

Goals of the research project

- Identify the plant management techniques being used.
- Evaluate their effectiveness at controlling plant abundance.
- Apply a holistic approach.

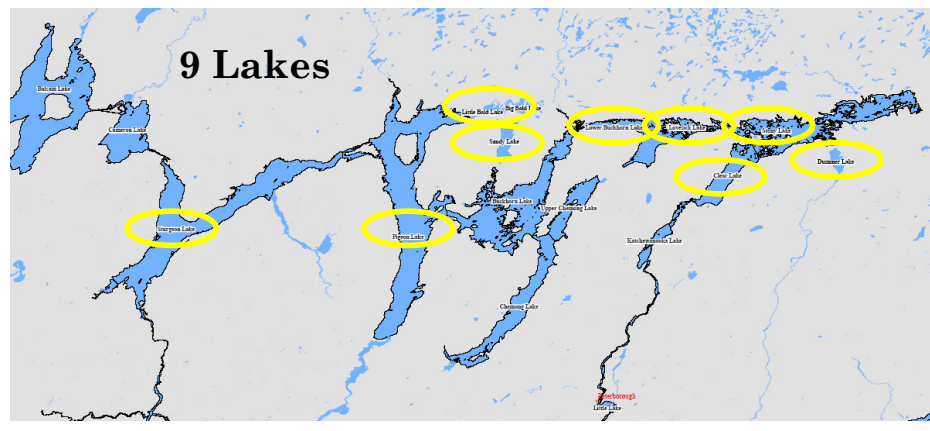


Selecting sampling sites

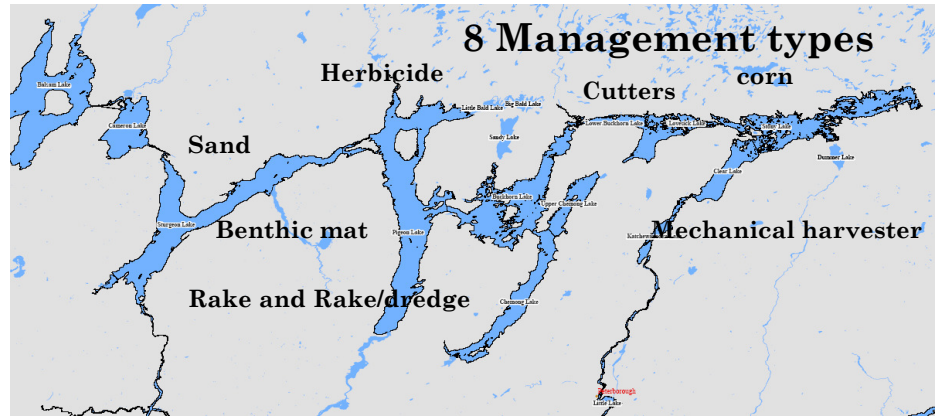
Lakes

Management types

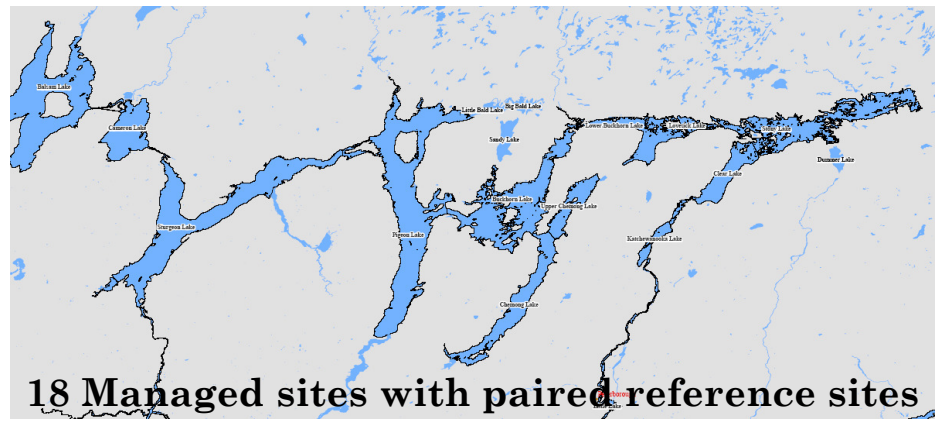
Paired reference sites



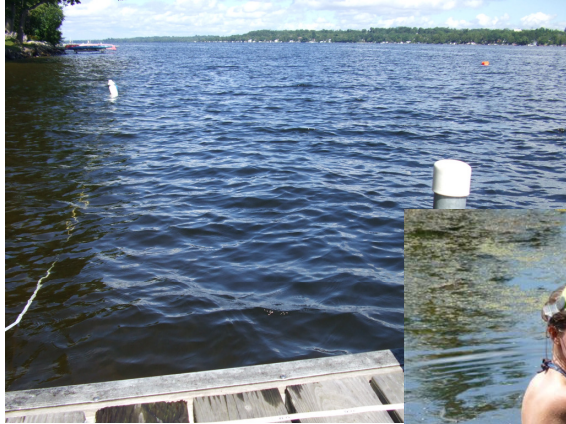
Paired reference sites



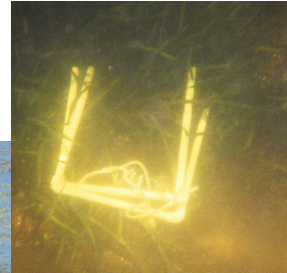
Paired reference sites



Using measuring tapes to mark out an area to randomly sample.



25 cm² sampling quadrants – three sided to make it easier to surround plant stems.



sampling plants along transects, lines perpendicular to the shoreline.



In the water “kick and sweep-ing” for aquatic invertebrates.



In the canoe “bump and sweep-ing” for invertebrates in deeper water.

