

Final Abstract

Final Report Approved on November 1, 2024

M.L. 2020 Project Abstract

For the Period Ending June 30, 2024

Project Title: Wastewater Pond Optimization Implementation

Project Manager: Joel Peck

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Funding Source:

Fiscal Year:

Legal Citation: M.L. 2021, First Special Session, Chp. 6, Art. 5, Sec. 2, Subd. 20a2

Appropriation Amount: \$700,000

Amount Spent: \$498,964

Amount Remaining: \$201,036

Sound bite of Project Outcomes and Results

It is clear that sites using the Steady State Primary Method are achieving better treatment for phosphorus as compared to the baseline sites which were not interested or unable to implement this method. On average, sites using the Steady State Primary Method have 2.25 mg/L less effluent phosphorus.

Overall Project Outcome and Results

Over the course of this project, the project team conducted outreach and site visits to roughly five wastewater pond sites every two weeks to share the steady state primary method operational strategy and other best practices to achieve better treatment for nutrients. As the project concludes, 23 sites were already implementing this method prior to a site visit through this project, 37 sites are newly implementing the method as a result of this project, 8 are planning to implement the method, 13 are interested and considering implementation, while 108 are not interested, 30 cannot implement, and 21 were not available for site visit. This is a total of 240 sites contacted and approached for assessment. The population count targets achieved are slightly different than proposed in the original grant document as the project team learned there were not that many to visit in the larger and medium category, so the team assessed as many as possible in those categories and then continued assessments in the small category.

We calculate that 668 pounds per year of phosphorus reduction as a result of this project from the 12 sites that implemented the method prior to 2024. There are an additional 21 sites implementing the method in 2024, which are also expected to find additional phosphorus savings.

Pond discharge monitoring report data was compared between pond sites using the Steady State Primary Method to a baseline of pond sites who responded with 'not interested' or 'not available' for assessment. The results show that the Steady State Primary Method seems to be having the intended impact of reducing effluent phosphorus in the pond sites that are using the method.

Project Results Use and Dissemination

The project team is in the process of finalizing a case study to highlight the city of Lynd success story in utilizing the Steady State Primary Method to achieve much better nutrient treatment.

Additionally, the project team has presented its preliminary findings at Central States Water and Environment Association and Minnesota Wastewater Operators in February 2024.



Environment and Natural Resources Trust Fund

M.L. 2020 Approved Final Report

General Information

Date: November 18, 2024

ID Number: 2020-084

Staff Lead: Michael Varien

Project Title: Wastewater Pond Optimization Implementation

Project Budget: \$700,000

Project Manager Information

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Project Reporting

Final Report Approved: November 1, 2024

Reporting Status: Project Completed

Date of Last Action: November 1, 2024

Project Completion: June 30, 2024

Legal Information

Legal Citation: M.L. 2021, First Special Session, Chp. 6, Art. 5, Sec. 2, Subd. 20a2

Appropriation Language: The appropriation in Laws 2019, First Special Session chapter 4, article 2, section 2, subdivision 8, paragraph (c), Sauk River Dam Removal and Rock Rapids Replacement, in the amount of \$2,768,000, no longer needed for its original purpose is transferred as follows:

(2) \$700,000 is transferred to the commissioner of the Minnesota Pollution Control Agency, in partnership with the Minnesota Rural Water Association and the University of Minnesota's technical assistance program, to implement a program to optimize existing pond wastewater treatment systems to increase nutrient removal and improve efficiency

without requiring costly upgrades;

(d) Transfers and Availability

The transfers under this subdivision are effective June 30, 2021, and the transferred amounts are available until June 30, 2023.

M.L. 2022, Chp. 94, Sec. 2, Subd. 19 Carryforward; Extensions, (b) The availability of the transfers for the following projects is extended to June 30, 2024: (2) Laws of 2021 First Special Session, chapter 6, article 5, section 2, subdivision 20, paragraph (a), clause (2), Wastewater Pond Optimization

Appropriation End Date: June 30, 2024

Narrative

Project Summary: Implementing the outcomes of our past project to research optimization activities in Minnesota wastewater ponds. This project will employ technical assistance and grant funds to improve nutrient removal and performance.

Describe the opportunity or problem your proposal seeks to address. Include any relevant background information.

There are opportunities for nutrient removal that optimization activities provide for wastewater ponds that reduce the need for costly upgrades. The 2018 ENRTF-Wastewater Treatment Plant and Pond Pilot Program identified many ways to optimize a wastewater pond. If implemented, the 2018 project estimates nitrogen reduction in Minnesota waters at 1,031,800 lbs., and phosphorous reduction at 1,655,679 lbs. The team has published the report, which provides case studies, and step-by-step optimization guidance. But implementing the findings state-wide, and especially in small cities, will be challenging without providing technical assistance and funding. Minnesota Rural Water Association is uniquely positioned to advise operators in identifying what opportunities exist for their facilities with on-site guidance and support. With the additional support of Minnesota Technical Assistance program, quantifying the data and measuring results, we will be able to achieve better nutrient reductions in wastewater ponds through steady-state primary methods, asset management and small-scale capital improvements to improve pond control, and operator knowledge of their own systems.

