AQUATIC CONTROL TECHNOLOGY, INC.
POND AND LAKE MANAGEMENT SPECIALISTS

December 28, 2011

Ms. Joanna Bilotta, President
Lake Shirley Improvement Corporation (LSIC)
PO Box 567
Shirley, MA 01464

**Re: Report on Post-Treatment Inspection and 2011 Project Completion Report**

Dear Joanna:

This report provides an overview and summary of the 2011 Aquatic Management Program at Lake Shirley. Our pre-treatment watermilfoil survey report/memo and a map showing the area of herbicide weed treatment in 2011 are attached to this report. We are also providing two plots (graphs) showing algal density, algal composition and Secchi Disk water clarity in both the north and south basins of the lake during the period from early June – late September. A chronology of the 2011 Management Program activities follows:

## 2011 Program Chronology:

- *Issuance of License to Apply Chemicals permit from MA DEP* ..... *April 28th*
- *Pre-treatment milfoil & aquatic plant inspections with LSIC* ..... *June 4th & 11th*
- *Herbicide (Reward/Diquat) treatment* ..... *June 20th*
- *Periodic lake inspections* ..... *May-Sept.*
- *Monitoring of microscopic algae and Secchi Disk water clarity-* ..... *June – Sept.*
- *Post-treatment & late summer plant inspection* ..... *Sept.23rd*

### *Pre-Treatment Survey:*

The date for our pre-treatment milfoil survey was set for June 4th based on when the LSIC Board members, whom were actively looking for milfoil during May and June, began to see some significant rooted plant growth in the lake. During the survey we spent the morning into the early afternoon, traveling around the perimeter of the lake and into the coves, in search of milfoil and other aquatic plants. Plant survey techniques that were employed in the field, included visual observation, use of a "throw-rake" and use of an "Aqua-Vu' underwater camera system.

I was accompanied by LSIC members, Earl Graves and Richie Patry during the pre-treatment survey on June 4th. During a second follow-up inspection of the lake on June 11th, both you and Earl joined me. The active participation of LSIC members in these surveys is helpful in allowing for the exchange of information and providing insight on the prioritization of herbicide treatment areas.

Based on the results of the pre-treatment surveys, it was determined that the overall area of invasive watermilfoil and curlyleaf pondweed warranting herbicide treatment in 2011 amounted to approximately 40 acres. This acreage was substantially less than 2010 and 2009 at 68 acres and 70 acres, respectively and markedly less than our very first herbicide treatment of Lake Shirley

performed in 2007, when we chemically treated approximately 102 acres of invasive watermilfoil. Herbicide treatment was performed in just one cove (referred to as Millionaire's Cove) in 2008, encompassing just ~ 10-12 acres out of the total lake area. Some reduction in treatment area is typically seen in the year(s) following herbicide treatment, however, complete eradication of an invasive plant species or population is rarely if ever attainable.

***2011 Herbicide Treatment:***

The 2011 Diquat herbicide treatment performed on June 20th proceeded smoothly. The treatment was again performed from one of our Airboats equipped with a tank, pump and a special chemical injection system. The diluted chemical was again applied sub-surface through weighted hoses that trail the Airboat, in order to eliminate the potential for aerial drift of the herbicide. GPS guidance was employed on the Airboat to track the location and passes of the boat during the treatment process. The dose of Reward herbicide applied this year was approximately ~ 0.75-1.25 gals/acre. This dose was similar to the dose applied in 2009 and 2010 but somewhat less than first application in 2007. The high sensitivity of the milfoil to Reward that was observed in Lake Shirley in 2007 has allowed for this reduction in herbicide dose. The dose applied was/is substantially less than the maximum permissible dose on the Reward/Diquat label of 2.0 gals/acre. I was again present to perform and oversee the chemical treatment with assistance from one of our other Biologists. Board members from LSIC followed our Airboat at a safe distance to ensure that all targeted areas were treated and to advise anyone who may have been out on the water that that the lake was closed to all water uses for the day.

As in previous years, the lake community and towns were notified prior to treatment by LSIC. Several means of notification were utilized including the placement of a written notice in the newspaper(s), the placement of large printed signs at major road intersections/locations around the lake and the posting of numerous 8.5 inch by 11 inch orange colored, printed signs around the lake shoreline.

***Post-treatment Well Sampling/Testing for Herbicide Residues:***

Herbicide residue samples were collected from two wells by LSIC at both two and four days post-treatment: Bowen Well - 28 Oakridge Road; Holman Well - 885 Flat Hill Road. These well water samples were analyzed for Diquat (the active ingredient in Reward herbicide) by ChemServe Laboratories in New Hampshire.

Results from annual testing of these wells performed between 2007 and 2009 were all below laboratory detection limits (< 5ug/l). Analysis of samples collected in 2011 were consistent with previous years and were again below laboratory detection limits, further supporting that the detectable levels of Diquat reported in 2010 were a result of lab error.

It is well established in the literature based on over 40 years of use for aquatic weed control and from testing performed elsewhere, that Diquat is readily bound by soils and does not leach or move in groundwater. There are no verified occurrences (to the best of our knowledge) of Diquat ever contaminating well water following an aquatic treatment. We recommend that LSIC request that the Conservation Commission consider removing the special condition requiring that Diquat analyses be performed post-treatment.

***Algae & Water Clarity Monitoring & Algaecide Treatments:***

Water clarity was monitored with a standard Secchi Disk between June and September by Earl Graves with occasional assistance from Richie Patry. Measurements were taken from both the north and south lake basins. Separate plots/graphs are provided for both the north and south lake basins. From these plots, one can see the relationship among Secchi Disk transparency (water clarity), total algal density (count) and the density/count for blue-green algae alone. During the July and August 2011 monitoring period, clarity was generally similar between the two lake basins, typically ranging from about 4 -5 feet. In prior years we have generally seen somewhat better clarity and lower algae cell in the south basin.

