AQUATIC CONTROL TECHNOLOGY, INC.
POND AND LAKE MANAGEMENT SPECIALISTS

November 20, 2009

Long Sought For Pond Protective Association
Mr. Douglas Bell, President
98 Dunstable Road
Westford, MA 01886

Re: 2009 Year-End Report for the Aquatic Management Program at Long Sought For Pond

Dear Association Members:

Please accept this as our Year-End Report for the 2009 Aquatic Management Program at Long Sought For Pond. Since the 2004 whole-lake treatment with Sonar herbicide to control Eurasian watermilfoil (*Myriophyllum spicatum*), the annual management program has focused on vegetation/water quality monitoring and control of curlyleaf pondweed (*Potamogeton crispus*).

Treatment Program

The Sonar (fluridone) herbicide treatment conducted in 2004 continues to provide excellent control of the Eurasian watermilfoil in Long Sought For Pond. With the exception of a few individual milfoil plants, there has been no other evidence of milfoil re-growth. Another non-native, invasive plant curlyleaf pondweed (*Potamogeton crispus*) became the primary target of management in 2006. Two consecutive years of "spot" treatment with Reward (diquat) herbicide (totaling ~ 20-acres out of the 100-acre pond) reduced the infestation of curlyleaf pondweed to the point where no treatment was required in 2008.

Early season treatments have been shown to be the key to managing curlyleaf pondweed. Although complete eradication is rarely achievable, aggressively treating all occurrences of curlyleaf pondweed with treatment in late April/early May has brought the infestation to a minimal level. After skipping treatment in 2008, the curlyleaf was treated on May 18th to keep the infestation in check. The treatment proceeded smoothly and without incident.

Monitoring Program

Vegetation surveys and water quality sampling/measurements were conducted on May 6th and October 1st. During each visit, the pond's aquatic vegetation was sampled using a combination of visual observation, an Aqua-Vu underwater camera and sub-surface collection with a specially designed throw-rake. Water samples were collected from three stations and a temperature/dissolved oxygen profile and Secchi disk water clarity reading were measured over the deepest point in the pond.

Vegetation Distribution

The assemblage of aquatic vegetation in Long Sought For Pond was surveyed during both visits. Figure 1 & 2 depict the distribution of plants as observed during these surveys. The spring vegetation assemblage was dominated by Robbins pondweed with only several areas of

sparse curlyleaf pondweed as indicated on the map. Robbins pondweed was fairly well distributed on the pond bottom except in areas of deeper water (>~ 15-feet). One specimen of Eurasian milfoil was pulled up on a rake toss, but we were unable to find any further evidence of the plant after a thorough search of the area. The area where milfoil was found also contained scattered curlyleaf pondweed growth and was slated to be included in the upcoming herbicide treatment.

During the September survey, the vegetation assemblage was dominated by a healthy abundance of Robbins pondweed and tapegrass. While neither of these plants were reaching the surface, the spiral reproductive structures of the tapegrass were emerging in some areas. Growth in shallow perimeter areas and within the beach areas was sparse, likely due to sandy substrates. A moderate amount of muskgrass (*Chara sp.*), a beneficial, rooted macro-algae, was observed to be co-habitating the areas of Robbins pondweed especially in deeper water. Widely scattered occurrences of largeleaf pondweed (*Potamogeton amplifolius*) bladderwort (*Utricularia sp.*), curlyleaf pondweed and ribbonleaf pondweed (*Potamogeton epihydrus*) were also observed. Small to moderate sized patches of white waterlilies (*Nyphaea odorata*) were observed in the coves.

No Eurasian milfoil was observed during the fall survey.

