Chateaugay Lakes

Milfoil Program

Benthic Matting and Transect Results

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Background

The Adirondack Watershed Institute (AWI) began working on Eurasian watermilfoil (hereafter called milfoil) control in the Chateaugay Lakes in the summer of 2008 under contract with the Chateaugay Lakes Foundation (CLF). In 2008 and 2009 the AWI was the sole contractor engaged by the CLF for milfoil control, since 2009 the CLF has contracted with both the AWI and Aquatic Invasive Management (AIM) for milfoil control activities. Hand harvesting and benthic matting are the two control methods used in the Chateaugay Lakes, as both techniques have proven effective in other lakes in the region, though albeit under significantly lower densities of milfoil infestation compared to the Chateaugay Lakes. In 2011 the AWI was responsible for benthic matting and AIM was responsible for hand harvesting. In addition, the AWI was responsible for monitoring the 19 transects installed on the lake bottom at 5 locations in the Chateaugay Lakes. The purpose of these transects is to monitor the effectiveness of the milfoil control program. This report provides a summary of the benthic matting work done by AWI in the summer of 2011 and an update of results from the transect monitoring.

Benthic Mats

The benthic mats deployed in the Chateaugay Lakes are approximately 340 square feet in surface area and are constructed from a semipermeable plastic material that is used for road underlayment. Because this material is buoyant five pieces of ½ inch rebar are attached to each benthic mat using plastic zip ties. The weight of this rebar is sufficient to counteract the buoyancy of the material so that the benthic mats can lay on the bottom of the lake. The Benthic mats are also perforated to allow gas bubbles to escape and to help lay them down. It is important to emphasize that the Benthic mats do not lay flat, rather the slight buoyancy of the material between each piece of rebar coupled with the mass of plant material trapped underneath results in humps in the material and a reduction in the effective surface area treated. The Benthic mats are rugged and reusable.

Over the last four summers, benthic mats have been deployed near the Sand Bar, in the Narrows, and at the entrance to the Lower Lake. The benthic mats are deployed in areas with a combination of high motor boat traffic and high milfoil density. These areas are targeted in an effort to rapidly control places where motor boats can create large numbers of milfoil fragments, these boats also catch fragments on their lower units and transport them to uninfested areas of the lake. Benthic mats are also deployed in these areas as a matter of safety, as having divers harvesting milfoil in high traffic areas is very hazardous. When a benthic mat is laid, its location is recorded using a GPS unit. Given the inaccuracy of the GPS reading, the location is approximate, generally within +/-30 feet of the actual location

depending on the number and orientation of satellites available when the reading is taken. Because the exact position of each benthic mat is not known finding mats that have been deployed can take considerable time. When finding benthic mats we use the GPS to establish a search area, and then divers swim the area to search for mats. Each diver has buoys with a rope and hook, and when a mat is found they hook an end piece of rebar which both marks that mat and allows it to be hauled up to the surface from a boat. As mats are brought onto the boat they are repaired as needed, folded, and stacked. After about 10 mats (depending on their weight) are accumulated on the boat they are redeployed to a new area that was pre designated. The procedure requires a five person crew consisting of 2 divers, 2 top waters, and 1 boat driver.

The daily activity log for benthic matting is shown in Table 1 and the general locations plus the number of benthic mats deployed at each location is shown in Figure 1.

Table 1. Summary of daily benthic matting activity in the Chateaugay Lakes in June, 2011.