On two occasions water samples were also collected by Mr. Graves and delivered to Aquatic Control following a decline in water clarity observed in early/mid-July. The water samples were examined microscopically upon delivery by biologists with Aquatic Control and then preserved for further analyses at a later date if found to be necessary.

Water samples collected on July 11th showed a moderate to high total algal cell count dominated by smaller, green algae species. A number of unicellular and colonial species of green algae and other algal taxa (such as diatoms and flagellated algae) tend to be more tolerant to the low dose of algaecide used and permitted at Lake Shirley. It should be noted that many of these algal cells are small in size, therefore, higher total algae counts may represent a lower total biomass of algae suspended throughout the water column when compared to a sample of blue-green algae species. Due to the dominance of green algae species in the July 11th sample, we recommended that LSIC not proceed with an algaecide treatment at that time.

A second sample was collected on July 19th. Analysis of this sample showed an increase in blue-green algae density and distribution. Blue-green algae species are of particular concern as some species in this taxa can produce potentially harmful toxins. Blue-green algae species are also more likely to form the unpleasant surface scums experienced in previous years at Lake Shirley. Most species of blue-green algae are sensitive and respond well to the copper sulfate algaecide. We discussed the increase in blue green algae species in the July 19th sample with LSIC and recommended that both lake basins be treated with an algaecide.

Copper sulfate algaecide was applied to both lake basins on July 25th and again on August 1st. Splitting the algaecide treatment over two applications helps to avoid loss of dissolved oxygen post-treatment and potential impacts on fish. Treatments were performed by Aquatic Control's MA licensed pesticide applicators in accordance with the Order of Conditions issued by the Shirley Conservation Commission, and the EPA and MA DAR approved aquatic use label.

Following the algaecide treatments, water clarity improved some (more so in the north basin) and was maintained at 4 to 5 feet through the remainder of August. Clarity then improved substantially from late August through the month of September. The algal population typically declines some as the water temperatures begin to cool in October.

***Post-Treatment Surveys:***

Cursory surveys were performed following treatment to confirm that control of the invasive watermilfoil and curlyleaf pondweed was achieved in treated areas. A more thorough late summer aquatic plant survey was conducted on September 23rd. The focus of this survey was to evaluate the efficacy of the treatments performed in 2011, identify potential new areas of invasive plant growth and examine the lake's overall plant community.

During the survey the entire littoral zone (the shallow area of a lake that supports plant growth) was toured and vegetation was identified using visual inspection and a throw-rake. Vegetation abundance was classified using the areal cover estimate as follows: sparse (< 5%), frequent (5-25%), common (25-75%) and abundant (75-100%). In comparison to our late summer survey results of 2007 and 2008, the 2009, 2010 and 2011 surveys showed greater plant cover in many areas of the lake and somewhat higher biomass (i.e. the extent that plants fill the water column). European naiad and tapegrass/wild celery appeared to be co-dominant and the two most frequently encountered species. We also noted an increase in the occurrence of invasive fanwort although the infestations appeared to be relatively small. Most of the fanwort was observed growing in water depths of between 6 and 7 feet and was a foot or more beneath the water surface at the time of the survey. No invasive watermilfoil was observed during our survey; however, Geosyntec reported non-dominant milfoil at four of their 64 sampling sites. A marked decrease in the distribution and abundance of muskgrass/stonewort throughout the lake was also observed. This decrease was also noted by Geosyntec.

The decline in muskgrass this year is difficult to explain. Muskgrass is quite tolerant to Diquat as evidenced by the increase in muskgrass cover observed following the more extensive treatment conducted in 2010. Muskgass and stonewort are generally tolerant to lake drawdowns. Literature from researchers in Scotland and Ireland note that stoneworts are highly sensitive to elevated concentrations of plant nutrients and algal blooms which compete with the stoneworts for available nitrogen and phosphorus. The planktonic algae may also shade-out the stoneworts that grow along the lake bottom. While the water clarity at Lake Shirley this past summer was on average not as good as that observed in 2010, the clarity was not as poor as compared to compared other years such as the summer of 2006, when a very heavy algae bloom developed and persisted. The observed decrease in muskgrass and stonewort is likely due to a combination of many factors rather than any one event. Fortunately, stonewort spores can remain dormant for many years and as such a rebound in the frequency of occurrence of this species is anticipated

Our observations on September 23rd follow (table 1). These observations correspond to the accompanying map/figure, which is also attached.