What is your proposed solution to the problem or opportunity discussed above? Introduce us to the work you are seeking funding to do. You will be asked to expand on this proposed solution in Activities & Milestones.

The work proposed includes on-site visits from a pond optimization specialist, who will evaluate the physical conditions of the pond, including riprap, control structures and valves that isolate each pond cell, aquatic vegetation present in ponds, color, odor, and other site conditions. Over the past project, we observed many control structures and valves in various states of disrepair, or missing entirely, increasing what is called a "short circuit" condition. This is a condition in which the flow of water moves uncontrolled through the primary cells to the secondary cells without the necessary detention time to achieve adequate treatment. Dye tests are sometimes necessary to verify a short circuited cell. Sometimes, operator understanding of actual pond characteristics may be incorrect. An example is assumed pond depth may be off. Verifying actual conditions may be a simple optimization activity to extend the holding capacity and treatment. Other activities include finding ways to hold back the water as long as possible with a steady-state flow condition, which maximizes the time wastewater has to be treated. There are times when chemical addition is the best solution to reduce nutrients. All these activities are possible depending on the facility's unique needs.

What are the specific project outcomes as they relate to the public purpose of protection, conservation, preservation, and enhancement of the state's natural resources?

Specific outcomes of the project will be increased nutrient removal of wastewater ponds systems in small cities, without costly capital projects. Optimization can take many forms. Sometimes it will be the addition of chemical treatment. Sometimes, it will be a modification of a flow scheme in the pond cells to increase hydraulic retention time. A pond optimization specialist will provide guidance for site specific conditions. A second outcome is increase asset management for small city pond systems. By establishing a grant to correct deficient control structures, we will increase treatment effectiveness. Thirdly, quantify success with reported Daily Monitoring Report data.

Project Location

What is the best scale for describing where your work will take place?

Statewide

What is the best scale to describe the area impacted by your work?

Statewide

When will the work impact occur?

During the Project

Activities and Milestones

Activity 1: Phase 1, Focus on small cities less than 1,000 in population where need is greatest

Activity Budget: \$262,500

Activity Description:

The team will develop a list of small pond facilities where technical assistance and guidance will serve the greatest need. Additional support will be provided by MnTAP where necessary to determine the optimization activity most likely to improve nutrient removal. This will include developing criteria to prioritize grant funds to correct failing infrastructure within the pond system. Promoting the steady-state primary regime to achieve greatest hydraulic retention time (HRT) to maximize the system's design capacity to deliver the longest duration of treatment. It will also include assessment of control structures, beneficial aquatic plant conditions, or other activities. The optimization specialist will complete a standardized pond assessment form to maintain objectivity. As pond discharges are only periodic, MnTAP will evaluate the success of each site by evaluating DMR data to ensure downward trend in nutrients. Bench testing of chemical addition may also be a component of technical assistance. Where appropriate, the use of alum or ferric chloride may prove to be the final option available to achieve permit compliance and the specialist will assist the facility staff in delivering the proper chemical at the proper dose. Continued monitoring will quantify degrees of success. Phase 1 is expected to last nine months.

Activity Milestones:

Description	Approximate Completion Date
Enlist smallest cities for participation and schedule site visit with goal 60 to 80 systems	September 30, 2021
Field notes and compliance inspection data will be used to develop grant criteria.	May 31, 2022
Evaluate outcomes of first spring discharge season	June 30, 2022
Conclude site work on Phase 1	June 30, 2023

Activity 2: Phase 2, Include cities with populations of 1,000 to 3,000 where nutrient removal remains elusive

Activity Budget: \$204,167

Activity Description:

The team will advance to site assessments and evaluations of key facilities in larger communities, though still under 5,000 population. Much like the smallest communities, on-site technical assistance and support will be important to municipalities where permit compliance remains elusive. Steady-state flow regime, evaluation of control infrastructure to eliminate short circuiting, operator knowledge, assessment of pond conditions (odor, color, presence or absence of aquatic vegetation) will be among the possible optimization activates. MnTAP technical support will continue and will ensure success is quantified. Where appropriate, bench testing alum and ferric chloride will also remain a component of service delivered. Delivery of grant funds will continue to be prioritized using field notes and MPCA compliance inspection document.