Date	Location	Benthic Mats	Comments
6/6/2011	Boat Launch	15	Mats pulled from in front of boat launch and moved Southeast of launch
6/7/2011	Boat Launch	16	Mats pulled from in front of boat launch/South West of launch and moved Southeast of launch
6/8/2011	Boat Launch	16	Pulled mats from Southwest of Launch and moved to Northeast of launch by no wake buoy.
6/9/2011	Boat Launch	15	10 mats from South of boat launch and 5 from sand bar. Moved Northeast of launch
6/10/2011	Boat Launch	16	all mats from sandbar. Moved them to Northeast of launch
6/13/2011	Sand Bar	18	Mats from point by sandbar, kept in area. Placed them West of sandbar.
6/14/2011	Sand Bar	15	Mats from point by sandbar, kept in area. Placed them West of sandbar.
6/15/2011	Sand Bar	16	Mats from point by sandbar, kept in area. Placed them West of sandbar.
6/16/2011	Lower Lake	13	All mats found were relocated in Lower Lake
6/17/2011	Sand Bar	11	Per request, searched for more mats at sandbar and relocated them West of sandbar
6/20/2011	Lower Lake	23	All mats found were relocated in Lower Lake
6/21/2011	Lower Lake	24	All mats found were relocated in Lower Lake
6/22/2011	Lower Lake	17	All mats found were relocated in Lower Lake
6/23/2011	Lower Lake	15	Last day search for mats. All in Lower Lake
Total		230	

Only 230 of the original 288 benthic mats installed in the Chateaugay Lakes were recovered in 2011 (Table 1). Of these, 57 were recovered from the Boat Launch area, 92 were recovered from the Lower Lake, and 81 were recovered from the Sand Bar area. The 58 unrecovered benthic mats thus remain on the bottom of the lake. These benthic mats will be more difficult to recover as they gradually silt over and vegetation becomes established on them. An additional week of effort would probably be required to recover these 58 benthic mats, for a total of 4 weeks of effort to recover all of them.

The locations where the 230 recovered benthic mats were move to are shown in Figure 1. The 86 mats recovered from the Lower Lake were moved to the area shown in Figure 1. The benthic mats recovered from the Boat Launch area were moved to new locations north and south of the Boat Launch site. Thirty one of the benthic mats recovered from the Boat Launch area were moved to an area just southeast of the Boat Launch. The remaining mats recovered from the boat launch area were moved to an area northeast of the Boat Launch, plus an additional 21 benthic mats recovered from the Sand Bar area were also moved to this location, for a total of 53 benthic mats being placed at this location. The remaining 60 mats recovered from the Sand Bar area were moved west of the Sand Bar.

Monitoring

The effectiveness of milfoil management activities in the Chateaugay Lakes is monitored using transects installed in the littoral (plant growth) zone. Each transect consists of 100 feet of ½ inch nylon rope that is fixed to the bottom of the lake with rebar. Each transect is divided into ten 10 foot segments, and milfoil stems are counted in a 6 foot wide band on each segment which allows us to scale the stem count to stems per acre. The presence of all other species that occur in each transect segment is also recorded. Three transects were installed in the Boat Launch area in August of 2008, four transects were installed in the Sand Bar area and four transects were installed in the Lower Lake area in May of 2009, four transects were installed in the South Inlet in August of 2009, and four transects were installed in the Narrows between the Boat Launch and Sand Bar in May of 2010. The transects are measured in May before control begins and again in August after control ends. The locations of these transect monitoring areas are shown in Figure 2.

Milfoil control in the Chateaugay Lakes began in August of 2008 in the Boat Launch area, where 96 benthic mats were placed at this location. These benthic mats have been moved each year and matting has also been supplemented with hand harvesting. The effort has been intense in this area, which is reflected in the large reduction in milfoil density observed when comparing August 2008 to August 2011 (Figure 3). Though milfoil is still a dominate plant species in the

Boat Launch area, at third most abundant species observed (Figure 4), its density is now too low to justify benthic matting, and thus the area is now controlled by AIM using hand harvesting. The August 2010 to August 2011 reduction in milfoil density at the Boat Launch can be attributed to hand harvesting, as the benthic mats were removed from the Boat Launch area in June and AIM followed up later in the summer with hand harvesting.