**Table 1:** ***Plant Survey Findings – Late Summer 2011***

| Area Number | Plants Observed |
|---|---|
| *1* | spiny naiad (sparse) |
| *2* | fanwort (sparse & patchy throughout this area); spiny naiad (frequent) |
| *3* | fanwort (frequent); muskgrass/stonewort (sparse); bushy pondweed (sparse) |
| *4* | tapegrass (sparse); muskgrass/stonewort (sparse) |
| *5* | tapegrass (frequent); fanwort (sparse) |
| *6* | tapegrass (abundant); spiny naiad (common) |
| *7* | tapegrass (abundant); spiny naiad (abundant); bladderwort (sparse) |
| *8* | spiny naiad (common); tapegrass (common) |
| *9* | spiny naiad (common); tapegrass (frequent); coontail (sparse) |
| *10* | thinleaf pondweed (sparse); tapegrass (frequent); fanwort (frequent); spiny naiad (abundant) |
| *11* | tapegrass (common); spiny naiad (common) |
| *12* | tapegrass (common); spiny naiad (abundant); fanwort (sparse) |
| *13* | tapegrass (common); spiny naiad (common) |
| *14* | tapegrass (common); fanwort (common); coontail (sparse); spiny naiad (frequent) |
| *15* | tapegrass (common); bladderwort (sparse); fanwort (frequent); spiny naiad (common) |
| *16* | tapegrass (abundant); spiny naiad (common); muskgrass/stonewort (sparse) |
| *17* | tapegrass (abundant); spiny naiad (common) |
| *18* | tapegrass (common); spiny naiad and thinleaf pondweed (frequent) |
| *19* | tapegrass (frequent); spiny naiad (common); thinleaf pondweed (sparse) |
| *20* | spiny naiad (sparse); tapegrass (sparse) |
| *21* | spiny naiad (common); bushy pondweed (frequent); tapegrass (common) |
| *22* | tapegrass (common); bladderwort (sparse); ribbonleaf pondweed (frequent); Pondweed (sparse) |
| *23* | tapegrass (sparse); spiny naiad (sparse) |
| *24* | tapegrass (sparse); spiny naiad (sparse) |
| *25* | tapegrass (common); spiny naiad (frequent) yellow waterlilies (sparse) |
| *26* | spiny naiad (common); tapegrass (frequent) |

***Concluding Remarks:***

Algae management and water clarity:
Algal densities and populations are constantly in-flux due to changes in water conditions and require diligent monitoring and prudent use of algaecides to maintain desirably low densities. It has been our observation at Lake Shirley that in those years with higher rainfall amounts, especially during the May through July period, there is a greater potential for nuisance algal blooms. The greater amount of rainfall occurring between May and August of 2011 as compared to the dry summer experienced in 2010 may well have resulted in a higher nutrient loading to the lake leading to the algae conditions experienced this past year. By comparison blue-green algae did not bloom until early September in 2010 despite high water temperatures. We presume that the delayed timing of the bloom in 2010 was a function of nutrient loading due to rainfall.

It should be noted that water clarity can be affected by not only algae type and size but also by non-living particulate or colloidal matter and as such microscopic analysis is a necessary supplement to the Secchi Disk monitoring. This may include suspended silt and organic matter in addition to naturally occurring dissolved tannic/humic acids that tend to impart a darker "tea color" to the lake water.

July and August are when microscopic blue-green algal densities in most lakes typically peak and recreational use of the lake is at its maximum. It is best to treat the algae before the peak is reached, when water clarity has dropped to 2-3 feet and dense surface film of algae have formed, in order to afford the greatest efficacy, avoid oxygen loss following treatment and to preserve the recreational quality of the lake during these maximum use time frames. As a result we recommend continuing with the diligent algal monitoring program currently in place throughout the summer and that monitoring efforts be at a maximum during the months of July and August.

Vegetation Monitoring and Management:
The annual monitoring of vegetation on Lake Shirley is important, not only for assessing the efficacy and impacts of the management techniques employed, but also for early detection of possible new invasive plants that may not have been previously found at Lake Shirley. Early detection and timely control measures may prevent a new invasive plant from becoming established in the lake.

The integrated management program currently in place, which includes monitoring, winter drawdown and chemical treatment, continues to successfully control invasive plant species in the lake. Winter drawdown provides good control of fanwort and watermilfoil in shallow waters that are subject to drying and/or freezing. However both naiad and tapegrass reproduce primarily by seed and as such are fairly tolerant to drawdown and in some instances may actually increase in abundance within the zone of drawdown. Tapegrass is a native plant and is generally considered beneficial, however it can become a nuisance later in the summer and localized management may be warranted in high use areas. Spiny naiad is a highly invasive plant that is capable of spreading quickly. As in the past spiny naiad, watermilfoil, curlyleaf pondweed and fanwort should be monitored and chemical treatment or alternative management techniques should continue to be used when drawdown is ineffective in order to curb the spread of these species.

***Anticipated Management in 2012:***

Given the density and distribution of invasive plant species observed in 2011 we anticipate that some level of management will be required in 2012 to maintain desirable conditions in the lake. While we expect a modest reduction of watermilfoil re-growth next spring, continued management of this species will likely be necessary. We also anticipate that areas of curly-leaf pondweed and spiny naiad will require treatment in 2012; however, the extent of treatment required cannot be determined until the pre-treatment survey has been performed in the spring of 2012.

We recommend LSIC continue to pursue an integrated approach of in-lake management, utilizing drawdown and herbicide/algaecide treatment as required and appropriate. The two plant surveys (June and September) along with monitoring water clarity and algae monitoring continue to provide useful information to guide the aquatic management program at Lake Shirley. Naturally, watershed management and public education are also very important and they must be ongoing as well. We hope this report will be of help to LSIC in planning for 2012 and beyond. Thank you.

