January 5, 2007

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

Re: 2006 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 2006 Aquatic Management Program at Long Sought For Pond. After successfully treating the pond with Sonar herbicide in 2004 for control of Eurasian watermilfoil, followed by a year of monitoring in 2005, this year's program included treatment of curlyleaf pondweed and continued assessment tasks.

Treatment Program

In response to a growing concern over curlyleaf pondweed (*Potamogeton crispus*), which is considered a non-native, invasive plant, plans were developed with the Association and approved by the Conservation Commission (under the current Order of Conditons) to conduct "spot" treatments of the pond with the Reward (diquat) herbicide. A pre-treatment survey was conducted on May 3rd to establish the treatment areas. The main areas of curlyleaf growth were located at the northwest end of the pond, the three coves in the northeast portion of the pond and in the southeast section of the pond. These areas were designated for treatment. Sporadic growth along the western shoreline was not dense enough to make treatment of this large area worthwhile.

The treatment was originally scheduled for May 16th, however heavy rains and high water levels in the pond caused the treatment to be postponed. The treatment was rescheduled for May 25th and was completed successfully. A cursory post-treatment inspection, conducted on July 5th, showed excellent control of the curly-leaf pondweed in the treatment areas. A developing cover of beneficial Robbins pondweed (*Potamogeton robbinsii*) was also noted.

Monitoring Program

Vegetation surveys and water quality sampling/measurements were conducted on May 3rd and September 28th. During each visit, the pond's aquatic vegetation was sampled using a combination of visual observation, an Aqua-Vu underwater camera and physical 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 plants and curlyleaf pondweed. As shown on Figure 1, the heaviest growth of curlyleaf pondweed was located in the northwestern end of the pond and in the coves in the eastern end of the pond. Other curlyleaf growth was limited to sporadic single plants, mostly along the western shoreline. Robbins pondweed was fairly well distributed on the pond bottom except in areas

of deeper water (>~ 18-feet). A single Eurasian milfoil plant was observed in the cove adjacent to the small campground beach.

During the September survey, there the vegetation assemblage was dominated by a healthy abundance of Robbins pondweed. Most of these plants were actively growing in areas of >4-feet of water depth and most were about 2-6 feet tall. 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 cohabitating the areas of Robbins pondweed. Widely scattered occurrences of bladderwort (*Utricularia sp.*) and tapegrass (*Vallisneria sp.*) were also observed. These are all native plants. Small patched of white waterlilies (*Nyphaea odorata*) were observed in the coves.

No Eurasian milfoil or curlyleaf pondweed was observed during the fall survey.

Water Quality Observations

Water quality samples were collected during each of the surveys. Three stations (see figure 1) were collected in May and two stations were collected in September. In September, station #3 showed no actively flowing water, so it was not sampled. The following section presents the results of the laboratory testing with interpretation:

TABLE 1 - WATER QUALITY RESULTS (2006)

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	6.89	17	0.24	<1	<0.1	<0.010	<10
	Sept	6.51	20	0.51	4	0.27	<0.010	10
# 2 (South End)	May	6.99	17	0.25	<1	<0.1	<0.010	<10
	Sept	6.79	20	0.49	3	0.3	0.015	<10
# 3 (Inlet)	May	5.56	<5	0.6	<1	<0.1	0.016	20
	Sept	-	-	-	-	-	-	-

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. 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.

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. The spring TKN values at LSFP were all below this threshold but rose significantly in the September sampling period. Typically, an increase in algal growth can cause increases in TKN values, which coincides with September water clarity measurements, which did indicate a marginal increase in microscopic algae in the water column. These results were quite a bit higher that any previously seen at the pond, but may not be indicative of average conditions, and should be monitored closely in the future.

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 2006 values at LSFP show values within the desirable concentration of 0.3 mg/l or less, in May and "hovering" around the threshold in September. The results are considerably lower that last year, showing that those values were likely just a transient "high level" and not representative of average conditions.

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 stations. 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 a fairly well mixed water column in May and a distinct layering (thermocline) occurring between 6 and 8 meters in September. The May profile showed good oxygenation (at or near saturation levels) except for directly near the bottom. The September profile showed anoxic condition below ~ 7 meters.

Water clarity measurements were taken with a standard Secchi disk during each of the sampling rounds. The May water clarity was ~ 25-feet while the September clarity was still good, but reduced to ~ 15-feet. Overall, the water clarity continues to be excellent in LSFP. There was some indication of a blue-green algae bloom of moderate proportions during the September survey, but it did not seem to affect the water clarity much. Most of the algae was seen to be growing in large size clumps, most of which were blown down to the south end of the pond.

