



Environment and Natural Resources Trust Fund (ENRTF)

M.L. 2018 ENRTF Work Plan (Main Document)

Today's Date: Aug. 8, 2018

Date of Next Status Update Report: July 1, 2019

Date of Work Plan Approval: 9/13/2018

Project Completion Date: On or before June 30, 2024.

Does this submission include an amendment request? No

PROJECT TITLE: Adaptive Lake Management Plan—Lake Winona and Lake Agnes

Project Manager: Executive Director of ALASD, Bruce Nelson (outgoing); and Scott Gilbertson (incoming).

Organization: Alexandria Lake Area Sanitary District (ALASD)

College/Department/Division:

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Location: This project will impact the Alexandria Lake Area in Douglas County, Minnesota. Specifically, the project is designed to benefit water quality in Lake Winona, Lake Agnes and other down-stream lakes in the Alexandria chain of lakes.

Total Project Budget: \$600,000

Amount Spent: \$0

Balance: \$600,000

Legal Citation: Laws of Minnesota 2018, chapter 214, article 4, section 2, subd. 4, (l)

Appropriation Language:

“\$600,000 the second year is to the Board of Water and Soil Resources for a grant to the Alexandria Lake Area Sanitary District for lake management activities, including, but not limited to, alum treatment in Lake Agnes, carp removal in Lake Winona, and related management and reassessment measures that are intended to achieve and maintain compliance with water quality standards for phosphorus and the total maximum daily load for Lake Winona.”

I. PROJECT STATEMENT:

The goal of the project is to achieve attainment of state water quality standards in Lake Winona, Lake Agnes and other downstream lakes and facilitate implementation of the Lake Winona Phosphorus Total Maximum Daily Load (TMDL) in a cost-effective manner prioritizing the use of best practices for lake management.

ALASD is presently facing an estimated \$14 million cost to upgrade its wastewater treatment infrastructure in order to achieve compliance with a very stringent phosphorus limitation contained in its wastewater permit that is based on the water quality standards for Lake Winona and the Lake Winona Phosphorus TMDL. The District has pioneered several wastewater treatment optimization techniques and has nearly achieved compliance with the phosphorus limit with its existing technology; yet, to achieve perfect compliance the District would be required to perform the costly infrastructure upgrade to its facility. The \$14 million-dollar infrastructure upgrade would be eligible for up to \$7 million dollars of state grant funds and the additional \$7 million-dollar cost would be passed on to the District's customers in Alexandria and the surrounding communities.

However, the most recent water quality data and lake management science demonstrates that even if ALASD makes the costly investment in infrastructure, it will not achieve the desired water quality outcome because of the existing carp infestation in Lake Winona. Because the District was concerned about spending limited state and local resources on infrastructure upgrades that would fail to achieve the water quality objectives established by the state, ALASD hired a top lake scientist to study alternatives that could achieve standards in Lake Winona and Lake Agnes—without performing costly infrastructure upgrades. The District's scientist developed a lake management plan that if implemented successfully will very likely achieve water quality standards in Lake Winona, Lake Agnes and potentially Lake Henry and other downstream lakes—without additional infrastructure upgrades from the District.

To address water quality in Lake Agnes which receives discharge from Lake Winona, the District intends to complete an alum treatment to reduce phosphorus loading from lake sediments. For deep lakes like Lake Agnes, the primary restoration approach is to reduce phosphorus load which in turn reduces algal growth and increases water clarity. One of the major sources of phosphorus to lakes is often from lake sediments known as internal phosphorus loading. Monitoring data suggests that internal phosphorus loading provides as much as 1,400 pounds of phosphorus to Lake Agnes annually, approximately 35% of the annual phosphorus load to the lake. Reducing the internal phosphorus load will result in Lake Agnes meeting state water quality standards.

Restoring shallow lakes is more complex, because water quality is impacted by biological conditions as well as phosphorus loading. Shallow lakes exist in either a clear, plant dominated state or a turbid, algae dominated state. Lake Winona currently exists in the turbid, algae dominated state with minimal aquatic plants. Carp are one of the major drivers of turbid water quality and must be managed before aquatic plants and the clear water state can be established. Therefore, this project focuses on carp management and plant establishment in Lake Winona to maximize the impacts of reducing phosphorus loading. To our knowledge, no carp infested lake has been restored through nutrient reductions alone. Rather, shallow lake managers such as Ducks Unlimited and the Minnesota DNR focus primarily on driving the lake to the clear state through invasive carp management and whole lake drawdown to establish plant communities.

