWD drove most of the feedback and report development. While no major obstacles were encountered within this Task, timelines were impacted by the data processing times encountered under Objective 1.

Task B: Conduct Training Workshops

- A staff workshop was conducted on October 27, 2016.
- On March 8, 2018, Jan Voit met with HEI staff at their office in Maple Grove. The purpose of the meeting was to review the PTMApp for the WFDMR watershed and prepare for the upcoming training workshops.
- Two PTMApp training sessions were held on March 28, 2018. The first began at 9:30 a.m. with the HLWD managers and staff, as well as Jim Eigenberg, Jackson County Commissioner. Drew Kessler and Rachel Olm, HEI gave a PowerPoint presentation which included an introduction to PTMApp, project background and process, planning products and a watershed and field scale, use of PTMApp to update the HLWD Watershed Management Plan, use by landowners and practitioners, and a summary. Discussion was held regarding the need to login to the web-based system, the usefulness of estimated data, sources of sediment and phosphorus in the watershed, cost-effective locations for pollution reduction, bank erosion, agriculture versus urban focus, ground truthing, water quality in the Heron Lake basin, land use changes within the last 30 years, potential programs for areas adjacent to streams, water flow delineation, funding needs, and potential for securing funds.

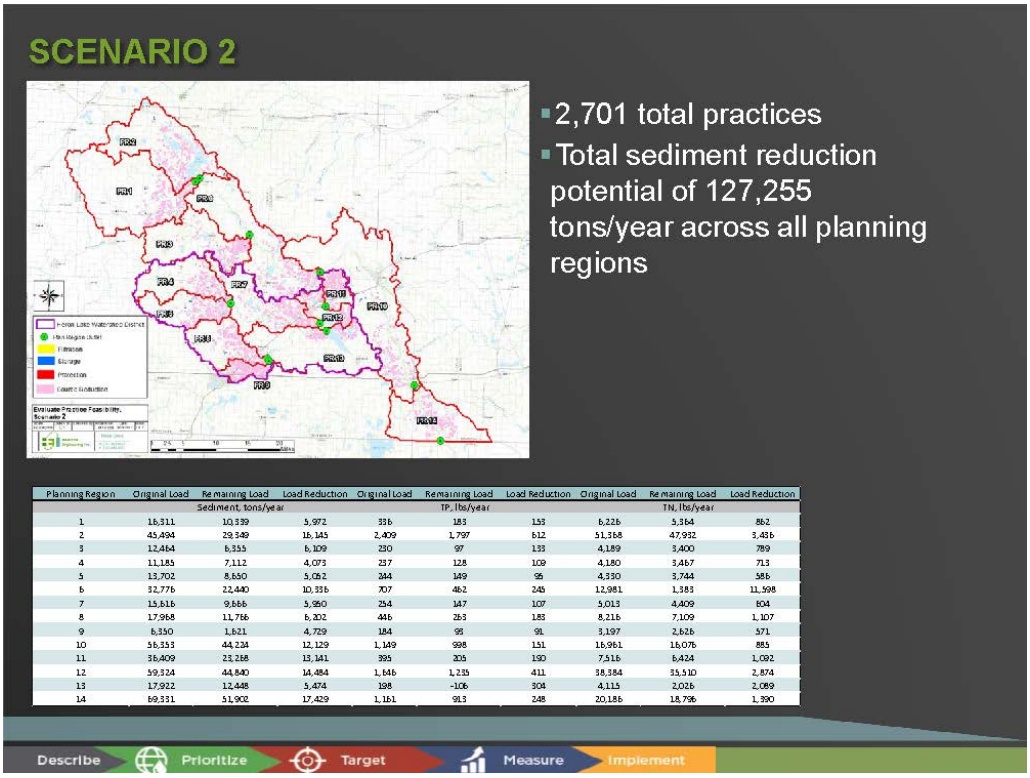
Figure 1. PTMApp Scenario 1



Planning Region	Original Load	Remaining Load	Load Reduction	Original Load	Remaining Load	Load Reduction	Original Load	Remaining Load	Load Reduction
	Sediment, tons/year			TP, lbs/year			TN, lbs/year		
1	16,311	13,154	3,157	336	203	133	6,226	5,510	716
2	45,494	39,605	5,889	2,409	2,185	224	51,368	50,123	1,245
3	12,464	9,197	3,267	230	153	77	4,189	3,744	445
4	11,185	9,924	1,261	257	183	74	4,180	3,711	469
5	13,702	12,070	1,632	344	202	42	4,330	4,080	250
6	32,776	28,394	4,382	707	558	149	12,981	12,154	827
7	15,616	13,237	2,379	254	184	70	5,013	4,635	378
8	17,968	15,449	2,519	446	335	111	8,216	7,520	696
9	6,350	4,757	1,593	184	142	42	3,197	2,960	237
10	58,353	50,504	3,849	1,149	1,086	63	18,961	18,603	358
11	36,409	30,117	6,292	395	275	120	7,516	6,831	685
12	59,324	52,416	6,908	1,846	1,429	217	38,384	36,873	1,511
13	17,902	15,178	2,744	198	24	174	4,115	3,091	1,024
14	69,331	61,103	8,228	1,161	1,029	132	20,186	19,469	717

- The second began at 1:00 p.m. Attendees included: Chris Bauer and Aaron Crowley, Jackson Soil and Water Conservation District (SWCD); Craig Christensen, Murray SWCD; John Shea and Austin DeWitte, Nobles SWCD; Dave Thiner and Sarah Soderholm, Murray County; Kevin Stevens, Cottonwood County; Becky Alexander and Hannah Herzfeld, Cottonwood SWCD; Brian Nyborg and Todd Kolander, Department of Natural Resources; Catherine Wegehaupt, and me. Drew Kessler and Rachel Olm, HEI gave a PowerPoint presentation which included an introduction to PTMApp, project background and process, planning products and a watershed and field scale, use of PTMApp to update the HLWD Watershed Management Plan (WMP), use by landowners and practitioners, and a summary.

