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Memorandum

To: Bassett Creek Watershed Management Commission
From: Barr Engineering Co.
Subject: Item 5A: Final Results of Carp Population Study on Schaper Pond and Sweeney Lake
BCWMC October 17, 2019 Meeting Agenda
Date: October 9, 2019

Recommendations:

1. Implement carp removal and carp control project consistent with the 319 grant funded project workplan and budget for the Sweeney Lake Water Quality Improvement Project
2. Design project to include in the following activities
    a. Obtain necessary permits
    b. Drawdown (lower) water level in Schaper Pond
    c. Electrofish to remove carp in Schaper Pond
    d. Install four baited box nets for carp removal from shallow areas of Sweeney Lake
    e. Perform post-treatment carp population monitoring to assess population changes and migration between Schaper Pond and Sweeney Lake,

1.0 Background

Schaper Pond is classified by the Minnesota Department of Natural Resources as a public water wetland; it is located south of Sweeney Lake and north of Highway 55 in Golden Valley. The pond receives about 90% of its flow from the Sweeney Branch of Bassett Creek from the south (under Highway 55), and 10% of its flow from a stormwater inlet (called the Railroad inlet) in the northwest lobe of the pond. The pond outlets directly to Sweeney Lake from its northeast lobe (Figure 1).

The BCWMC selected the Schaper Pond Diversion Project alternative from the Schaper Pond Improvement Project feasibility study (Barr, 2012). The City of Golden Valley constructed this BCWMC CIP project in 2015, which was designed to divert water, via a floating water baffle, within the pond to direct more of the water flows to the northwest part of the pond so that more settling could occur. Based on the 2011 monitoring data and modeling, it was believed that the diversion would reduce the amount of phosphorus reaching Sweeney Lake by an estimated 81 - 156 pounds per year.

After the floating barrier was secured and working properly, the Commission approved a program to monitor the effectiveness of the diversion project in 2017. Figure 1 shows the water quality grab sample locations in both 2011 and 2017 (using identical equipment and methods). When comparing the water quality in the pond and upstream of the pond between 2011 and 2017, it was determined that Schaper

Figure 1

MONITORING & BAFFLE LOCATIONS
Schaper Pond Effectiveness Monitoring
Bassett Creek Watershed Management Comission

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Pond was not removing suspended solids or total phosphorus as well as it did in 2011, and during most of the monitored events, the flow-weighted pollutant concentrations were higher at the pond outlet than the combined inflows. (In other words, after the diversion project was completed, more total phosphorus was leaving the pond than entering the pond.) In addition, a single longitudinal monitoring event appeared to provide a better understanding about where within the pond system the treatment effectiveness is compromised.

2.0 Results of preliminary monitoring and surveys

The 2017 monitoring indicated that there were unexpected factors contributing to the results, which had not previously been assessed (e.g., carp) or might require updated information (such as the pond's bathymetry). Consequently, additional monitoring occurred during the summer of 2018 to identify the gaps in the available data and distinguish the source(s) or factors that are limiting the treatment capacity of the pond. The additional monitoring included performing longitudinal water quality monitoring and surveys of the carp and pond's bathymetry. Results of the 2018 monitoring and surveys indicated the following:

- The bathymetric survey indicates that some sedimentation has taken place in discrete areas of the pond, but that it is unlikely that those changes have greatly altered the settling or treatment capacity in the northwest corner of the pond.

- The water quality monitoring confirmed that pollutant concentrations are higher as the flow moves longitudinally through the pond. One out of the four water quality monitoring events showed that sediment phosphorus release could have contributed to higher phosphorus levels at the outlet, compared to the upstream sites. Otherwise, it does not appear that anoxic sediment phosphorus release is a significant source of the phosphorus that reaches the outlet when higher flows (above summer baseflow levels) are conveyed through the pond.

- The first carp survey estimated the carp population in the pond that day to be 227 individuals, with an average mass between 4 and 5 pounds. The carp biomass for the pond at that time was calculated to be about 368 kilograms/hectare, which is nearly four times the recommended threshold for carp management. The second survey resulted in the capture of 37 carp in one hour of electrofishing. Most of the carp were captured in the deeper-water portion of the northwest lobe. Six of the 37 carp were young of year (YOY), making it very likely that successful recruitment (i.e., fish surviving to enter the fishery or a mature life stage) occurred this year, and likely within Schaper Pond (i.e., these fish likely hatched, and continue to survive, in the pond). Three of the 37 fish were recaptured from the first survey, which provided another way of assessing the population.