The \$600,000 appropriation to the District will go to fund implementation of the District's adaptive lake management plan. If the plan is successful it will save the state and local community millions of dollars, lead to attainment of water quality standards in Lake Winona, Lake Agnes, and Lake Henry, while facilitating implementation of the Lake Winona TMDL. Further, this project serves as a model for flexible and cost-effective approaches to addressing compliance with state and federal water quality regulations.

II. OVERALL PROJECT STATUS UPDATES:

Updates will be provided every 6 months (July 1 and January 1) commencing July 1, 2019. A final report will be submitted within 6 months of completion of the project.

First Update July 1, 2019

Second Update January 1, 2020

Third Update July 1, 2020

Fourth Update January 1, 2021

Fifth Update July 1, 2021

Sixth Update January 1, 2022

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Final Report by June 30, 2024

III. PROJECT ACTIVITIES AND OUTCOMES:

The overarching goal is to reduce and manage common carp in Lake Winona chain of lakes to reestablish submersed aquatic vegetation and improve water clarity and achieve water quality standards in Lake Winona, Lake Agnes and Lake Henry. The three principal project activities are as follows:

1. Alum treatment in Lake Agnes.
2. Control carp in Lake Winona to prevent adverse impacts on water quality and submersed aquatic vegetation.
3. Switch lake Winona from the turbid water, algae dominated state to the clear, plant dominated stated and achieve state water quality standards.

Please note that the completion dates listed for the outcomes are subject to final approval from the Minnesota Pollution Control Agency (MPCA) and some of the completion dates and project activity timelines may be adjusted based on MPCA's input and development of the District's National Pollutant Discharge Elimination System (NPDES) permit.

PHASE 1: Alum Treatment in Lake Agnes

Description: There are several steps for completing an alum treatment starting with collecting sediment cores to identify mobile phosphorus concentrations in the sediment, followed by dose determination, plans and specifications and application management. Table 1 outlines a preliminary schedule for each of the steps. To determine the appropriate areas and amounts of alum to be applied in Lake Agnes and two upstream ponds, intact sediment cores will be collected to determine vertical profiles of mobile phosphorus for alum dosage cost estimates. Sediment cores will be collected from three points in Lake Agnes and one each in the North and South Ponds. Once the appropriate amount of alum and application areas are determined, a forma bidding process will be initiated that includes the development of plans and specifications, bidding, and contract management. Additionally, contractor management is necessary to ensure that the alum treatment is completed according to the specifications. The alum treatment will be completed in two applications with half of the dose applied in the first application and the remaining dose in the second application to ensure peak binding efficiency of the aluminum and mobile phosphorus. Sediment cores will be collected to determine if the sediment goal of 90% reduction in mobile phosphorus is accomplished. Sediment monitoring between applications allows for an adaptive approach where adjustments to the application can occur to ensure effectiveness.

ACTIVITY 1 ENRTF BUDGET: \$ 405,000

Outcome	Completion Date
1. Collection of analysis of lake sediment cores (3 locations in Lake Agnes, 1 in North Pond, 1 in South Pond) to determine sediment phosphorus release, quantify the mass of mobile phosphorus in the sediment, and determine the area contributing to internal phosphorus loading.	May, 2019
2. Dose determination: the results sediment analysis will be used to determine the amount of alum needed and application areas	July, 2019
3. Plans specifications, bid and award: Once the application approach is determined, plans and specifications will be developed and the project will be competitively bid.	August, 2019
4. Initial Application: Half of the alum prescribed will be applied by the selected contractor with oversight from the designing engineer. Field management includes ensuring that alum quantities and purity is as specified, application occurs as prescribed, and pH is managed to protect aquatic life.	September/October 2019;
5. Follow-up sediment monitoring: Sediment cores will be collected from the same sites as the initial analysis to determine if sediment targets (90% reduction in mobile P) are achieved. The second application will be adjusted if necessary.	September 2020
6. Second Application: Half of the alum prescribed will be applied by the selected contractor with oversight from the designing engineer. Field management includes ensuring that alum quantities and purity is as specified, application occurs as prescribed, and pH is managed to protect aquatic life.	September/October 2021
7. Follow-up sediment monitoring. Sediment cores will be collected from the same sites as the initial analysis to determine if sediment targets (90% reduction in mobile P) are achieved. Results will be used to determine if future applications are necessary.	September 2022
8. Completion of the project will result in a 90% reduction in internal loading in Lake Agnes which results in a 1,260 pound reduction in phosphorus loading to Lake Agnes.	December 2022

Project updates inclusive of each relevant activity will be made consistent with section II.