Activity Milestones:

Description	Approximate Completion Date
Enlist and schedule municipalities between 1,000 and 3,000 population, goal 50 to 60	July 31, 2022
Expand grant selection criteria to cities with populations between 1,000 and 3,000	September 30, 2022
Evaluate outcomes to ensure downward trends in nutrient removal resulting from optimization activities.	February 28, 2023
Conclude site work for Phase 2	May 31, 2023

Activity 3: Phase 3, Include largest of cities of target population in implementation

Activity Budget: \$233,333

Activity Description:

Speaking broadly, cities of populations between 3,000 and 5,000 are often better equipped to manage and maintain their infrastructure. So, technical assistance may take different approach. Operator education and understanding of optimal conditions within the pond system are only becoming better understood. Technical assistance and guidance will continue to focus on maximizing treatment with various flow regimes - in series or in parallel, or steady-state. But advising on inflow and infiltration, pH of influent, and pretreatment will be components of services delivered. Grant funds by this phase in the project may well be fully expended, as lower populous cities in general, tend to have greater need and fewer resources to pay for them. But, should funds still be available, the team will expand the prioritization method to include this population group. MnTAP will continue to review DMR data and provide technical support.

Activity Milestones:

Description	Approximate Completion Date
Enlist and schedule municipalities of 3,000 to 5,000 population, goal 55 to 60	February 28, 2023
Expand grant selection criteria to cities between 3,000 to 5,000 in population	June 30, 2023
Conclude site work for Phase 3	June 30, 2023
Evaluate outcomes to ensure downward trends in nutrient removal resulting from optimization activities.	June 30, 2023

Project Partners and Collaborators

Name	Organization	Role	Receiving Funds
Frank Stuemke	Minnesota Rural Water Association	Technical assistance and field work necessary to implement the 2021 Optimization Guide for Wastewater Operators	Yes
Jon Vanyo	Minnesota Technical Assistance Program (MnTAP)	MnTAP will provide data analysis and technical review for the project. MnTAP will also serve as an advisor for applications for optimization activities where the best activities are unclear. MnTAP will also hire and train student workers, and provide oversight and guidance to them.	Yes

Dissemination

Describe your plans for dissemination, presentation, documentation, or sharing of data, results, samples, physical collections, and other products and how they will follow ENRTF Acknowledgement Requirements and Guidelines.

Additional case studies will be drafted and added to the Wastewater Treatment Plant and Pond Optimization Pilot Project web site, hosted by MnTAP. The following ENRTF acknowledgement: "Funding for this project was provided by the Minnesota Environment and Natural Resources Trust Fund as recommended by the Legislative-Citizen Commission on Minnesota Resources (LCCMR)," or the official logo of ENRTF will be made. The logo and acknowledgement will be included in all presentations, publications, and printed materials.

Long-Term Implementation and Funding

Describe how the results will be implemented and how any ongoing effort will be funded. If not already addressed as part of the project, how will findings, results, and products developed be implemented after project completion? If additional work is needed, how will this work be funded?

Through this appropriation, MPCA will engage Minnesota Rural Water Association to implement recommended wastewater optimization techniques that ensure improved nutrient removal in wastewater stabilization ponds. Activities may include guiding operators through "steady-state primary" flow, identifying short-circuit conditions, or repairing control structures that improve hydraulic retention time. These are among the activities that have proven to improve nutrient removal in previous pilot test scenarios. Quality control will be provided by MnTAP's evaluation of Daily Monitoring Report (DMR) data. A portion of the appropriation will be set aside as a grant fund to provide small-dollar capital projects for on-site control structure repair.

Budget Summary

Category / Name	Subcategory or Type	Description	Purpose	Gen. Ineligible	% Benefits	# FTE	Classified Staff?	\$ Amount	\$ Amount Spent	\$ Amount Remaining
Personnel										
							Sub Total	-	-	-
Contracts and Services										
Minnesota Technical Assistance Program	Professional or Technical Service Contract	MnTAP will provide a student and a supervising advisor to monitor the success of pond optimization activities, through analysis of DMR data, and literature view. Activities may also include GIS and shapefile development.				3		\$110,000	\$71,592	\$38,408
Minnesota Rural Water Association	Sub award	Minnesota Rural Water will provide on-site technical assistance through the services or a pond optimization specialist. The specialist will document conditions, and scope of infrastructure needs, recommend the best approach to improve nutrient removal, and instruct operators on best practices for wastewater pond operations.				2		\$306,000	\$306,000	-
Minnesota Technical Assistance Program	Sub award	Minnesota Technical Assistance Program, with consultation from Minnesota Rural Water Association and Minnesota Pollution Control Agency, will administer a grant to fund the replacement of control structure assets within municipal wastewater pond systems. The maximum award amount will be \$25,000, and will cover non-construction costs, like gates and valves.		X		0		\$200,000	\$53,927	\$146,073
							Sub Total	\$616,000	\$431,519	\$184,481
Equipment, Tools, and Supplies										
	Tools and Supplies	One televising kit. Additional Confined space safety equipment.	The purpose of this line item is for safety of personnel on site.					\$20,000	\$3,654	\$16,346

