Houghton Lake
2007 Aquatic Vegetation Survey Report

Prepared for:

Houghton Lake Improvement Board
PO Box 843
Houghton Lake, MI 48629

Prepared by:

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Grand Rapids, MI 49525-2442
616/361-2664

February 2008

Project No: 55520101

Aquatic Vegetation Survey

ProgressiveAE

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Background

In 2001, the invasive aquatic plant Eurasian milfoil (Figure 1) infested about 11,000 acres (approximately 54%) of the total area of Houghton Lake. Eurasian milfoil crowded out many of the beneficial, native plant species and severely limited fishing, boating, and other recreational activities on the lake. During the summer of 2002, the Houghton Lake Improvement Board coordinated a treatment of the main body of Houghton Lake with the systemic herbicide Sonar® (active ingredient "fluridone") for the purpose of controlling Eurasian milfoil growth. Since 2001, whole-lake aquatic vegetation monitoring surveys of Houghton Lake have been conducted on an annual basis to evaluate the impact of the fluridone treatment and ongoing plant control alternatives.

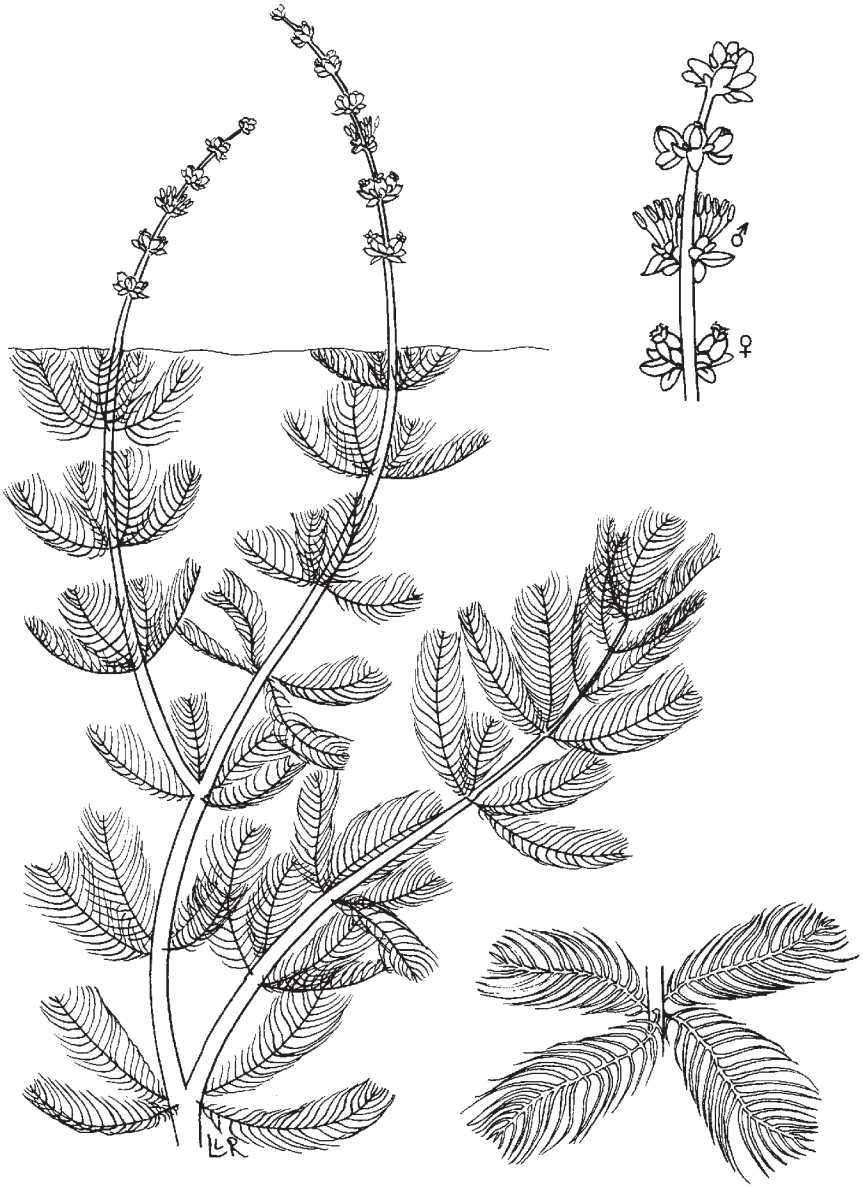

Figure 1. Eurasian milfoil (*Myriophyllum spicatum*). Aquatic plant line drawing is the copyright property of the University of Florida Center for Aquatic Plants (Gainesville). Used with permission.