Milfoil control in the Narrows area between the Boat Launch and the Sand Bar began in the summer of 2010 using hand harvesting, thus there have been two seasons of control. Initial milfoil density measured in May of 2010 at this location was about ½ of the pre-control (August 2008) milfoil density measured in the Boat Launch area (compare Figures 3 and 5). Two seasons of hand harvesting have reduced May to May milfoil density by about two thirds in the Narrows area. Milfoil was the second most abundant plant species found on the Narrows area transects in August of 2011 (Figure 6).

The South Inlet in Upper Chateaugay Lake has not been controlled, so at the moment it serves as a useful reference condition. Three years of August measurements show that the milfoil density in the South Inlet has been relatively stable (Figure 7). This should not be taken to mean that the milfoil population at this location is stable, as the beds could still be expanding laterally. The August to May densities illustrate the natural winter dieback that occurs followed by the rapid regrowth during the summer. Milfoil was the fifth most dominate species found on the South Inlet transects in August of 2011 (Figure 8).

The inlet to the Lower Lake has been exclusively controlled using benthic mats since 2009. The transect results from this area are not encouraging, rather the lack of a downward trend in milfoil density shows that matting has had no measureable effect on milfoil density (Figure 9). The milfoil bed in the Lower Lake covers a vast area and the 100 benthic mats deployed to this area only treat a relatively small part of the bed. When the benthic mats are moved adjacent milfoil likely reinvades the previously matted areas, which is a reason why benthic matting is often coupled with hand harvesting. Milfoil was the dominate species found on the Lower Lake transects in August of 2011 (Figure 10).

The Sand Bar area was the second location in the Chateaugay Lakes to be controlled. Control began in this area in 2009 using a combination of benthic matting and hand harvesting. Initial milfoil density measured in May of 2009 was comparable to the initial milfoil density measured at the Boat Launch in August of 2008 (compare Figure 3 and 11). Like the Boat Launch area, a significant reduction in milfoil density has been achieved at the Sand Bar area, but the amount of reduction was less at the Sand Bar area. One explanation for this is that the Sand Bar area has been controlled for one year less and at a lower level of intensity compared to the Boat Launch area. Another explanation has to do with the initial milfoil densities in each area: the initial milfoil density at the Boat Launch was an August measurement while the initial milfoil

density at the Sand Bar was a May measurement, this is significant because we know based on the South Inlet data that the density at the Sand Bar would have increased significantly during the summer if it was not controlled. Thus the fact that the May measurement at the Sand Bar had a similar density as the August measurement at the Boat Launch suggests that the Sand Bar area had a much higher milfoil density than the Boat Launch before control started. Milfoil was the dominate species found on the Sand Bar transects in August of 2011 (Figure 12).

Dense beds of milfoil have been reported to reduce the number of other plant species in the bed, thus removing the milfoil should increase the number of other plant species. A simple measure of plant species is species richness, the total number of species observed at a location. Species richness has not changed markedly with control activity at most locations, the exception is at the Sand Bar where an uptick in species richness was observed from 2010 to 2011 (Table 2), though milfoil changed in rank from number three in overall dominance in 2009 to number one in overall dominance in 2011 at this location. The Sand Bar and Narrows areas were the most diverse locations in 2011 in terms of species richness, which may reflect more suitable lake sediments to support growth in these areas. In combination with the lower amount of total effort (on a per acre basis) at the Sand Bar and Narrows, more suitable lake sediments may also help explain the high density and persistent regrowth of milfoil at these two locations compared to the Boat Launch.

Table 2. August species richness and milfoil dominance at the Chateaugay Lake transect sites, 2008 to 2011. R = species richness, the total number of species found at each location. Milfoil rank = the overall dominance of milfoil relative to other species at each location.