Water Quality Observations

Water quality samples were collected during each of the surveys. Three stations were collected in May and three in September (see Figure 1), however one of the samples (Station #2 in May) was damaged on the way to the lab and was not analyzed). The following section presents the results of the laboratory testing with interpretation:

TABLE 1 - WATER QUALITY RESULTS (2009)

Station	Date	PH (S.U.)	Alkalinity (mg/L)	Turbidity (NTU)	Total Kjeldal Nitrogen (mg/l)	Nitrate Nitrogen (mg/l)	Phosphorus (mg/l)	E.Coli (org/100ml)
# 1 (North End)	May	7.18	14	0.75	1.9	<0.1	0.016	<10
	October	6.88	8.9	0.64	0.8	<0.1	0.013	<10
# 2 (South End)	May	NT	NT	NT	NT	NT	NT	NT
	October	6.84	9.3	0.65	0.7	<0.1	0.014	<10
# 3 (Inlet)	May	6.01	3.5	0.92	1.6	<0.1	0.035	80
	October	6.74	32.1	5.7	12.6	<0.1	0.046	<10

pH – The pH measurement scale is from 0 to 14, where zero is extremely acidic, 7 is neutral, and 14 is the most basic. pH is related to the concentration of H^+ (hydrogen ions) in solution and can affect many different aspects of water chemistry. The values obtained at LSFP were very nearly neutral, except for the inlet sample station in May. This may indicate influence from the surficial geology of this stream's watershed or possibly due to decomposition of humic material in the stream bed. A pH range of about 5.5 – 8.5 is desired for maintaining a healthy fishery.

Total Alkalinity – Alkalinity is a measure of the buffering capacity of a waterbody against acid additions such as acid rain and pollution, which can be detrimental to wildlife populations. Total alkalinity measures the presence of carbonates, bicarbonates and hydroxides. Values below 20 mg/l are a signal that the pond may be susceptible to fluctuations in pH. Alkalinity at LSFP is low, like many ponds in the region owing to the natural geology and soils in the area.

Turbidity - Turbidity is a relative measurement of the amount of suspended material in the water. It is measured through a process involving light diffraction of the pond sample as compared to a series of prepared samples. Turbidity values can range from less than one to thousands of units, however, values in most ponds and lakes rarely rises above 5 NTU. The turbidity values at the pond were desirable and show a low-level of suspended material. This value can vary significantly with stormwater influence.

Nitrogen - Nitrogen is a vital nutrient in the pond environment for plant and algae growth. Nitrogen exists in water as various compounds, with relative amounts governed by such things as atmospheric influence, precipitation, biological activity and water chemistry. Total Kjeldal nitrogen (TKN) is a measure of the nitrogen contained in organic compounds, such as proteins and amino acids, and as ammonia. It is created from biological growth and decomposition. A concentration of 1.0 mg/l or below is considered desirable. Both the in-lake and tributary samples showed slightly elevated TKN values in May, possibly a result of high spring run-off or a moderate algae bloom. While in the in-lake values returned to desirable levels in October, the tributary value was very high. Often inlet streams have higher TKN concentration due to the low water volume and abundance of decaying organic material.

Nitrate is another form of nitrogen in the water. Nitrate nitrogen is usually the most prevalent form of inorganic nitrogen in the water and results from such things as natural aerobic bacterial activity and fertilizer use. The 2009 values at LSFP were all desirably below this threshold.

Total Phosphorus – Phosphorus is generally considered to be the limiting nutrient for plant and algae growth, with concentrations of 0.03 mg/l or more being sufficient to stimulate algae blooms. The phosphorus level in LSFP was desirably below this level at all the in-lake stations although the sampling at the inlet showed slightly elevated levels. Water column phosphorus does not generally relate to rooted plant growth as they obtain most of their nutrients from the pond sediment.

E. Coli Bacteria – Coliform bacteria are naturally occurring in pond systems as well as resultant from human and animal inputs. E.Coli is an indicator of the presence of human or animal waste inputs. In general, acceptable values in "swimmable waters" for E. Coli is less than 230 organisms per 100 ml. Bacteria tests were well within these acceptable limits.