Aquatic Plant Survey Methods and Results

The 2007 aquatic plant survey data was collected from August 20 through 22 and analyzed using the point intercept method (Madsen 1999). In 2001, a grid of 912 sampling points was established with a global positioning system (GPS) at 300-meter intervals across the lake (Figure 2). Note that grid points were re-labeled with new numbers in 2006 that zig-zag from west to east (left to right) and consecutively from north to south (top to bottom). At each sampling point, a double-sided thatch rake attached to a line was dragged for approximately 15 feet in two rake tosses, one on each side of the boat. Species presence or absence along with an estimate of species density was recorded. Because density estimates are subjective, only the objective measure of species presence and absence is included in this report (Figure 3 and Table 1). Note that some species were lumped together as a genus in 2001 and were recorded as separate species in 2007. These include *Potamogeton epihydrus* and *P. diversifolius* lumped as thin-leaf pondweed and *Najas flexilis* and *N. guadalupensis* lumped as naiad. Table 1 lists all species separate.

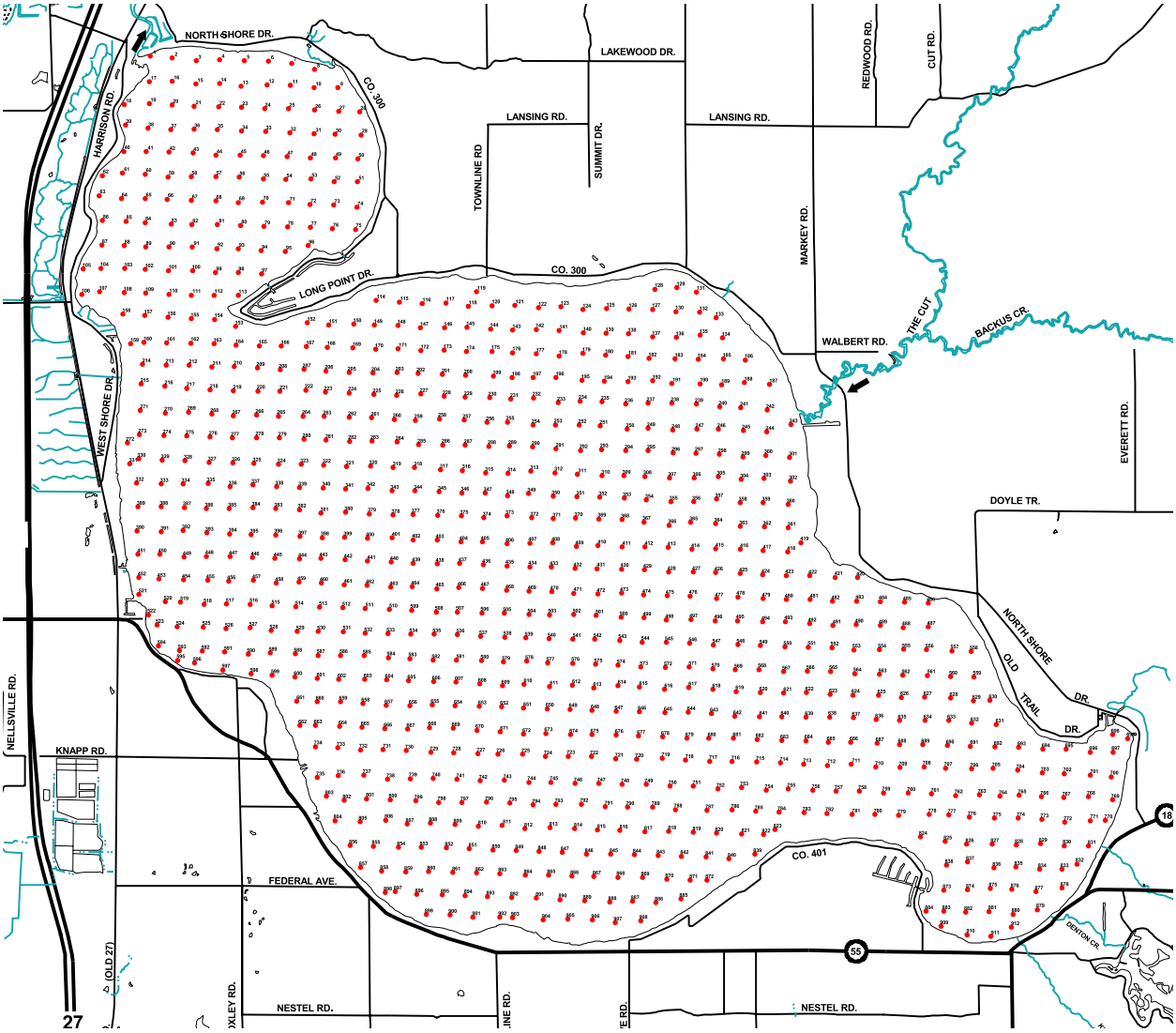

Figure 2. Houghton Lake aquatic plant survey grid point locations.