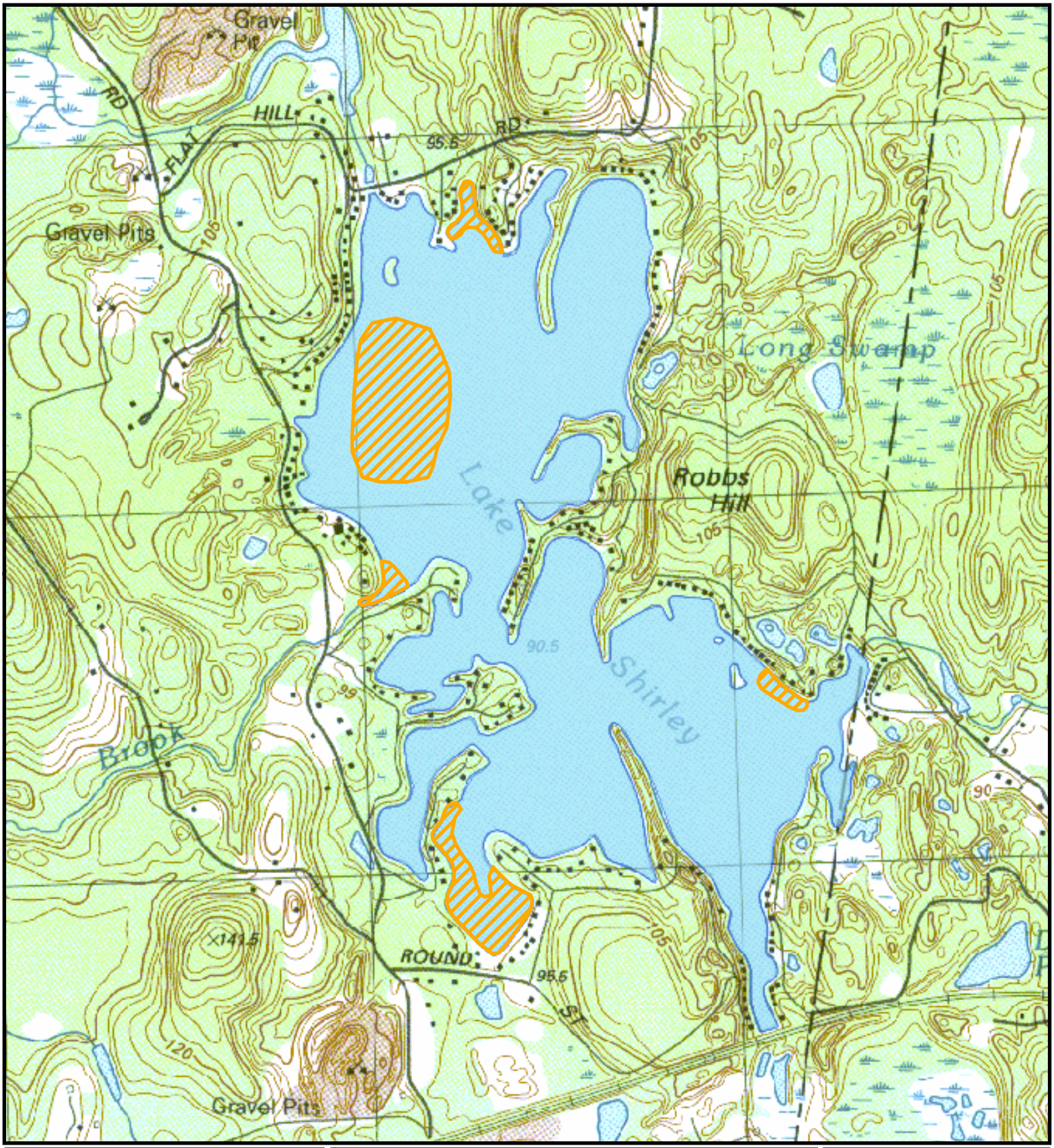
Sincerely,

**AQUATIC CONTROL TECHNOLOGY, INC.**

Gerald N. Smith
President/Aquatic Biologist

Enclosures:

- Treatment Area Map 2011
- Water clarity & Algae Count Comparison Charts
- Aquatic Plant Sampling Locations – 9/23/11
- 2011 Pre-treatment Survey Report
- 2011 Results of the Well Testing for Diquat Herbicide




# Lake Shirley

Lunenburg/Shirley, MA

## 2011

## Treatment Area

| FIGURE: | SURVEY DATE: | MAP DATE: |
|---|---|---|
| 1 | 6/2011 | 6/13/11 |

**Legend:**

Treatment Area

N

*Total Treatment Area: ~40 acres*

0 600 1,200 2,400 3,600 Feet

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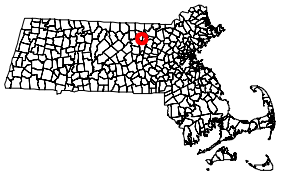