Dissolved oxygen (DO) is very important in the pond system. Not only do fish and other aquatic fauna require adequate levels of oxygen, but it also controls many aspects of water chemistry. Values below 5.0 mg/l are undesirable for most aquatic life, however lower values are not uncommon near the sediment layer where oxygen demand is great and oxygen influx is at a minimum. Under extreme anoxic conditions (<1.0 mg/l), phosphorus can be released from the sediment and stimulate algae blooms. Under stratified conditions, which occur in many deeper lakes, oxygen depletion can occur in a significant portion of the water column, possibly endangering fish populations, especially coldwater species.

Temperature/dissolved oxygen profiling at LSFP was performed in the southern end of the pond over the "deep hole". Measurements taken during the two surveys showed that stratification was already "setting up" between 3 & 4 meters in May and was already beginning to "break-down" in October. October is usually the month where the temperature stratification begins to equalize in most waterbodies. The May profile showed good oxygenation (at or near saturation levels) except for directly near the bottom. The September profile showed anoxic conditions below ~ 9 meters.

Water clarity measurements were taken with a standard Secchi disk during each of the sampling rounds. The May water clarity was ~ 14.5-feet while the September clarity was still good, but reduced to ~ 11.5-feet. Overall, the water clarity continues to be excellent in LSFP.

Management Recommendations

After observing the continued milfoil control this year from the 2004 treatment, we fully expect to see little re-growth of milfoil in 2010. In the event that some localized milfoil growth is observed in 2010, we may recommend some alternative methods of control including diver handpulling and/or benthic barrier. These methods are much more suitable for small infestation (<1/2 acre) and may help to prolong the duration of control before another treatment is required. More sizable infestations (> 1-acre) or one located along with curlyleaf pondweed should be "spot" treated with the Reward (diquat) herbicide. If the Association decides to manage smaller areas of re-growth with hand-pulling, barriers or treatment, you may want to budget a contingency amount of ~$5,000-$7,500 to do so.

Past experience suggests that the curlyleaf pondweed population should be kept in check with periodic treatments. Continued periodic treatments of curlyleaf pondweed, performed before the plant produces its reproductive structures (called "turions") has shown at some waterbodies to result in a gradual, long term reduction of this highly invasive plant. A pre-treatment survey will be used to confirm if treatment is required in 2010. If needed, we estimate the cost of such a treatment to be in the range of $5,000-$6,000.