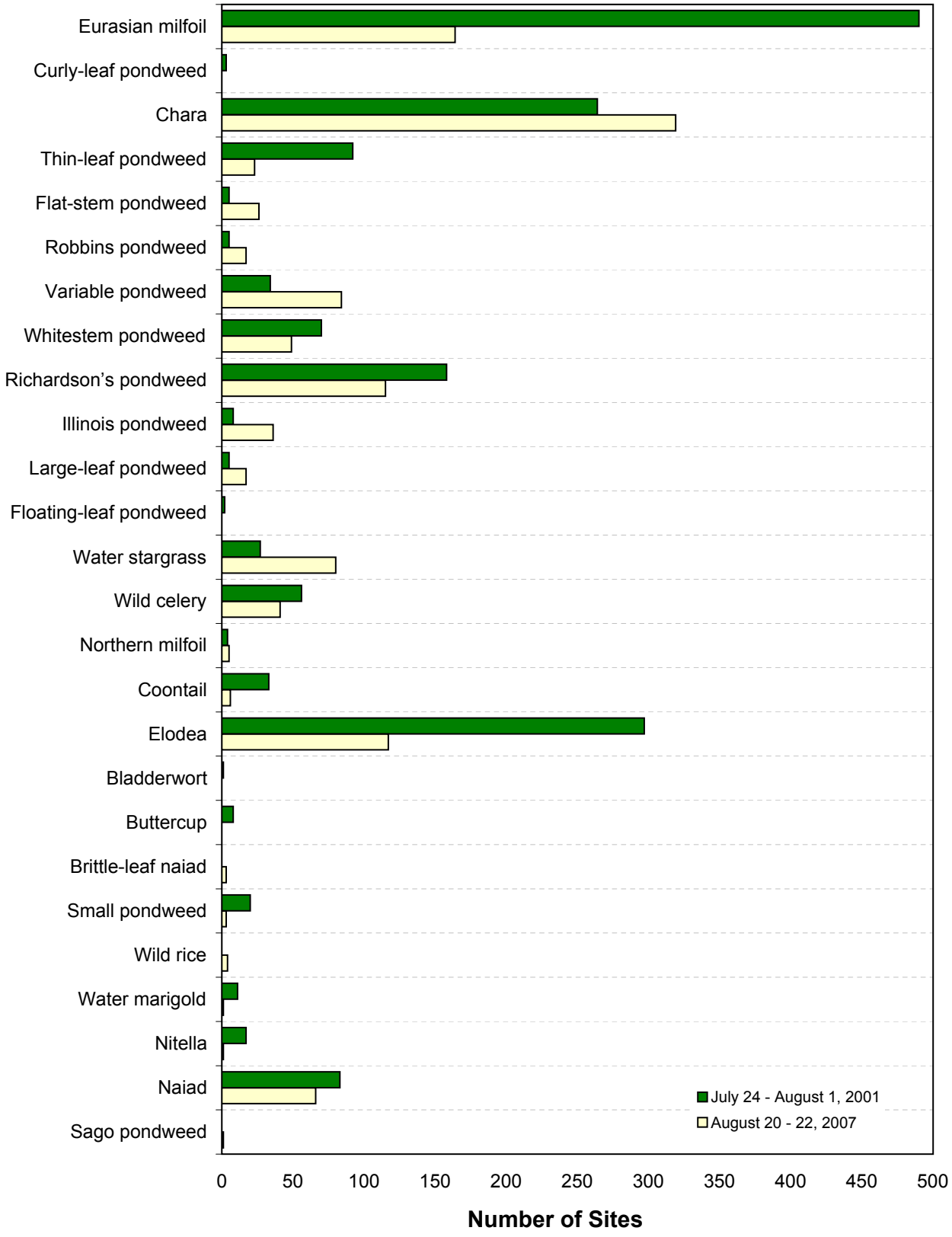

Figure 3. Number of survey sites per plant species in Houghton Lake 2001 (pre-treatment) and 2007 (post-treatment). Ribbon-leaf pondweed (*Potamogeton epihydrus*) and variable-leaf pondweed (*P. diversifolius*) were lumped with thin-leaf pondweed. All *Najas* species were lumped under naiad.

TABLE 1
HOUGHTON LAKE AQUATIC PLANTS
2007

Common Name	Scientific Name	Number of Sites Where Present
Chara	*Chara* sp.	319
Eurasian milfoil	*Myriophyllum spicatum*	164
Elodea	*Elodea canadensis*	117
Richardson's pondweed	*Potamogeton richardsonii*	115
Variable pondweed	*Potamogeton gramineus*	84
Water stargrass	*Heteranthera dubia*	80
Naiad	*Najas* sp.	65
Whitestem pondweed	*Potamogeton praelongus*	49
Wild celery	*Vallisneria americana*	41
Illinois pondweed	*Potamogeton illinoensis*	36
Flat-stem pondweed	*Potamogeton zosteriformis*	26
Thin-leaf pondweed	*Potamogeton* sp.	23
Large-leaf pondweed	*Potamogeton amplifolius*	17
Robbins pondweed	*Potamogeton robbinsii*	17
Coontail	*Ceratophyllum demersum*	6
Northern milfoil	*Myriophyllum sibiricum*	5
Wild rice	*Zizania aquatica*	4
Brittle-leaf naiad	*Najas minor*	3
Small pondweed	*Potamogeton pusillus*	3
Water marigold	*Megalodonta beckii*	1
Southern naiad	*Najas guadalupensis*	1
Nitella	*Nitella* sp.	1
Sago pondweed	*Stuckenia pectinata*	1