Sampling Methods: When?

**Early Summer –
late June, early July**

**Mid Summer –
late July**

**Late Summer –
mid-late August**

**Continuous
Methods:
Raking, cutting, etc.**

**Single
Methods:
Herbicide,
harvester**

Plant communities

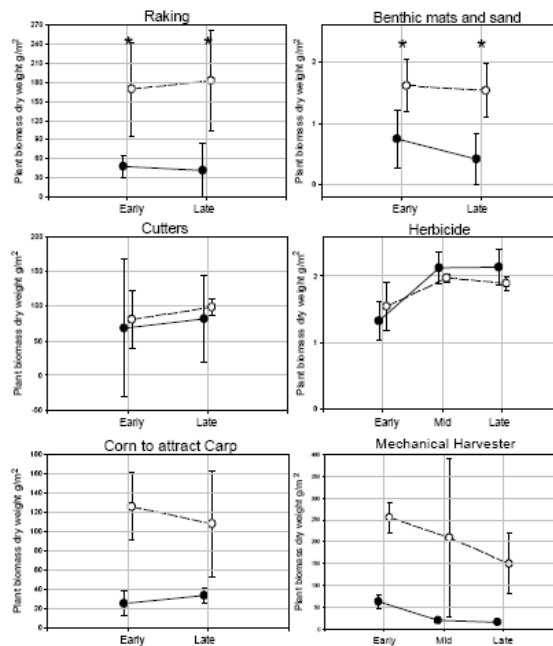
Common plant species – Top 10 List

Early Summer Sampling	Late Summer Sampling
Elodea canadensis	Ceratophyllum demersum
Ceratophyllum demersum	Elodea canadensis
Vallisneria americana	Vallisneria americana
Potamogeton zosteriformis	Myriophyllum spicatum (Eurasian)
Lemna trisulca	Zosterella dubia
Myriophyllum spicatum (Eurasian)	Lemna trisulca
Myriophyllum sibiricum (Native)	Myriophyllum sibiricum (Native)
Ranunculus longirostris	Najas flexilis
Potamogeton pusillus	Potamogeton zosteriformis
Myriophyllum heterophyllum	Chara sp.