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ACTIVITY 2: Integrated Carp Management Plan and Implementation in Lake Winona

Description: To restore Lake Winona, the first step is to assess and reduce the carp population to allow establishment of submerged aquatic vegetation and the clear lake, plant dominated state. The goal of this step is to determine the impact of carp on lake water quality, identify management opportunities for long term control of the carp population, and to reduce carp density to sustainable levels such that submerged aquatic vegetation can thrive in Lake Winona.

Using the Integrated Pest Management approach established by University of Minnesota researchers, there are a number of steps to evaluate the carp population to develop an understanding of their impact on the lake and to determine appropriate control strategies. The focus of activity 2 is to control the size of the carp population in Lake Winona to prevent adverse impacts on water quality and submersed aquatic vegetation by:

1. **Quantifying the number and biomass of common carp in the lake system.** This task includes populations estimates through electrofishing surveys to determine carp densities and their impact on lake water quality. University of Minnesota research suggest carp population densities should be less than 190 kg/ha for plants to establish.
2. **Quantifying immigration/migration in the lake system, spawning areas, and overwintering habits.** During the initial population evaluation using electrofishing, 50 radio tags will be surgically implanted into carp so their movements can be tracked and documented. This will allow us to determine where fish removals may be most effective, and where carp may be moving in and out of the system. Further, this approach allows us to determine spawning areas for future control. These data will be used to determine if carp barriers are necessary, where they are needed and where carp are spawning.
Reducing the numbers and biomass of common carp in the lake. Once the carp population dynamics are understood so that future recruitment and immigration can be controlled, carp removal will occur using seining by local commercial fisherman or other techniques as appropriate. The goal is to reduce the carp population below 150 kg/ha to allow for aquatic plant establishment.
3. **Preventing or limiting future reproduction of common carp in the lake system.** As the carp population is reduced, ALASD is committed to limiting carp reproduction and immigration through the use of carp barriers, aeration, or other techniques necessary. Carp barriers may include grates, velocity barriers, permeable berms, or drop structures. Because the extent and design of these projects is not known, the District is committed to implementing these projects using their own funds as needed. The City of Alexandria is committed to taking over long-term management of carp once this project is complete.
4. **Measure impacts of carp management on water quality and submersed aquatic vegetation.** The final step is to determine the water quality benefits of the carp management efforts through aquatic plant surveys and water quality monitoring. The District will monitor total phosphorus, chlorophyll-a and Secchi depth. Plant surveys will be completed using Minnesota DNR point intercept methods.

ACTIVITY 2 ENRTF BUDGET: \$195,000

Outcome	Completion Date
1. Carp Population Estimates and Tracking; The goal of this step is to determine the current carp density in Lake Winona, Lake Agnes and Lake Henry to estimate impacts to water quality. In shallow lakes, carp densities greater than 190 kg/ha can limit submerged aquatic vegetation.	Dec. 2021
2. <i>Quantifying immigration/migration in the lake system, spawning areas, and overwintering habits.</i> The goal of this step is to determine spawning areas, locations and	Dec. 2021

preliminary designs for carp barriers, determine and install control methods to control carp recruitment, and determine the best methods for removal to reduce carp density.	
3. <i>Reducing the numbers and biomass of common carp in the lake.</i> Carp removal will be conducted using the most appropriate method including seining by commercial fisherman, trapping, or other methods. The goal of this step is to reduce carp populations in Lake Winona, Lake Agnes, and Lake Henry to less than 150 kg/ha.	March 2023
4. <i>Measure impacts of carp management on water quality and submersed aquatic vegetation</i> The ultimate goal is to sustainably reduce carp densities in Lake Winona, Lake Agnes, and Lake Henry below 150 kg/ha, prevent spawning and recruitment by limiting access to spawning areas and preventing carp from immigrating into the system using barriers or other technologies, and provide a long term carp management plan for the City of Alexandria to implement using the Integrated Pest Management approach developed by University of Minnesota Researchers. The project should result in greater that 80% of the lake covered in submerged or emergent aquatic vegetation.	June 30, 2024

Project updates inclusive of each relevant activity will be made consistent with section II.