Houghton Lake has an abundant and diverse aquatic plant population. When comparing pre- and post-treatment vegetation survey data, the number of species found in the lake has remained largely unchanged. When pondweed and naiad species are lumped as described above, there were 22 species of aquatic plants found in Houghton Lake in 2007, as compared with 23 species before the fluridone treatment. The total number of sites where plants have been observed in Houghton Lake decreased from 706 in 2001 to a minimum of 431 in 2004 but has since increased to 530 (Figure 4).

The total number of species has fluctuated slightly up and down since 2001. Figures 5 through 9 illustrate the population fluctuations over time from the most abundant species (Figure 5) to the least abundant species (Figure 9). A total of 31 aquatic plant species has been found in Houghton Lake since 2001. Eurasian milfoil decreased from 490 sites in 2001 to zero in 2003 and has since steadily increased to the current abundance of 164 sites. Of the 164 sites, the density of Eurasian milfoil was moderate or dense in 34 sites and was sparse in the remaining 130 sites. Other highly abundant plants followed a similar pattern of decrease and increase as Eurasian milfoil. Plants other than the highly abundant species were highly variable with populations fluctuating up and down over time.

If a species' maximum number of sites found in the years 2002 through 2007 is compared to 2001, then four species decreased significantly since 2001 (Eurasian milfoil, Elodea, Richardson's pondweed, and wild celery) while nineteen species increased significantly at some time between 2002 and 2007. Of those that increased, eight species were relatively rare in 2001 (i.e., found in ten sites or less) and remained rare, including six species that were not present in 2001. In addition, one species, wild rice, was not found in 2001 and increased to a maximum of 18 sites in 2004.

Over time, pre- and post-treatment comparisons become less meaningful as treatment effects are masked by other factors. It is recommended that future vegetation monitoring focus more on locating Eurasian milfoil since further spread of milfoil poses a threat to the ecology Houghton Lake.