							Sub Total	\$20,000	\$3,654	\$16,346
Capital Expenditures										
							Sub Total	-	-	-
Acquisitions and Stewardship										
							Sub Total	-	-	-
Travel In Minnesota										
	Miles/ Meals/ Lodging	Performing the necessary field work for the Wastewater Treatment Plant and Pond Optimization amounted to 47,000 miles in one year for the MRWA Pond Optimization Specialist in 2020. This category should cover mileage at a rate of \$.56, meals, and lodging for this position.	To perform the field work necessary to implement optimization activities, the Pond Optimization Specialist must travel, and travel state-wide. Meals are taken on the road, and over-night lodging is frequent.					\$64,000	\$63,791	\$209
							Sub Total	\$64,000	\$63,791	\$209
Travel Outside Minnesota										
							Sub Total	-	-	-
Printing and Publication										
							Sub Total	-	-	-
Other Expenses										
							Sub Total	-	-	-
							Grand Total	\$700,000	\$498,964	\$201,036

Classified Staff or Generally Ineligible Expenses

Category/Name	Subcategory or Type	Description	Justification Ineligible Expense or Classified Staff Request
Contracts and Services - Minnesota Technical Assistance Program	Sub award	Minnesota Technical Assistance Program, with consultation from Minnesota Rural Water Association and Minnesota Pollution Control Agency, will administer a grant to fund the replacement of control structure assets within municipal wastewater pond systems. The maximum award amount will be \$25,000, and will cover non-construction costs, like gates and valves.	This generally ineligible cost is justified as isolation of pond cells is critical to the success of wastewater treatment, and especially so with the steady-state primary flow regime. Missing and damaged infrastructure continues to be a symptom of the age and condition of many systems throughout the state. If this small grant program can demonstrate success, it could be the first step in a broader effort to address such conditions. See attachment for proposed program description.

Non ENRTF Funds

Category	Specific Source	Use	Status	\$ Amount	\$ Amount Spent	\$ Amount Remaining
State						
			State Sub Total	-	-	-
Non-State						
			Non State Sub Total	-	-	-
			Funds Total	-	-	-

Attachments

Required Attachments

Visual Component

File: [6b2dbdab-d30.docx](#)

Alternate Text for Visual Component

The map attached detail pond site visits and assessments for 2018 Wastewater Treatment Plant and Pond Optimization Pilot Project. Further, it details where future work will be beneficial....

Supplemental Attachments

Capital Project Questionnaire, Budget Supplements, Support Letter, Photos, Media, Other

Title	File
System Assessments	5afbe9da-7e7.pdf
Background Check	4490655b-aa2.pdf
Grant Request for Proposals, grant scope and scale	3fa198f6-fb8.docx
Best Practices For Wastewater Ponds	e06e4e03-3f3.pdf
Baudette Case Study	0696816a-cca.pdf
Gaylord Case Study	9e2956ab-c30.pdf
Steady State Primary Method	017acb16-921.pdf
Site Visits as of 9.22.22	56798b86-056.pdf
April 1, 2023 Site Visits and Interest Status	649c0e97-4e7.pdf
LCCMR Wastewater Pond Project Sites 10/23	4bd29e9d-265.pdf
LCCMR Pond Nutrient Optimization Summary Information, 6/18/24	35117d49-869.docx
MRWA Wastewater Presentation 2023	339c5c35-40c.pptx
Wastewater Pond Optimization Implementation Project 2024 Measurables	1c2b898c-248.docx
Capital Grant Awards and Reimbursements	a05465b7-9e0.xlsx

Media Links

Title	Link
Work Product from 2018 Wastewater Treatment Plant and Pond Optimization Pilot Project	http://www.mntap.umn.edu/industries/facility/potw/wastewater/wastewater-nutrient-optimization/

Difference between Proposal and Work Plan

Describe changes from Proposal to Work Plan Stage

This project did not have a proposal, but is the result of legislative action.

Additional Acknowledgements and Conditions:

The following are acknowledgements and conditions beyond those already included in the above workplan:

Do you understand and acknowledge the ENRTF repayment requirements if the use of capital equipment changes?

N/A

Do you agree travel expenses must follow the "Commissioner's Plan" promulgated by the Commissioner of Management of Budget or, for University of Minnesota projects, the University of Minnesota plan?

Yes, I understand the Commissioner's Plan applies.