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ACTIVITY 3: Establishment of Clear Lake State and Submerged Aquatic Vegetation through Whole Lake Drawdown (if necessary) [Note: If the Whole Lake Drawdown is necessary it would be self-funded by ALASD].

Description: The goal of the project is to establish submerged aquatic vegetation in Lake Winona and flip the lake the clear lake state. Recent work by the University of Minnesota suggest that this can be accomplished through carp management. However, if carp management (activity 2) fails to result in the plant dominated state and achievement of water quality standards, the next step in the lake management sequence is to pursue a whole-lake drawdown. Ducks Unlimited and the Minnesota DNR routinely conduct whole lake drawdowns in Minnesota to establish submerged aquatic vegetation and most of the examples for shallow lake restoration in the Upper Midwest include combined management techniques of carp removal and whole-lake drawdown. These projects have demonstrated good success in invigorating the existing seed bed resulting in plant establishment without any need for transplanting. While we are confident that carp removal will result in plant establishment in Lake Winona, additional efforts may be needed to switch the lake into the clear lake state. In the case of Lake Winona, drawdown will be extremely expensive and is a more onerous process that requires approval by 75% of riparian landowners.

ACTIVITY 3 ENRTF Budget: \$0

If this phase of the project is necessary the cost will be borne by the District (est. \$500,000- \$750,000).

Outcome	Completion Date
1. Evaluate feasibility of Whole Lake Drawdown (perform landowner survey). The District will conduct a landowner survey to gauge support for the drawdown. The District will also conduct a hydrologic analysis to determine the methods and feasibility of conducting a drawdown on Lake Winona.	Dec. 2023
2. Conduct Drawdown, if feasible. If feasible and necessary, the District will lower water levels in Lake Winona exposing as much of the sediment surface as possible in late summer and early fall. The outcome of the project will be to expose sediment of Lake Winona for 2 to 3 months.	Oct. 2026
3. Water Quality and Vegetation Monitoring. Result of the project will result in greater than 80% coverage in submerged aquatic vegetation and water quality (chlorophyll-a and Secchi depth) meeting water quality standards.	Oct. 2028

Project updates inclusive of each relevant activity will be made consistent with section II.

IV. DISSEMINATION:

Description: ALASD’s website will be the principal vehicle for dissemination of information and results related to the project, including status updates. However, the City of Alexandria will be an active participant in the project and will also use their communication department to disseminate information regarding the project. ALASD will also likely hold at least one additional public meeting associated with the project and engage in additional efforts to keep the media informed about the project. ALASD will adhere to the ENRTF Acknowledgment Guidelines.

Relevant project updates regarding dissemination will be made consistent with section II.

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V. ADDITIONAL BUDGET INFORMATION:

A. Personnel and Capital Expenditures

Explanation of Capital Expenditures Greater Than \$5,000: The District anticipates purchasing a stationary carp tracking device to place at the outlet of the Lake Henry to track carp immigration and emigration. The stationary carp tracking device will be installed and operated throughout the 5 year implementation period, at which time the equipment will be past its useable life.

Explanation of Use of Classified Staff: The appropriation will not be used to pay any classified staff.

Total Number of Full-time Equivalents (FTE) Directly Funded with this ENRTF Appropriation: N/A

Enter Total Estimated Personnel Hours: N/A	Divide by 2,080 = TOTAL FTE: N/A
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Total Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation: The technical analysis will require about 1,400 hours over the course of the project; Subcontractors are estimated to contribute about 300 hours.