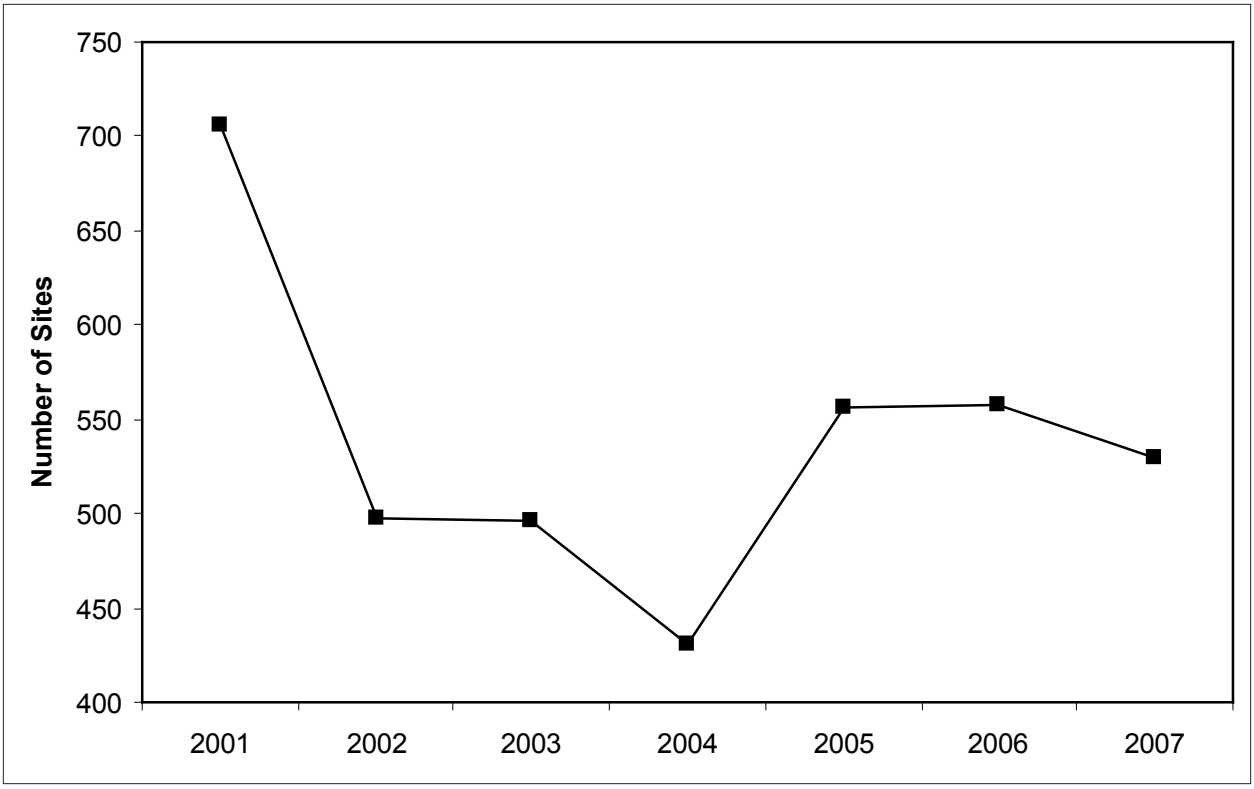

Figure 4. Total number of Houghton Lake sites with aquatic plant present, 2001-2007.

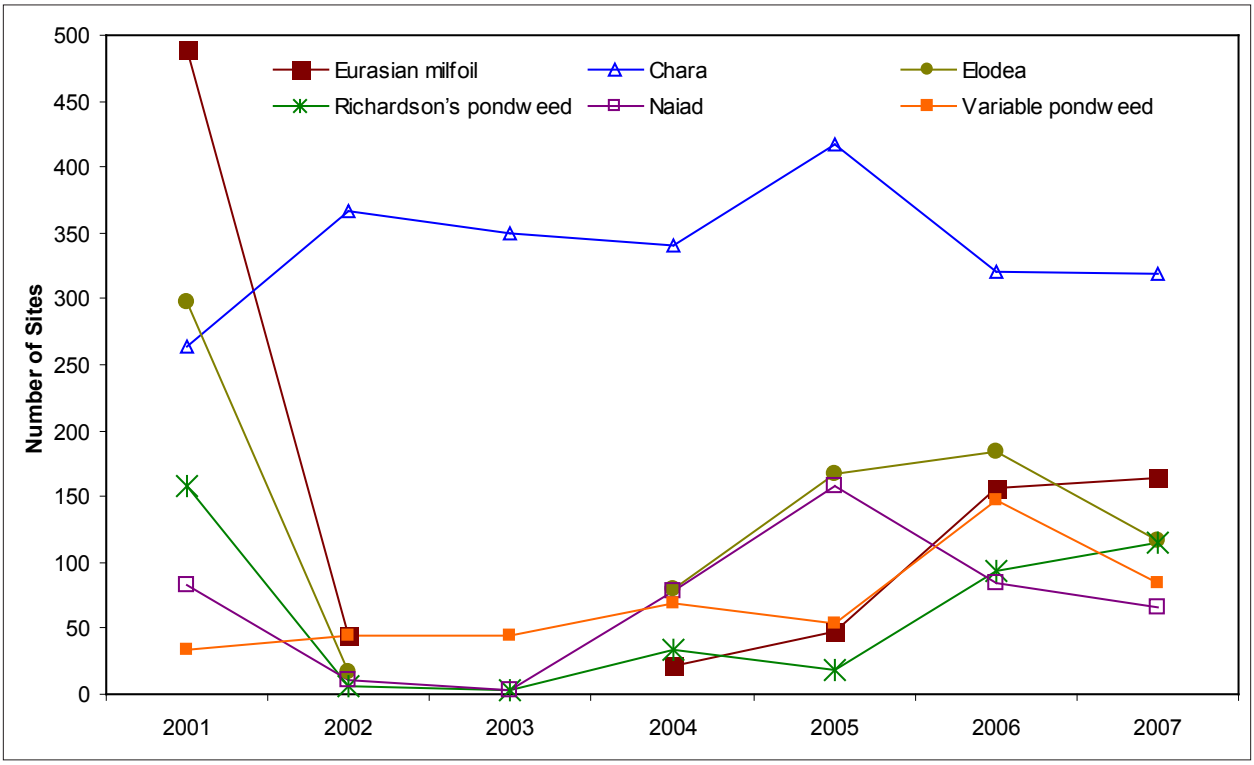

Figure 5. Houghton Lake highly abundant aquatic plant species, 2001-2007. Maximum number of sites where aquatic plant species were observed from 2001 through 2007 is greater than 120.