Does your project have potential for royalties, copyrights, patents, sale of products and assets, or revenue generation?

No

Do you understand and acknowledge IP and revenue-return and sharing requirements in 116P.10?

N/A

Do you wish to request reinvestment of any revenues into your project instead of returning revenue to the ENRTF?

N/A

Does your project include original, hypothesis-driven research?

No

Does the organization have a fiscal agent for this project?

No

Work Plan Amendments

Amendment ID	Request Type	Changes made on the following pages	Explanation & justification for Amendment Request (word limit 75)	Date Submitted	Approved	Date of LCCMR Action
1	Amendment Request	<ul style="list-style-type: none"> • Activities and Milestones • Budget - Professional / Technical Contracts • Attachments 	As we had a late start to the project, it seemed expedient to begin grouping site visits less by population size than geography. We needed to adopt a strategy that maximized location. The result is that we have groups site visits in clusters of five or six municipalities. Necessarily, this strategy has required that we are starting tasks of Activity 2 and Activity 3 before Activity 1 is complete. We will focus on all concurrently.	October 4, 2022	Yes	October 14, 2022
2	Amendment Request	<ul style="list-style-type: none"> • Budget - Professional / Technical Contracts • Attachments 	I do not intend to request a narrative or budget amendment request at this time. But, as it seems I cannot advance to the "review and submit" step without completing this field, I am doing so.	March 29, 2023	Yes	May 9, 2023
3	Completion Date	<p>Previous Completion Date: 06/30/2023</p> <p>New Completion Date: 06/30/2024</p>	The change is needed because the project began six months later than was anticipated due to staffing changes with a project partner. Posting for the position, selecting a candidate, and onboarding the pond expert cause a significant delay. We have restructured the project timelines to make up for lost time, but I do not see a path forward to complete the project by the June 30, 2023 completion date. Another year would make this successful.	November 22, 2022	Yes	December 9, 2022

Status Update Reporting

Final Status Update August 14, 2024

Date Submitted: September 27, 2024

Date Approved: October 15, 2024

Overall Update

Over the course of this project, the project team conducted outreach and site visits to roughly five wastewater pond sites every two weeks to share the steady state primary method operational strategy and other best practices to achieve better treatment for nutrients. As the project concludes, 23 sites were already implementing this method prior to a site visit through this project, 37 sites are newly implementing the method as a result of this project, 8 are planning to implement the method, 13 are interested and considering implementation, while 108 are not interested, 30 cannot implement, and 21 were not available for site visit. This is a total of 240 sites contacted and approached for assessment. The population count targets achieved are slightly different than proposed in the original grant document as the project team learned there were not that many to visit in the larger and medium category, so the team assessed as many as possible in those categories and then continued assessments in the small category.

A total of 668 pounds per year of phosphorus reduction has been calculated for nutrient savings as a result of this project from the 12 sites that implemented the method prior to 2024. There are

Activity 1

This activity was previously marked complete.

(This activity marked as complete as of this status update)

Activity 2

This activity was previously marked complete.

(This activity marked as complete as of this status update)

Activity 3

Pond discharge monitoring report data was compared between pond sites using the Steady State Primary Method to a baseline of pond sites who responded with 'not interested' or 'not available' for assessment. The results show that the Steady State Primary Method seems to be having the intended impact of reducing effluent phosphorus in the pond sites that are using the method. The figures below were shared in the 2024 presentation on the project and highlight the phosphorus savings achieved by sites utilizing this method.

It is clear from these figures that sites using the Steady State Primary Method are achieving better treatment for phosphorus as compared to the baseline sites which were not interested or unable to implement this method. While this shows that the method seems to result in good phosphorus treatment, it is also worth considering that sites willing to trial a new method may also be in general better at maintaining and managing the pond system.

A sum of \$200,000 was reserved for capital improvement grants. Eight cities were awarded the grant, of which only four were able to execute their projects, expending a total of \$53,927.

(This activity marked as complete as of this status update)

Dissemination

No new presentations or publications since the April update. All future presentations and publications will include appropriate logos and verbiage.

Status Update Reporting

Status Update April 1, 2024

Date Submitted: March 29, 2024

Date Approved: July 2, 2024

Overall Update

Through the end of 2023 to this reporting period, the project team continued to outreach and visit approximately five wastewater pond sites every two weeks to share the steady-state primary method operational strategy and other best practices to achieve better treatment for nutrients. At this time, 38 new sites are implementing this method, 17 have committed to planning to implement the method, 19 more are interested and considering implementation, and 24 sites were already operating this way prior to this project.

The project team has begun monitoring the outcomes of the steady-state primary method using daily monitoring reports submitted from these facilities, compiling the data for evaluation. While this evaluation is somewhat limited as wastewater ponds discharge periodically, the data gathered does seem to indicate this method is more effective in nutrient removal than ponds that are not employing it.