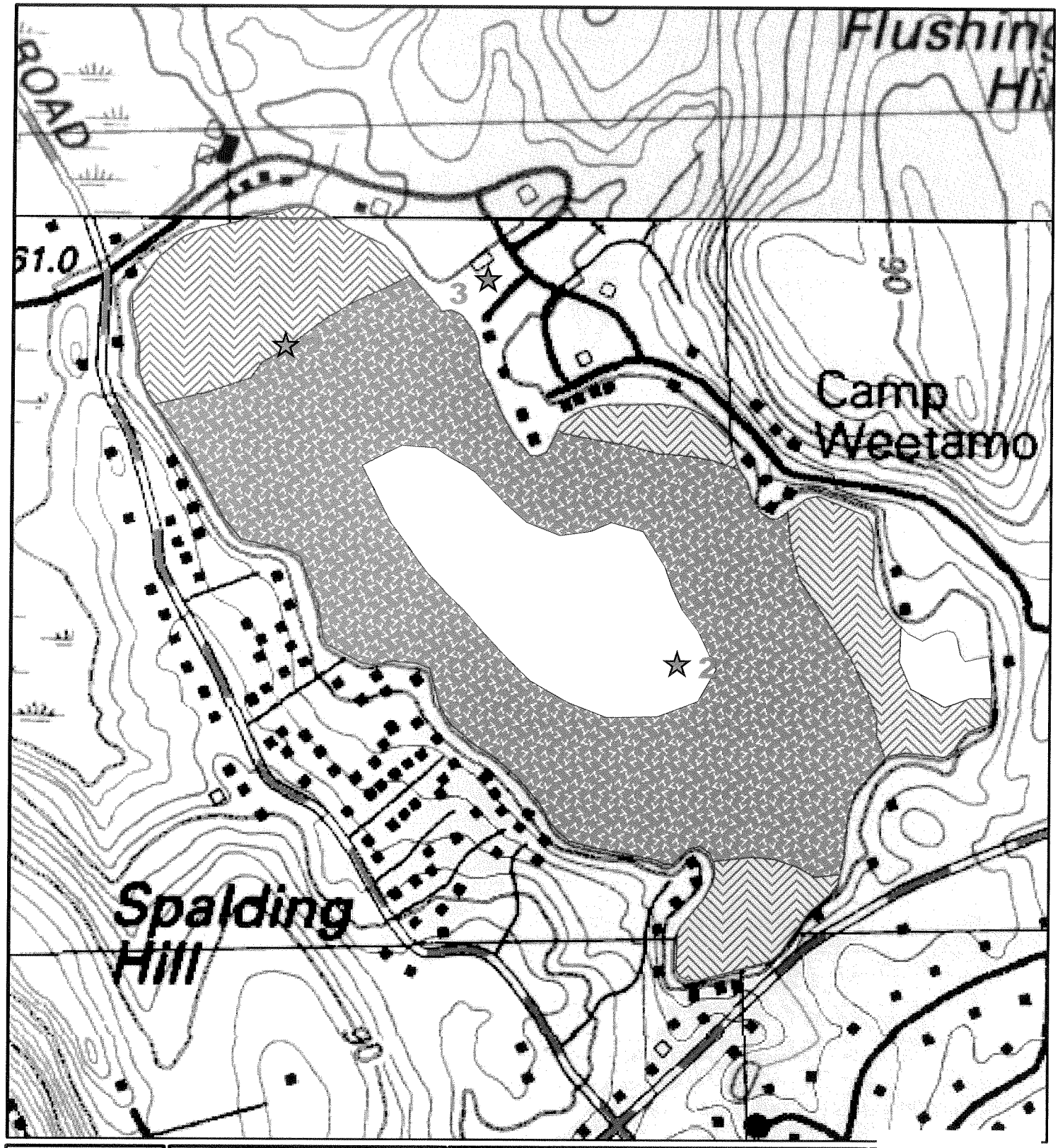
For 2010, we also strongly recommend continuing with an early & late summer vegetation/water quality survey. The vegetation surveys will be important to monitor for re-growth of milfoil and document the presence and extent of other species in the pond. We recommend that you budget $2,950 for the two vegetation surveys and water quality monitoring sampling rounds. Continued monitoring of the pond is not only prudent but was also alluded to, if not required, by the Order of Conditions permit issued by the Town for this project. In the event that the Association moves forward with treatment of the curly-leaf pondweed, the cost of monitoring will be somewhat reduced as we can perform some of the monitoring tasks during our visits to the pond as part of the treatment program.

We appreciate your cooperation with this past year's program and look forward to working with you again next year. If you have any questions, please feel free to give me a call. Please be sure to forward a copy of this report to the Conservation Commission.

Sincerely,
AQUATIC CONTROL TECHNOLOGY, INC.

Dominic Meringolo

Dominic Meringolo
Senior Environmental Engineer



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Long Sought For Pond

Vegetation Distribution May 2009

FIGURE	SURVEY DATE	MAP DATE
1	5/6/09	11/2009

LEGEND

- No Plants
- Areas of Moderate curlyleaf pondweed growth
- Areas with Robbins Pondweed
- **Sampling Station**