3.0 Results of additional carp survey work

The initial carp surveys confirmed that large numbers of carp inhabit the northwest lobe of Schaper Pond, with more than enough biomass to adversely impact water quality, including indications that Schaper Pond represents a place for rearing young-of-year carp. As a result, the Commission (at its September 2018 meeting) approved additional carp monitoring during the fall of 2018 and spring of 2019. This additional carp monitoring was intended to gather the kind of data needed to make future carp management decisions, including information about carp recruitment and mobility throughout the Sweeney Branch system.

PIT (passive integrated transponder) tags were attached to nearly all of the carp that were caught during the October, 2018 carp survey and antenna stations were installed at the Hwy 55 inlet and the Schaper Pond outlet to Sweeney Lake. PIT tags are attached to carp, and used in conjunction with stationary antenna (to trip a signal) and recorders, to track the movement of each fish. PIT tags provide a means to obtain representative data on the whole carp population (including young of year carp), including the upstream and downstream movement of the carp from the pond over time.

Three boat electrofishing surveys were conducted in October 2018; two in Sweeney and one in Schaper. A total of 206 carp were captured (70 in Shaper and 136 in Sweeney). Of the 70 carp tagged in Schaper Pond, 50 were young of year and 20 were adults. Based on the average electrofishing catch of carp per hour, the carp biomass in the Schaper Pond and Sweeney Lake systems are estimated to be 420 and 1,030 kg/ha, respectively.

PIT antennas showed that very little movement occurred in the fall of 2018. Nevertheless, there were two tagged young of year carp, both of which were tagged in Schaper Pond, which moved downstream to Sweeney Lake on 11/25/18. No detections were recorded over the winter, but more movement occurred in April of 2019. Between April 8 and June 27, 2019, there were 31 unique carp that crossed at least one of the two antennas. All of these carp were tagged as adults and there were no detections of young of year carp at either antenna. Of the 31 carp detected, 7 were originally tagged in Schaper Pond (35% of tagged adults) and the other 24 were from Sweeney Lake. The antenna at upper Schaper Pond (pump house) detected a total of 21 unique tags (7 from Schaper Pond and 14 from Sweeney Lake).

4.0 Conclusions and Recommendations

Electrofishing surveys suggest that carp biomass in both Schaper Pond and Sweeney Lake is extremely high, 5 to 10 times above the threshold associated with impacts on water quality (Bajer et al., 2009). Young of year carp were captured in Schaper Pond, suggesting that this system functions as a nursery for carp from Sweeney Lake. However, relatively few of these fish moved downstream from Schaper Pond to Sweeney Lake in the fall and spring. On the other hand, adults moved frequently between the two systems. The migration of juvenile carp is often delayed until the 2nd or 3rd year of life (Lechelt et al.,

2017). Thus, more intense movement of the monitored young of year carp might occur later in 2019 or 2020.

Management recommendations include the reduction of carp biomass in Sweeney Lake and Schaper Pond below 100 kg/ha. Consistent with the 319 grant funded project workplan for the Sweeney Lake Water Quality Improvement Project, it is recommended that the Commission perform carp removal and control work in Schaper Pond and Sweeney Lake in 2020 and 2021. This work, funded through MPCA's 319 grant, would include design, permitting, and the drawdown and electrofishing of Schaper Pond to remove carp under low flow conditions, the installation of four baited box nets for the removal of carp from the shallow areas of Sweeney Lake, followed by post-treatment carp population monitoring to assess changes to overall populations and migration between Schaper Pond and Sweeney Lake. These recommended carp management activities are in-line with the 319 grant budget. While the 319 grant workplan has a flexible timeline (up to a year-and-a-half), it is expected that these carp management actions would largely occur during the spring and summer of 2020, followed by the first phase of the Sweeney Lake alum treatment in the fall of 2020. It is expected that carp removal will restore the water quality treatment capacity of the Schaper Pond diversion project, which should result in a 100 pound reduction of total phosphorus delivered to Sweeney Lake (Barr, 2012). It is also noted that the water quality improvements envisioned for all of the 319 grant funded project activities should be realized as long the Sweeney Lake aerators are not used during the summer.

Physical and non-physical migration barriers can also be considered as future management actions, if post-treatment carp population monitoring indicates that additional carp control efforts are necessary.

References

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