As of this date, one grant recipient has fulfilled the requirements of the Wastewater Capital Replacement grant and has been reimbursed, with the remainder recipients expecting to complete project later this spring.

Activity 1

Initial outreach has been completed for this group. Efforts in this phase have transitioned to follow-up visits.
(This activity marked as complete as of this status update)

Activity 2

Initial outreach has been completed for this group. Efforts in this phase have transitioned to follow-up visits.
(This activity marked as complete as of this status update)

Activity 3

The plan for 2024 through the end of the project in June is to focus on follow up with sites who previously expressed interest in the steady state primary method to help support and motivate implementation of this nutrient reduction strategy.

Pond discharge monitoring report data was compared between pond sites using the Steady State Primary Method to a baseline of pond sites who responded with 'not interested' or 'not available' for assessment. The results show that the Steady State Primary Method seems to be having the intended impact of reducing effluent phosphorus in the pond sites that are using the method.

The City of Cottonwood has met the requirements of the capital replacement grant and has been reimbursed for the equipment purchased to replace aged infrastructure. These capital replacement grants are intended to improve the control and movement of wastewater between pond cells. As weather warms and municipalities initiate these projects, we expect to see additional nutrient removal as the steady-state primary method is achievable for these grant recipients.

Dissemination

The project team is in the process of finalizing a case study to highlight the city of Lynd success story in utilizing the Steady State Primary Method to achieve much better nutrient treatment.

Additionally, the project team has presented its preliminary findings at Central States Water and Environment Association and Minnesota Wastewater Operators in February 2024.

Status Update Reporting

Status Update October 1, 2023

Date Submitted: September 29, 2023

Date Approved: January 17, 2024

Overall Update

The project team continues to outreach and visit approximately five wastewater pond sites every two weeks to share the steady state primary method operational strategy and other best practices to achieve better treatment for nutrients. At this time, 28 new sites are implementing this method, 13 have committed to planning to implement the method, 16 more are interested and considering implementation, and 20 sites were already operating this way prior to this project. We have also started follow-up communications with those interested in implementation, and developing plans for them to do so.

The project team is in the process of finalizing a case study to highlight the city of Lynd success story in utilizing the Steady State Primary Method to achieve much better nutrient treatment.

In the upcoming months of the project, in addition to continuing to outreach to pond sites, the team will be reviewing the discharge monitoring report (DMR) data from pond sites that have implemented the Steady State Primary Method to quantify the nutrient reduction potential this operational method is having on pond nutrient treatment for sites who have chosen to use it.

Activity 1

The target for this population group has been met, but the project team continues to add them to the overall site visits to offset the small number of pond systems for the 3,000-5,000 population group. To date, we have completed 136 site visits for communities of 1,000 or less in population, exceeding the target number of site visits by 56 to offset the unavailable sites in the 3,000 to 5,000 category.

We have started analysis of daily discharge monitoring (DMR) reports from Fall 2022 to present to evaluate the efficacy of the Steady State Primary Flow regime in nutrient reduction. The datasets are expected to be limited in that the data are collected only sporadically upon discharge - and during dry to drought conditions, discharges may not even occur. So the data analysis will not be sufficient to show a trend. But, our position is that it can be sufficient enough to indicate the Steady State Primary Method is worthy of employment and further analysis.

Activity 2

For communities between 1,000 and 3,000, our team has accomplished 41 site visits. There are several sites that have remained unresponsive to project partner contacts, and we will continue to make attempts. But the target goal of 50 to 60 site visits in this population category is unlikely. To offset the reduced number, the project team has continued outreach to the 1,000 population category, as is seen in the Activity 1 Update.

Data Analysis of DMRs will pick up steam as fall discharges are reported.

Activity 3

For this category, because there are simply too few facilities in this population category that are pond systems, the team has achieved 10 site visits.

The team has solicited proposals for the capital replacement grant and has awarded the following communities to perform projects and replace pond infrastructure that will improve their nutrient reduction:

City of Evansville	\$25,000.00
City of Silver Lake	\$25,000.00
City of Stewart	\$9,375.00
City of New Auburn	\$25,000.00
City of Hill City	\$25,000.00
City of Shafer	\$13,125.00
City of Cottonwood	\$25,000.00
City of Watkins	\$25,000.00
Gaylord 1	\$25,000.00
Gaylord 2	\$2,500.00

Most of these project will be performed in the spring of 2024 and reimbursed thereafter.

Dissemination

The team is in the final edits of publishing a case study for the City of Lynd with we consider to be a success story.