# 2011 Secchi Disk & Algae Counts for Lake Shirley

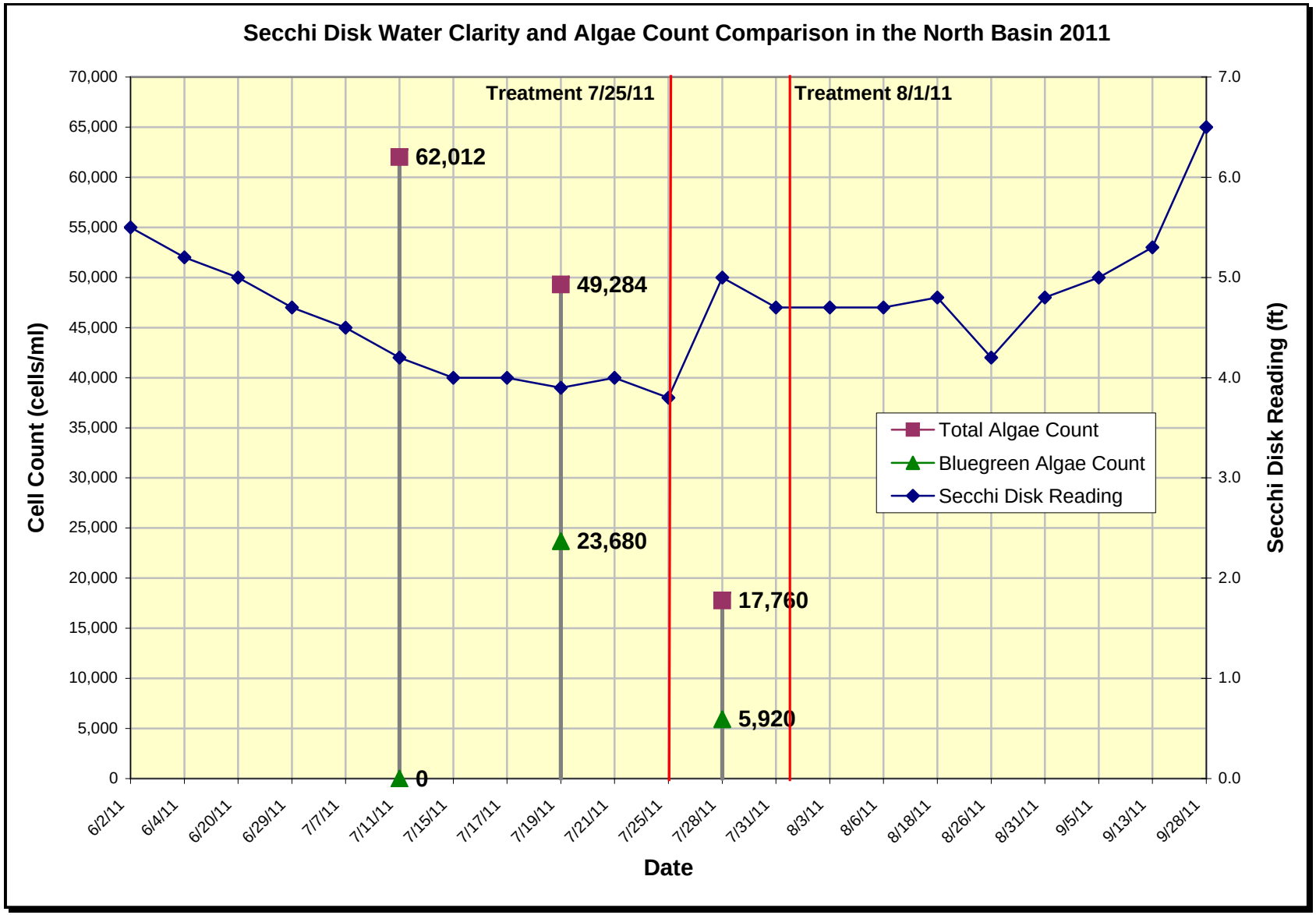
**2011 North Basin - Lake Shirley**

| Date | Algae Total (North Basin) | Bluegreen Total (North Basin) | Percent Bluegreen | Secchi Disk (ft) | | |
|---|---|---|---|---|---|---|
| | | | | North | South | Average |
| 6/2/11 | | | | 5.5 | 6.6 | **6.1** |
| 6/4/11 | | | | 5.2 | 6.7 | **6.0** |
| 6/20/11 | | | | 5.0 | 5.4 | **5.2** |
| 6/29/11 | | | | 4.7 | 5.4 | **5.1** |
| 7/7/11 | | | | 4.5 | 5.5 | **5.0** |
| 7/11/11 | 62,012 | 0 | 0% | 4.2 | 5.0 | **4.6** |
| 7/15/11 | | | | 4.0 | 4.3 | **4.2** |
| 7/17/11 | | | | 4.0 | 4.2 | **4.1** |
| 7/19/11 | 49,284 | 23,680 | 48% | 3.9 | 4.6 | **4.3** |
| 7/21/11 | | | | 4.0 | 4.5 | **4.3** |
| 7/25/11 | | | | 3.8 | 4.3 | **4.1** |
| 7/28/11 | 17,760 | 5,920 | 33% | 5.0 | 4.5 | **4.8** |
| 7/31/11 | | | | 4.7 | 4.7 | **4.7** |
| 8/3/11 | | | | 4.7 | 5.0 | **4.9** |
| 8/6/11 | | | | 4.7 | 4.8 | **4.8** |
| 8/18/11 | | | | 4.8 | 4.7 | **4.8** |
| 8/26/11 | | | | 4.2 | 4.0 | **4.1** |
| 8/31/11 | | | | 4.8 | 4.7 | **4.8** |
| 9/5/11 | | | | 5.0 | 5.2 | **5.1** |
| 9/13/11 | | | | 5.3 | 5.3 | **5.3** |
| 9/28/11 | | | | 6.5 | 6.0 | **6.3** |

**2011 South Basin - Lake Shirley**

| Date | Algae Total (South Basin) | Bluegreen Total (South Basin) | Percent Bluegreen | Secchi Disk (ft) | | |
|---|---|---|---|---|---|---|
| | | | | North | South | Average |
| 6/2/11 | | | | 5.5 | 6.6 | **6.1** |
| 6/4/11 | | | | 5.2 | 6.7 | **6.0** |
| 6/20/11 | | | | 5.0 | 5.4 | **5.2** |
| 6/29/11 | | | | 4.7 | 5.4 | **5.1** |
| 7/7/11 | | | | 4.5 | 5.5 | **5.0** |
| 7/11/11 | 17,316 | 0 | 0% | 4.2 | 5.0 | **4.6** |
| 7/15/11 | | | | 4.0 | 4.3 | **4.2** |
| 7/17/11 | | | | 4.0 | 4.2 | **4.1** |
| 7/19/11 | 34,151 | 8,880 | 26% | 3.9 | 4.6 | **4.3** |
| 7/21/11 | | | | 4.0 | 4.5 | **4.3** |
| 7/25/11 | | | | 3.8 | 4.3 | **4.1** |
| 7/28/11 | 26,492 | 7,400 | 28% | 5.0 | 4.5 | **4.8** |
| 7/31/11 | | | | 4.7 | 4.7 | **4.7** |
| 8/3/11 | | | | 4.7 | 5.0 | **4.9** |
| 8/6/11 | | | | 4.7 | 4.8 | **4.8** |
| 8/18/11 | | | | 4.8 | 4.7 | **4.8** |
| 8/26/11 | | | | 4.2 | 4.0 | **4.1** |
| 8/31/11 | | | | 4.8 | 4.7 | **4.8** |
| 9/5/11 | | | | 5.0 | 5.2 | **5.1** |
| 9/13/11 | | | | 5.3 | 5.3 | **5.3** |
| 9/28/11 | | | | 6.5 | 6.0 | **6.3** |