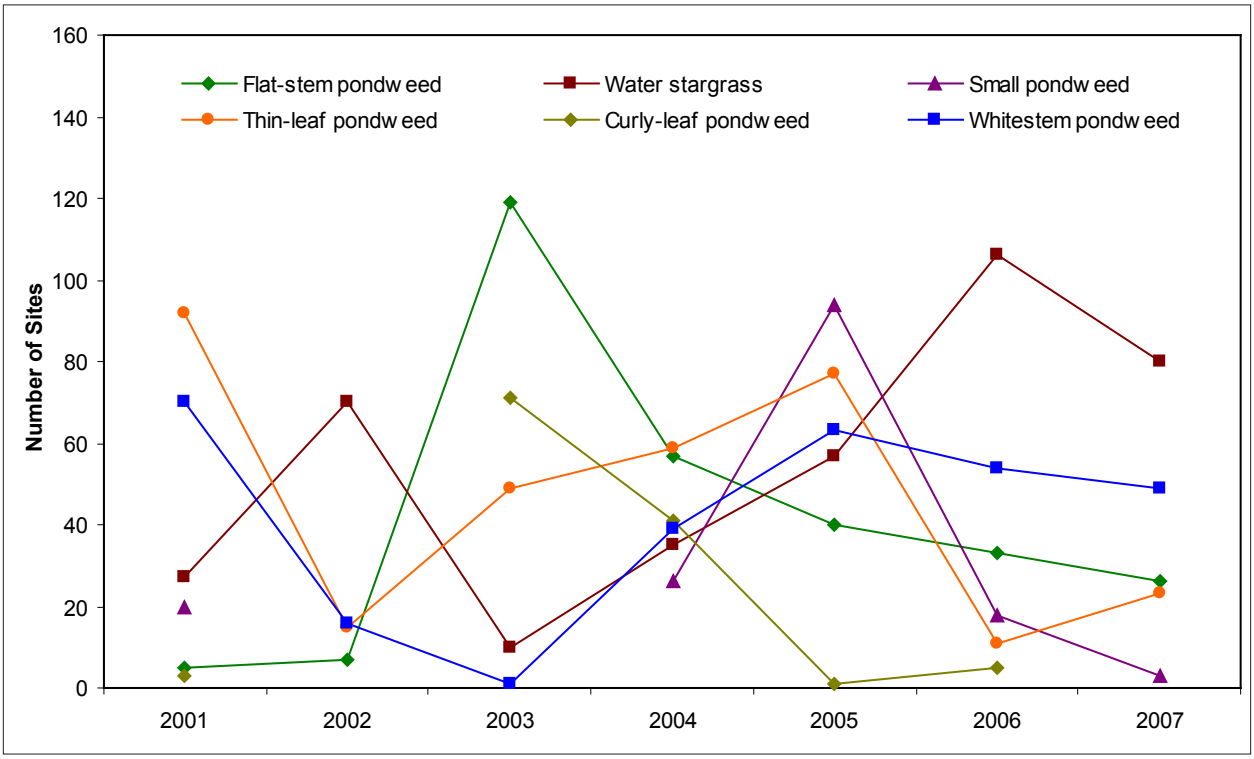

Figure 6. Houghton Lake moderately abundant aquatic plant species, 2001-2007. Maximum number of sites where aquatic plant species were observed from 2001 through 2007 is between 70 and 120.