Enter Total Estimated Personnel Hours: 1,700	Divide by 2,080 = TOTAL FTE: 0.82
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B. Other Funds:

SOURCE OF AND USE OF OTHER FUNDS	Amount Proposed	Amount Spent	Status and Timeframe
Other Non-State \$ To Be Applied To Project During Project Period:			
The District may need to use its cash resources to fund all or a portion of activity 3 of the project, if said activity is necessary. The District may also fund additional alum if the final calculated dose requires more than budgeted.	\$ 500,000- \$750,000	\$	TBD
Other State \$ To Be Applied To Project During Project Period:			
N/A	\$ N/A	\$	
In-kind Services To Be Applied To Project During Project Period:			
N/A	\$	\$	
Past and Current ENRTF Appropriation:			
N/A	\$	\$	
Other Funding History:			
	\$	\$	

VI. PROJECT PARTNERS:

A. Partners outside of project manager’s organization receiving ENRTF funding

The District’s Executive Director, Scott Gilbertson, will act as the Project Manager. Wenck Associates, Inc. will be the primary technical consultant. Joe Bischoff, a Principal in the firm, will act as project manager for the technical pieces.

B. Partners outside of project manager’s organization NOT receiving ENRTF funding

City of Alexandria

VII. LONG-TERM- IMPLEMENTATION AND FUNDING:

Because completion of several components of the project will be required pursuant to the District's NPDES permit, the District will be responsible to fund efforts not covered by the ENRTF related to the project. It is also anticipated that ongoing efforts will be addressed and funded through the Lake Winona TMDL implementation group of which ALASD is a member and the City of Alexandria is the lead local government agency.

VIII. REPORTING REQUIREMENTS:

- The project that includes ENRTF funding is for 5 years, beginning on or before Sept. 1 2019 and ending on or before June 30, 2024. The overall restoration may need to extend to 2028, but does not require ENRTF funds.
- Periodic project status update reports will be submitted every six months consistent with section II.
- A final report and associated products will be submitted on or before June 30 2024.

IX. SEE ADDITIONAL WORK PLAN COMPONENTS:

- A. Budget Spreadsheet**
- B. Visual Component or Map**
- C. Parcel List Spreadsheet**
- D. Acquisition, Easements, and Restoration Requirements**
- E. Research Addendum**

**Attachment A:
Environment and Natural Resources Trust Fund
M.L. 2018 Budget Spreadsheet**



Legal Citation: M.L. 2018, Chp. 214, Art. 4, Sec. 2, Subd. 4I
Project Manager: Joe Bischoff, Wenck & Associates
Project Title: Adaptive Management Plan—Lake Winona
Organization: Alexandria Lake Area Sanitary District (ALASD)
Project Budget: \$600,000
Project Length and Completion Date: up to 5 years (June 30, 2024)
Today's Date: Aug. 8, 2018

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Budget	Amount Spent	Balance
BUDGET ITEM			
Professional/Technical/Service Contracts	\$200,500		\$200,500
Wenck Associates, Inc.: ALASD has contracted with Wenck & Associates to develop and implement the project and to serve as the technical lead of the project; to implement certain components of the project additional contracts will need to be executed as indicated below; and to provide project design, technical analysis. Wenck will conduct the carp surveys, tag and track carp, complete vegetation surveys, provide design services, and data analysis. Wenck will complete the alum dose calculations, plans and specifications, and data analysis. The District contracts for various services with multiple consulting firms based on qualifications to ensure the highest quality and experience with competitive pricing. Wenck was selected based on their extensive lake management experience, history with the Winona-Agnes-Henry chain of lakes, and experience in alum treatments and shallow lake management.			
Commercial fisherman (carp removal and disposal); Commercial fisher will be hired based on dedicated contracts with area fisherman or competitive bid if the area fisherman releases their rights	\$50,000	\$0	\$50,000
Alum applicators (includes cost of alum). Alum applications will be completed using the competitive bid process.	\$290,000		\$290,000
University of Wisconsin-Stout (sediment analysis). The sediment analysis is a highly specialized technique. The University of Wisconsin Stout is the leading national lab in sediment phosphorus extractions and has completed these analyses for over 50 lakes in Minnesota and Wisconsin. Lab assays for this approach were developed by Bill James at UW Stout	\$50,000		\$50,000
		\$0	\$0
Capital Expenditures Over \$5,000:			
Stationary carp tracker and installation supplies	\$9,500	\$0	\$9,500
COLUMN TOTAL	\$600,000	\$0	\$600,000