Plant communities

Dominant plant species – >40% of the biomass

Early Summer Sampling	Late Summer Sampling
Vallisneria americana	Vallisneria americana
Myriophyllum spicatum (Eurasian)	Chara sp.
Ceratophyllum demersum	Nuphar variegata
Chara sp.	Ceratophyllum demersum
Myriophyllum heterophyllum	Myriophyllum heterophyllum
Elodea canadensis	Elodea canadensis
Nuphar variegata	
Potamogeton pusillus	



Invertebrates – Why bother?



- Environmental monitoring
- Food web complexity
- Pollution/disturbance
- Habitat types

Similarity index for aquatic plants

Management Type	Site ID	Percentage Similarity Index	Average
Raking	CLE	54%	56%
	LBR	68%	
	LOWR	78%	
	WHS	25%	
Benthic mat/sand	LOWS	57%	38%
	LVB	30%	
	PIM	37%	
	SGV	0%	
	WHE	27%	
Cutters	LOD	69%	71%
	LOWC	54%	
	SGW	90%	
	STG	72%	
Herbicide	PIB	6%	51%
	SGM	95%	
Corn for Carp	SGK	73%	58%
	STS	43%	
Mechanical Harvester	WHB	31%	31%

Macroinvertebrate density

Lake	Treatment	Density (# individuals collected/100 seconds)	Species Richness
White	Harvester	444	9
	Reference	909	17
Pigeon	Herbicide	51	17
	Reference	2133	14
Sturgeon	Herbicide	760	16
	Reference	2496	23
Sturgeon	Cutter	991	19
	Reference	2496	23
Lovesick	Benthic	373	14
	Reference	1221	16
Little Bald	Raking	51	11
	Reference	917	21

Aquatic Plant Management Approaches

- Biological
 - Augmenting native and introducing non-native herbivorous species
- Mechanical/Physical
 - Harvesters, diver assisted dredging
- Chemical
- Cultural
 - Prevention, education, Lake BMP

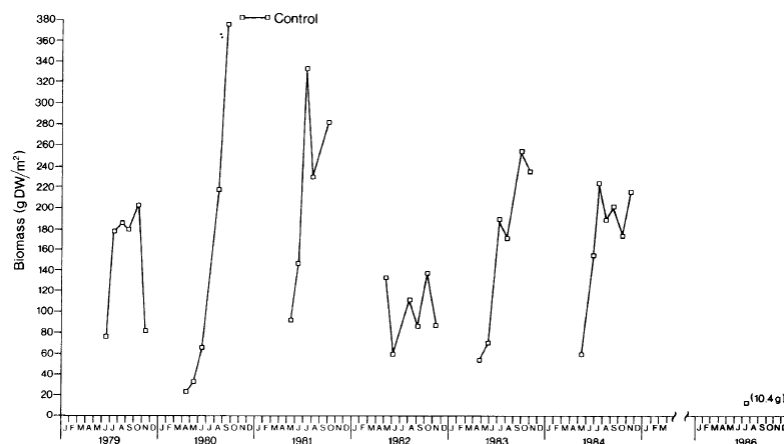


Figure 1. Milfoil biomass (g DW/m²) at a Buckhorn Lake site from 1979 to 1986. 1 standard error = 23% of the mean.

Milfoil Weevil (*Euhrychiopsis lecontei* Deitz)



Figure 3: near adult feeding scars at Cornell University Research Ponds (Photo Credit: Robert L. Johnson, Cornell University, Bugwood.org)

Pyralid Moth (*Acentria ephemerella*)



Figure 4: An adult male moth at Cornell University Research Ponds (Photo credit: Robert L. Johnson, Cornell University, Bugwood.org)

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