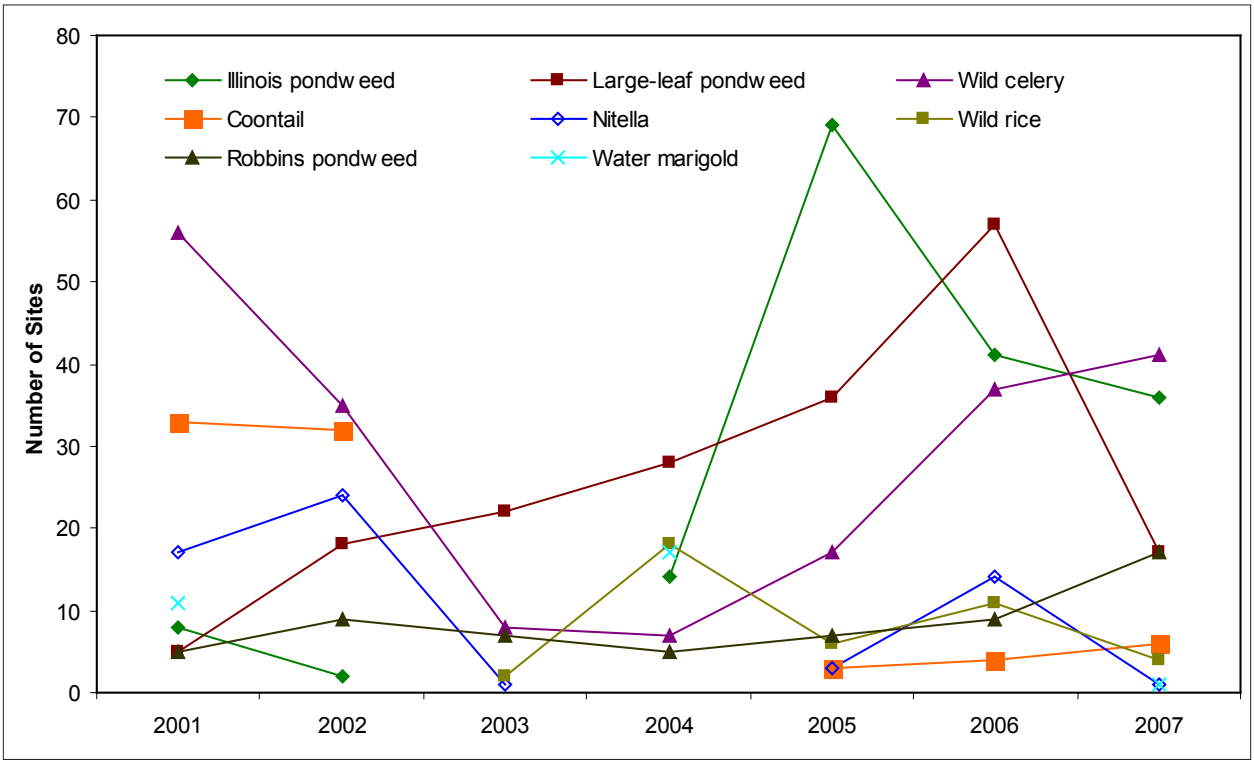

Figure 7. Houghton Lake moderately sparse aquatic plant species, 2001-2007. Maximum number of sites where aquatic plant species were observed from 2001 through 2007 is between 10 and 69.

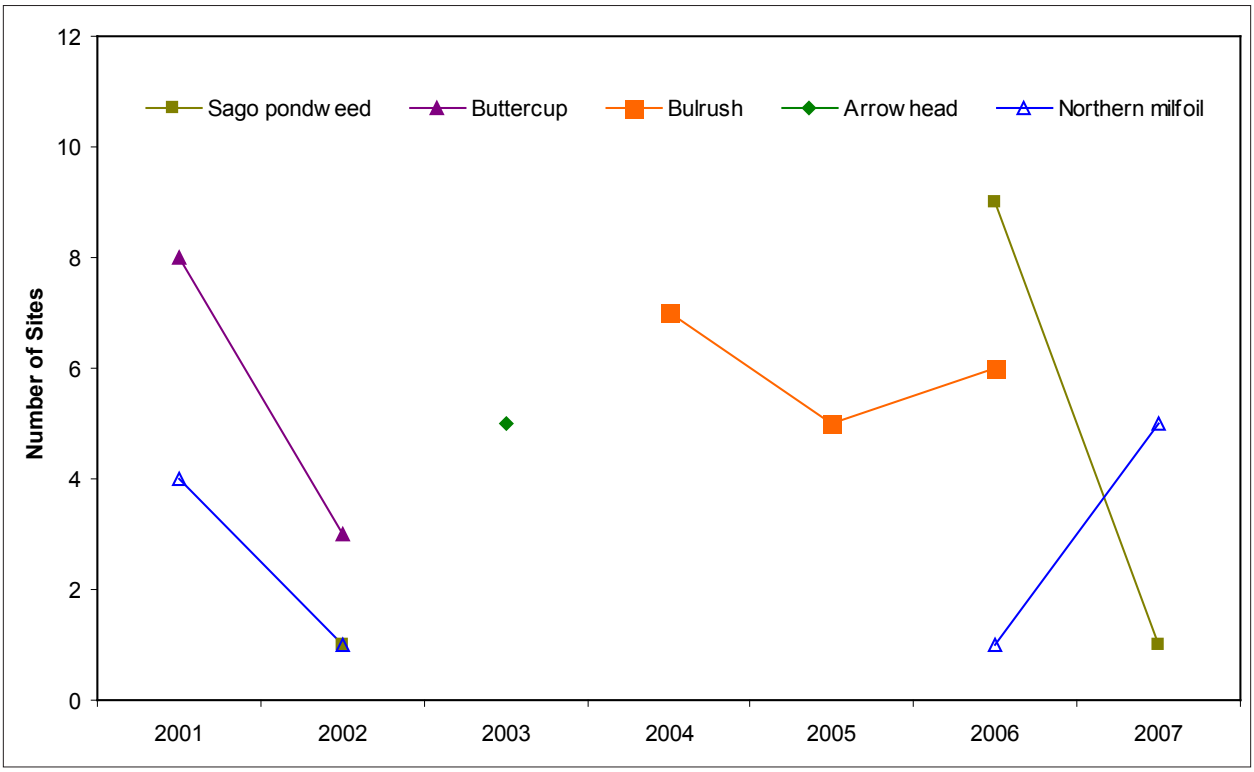

Figure 8. Houghton Lake sparse aquatic plant species, 2001-2007. Maximum number of sites where aquatic plant species were observed from 2001 through 2007 is between 5 and 9.