Represents an Algaecide Treatment


Secchi Disk Water Clarity and Algae Count Comparison in the North Basin 2011
Treatment 7/25/11
Treatment 8/1/11
62,012
49,284
23,680
17,760
5,920
0
Total Algae Count
Bluegreen Algae Count
Secchi Disk Reading
Cell Count (cells/ml)
Secchi Disk Reading (ft)
Date
70,000
65,000
60,000
55,000
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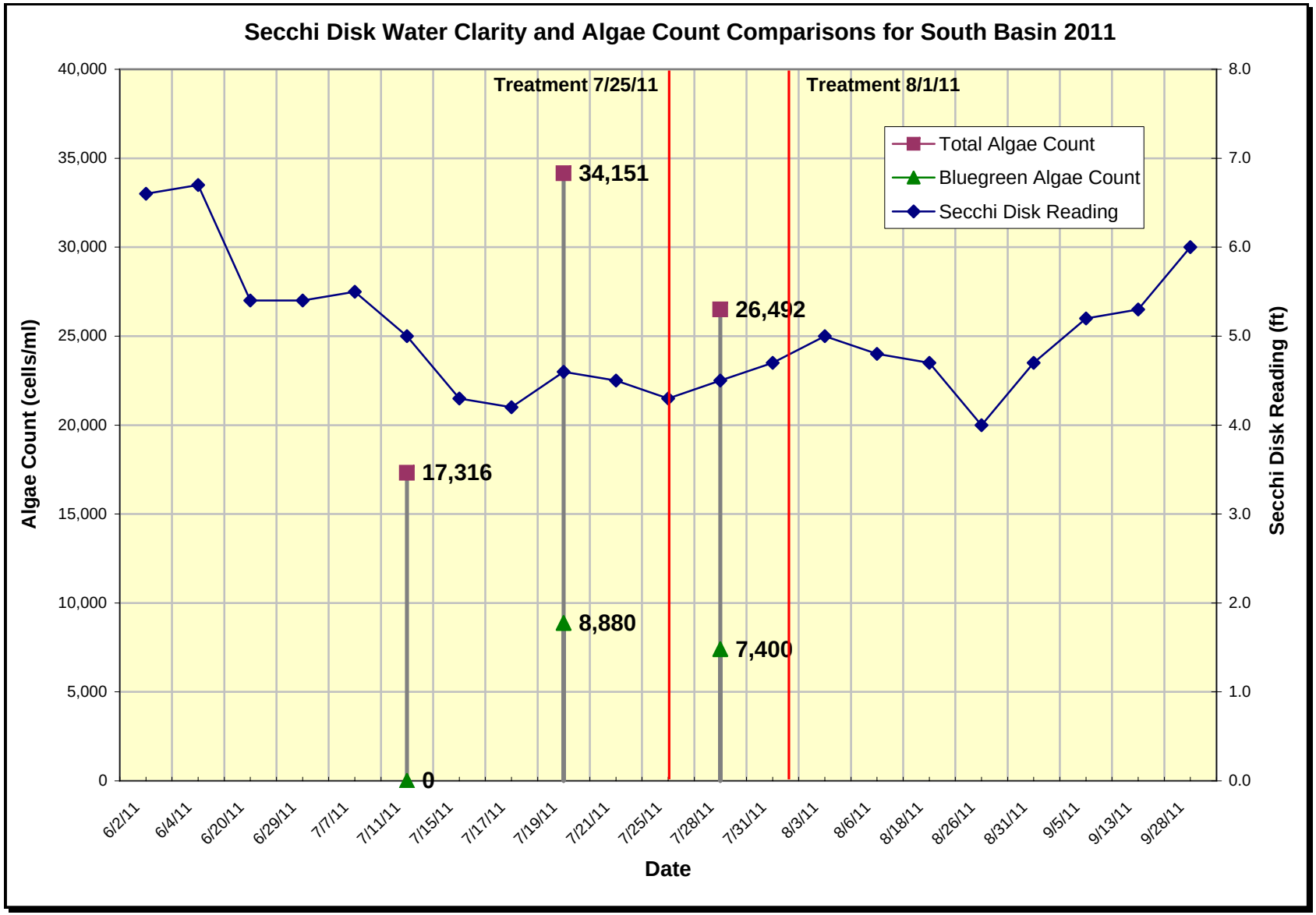
9/28/11