0 180 360 720 1,080 1,440 Fee

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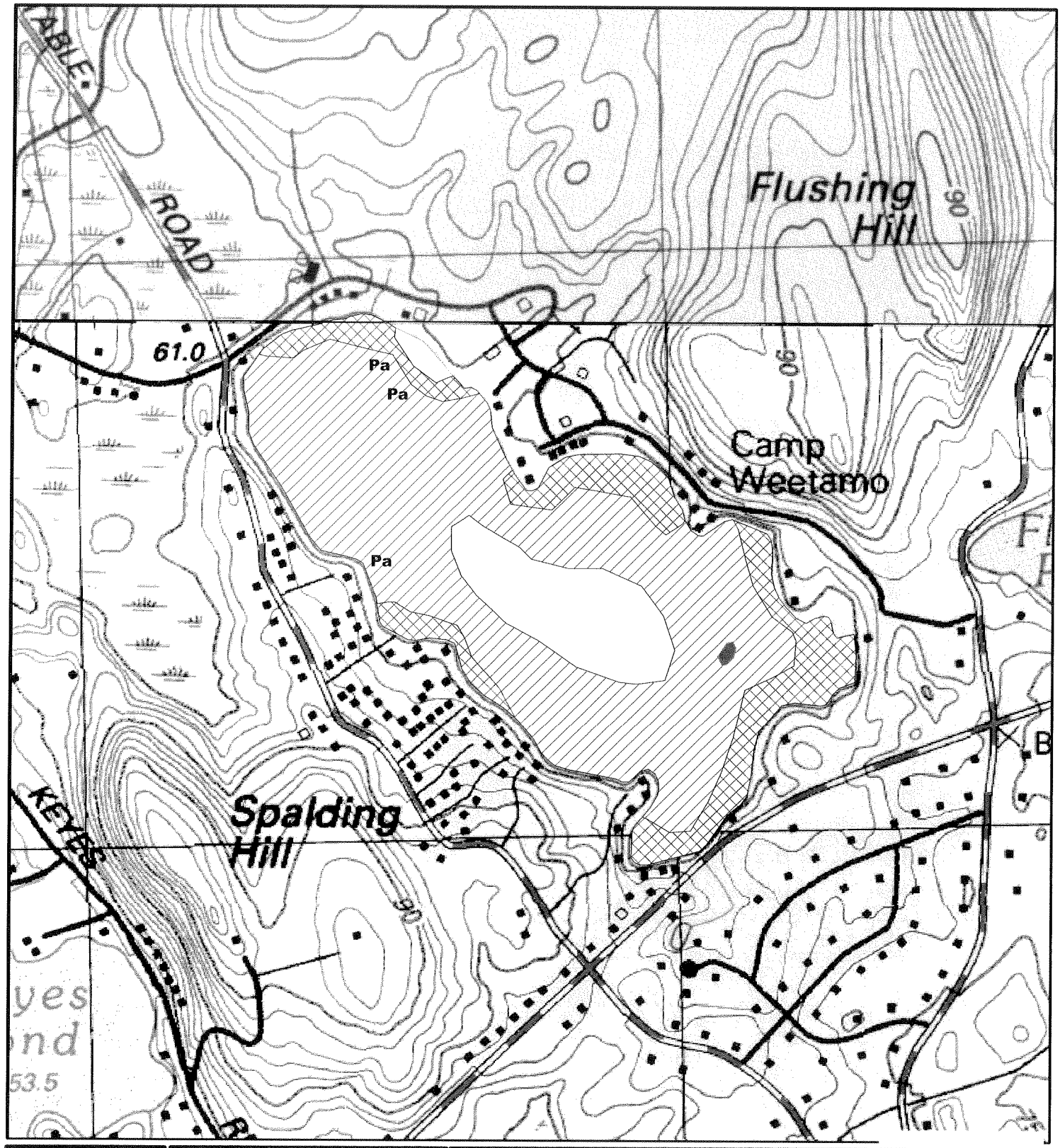

Long Sought For Pond

Vegetation Distribution August 2008

FIGURE	SURVEY DATE	MAP DATE
2	10/1/09	11/2009

Rock Island

Moderate to dense cover of Robbins pondweed and stonewort

Moderate tapegrass and Robbins pondweed

Pa - Largeleaf pondweed

0 120 240 480 720 960 Feet

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