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 2007. The one milfoil plant observed in the May survey was located in a Reward treatment area and was likely controlled along with the curlyleaf pondweed. In the event that some localized milfoil growth is observed in 2007, 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.

Curlyleaf pondweed was successfully treated in 2006, however our considerable experience with managing this plant suggests that a majority of the plants will re-grow in 2007. While there may be some financial benefit to not treating this coming summer, we'd recommend being prepared to treat the curlyleaf pondweed on an annual basis, in order to keep the infestation in check. A pre-treatment survey will be used to confirm the areas of curlyleaf growth and set the actual treatment areas. We estimate the cost of such a treatment to be in the range of $5,000-$6,000, similar to last year.

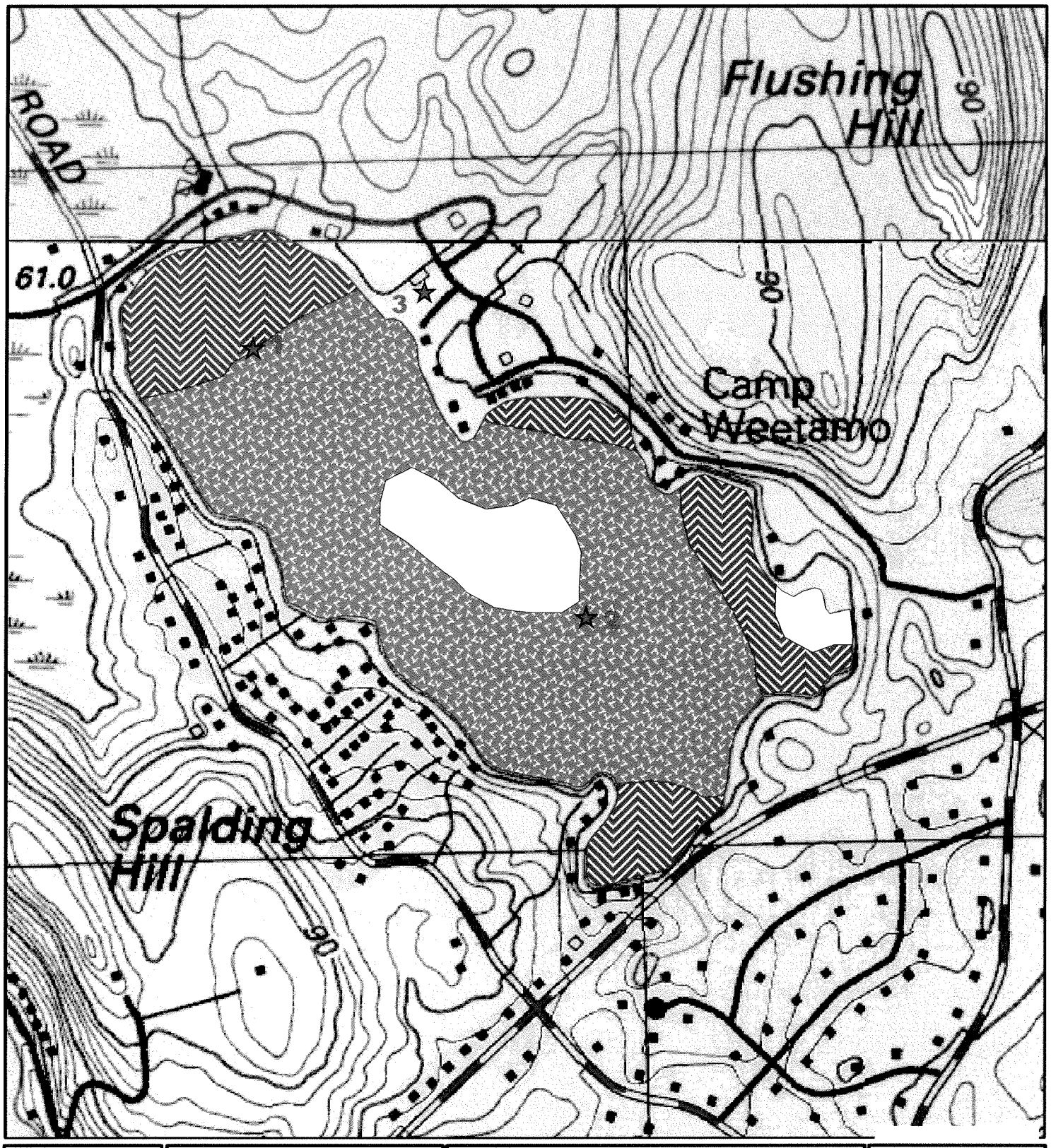
For 2007, we also strongly recommend continuing with an early & late summer vegetation/water quality survey. The vegetation surveys will be important to monitor for re-growth of milfoil and document the presence and extent of other species in the pond. We recommend that you budget $2,750 for the two 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.