Secchi Disk Water Clarity and Algae Count Comparisons for South Basin 2011
Treatment 7/25/11
Treatment 8/1/11
Total Algae Count
Bluegreen Algae Count
Secchi Disk Reading
34,151
26,492
17,316
8,880
7,400
0
Algae Count (cells/ml)
Secchi Disk Reading (ft)
Date
40,000
35,000
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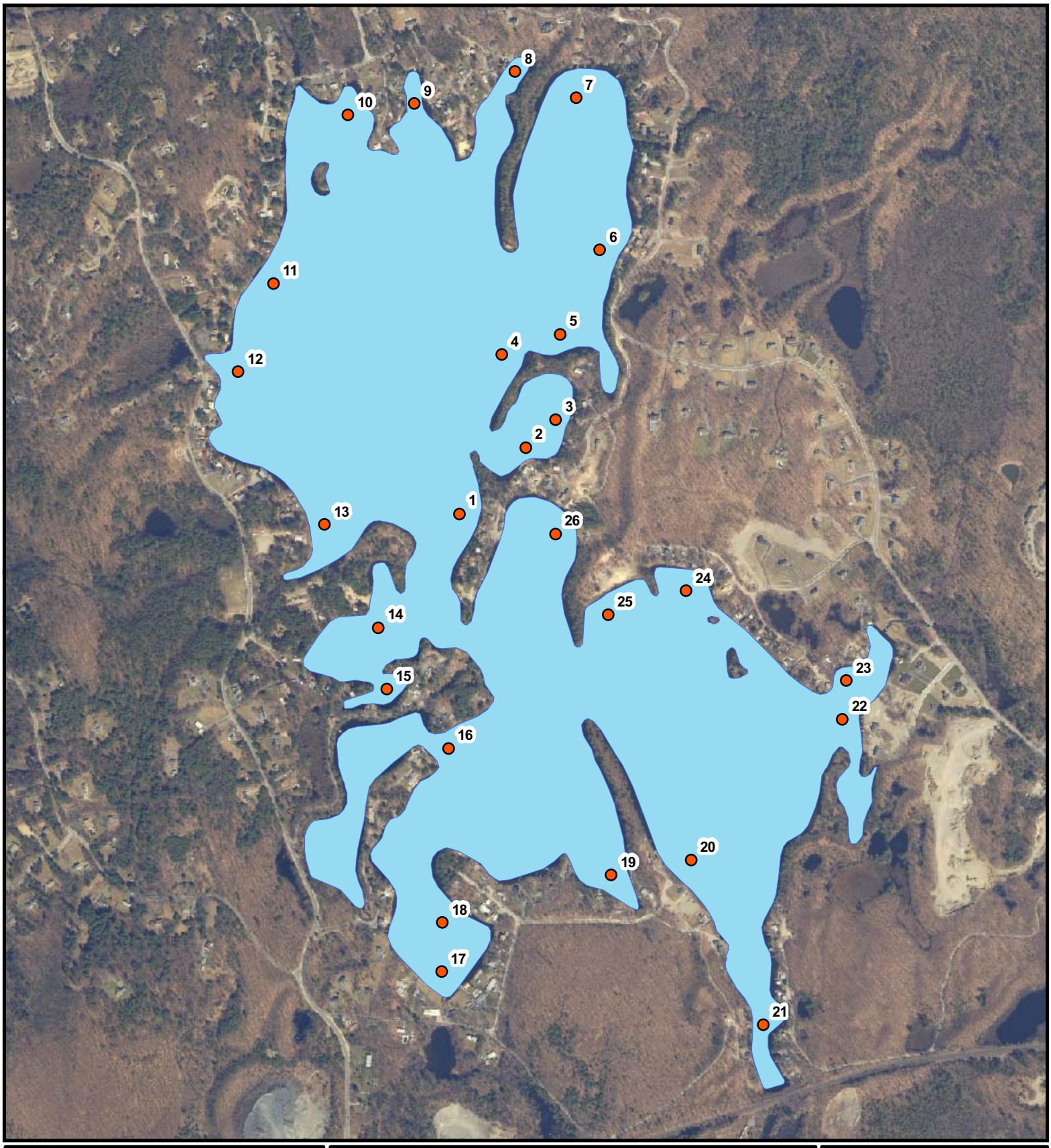


# Lake Shirley

Lunenburg/Shirley, MA

**Plant Sampling Locations**

| FIGURE: | SURVEY DATE: | MAP DATE: |
|---|---|---|
| 1 | 9/23/11 | 12/27/11 |

**Legend:**

N

● Plant sampling locations during 9/23/11 survey

0 500 1,000 2,000 3,000 Feet

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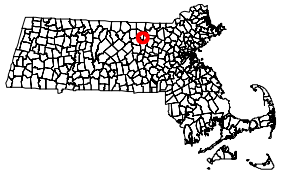

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Date: June 15, 2011

To: Joanna Bilotta; President, Lake Shirley Improvement Corporation

From: Gerry Smith; President/Aquatic Biologist

Re: **Aquatic Plant Survey & Inspection of June 4th & 11th, 2011 – Lake Shirley**

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This memo summarizes the findings of our Aquatic Plant Survey and Inspection performed on June 4th and June 11th. Previous cursory inspections of the lake over the Memorial Day weekend by LSIC Officers and Board members, indicated that the milfoil and other plants were actively growing, however, given the cool weather this spring, the stage of plant growth this year was somewhat behind that of previous years. I performed the primary survey/inspection on June 4th, accompanied by LSIC members Earl Graves and Richie Patry. The water clarity was only "fair" for Lake Shirley at this time of year with a Secchi Disk clarity reading in the North Basin of 5" 2" and 6' 8" in the lake's South Basin. A cursory second inspection/check of the weed growth in several areas of the lake was performed last Saturday with you and Earl.

The survey was performed from a Pontoon Boat, while traveling around the entire shoreline and littoral (shallow water) zone of Lake Shirley. Given the overall shallow depth of the lake, additional transects were made across the coves and open-water portions of the lake to also survey for and characterize the distribution of milfoil and other invasive plants. A combination of survey techniques were utilized, including; visual observation, use of a "throw-rake and an Underwater View Scope. Invasive watermilfoil, curlyleaf pondweed, fanwort and other aquatic plants were noted and recorded.

We observed milfoil and curlyleaf pondweed growth in water depths of up to about 9 feet. Of the two invasive and non-native milfoil species found in Lake Shirley in the past, Eurasian watermilfoil was the only milfoil species we observed during our two surveys this spring. We did not find any variable watermilfoil but that is not to say that it no longer is present in the lake. We also observed considerable cover of invasive curlyleaf pondweed. We're pleased to report, however, that the overall cover of watermilfoil and curlyleaf pondweed was substantially less than seen last year. The growth of invasive European naiad was just beginning and evident , seeing how this is an annual plant that grows from seed.

