

Hey and Associates, Inc.

Water Resources, Wetlands and Ecology

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MEMORANDUM

TO: Kirk Reimer and Dennis Jahnke, CLPD

CC: Gary Schaefer and Neal O'Reilly, Hey and Associates, Inc.

FROM: Dwight Osmon, Hey and Associates, Inc.

DATE: July 17th, 2008

RE: Aquatic Plant Management Recommendations

PROJECT NO. 07068C

Dear Mr. Reimer,

This is a summary of management recommendations and significant findings with respect to the lake-wide aquatic plant survey occurring on July 15th-16th, 2008. We surveyed 37 transects at depths of 2, 4, 6, 8, 10, and 12 feet as appropriate for each site. Some sites did not contain sufficient depth to sample the 8-10 foot depth range.

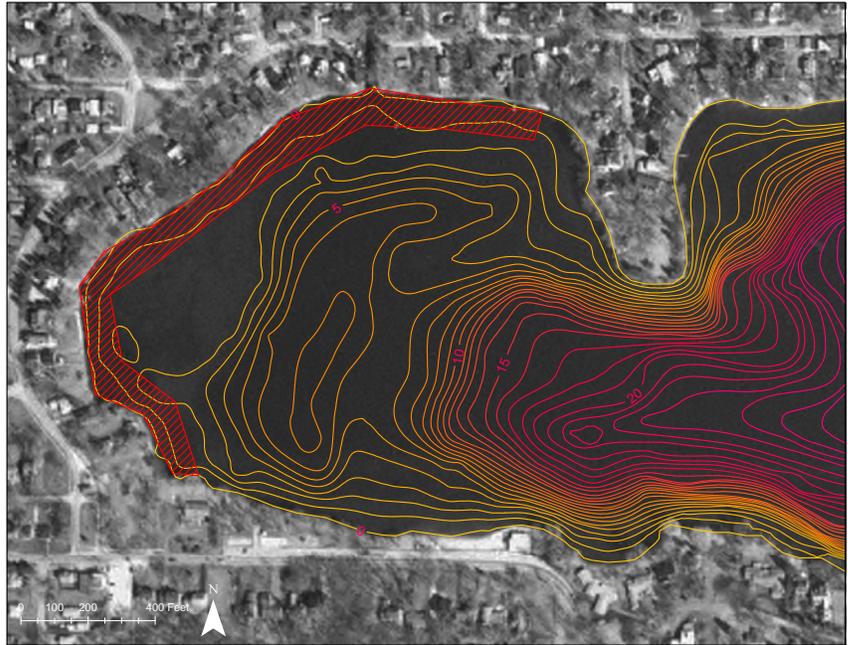
In general the aquatic plant community appears to be comparable to previous years with a few exceptions, but this will be confirmed with a more rigorous analysis of data included in the final summary report.

Eurasian water-milfoil is largely absent from deeper areas of the lake targeted for potential treatment in 2007 in the southern portion of the west bay and lake-ward of Main Beach. Eurasian water-milfoil is also largely absent from the small bay just east the peninsula separating the west bay from the main basin.

Similar to 2007 conditions Eurasian water-milfoil has concentrated in the shallow near shore areas of the west bay and is causing some navigation problems. The treatment area for a late summer/fall 2,4-D treatment should be centered on the area from the shoreline out to 150 feet from shore in the west bay from the housing association piers just northwest of the Lakewood police station to the peninsula (see red area on map). The total area of the proposed treatment is approximately 5 acres. The actual treatment area

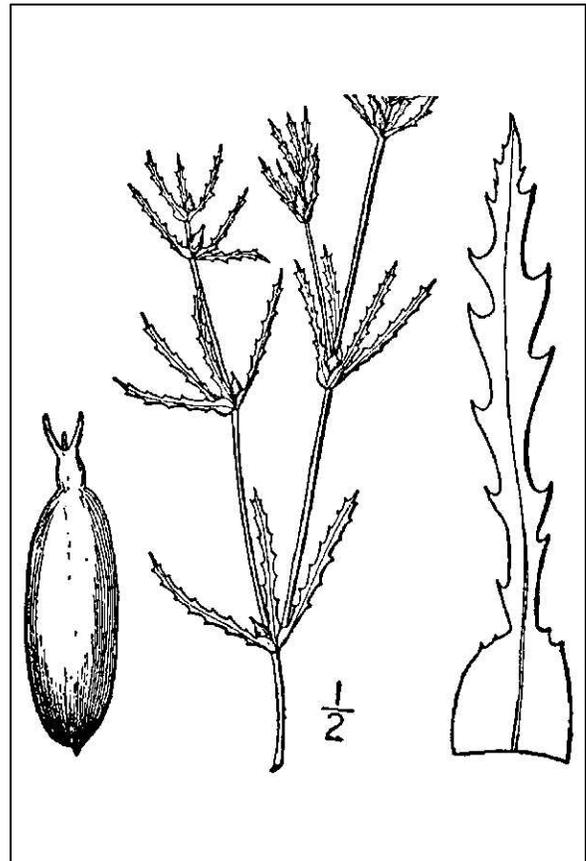
should be determined at the time of application. A dose rate of 100-200 lbs. per acre is recommended to effectively treat Eurasian water-milfoil. A dose rate of at least 150 lbs. per acre is recommended.

Spiny naiad (*Najas marina*, see photo below), a non-native plant, has greatly expanded its range in Crystal Lake. Although the plant is non-native to the region it not documented to cause ecological or recreational problems in infested waters. It has benefit to waterfowl populations as a food source. Comments from the public should be monitored to determine if there are any issues related to its range expansion.



The other emerging issue is the co-expansion of the zebra mussels (*Dreissena polymorpha*) and filamentous algae on the lake bottom. Zebra mussels were found at a large number of sites attached to rocks and plant materials. Filamentous algae were found coating much of the lake bottom and will significantly eclipse the 9% frequency of samples it was identified in 2007.

The UWM WATER Institute has identified a relationship between zebra mussel density and filamentous algae on the bottom of Lake Michigan. In essence, a combination of increased water clarity due to zebra mussel filter feeding of phytoplankton and subsequent deposition of nutrient rich feces on the lake bottom both may contribute to this issue. Because much of the lake bottom of Crystal Lake is rocky, there is little competition for algae if sufficient nutrients become available in those areas.



The relationship to zebra mussels and filamentous algae on the bottom of Crystal Lake is only an observation at the current time, but should continue to be monitored in the future to assess if the pattern continues. Filamentous algae may also be the result of human activities such as fertilizing lawns, poorly maintained septic systems, inadequate sewage treatment, agricultural runoff and detergents containing phosphorus. If the zebra mussel population decreases, other causes may be identified if the filamentous algae persist.

Please feel free to contact me if you have any additional questions at 262-796-0440X20 or via email at dosmon@heyassoc.com.

Sincerely,

Dwight Osmon, CLM
Water Resources Planner