Figure 2. PTMApp Scenario 2



Planning Region	Original Load	Remaining Load	Load Reduction	Original Load	Remaining Load	Load Reduction	Original Load	Remaining Load	Load Reduction
	Sediment, tons/year			TP, lbs/year			TN, lbs/year		
1	18,311	10,339	5,972	336	183	153	6,226	5,364	862
2	45,494	29,349	16,145	2,409	1,797	612	51,368	47,932	3,436
3	12,464	6,355	6,109	230	97	133	4,189	3,400	789
4	11,185	7,112	4,073	257	128	109	4,180	3,467	713
5	13,702	8,650	5,052	244	149	95	4,330	3,744	586
6	32,776	22,440	10,336	707	462	245	12,981	1,383	11,598
7	15,616	9,666	5,950	254	147	107	5,013	4,409	604
8	17,968	11,766	6,202	446	263	183	8,216	7,109	1,107
9	6,330	1,621	4,729	184	93	91	3,197	2,626	571
10	56,553	44,234	12,129	1,149	998	151	16,961	16,076	885
11	36,409	23,268	13,141	395	205	190	7,516	6,424	1,092
12	59,324	44,840	14,484	1,846	1,235	411	38,584	35,510	2,874
13	17,922	12,448	5,474	198	-106	304	4,115	2,026	2,089
14	69,351	51,902	17,429	1,161	913	248	20,186	18,796	1,390

Obstacles and Lessons Learned

An obstacle to utilizing this data in the future may be access to the appropriate software licensing. GIS based licenses can be pricey and the local technical resources needed to operate the software are not always available. As a result of this project, stakeholders should consider opportunities to build and maintain the local resources needed to enable conservation professionals to fully utilize the types of data and information generated from this project.

Task C: Refine Data Products and Training

- Post workshop debriefing to get agreement on data product refinements that are needed.
- Based on training workshops and comments from HLWD staff, data products are being regenerated on the newest version of the PTMApp-Desktop toolbar and will include the impacts of lakes on surficial Sediment, TN, and TP loading.

Obstacles and Lessons Learned

Due to the size of the watershed, it is likely that data processing times will continue to be an issue. Future projects might consider how use of the data might consider breaking the watershed into smaller units, e.g., planning regions.

Objective 4: Project Coordination

Task A: Grant Reporting

- The mid-project review for the WFDMR Targeting and Prioritizing Endeavor was done by Minnesota Pollution Control Agency (MPCA) staff from St. Paul and Willmar on February 5. The purpose was to review the process used for tracking project expenditures, grant cash, local match, and inkind contributions.
- All reports were submitted to MPCA on a timely basis as required by the work plan and grant contract.