Invasive fanwort was still low in the water column as its growth lags far behind the watermilfoil species during late spring and early summer. As the summer progresses, fanwort will be come more evident. We saw little fanwort during our recent inspections which strongly suggests that the previous fall/winter drawdown of the lake worked well. You and other LSIC members report that weather and other conditions were favorable for partial de-watering of the lake and an effective "kill" of drawdown susceptible plants like fanwort.

Some of native aquatic plants also observed during the survey, included, coontail, bushy pondweed, bladderwort, sago pondweed, wild celery, ribbonleaf pondweed, thinleaf pondweed, coontail, waterlilies and two macro-algae called muskgrass and stonewort. The growth for many of these native species was just beginning and typically lags behind the early season and aggressive growth of milfoil and

curlyleaf pondweed. The growth of sago and thinleaf pondweed, however, in “Millionaire’s Cove was desne and well up in the water column.

A map of proposed Treatment Areas is attached. Based upon our survey findings, we recommend approximately 40 acres of the total lake area be chemically treated with Reward (Diquat) herbicide. This 40 acres is well under the 68 acres treated in 2010 and the 70 acres treated in 2009. No chemical treatment will occur within Shirley. The attached map represents primarily milfoil and curlyleaf pondweed cover, in most treatment areas, of generally between > 5% and 100% and was judged by myself and other participants during the survey to represent an impairment to the normal uses of Lake Shirley and not feasible to manage with “hand-pulling” or other non-chemical techniques. Aggressively managing these invasive species now, is especially important in trying to reduce their further spread throughout Lake Shirley, to prevent degradation of fish and wildlife habitat

We are intending to chemically treatment of Lake Shirley on Monday, June 20th. The lake will be closed to all water uses, including swimming, fishing and boating on that day. There will be an additional restriction on water use for irrigation, watering livestock and drinking purposes for 5 days. We have recently sent you a written “notice of treatment” for you to publish in the local paper(s) and we will also mail you printed posters today, for you to post around the lake shoreline a few days prior to treatment.

We’ll again be treating with the Reward (Diquat) herbicide as we have in prior years. Considering the high sensitivity of the milfoil and curlyleraf pondweed in Lake Shirley to the Reward herbicide, we’ll be treating at a low rate (dose) of ~ 1.0 gal per treated acre of vegetation. In areas which have mixed populations of invasive milfoil, curlyleaf pondweed or other nuisance vegetation. we’ll need to treat at ~1.25-1.5 gals/acre. Maximum USEPA label rate for Reward is 2.0 gals/acre.

I hope this information is helpful to LSIC. Feel free to forward this memo to the Conservation Commissions and other appropriate parties. Thank you.

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Control #: 86149
Project Number: N/A
Project Name: Diquat Testing
Project Location: N/A

Analytical Results
Lab ID: 11060284
Date: 7/18/2011

| Sample | Method | Client Sample Identity | Units | Matrix | Analyst |
|---|---|---|---|---|---|
| 11060284-001 | EPA 549.1 | #1 Bowen Lake Shirley | ug/L | Groundwater | CalebH |

Start Date/Time Sampled: 6/22/2011 4:30:00 PM Composite End Date/Time:

| Parameter | CAS Number | Result | Qualifier | Date/Time Analyzed | Dilution Factor | RDL |
|---|---|---|---|---|---|---|
| Diquat | 85-00-7 | < 5 ug/L | | 7/14/2011 | 1 | 5 |
| Extraction 549.1 Diquat | | | | 6/29/2011 | 1 | 0 |

| Sample | Method | Client Sample Identity | Units | Matrix | Analyst |
|---|---|---|---|---|---|
| 11060284-002 | EPA 549.1 | #2 Bowen Lake Shirley | ug/L | Groundwater | CalebH |

Start Date/Time Sampled: 6/24/2011 9:00:00 AM Composite End Date/Time:

| Parameter | CAS Number | Result | Qualifier | Date/Time Analyzed | Dilution Factor | RDL |
|---|---|---|---|---|---|---|
| Diquat | 85-00-7 | < 5 ug/L | | 7/14/2011 | 1 | 5 |
| Extraction 549.1 Diquat | | | | 6/29/2011 | 1 | 0 |

| Sample | Method | Client Sample Identity | Units | Matrix | Analyst |
|---|---|---|---|---|---|
| 11060284-003 | EPA 549.1 | #1 Holman Lake Shirley | ug/L | Groundwater | CalebH |

Start Date/Time Sampled: 6/22/2011 Composite End Date/Time:

| Parameter | CAS Number | Result | Qualifier | Date/Time Analyzed | Dilution Factor | RDL |
|---|---|---|---|---|---|---|
| Diquat | 85-00-7 | < 5 ug/L | | 7/14/2011 | 1 | 5 |
| Extraction 549.1 Diquat | | | | 6/29/2011 | 1 | 0 |

| Sample | Method | Client Sample Identity | Units | Matrix | Analyst |
|---|---|---|---|---|---|
| 11060284-004 | EPA 549.1 | #2 Holman Lake Shirley | ug/L | Groundwater | CalebH |

Start Date/Time Sampled: 6/24/2011 1:30:00 PM Composite End Date/Time:

| Parameter | CAS Number | Result | Qualifier | Date/Time Analyzed | Dilution Factor | RDL |
|---|---|---|---|---|---|---|
| Diquat | 85-00-7 | < 5 ug/L | | 7/14/2011 | 1 | 5 |
| Extraction 549.1 Diquat | | | | 6/29/2011 | 1 | 0 |