As well, the team has presented at the following conferences:

Presentation	Date
MRWA Conference	3/8/2023
Resource Recovery & Efficiency (R2E) Presentation	2/16/2023
Conference on Environment Presentation	11/10/2022
P2RX Wastewater Efficiency Journey Presentation	10/20/2022
Innovative Conference Presentation	4/5/2022
R2E Award Acceptance	4/5/2022

Status Update Reporting

Status Update April 1, 2023

Date Submitted: March 29, 2023

Date Approved: May 9, 2023

Overall Update

Winter months in the field of wastewater pond operations are different than the summer months. There is less to observe as ponds are usually covered with ice, limiting reports of color, odor, vegetative growth, and pond depth. But, as past projects have demonstrated, treatment is still occurring under the ice in an anoxic state. While this is occurring, project partners used the opportunity to engage wastewater pond operators in their offices, and at conferences and conventions to promote the benefits of steady-state primary method. The project team continues to visit approximately five wastewater pond sites every two weeks to share the steady state primary method operational strategy and other best practices to achieve better treatment for nutrients. Total outreach by project partners to Publicly Owned Treatment Works (POTW) districts to date is 117, with 102 site visits completed. An additional followup call to 13 of these POTWs. Further, we have learned that 9 of these POTWs are already implementing the steady-state primary method, 15 have begun to implement after our site visit, 26 are planning to implement in the near future, 36 are not planning to implement, and 9 are not able to implement because deficiencies in their systems.

Activity 1

At this stage of the project, we have engaged 79 municipalities with populations of 1,000 people or less. This group continues to be the largest of the three population groups that we have identified in this project, which makes sense as small population centers vastly represent the majority of geographical Minnesota. Of this group, 35 either are already, intend to, or hope to implement the steady-state-primary method soon. These will receive follow-up from the project team.

Not everyone was as embracing, however; 27 responded they are not interested; 4 had previously tried the method, but returned to a former flow method; 8 could not because of the physical attributes of the pond system. Four did not respond to attempts to contact.

Activity 2

This groups is a smaller set, but at 30 listed municipalities it can prove to have great potential in terms of nutrient-reduction. This set includes populations of cities that have more means to employ specialized operators. Loading to these ponds tend to be more nutrient-heavy. To date, this group includes 5 that are already implementing the steady-state primary methods, seven that will be doing so this spring, and seven that hope to sometime soon.

While four are not interested, one cannot implement because of the physical attributes of the system, and three that already have, but returned to their former flow regime.

The capital grant of \$200,000 will finally be made available this spring to improve control structure performance in wastewater ponds. These funds to replace or repair slide gates and valves that are critical to isolating the pond cells will further improve pond performance and nutrient reduction rates.

Activity 3

This group of municipalities is the smallest in terms of number, but the greatest in population and potential loading. It was about evenly divided in terms of how well it received the concept of greater nutrient reduction through maintaining greater capacities to maximize treatment. Three already are employing the steady-state primary method, and two additional will be doing so this spring.

For a variety of reasons, the other half do not consider themselves to be candidates. Many fear the loss of available capacity over the winter months can jeopardize their overall capacity through the winter months when discharges are prohibited. Others want to preserve the available capacity of the ponds because of known inflow and infiltration issues. Five reported that they are not interested, while once reported that they previously have tried it and had to return to their previous flow regime.

Dissemination

As this project moves forward, the project team continues to visit approximately five wastewater pond sites every two weeks to share the steady state primary method operational strategy and other best practices to achieve better treatment for nutrients.

Status Update Reporting

Status Update October 1, 2022

Date Submitted: October 4, 2022

Date Approved: October 14, 2022

Overall Update

The project partners have been active since the last project report accomplishing outreach to 63 facilities and completing 58 site visits. As we had a late start to the project, it seemed expedient to begin grouping site visits less by population size than geography. We needed to adopt a strategy that maximized location. The result is that we have groups site visits in clusters of five or six municipalities that may be anywhere from 100 to 5,000 in population. Necessarily, this strategy has required that we are starting tasks of Activity 2 and Activity 3 before Activity 1 has been fully completed. If our total of 180 site visits are completed by June 2023, we are about one-third of our way through the project at the time of this report. To date, 11 facilities have expressed interest in Steady State Primary Method, and eight had already begun employing it.

Project partners have been able to adapt to the challenges of the late start, and other challenges and meets biweekly to discussed accomplishments of the past two weeks. The challenge will continue to be timely measurement of success as discharges occur in spring and summer so data is delayed.

Activity 1

To date, the project team has completed 31 site assessments of the target 60 to 80 assessments in Activity 1, due to a late start date. We have developed a strategy that allows us to use geography to our advantage, combining municipalities from all three activity groups. Our partners at MnTAP provide the MRWA pond expert with a logistically feasible group of five municipalities geographically close to each other. MnTAP has also equipped MRWA with best practices material to support nutrient reduction, and SSPM in particular. MRWA assesses control infrastructure and general conditions, making notes for future capital improvement grant candidates.