Obstacles and Lessons Learned

There were no problems with reporting procedures during the grant period. The change order process went well.

Grant Results

3. Measurements

Successful implementation of a grant program requires an extensive effort in recordkeeping. Section 2 summarized the activities completed during the grant period. The methods of measured results and success are varied and dependent upon the tasks. The measurements are described below by objective and task as presented in the work plan.

Objective 1: Generate Enhanced Water Quality Products

Generate Travel Time Grids to Priority Resources

- Successfully generated travel time grids and provided data for future use

Estimate TN, TP, Sediment, and Hydrologic Loading

- Successfully generated TN, TP, Sediment, and hydrologic loading information and provided data for future use

Objective 2: Develop Targeted Implementation Plan

Priority Area Identification

- Worked with project partners to define priority areas for management, leading to the use of these data in guiding a grant application for new conservation practices to address priority areas.

Data Verification

- Successfully completed a field validation of the GIS data products

BMP Truthing

- Use the lessons learned from the field validation protocols to adjust future use and education and outreach.

Objective 3: Knowledge and Technology Transfer

Develop Final Reports

- One Interim Report
- One Final Report

Conduct Training Workshops

- One staff workshop
- One training workshop preparation session
- Two training workshops

Refine Data Products and Training

- Debrief session with HLWD staff and HEI after workshops
- Full update of the data products based upon feedback received at the workshop and through the debrief session

Objective 4: Project Coordination

- Semi-annual and annual reports were submitted and approved as described in Section 2 above. The reports were uploaded to the web page.

4. Products

There have been several products produced through this grant. Below is a list of the products created and the appendices in which the products are located.

4.1. Appendix 1 – Geodatabase and Enhanced Water Quality Data

- Maps
- CLU Index
- HLWD Field to Map Index
- Outside HLWD Map Index
- PTMApp Field Protocols Final

4.2. Appendix 2 – Knowledge and Technology Transfer

- Estimate Benefits
- Practice Feasibility
- Source Assessment
- Target Practices
- Heron Lake PTMApp Workshop PowerPoint presentation
- Targeted Plan Summary
- Staff Workshop Summary
- PTMApp letters database
- Nobles County letters
- Jackson County letters
- Updated letters
- Managers save-the-date
- Partners save-the-date
- Managers Workshop Agenda
- PTMApp Workshop Managers
- Partners Workshop Agenda
- PTMApp Workshop Partners

4.3. Appendix 3 – Reports

- PTMApp Interim Report
- Final Report Transmit Letter
- PTMApp Final Report

5. Public Outreach and Education

The following section summarizes the public outreach and education efforts undertaken.

Public outreach was not a component of this endeavor. Information was provided to HLWD managers and potential project partners through the workshops that were held in March of 2018. However, the data generated through this project will serve as a foundational set of information for future public outreach and education events around opportunities for additional conservation and the associated water quality benefits to local, regional, and state water resources.

