

MEETING DATE: July 12, 2018

TITLE: Authorization to Execute Contract with St. Croix Watershed Research Station for Wasserman Lake Sediment Analysis

RESOLUTION NUMBER: 18-067

PREPARED BY: Brian Beck

E-MAIL: bbeck@minnehahacreek.org

TELEPHONE: 952-471-8306

REVIEWED BY: Administrator Counsel Program Mgr. (Name): Brian Beck_
 Board Committee Engineer Other: Anna Brown

WORKSHOP ACTION:

<input type="checkbox"/> Advance to Board mtg. Consent Agenda.	<input type="checkbox"/> Advance to Board meeting for discussion prior to action.
<input type="checkbox"/> Refer to a future workshop (date):_____	<input type="checkbox"/> Refer to taskforce or committee (date):_____
<input type="checkbox"/> Return to staff for additional work.	<input type="checkbox"/> No further action requested.
<input checked="" type="checkbox"/> Other (specify): Approval at July 12th Board Meeting	

PURPOSE or ACTION REQUESTED:

Authorization to execute contract with St. Croix Watershed Research Station to analyze sediments to assess carp impacts on phosphorus cycling in Wasserman Lake and inform future lake management activities.

PROJECT/PROGRAM LOCATION:

Wasserman Lake, Victoria, MN

PROJECT TIMELINE:

July 2018 – Collect and submit sediment samples from Wasserman Lake to St. Croix Watershed Research Station

September 2018 – Obtain sediment results from St. Croix Watershed Research Station

PROJECT/PROGRAM COST:

Fund name and number: Research and Monitoring Department: Water Quality Program (500-5001-4320)

Current Budget: \$40,000 (Responsive Monitoring Budget)

Expenditures to date: \$3,000

Requested amount of funding: \$8,000

PAST BOARD ACTION:

17-036 Authorization to Request Funding from Lessard Sams Outdoor Heritage Council

SUMMARY:

In September of 2017, the Lessard Sams Outdoor Heritage Council recommended the Six Mile Creek-Halsted Bay (SMCHB) Habitat Restoration Project for \$567,000 to the Minnesota State Legislature. The funding bill was approved by the legislature and funds will be available July 1, 2018 for project implementation.

The program takes a holistic and comprehensive approach to managing common carp in the SMCHB Subwatershed, consisting primarily of three management strategies:

- Adult biomass removal
- Aeration of shallow lakes to prevent successful carp reproduction
- Barriers to prevent carp movement between waterbodies and assist with removal

The Research and Monitoring Department staff will be responsible for implementing carp management, as well as developing and implementing a monitoring plan that will evaluate the ecological response from carp removal. Research has shown that carp removal often results in reductions in lake turbidity, improved water clarity and thus increasing aquatic vegetation abundance and restoration of habitat for fish and waterfowl. However, the connection between water quality improvements after carp management are difficult to predict without characterizing the spatial impact of carp on sediment.

As we evaluate the system response to carp removal, we will be better able to identify subsequent management strategies to continue to improve water quality in the system. The purpose of this assessment is to answer management questions related to carp removal in Wasserman Lake. These questions include:

- What is the degree and extent of carp impacts on sediment resuspension and water quality in Wasserman Lake?
- After carp removal, when is an aluminum sulfate (alum) treatment appropriate on Wasserman Lake?

The data collected from this analysis will be used in conjunction with existing water quality, habitat, and fisheries data to provide a better understanding of how carp management will improve water quality conditions in Wasserman Lake and inform other management decisions such as timing of alum treatments.

It is important to note that this is an experimental approach since research on carp impacts on lake water quality in deep and shallow lakes is relatively scarce. Therefore, we are proposing a pilot scale project on Wasserman Lake to determine the efficacy of this method. If successful, we plan to implement this methodology on a larger scale in the SMCHB watershed in order to holistically describe the improvements in habitat and water quality.

Staff are seeking authorization to submit sediment samples to St. Croix Watershed Research Station. Their scope of work includes isotopic analysis of sediment samples from four locations on Wasserman Lake. The total cost for this activity will not exceed \$8,000. These expenditures would be considered matching funds and are not eligible for grant reimbursement.

RESOLUTION

RESOLUTION NUMBER: 18-067

TITLE: Authorization to Execute Contract with St. Croix Watershed Research Station for Wasserman Lake Sediment Analysis

- WHEREAS, pursuant to Resolution 14-047 the MCWD Board of Managers has identified the Six Mile Creek-Halsted Bay (SMCHB) Subwatershed as a priority area for focusing District planning activities and coordination efforts with subwatershed partners; and
- WHEREAS, on October 10, 2013, the MCWD Board of Managers authorized the execution of a contract with Dr. Peter Sorenson and the University of Minnesota to conduct a three-year carp assessment of the SMCHB subwatershed to identify recruitment, carp census, and management strategies; and
- WHEREAS, in May of 2017, the MCWD Board of Managers authorized staff to apply for funding to the Lessard-Sams Outdoor Heritage Council to restore 2,488 acres of deep and shallow lake habitat through carp management; and
- WHEREAS, at the February 22, 2018 MCWD Planning and Policy Committee meeting, staff presented the Lessard-Sams Outdoor Heritage Council approved accomplishment plan, under which the grant funds capital cost of barrier installation, utility installation for aeration, and the fish removal contracts; and the District match includes equipment for removal and monitoring, the aeration units, and design services for barriers; and
- WHEREAS, the District’s Research and Monitoring Program is developing a monitoring plan to evaluate the ecological response across the subwatershed from carp removal, and identify future implementation strategies to achieve further water quality improvements; and
- WHEREAS, sediment samples will be collected by District staff and submitted to St. Croix Watershed Research Station to assess the impact carp have on sediment resuspension and phosphorus cycling in Wasserman Lake; and
- WHEREAS, this analysis will help inform future management strategies in Wassermann Lake to address internal loading;

NOW, THEREFORE, BE IT RESOLVED that the Minnehaha Creek Watershed District Board of Managers hereby authorizes the District Administrator to execute contract with St. Croix Watershed Research Station for sediment analysis in Wassermann Lake that is not to exceed \$8,000.