Sincerely,
AQUATIC CONTROL TECHNOLOGY, INC.

Dominic M. Meringolo
Environmental Engineer

Gerald N. Smith
President/Aquatic Biologist



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Long Sought For Pond

Vegetation Distribution May 2006

FIGURE	SURVEY DATE	MAP DATE
1		1/2007

LEGEND

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

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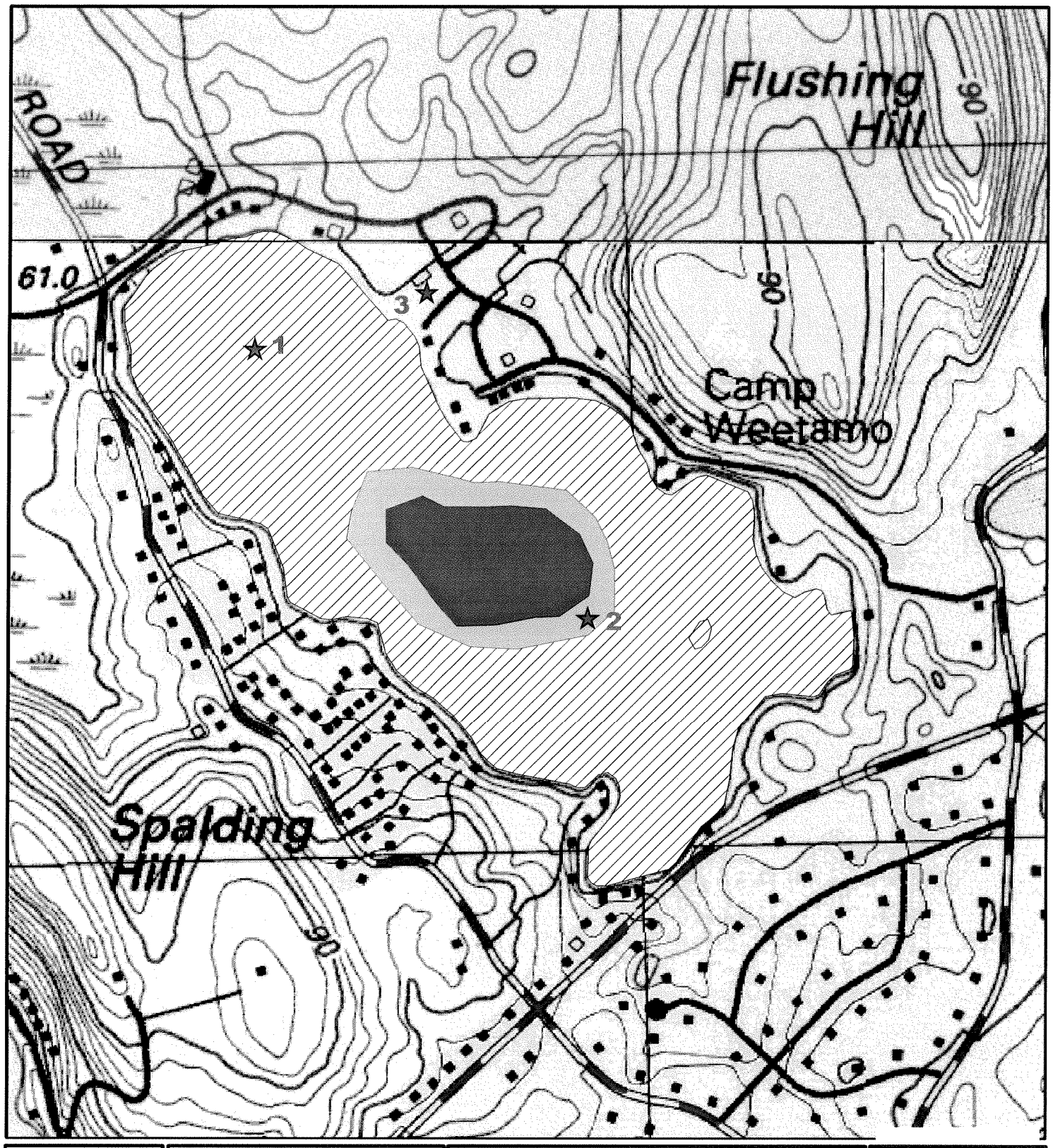

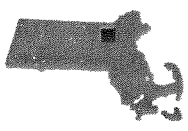

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Long Sought For Pond

Vegetation Distribution Sept 2006

FIGURE	SURVEY DATE	MAP DATE
2		1/2007

LEGEND

- *Deeper water muskgrass*
- *No Plants*
- *Moderate to dense cover of Robbins pondweed and muskgrass*
- ★ **Sampling Station**

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