6. Long-term Results

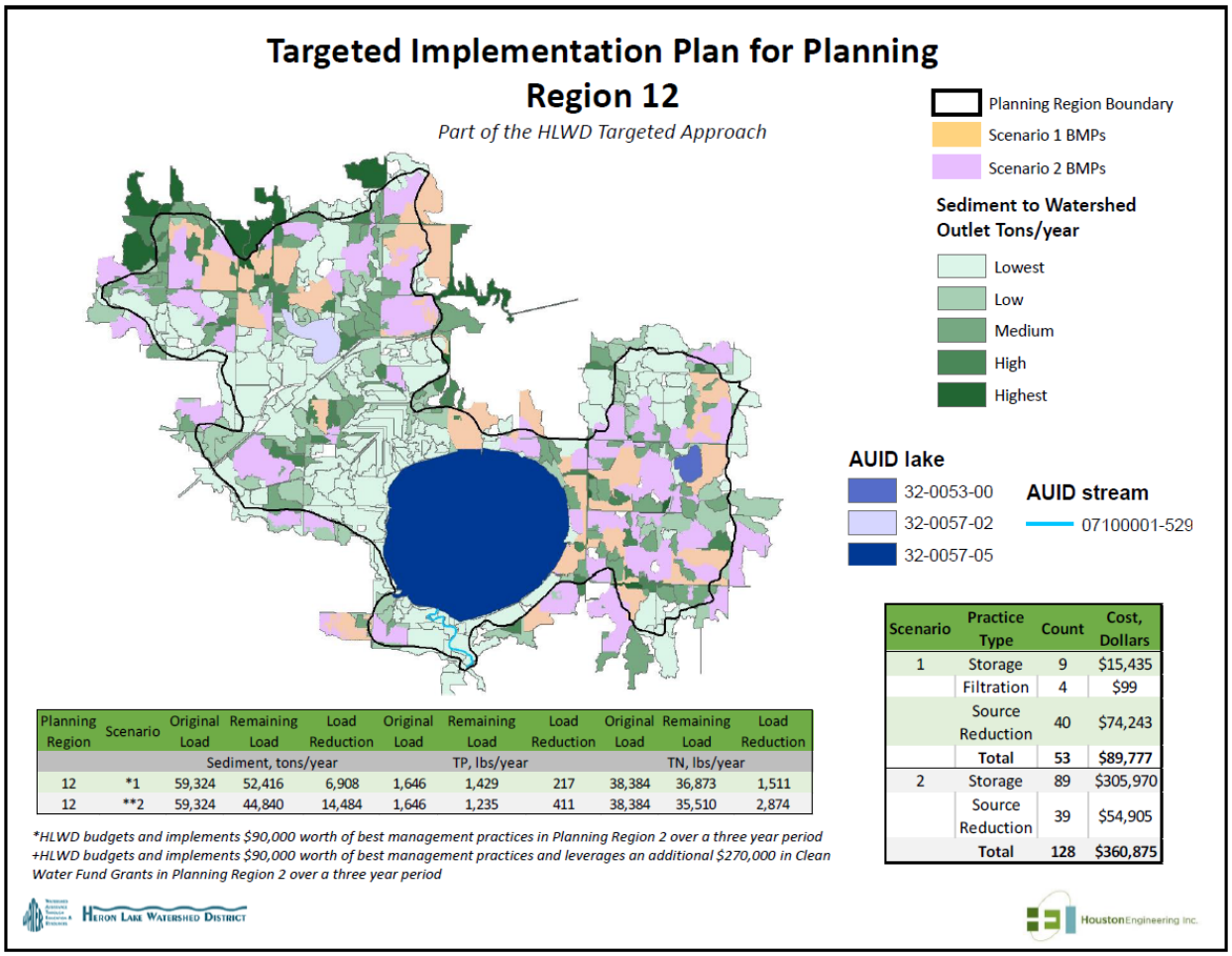
As a result of the working relationship between the HEI and local government units, information from the PTMApp was used in an Environmental Protection Agency Section 319 grant application. Results of the effort will be known after this grant period ends.

PTMApp information will be used in the HLWD budgeting process. Maps and financial information regarding BMP targeting will be developed and distributed to managers for consideration in the 2019 budgeting process and beyond.

As the WFDMR Watershed Restoration and Protection Strategies nears completion, the PTMApp data will be used. It is also the hope of the HLWD that the data will be the basis for targeting and prioritizing when the time comes to transition into One Watershed, One Plan.

Finally, the data will also serve as a continuous opportunity to engage landowners in discussions about opportunities for additional conservation practices and their associated water quality benefits. Moreover, the HLWD is exploring how the results of this project can be used as a guidance document for implementing the HLWD's 10-year WMP.

Figure 3. HLWD WMP Scenario



Planning Region	Scenario	Original Load	Remaining Load	Load Reduction	Original Load	Remaining Load	Load Reduction	Original Load	Remaining Load	Load Reduction
		Sediment, tons/year			TP, lbs/year			TN, lbs/year		
12	*1	59,324	52,416	6,908	1,646	1,429	217	38,384	36,873	1,511
12	**2	59,324	44,840	14,484	1,646	1,235	411	38,384	35,510	2,874

Scenario	Practice Type	Count	Cost, Dollars
1	Storage	9	$15,435
	Filtration	4	$99
	Source Reduction	40	$74,243
	Total	53	$89,777
2	Storage	89	$305,970
	Source Reduction	39	$54,905
	Total	128	$360,875

*HLWD budgets and implements $90,000 worth of best management practices in Planning Region 2 over a three year period
+HLWD budgets and implements $90,000 worth of best management practices and leverages an additional $270,000 in Clean Water Fund Grants in Planning Region 2 over a three year period

7. Final Expenditures

The expenditures for this grant can be found in the attached spreadsheet.