Carleton UNIVERSITY
Canada's Capital University

2020 May Scientific Data Report for MALLA
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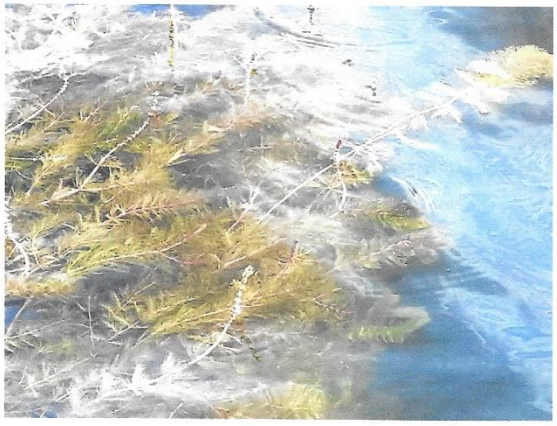
Assessing the physical, chemical and biological impacts of Myriophyllum spicatum L. control by burlap benthic barriers on the Malcolm lake littoral zone



PILOT PROJECT
REPORT ON

EURASIAN WATER
MILFOIL

FOR TOWNSHIP OF
NORTH FRONTENAC

Carleton University participation objectives of this project:

1) **to examine what impact(s) if any, the use of these benthic barriers has on aquatic habitat.**
2) **and to assess the use of biodegradable benthic barriers as a control of dense M. spicatum beds.**

The following summarizes the mean values of water quality parameters measured during the first 4-month sampling period, at depth of 2m:

- Water temperature 21.4 C
- Dissolved Oxygen (DO) 79%
- Conductivity 201 microsiemens
- pH 8.4
- % light reaching bottom 11%
- Dissolved Organic Carbon (DOC) 2.9 m/L
- Total Kieldahl Nitrogen (TKN) 0.54 m/L
- Total Phosphorus (TP) 0.009 mg/L
- Sediment moisture content 96%
- Dry sediment organic content 51%
- Chlorophyll a (Chla, a rough estimate of biomass) 1.9 mg/L

The following is a comparison between control (EWM patches) and impact (EWM smothered by burlap) sites:

- higher **conductivity** in EWM patches (a statistically 'significant' difference)
- lower **pH** in EWM patches (also significant)
- way less **light** penetrating to bottom in EWM patches (also significant)
- similar **DO,** slightly lower in EWM patches (but not significant)
- similar **DOC,** slightly lower in EWM patches (but not significant)
- similar **Chla** slightly higher in EWM (but not significant)
- similar **zooplankton density,** with slightly less in impact areas (but not significant)
- no difference in **temperature**
- no difference in nutrient levels (**TP or TKN**)

In terms of the zooplankton community, it WAS impacted, and quite drastically in terms of community composition (not significantly in terms of total abundance):

- dominance of chydoridae (a small cladoceran crustacean) in EWM patches throughout the sampling period, although more and more copepods as the seasons progressed
- immediately after the mats were laid down the chydoridae were replaced by a surge in bosminidae (a different family of cladoceran crustaceans)
- after that, there was a complete takeover by copepod crustaceans (cyclopidae) in the impact trenches, and an almost complete elimination of cladocerans (the EWM patches were still dominated by chydoridae at the end of the season)

Interpretation:

- nutrient (P) and algae (chla) levels are low (oligotrophic)...yeah!
- benthic barriers do not seem to have any significant impacts on local lake water quality (neither good nor bad). This is consistent with the limited literature on this topic. It will be interesting to see what results are obtained if the grad student is able to measure under the barriers next year.
- The benthic barriers do seem to prevent a drop in pH, which was noted in the adjacent EWM patches. Although the difference is small, it is significant. Generally keeping the pH higher and more stable is actually a good thing, especially for fish. The barriers also allow more light to the bottom, which may provide a (minor) positive benefit to periphyton, and the organisms that graze it (snails). Because the barriers cover the sediment, they do not benefit native macrophytes.
- While the benthic barriers do not have a significant impact on zooplankton density, they do lower it but not significantly. They do change what species live where. This is very open to interpretation, as zooplankton are quite complex organisms that sit in the 'messy' middle regions of aquatic food chains. They are subjected to both top-down and bottom-up pressures. Because zooplankton are a major food source for planktivorous fish (eg. tons of little sunfish!), these barriers will change where fish go in the lake (eg

their dispersal, dispersion and distribution). The benthic barrier strips may provide a corridor for fish travel, particularly bass.

This study examined what impact, if any, these benthic barriers are having on important components of aquatic habitat, including light and temperature, nutrient concentrations, algal biomass, zooplankton abundance, and benthic invertebrates. These data could help lake users and managers across Canada better develop management plans for this invasive species and where appropriate, take management actions to ensure healthy and functional lake ecosystems.