Resolution Number 18- was moved by Manager _____, seconded by Manager _____.
Motion to adopt the resolution ___ ayes, ___ nays, ___ abstentions. Date: _____.

Secretary

Date: _____

A Pilot Study of Sediment Mixing by Common Carp using Cosmogenic Beryllium-7 (^7Be)

Dr. Daniel Engstrom: dre@smm.org

Dr. Shawn Schottler: schottler@smm.org

St. Croix Watershed Research Station, Science Museum of Minnesota

July 9, 18

Overview

Mixing of lake bottom sediments by common carp has the potential to increase internal loading of phosphorus (P) to the water column, thereby limiting efficacy of watershed BMPs as well as in-lake P-inactivation (alum treatments). Possible negative effects of carp bioturbation include removal of rooted aquatic plants, resuspension of sediment particles, and disruption of the oxidized sediment surface.

An important first step in understanding the impact of carp on sediment-P release is the determination of the depth and spatial extent of sediment mixing. Here we propose to employ beryllium-7 (^7Be), a short-lived, naturally occurring radionuclide to assess carp mixing depth in Wasserman Lake (Carver County, MN). Beryllium-7 is formed in outer space (cosmogenic) and deposited to the earth's surface in rainfall. It has a half-life of just 53 days and attaches readily to sediment particles, such that recent sediments in lakes are enriched in ^7Be , while deeper layers are depleted. Mixing (by carp, burrowing organisms, bottom currents) will move some the surface ^7Be downward in the sediment column, such that the depth profile of ^7Be provides a direct measure of mixing depth. We have used this approach to assess mixing caused by wave-induced turbulence in large shallow basins such as Lake Okeechobee, Florida, and Lake of the Woods, Minnesota/Ontario. Mixed depths in these basins was on the order of 1-3 cm in deeper regions of the lake.

A recent assessment of carp mixing using alum treatment as a sediment tracer indicated a mixed depth on the order of 10-12 cm. This amount of mixing could be near the limit at which ^7Be might be detectable, depending on sediment density and the cumulative mass of sediment into which the ^7Be -enriched surface layer would be redistributed. Another issue that requires study is spatial variability in mixing, which might be expected to be greater in oxygenated littoral areas than in deeper and possibly hypoxic areas of the basin. A third concern is the need to quickly measure samples following collection and before a substantial fraction of the ^7Be originally present decays away, further limiting detection and accurate assessment of mixed depth. For these reasons, we are proposing a pilot study to determine feasibility of this approach to assess sediment mixing by common carp.

Methods

Field sampling

A preliminary set of 2 cores will be collected from Wasserman Lake, one from a shallow littoral area and the other from a deep area of the basin. The cores will be collected by MCWD staff based on known carp distribution in the lake and using a wide-diameter gravity corer. The cores will be sectioned into 1-cm intervals down to a depth of 15-20 cm and placed in wide-mouth sample jars. Collected cores must have a visibly intact sediment-water interface upon retrieval. The cores will be maintained undisturbed in vertical position until sectioning. The samples will be immediately transferred to the St. Croix Watershed Research Station (SCWRS) where they will be processed and counted for ^7Be .

Once this first set of cores is counted, and based on the preliminary results, a second set of 4 cores – 2 each from shallow and deep parts of the basin and distant from one another and the original 2 cores – will be collected and processed in a similar manner. The strategy here is to quickly assess the depth distribution of ^7Be and the number of samples that need to be counted before proceeding with the second

set of cores. The aim is to both increase lab (counting) efficiency and also limit the amount of radioactive decay once cores are removed from the lake and stop accumulating new ^7Be .

Laboratory analyses

Samples will be logged upon receipt at the SCWRS and immediately freeze-dried. Water content will be determined as part of the drying process so that dry density and cumulative dry mass of the sediment column can be calculated.

Beryllium-7 will be analyzed on 6-8 sections in each sediment core to determine the depth and degree of sediment mixing. We anticipate, based on prior experience, that ^7Be activity (concentration) will decrease somewhat with depth in the sediment column owing to less frequent mixing by carp. This depth distribution can ultimately be used to simulate sediment mixing regime, although such modeling efforts are not included in this pilot study.

Isotopic activities will be measured at 477.56 keV for 1-3 days using an EG&G Ortec high-resolution germanium well detector and multichannel analyzer. For counting approximately 5 cm^3 of sediment are packed into a 1-cm x 10-cm polycarbonate tube and sealed with a plastic cap; the mass of sediment associated with this volume is generally between 0.5 and 3 grams.

Reporting

Results will be summarized in tabular (Excel) and graphic formats, which will be accompanied by a brief written summary with recommendations for further application of the method.

Cost

A total of 40 samples will be analyzed at a cost of \$200 each, for a total project cost of \$8,000. The number of samples counted per core will vary, depending on initial results, with the aim of optimizing the number of cores analyzed along with stratigraphic (depth) resolution of each core.

Time Frame

Analyses will begin immediately upon receipt of core samples, and each will require an average of 2 days to count, or 40 days (5 weeks) total on our two gamma detectors. An additional week will be required to freeze-dry and prepare the samples for counting for a total of 6 weeks analytical time. With data processing and report preparation the project will require 8 weeks (two months) to complete, assuming no delays in sample collection and delivery to SCWRS.