The \$200,000 capital improvement grant has not been made available for applications. Our plan is to use the site assessment documents to best guide the use of those funds, and until we have a good understanding of the scope of that need and where the need exists, we will not begin that scope of this project.

Our target date for completion has not been met for this activity for reasons already described. However, the work as it is now being performed, is more efficient and is meeting the overall goal of this project.

Activity 2

As of September 29, the project team has achieved 20 of the expected 55 or so site visits that we anticipate to make by December 31, 2022. We believe we are on pace to meet that goal, as well as making ground on the outstanding Activity 1 site visits. We are finding the ENRTF-funded 2018 optimization project are bearing fruit, as some operators are already trying the SSPM, and finding good results. One operator who heard about SSPM from the earlier project had some adverse effects on the ponds he manages, saying that it turned them "sour," which we interpret as septic conditions. We need to learn more about that particular case to fully understand it.

One additional adaptation we have made to the project is to select only those municipalities that have three or more ponds in their system. Many municipalities under 2,000 population have only two-pond systems, which would not be candidates for the SSPM. Nevertheless, Minnesota has more than enough three-pond systems to complete this project.

Activity 3

To date, the project team has completed seven site assessments within Activity 3. But, we are beginning Activity 3 four months early, so we believe we are on track to complete this goal in timely fashion. A challenge we found with Activity 3 is that there are not enough large pond systems in Minnesota to meet the original target of 55-60 assessments to ponds with city populations between 3,000-5,000. The team plans to do as many as possible in this category and to transfer the remaining assessments to the smaller population categories to achieve the same total number of assessments.

Dissemination

Case studies, and best practice documents conveyed to wastewater operators during site visits are uploaded to this platform.

Status Update Reporting

Status Update April 1, 2022

Date Submitted: April 25, 2022

Date Approved: June 3, 2022

Overall Update

The project began with a setback: Our field staff who performed outreach and technical assistance for the 2018 Wastewater Optimization for Treatment Plants and Ponds took a position in the private sector. Project Partner Minnesota Rural Water Association (MRWA) needed to fill that position, which took several months. Another delay to the project was the time MPCA required to develop and issue the contract to Minnesota Technical Assistance Program (MnTAP). These two setbacks amount to a near-six-month delay in the project timeline. But, I can report that as of March 1, this project is in full swing, with 14 site assessments having been completed.

MnTAP has prepared literature for our field staff to provide to wastewater pond operators, describing best practices of wastewater pond management, as well as the Steady State Primary method. Site assessments include observations of physical conditions of the infrastructure (dikes, riprap, control structures, etc.), a review of current pond management (flow though in series, or parallel), pond depths, odor, visual characteristics. Additional detail is added where infrastructure presents some need or deficiency and placed in a database for reference in grant award.

Activity 1

It became clear that simply focusing on one population category at a time is inefficient. So, MnTAP has been grouping municipalities by geographic radius, and placing multiple from municipalities from each category into the same trip. So, progress is advancing across each population category at the same time.

To date, site assessments have been performed in six Phase 1 municipalities of less than 1,000 population: Baudette, Onamia, Stockton, Herman, Wendell, and Campbell - ten percent of the overall goal for this category. Site assessments have been included in our database for review when awards from the infrastructure grant are evaluated and scored.

During site visits, field staff provides technical assistance to wastewater operators, transferring knowledge through conversations, using case studies, and literature; and where necessary scheduling meetings with MnTAP and MPCA wastewater engineers.

The project has not yet begun the evaluation of springtime wastewater discharge data as discharges are weather dependent and most ponds are currently still ice-covered. When daily monitoring reports become available, MnTAP Staff and interns will begin the evaluation of discharge data for efficacy of optimization activities.

Activity 2

To achieve efficiency in time and travel, the project team has begun to group site visits by geographic region, rather than population group.

Site visits from Phase 2 municipalities between 1,000 and 2,000 population include: Bird Island, Canby, Gaylord, Sandstone, Shafer, Grand Meadow, and Elbow Lake. Site visits include knowledge transfer, problem solving through technical assistance through MRWA, MnTAP, and MPCA wastewater engineers. These visits have the value-added benefit of communicating to wastewater operators that they are not alone in their efforts, but have many resources available at not cost to them.

As most ponds are still ice-covered, DMR data for discharges are not yet available. Data analysis to validate optimization activities will begin when that data becomes available.

Activity 3

No progress on Phase 3 municipalities at this time.

Dissemination

No progress on dissemination at this time.