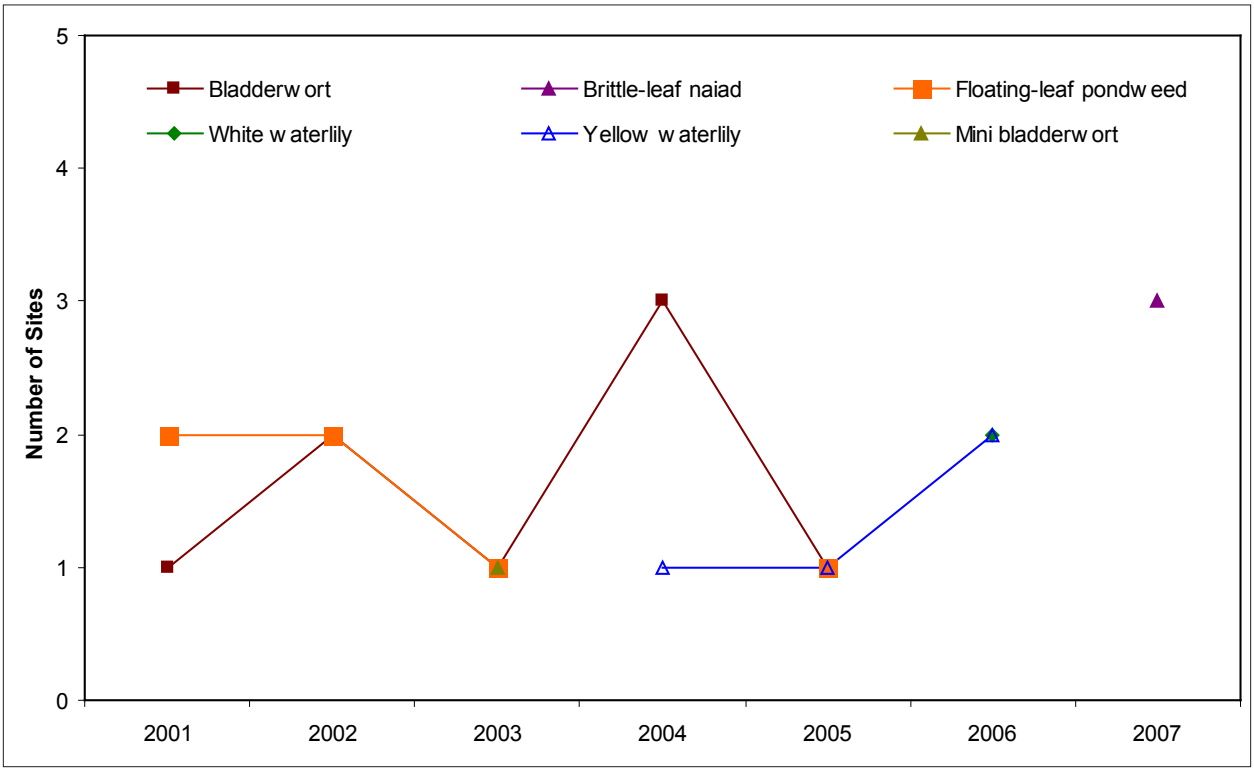

Figure 9. Houghton Lake rare aquatic plant species, 2001-2006. Maximum number of sites where aquatic plant species were observed from 2001 through 2006 is less than 5.

Plant Control in Houghton Lake, 2002 - 2007

A summary of plant control activities completed on Houghton Lake since 2002 is presented in Table 2. Since the whole-lake fluridone treatment of Houghton Lake was completed in 2002, Eurasian milfoil growth has decreased dramatically and measures to control Eurasian milfoil have been limited to relatively small portions of the lake. In 2003 through 2004, a total of only 76 acres of the lake required treatment. Since then, the area treated has increased, totalling 766 acres in 2007. While there has been an increase since 2003, the 2007 treatment area represents less than 4% of the total area of Houghton Lake. In addition to the herbicide treatments, 63,000 weevils (*Euhrychiopsis lecontei*) have been stocked and a total of 270 acres of primarily curly-leaf pondweed in the south end of the lake has been mechanically harvested.

To facilitate plant control efforts in Houghton Lake in 2008, it is recommended that two grid-point plant surveys be conducted, one in June and one in August or September. The survey in June should focus on the presence or absence of Eurasian milfoil and other exotic species in order to target control areas. It would only include those grid points where plant growth has been observed at any time since vegetation monitoring began in 2001, and the number of grid-point intervals would be increased. The grid-point survey in August or September can be used to evaluate the efficacy of early-season control efforts and identify the need for additional control. It should include presence or absence for all species along with an estimate of density to assess the condition of the plant community.

TABLE 2
HOUGHTON LAKE PLANT CONTROL HISTORY

	Herbicides (acres treated)			Acres	Milfoil Weevils
	Sonar®	Contacts	Systemic	Harvested	(# Stocked)
2002	20,044	17			
2003			32		
2004			44	81	5,000
2005		50	395	84	28,000
2006		59	444	105	
2007		106	660		30,000

References

Madsen, J. 1999. Aquatic Plant Control Technical Note MI-02. Point intercept and line intercept methods for aquatic plant management. Us Army Engineer Waterways Experiment Station. Published on the internet at www.wes.army.mil/el/aqua/pdf/apcmi-02.pdf