	2008		2009		2010		2011	
Location	R	milfoil rank	R	milfoil rank	R	milfoil rank	R	milfoil rank
Boat Launch	10	second	8	third	11	second	10	third
Narrows					14	second	13	second
South Inlet			9	third	8	third	10	sixth
Inlet Lower			12	third	10	first	10	first
Sandbar			11	third	11	second	14	first

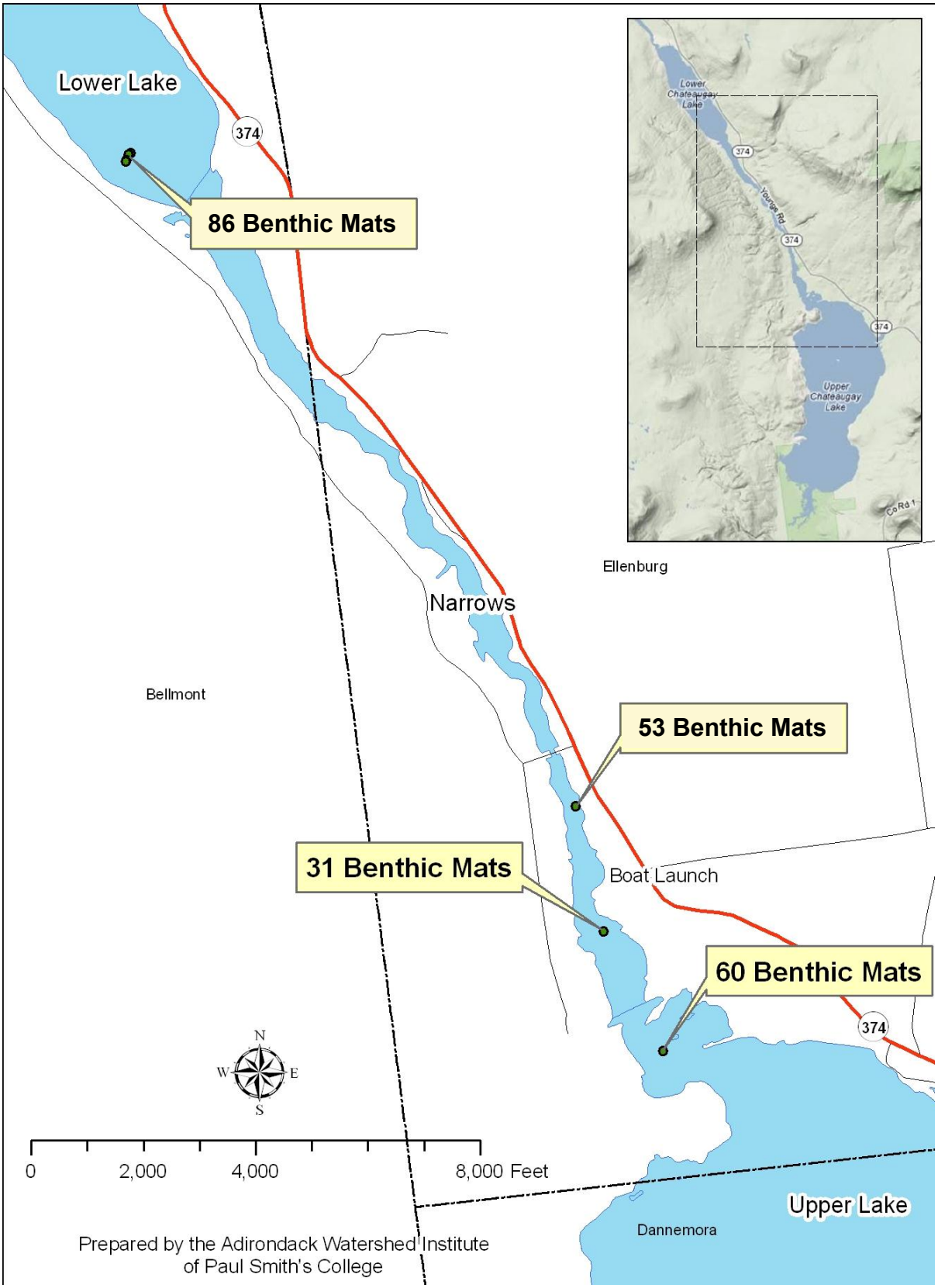

Figure 1. Locations of benthic mats placed in the Chateaugay Lakes in June, 2011.

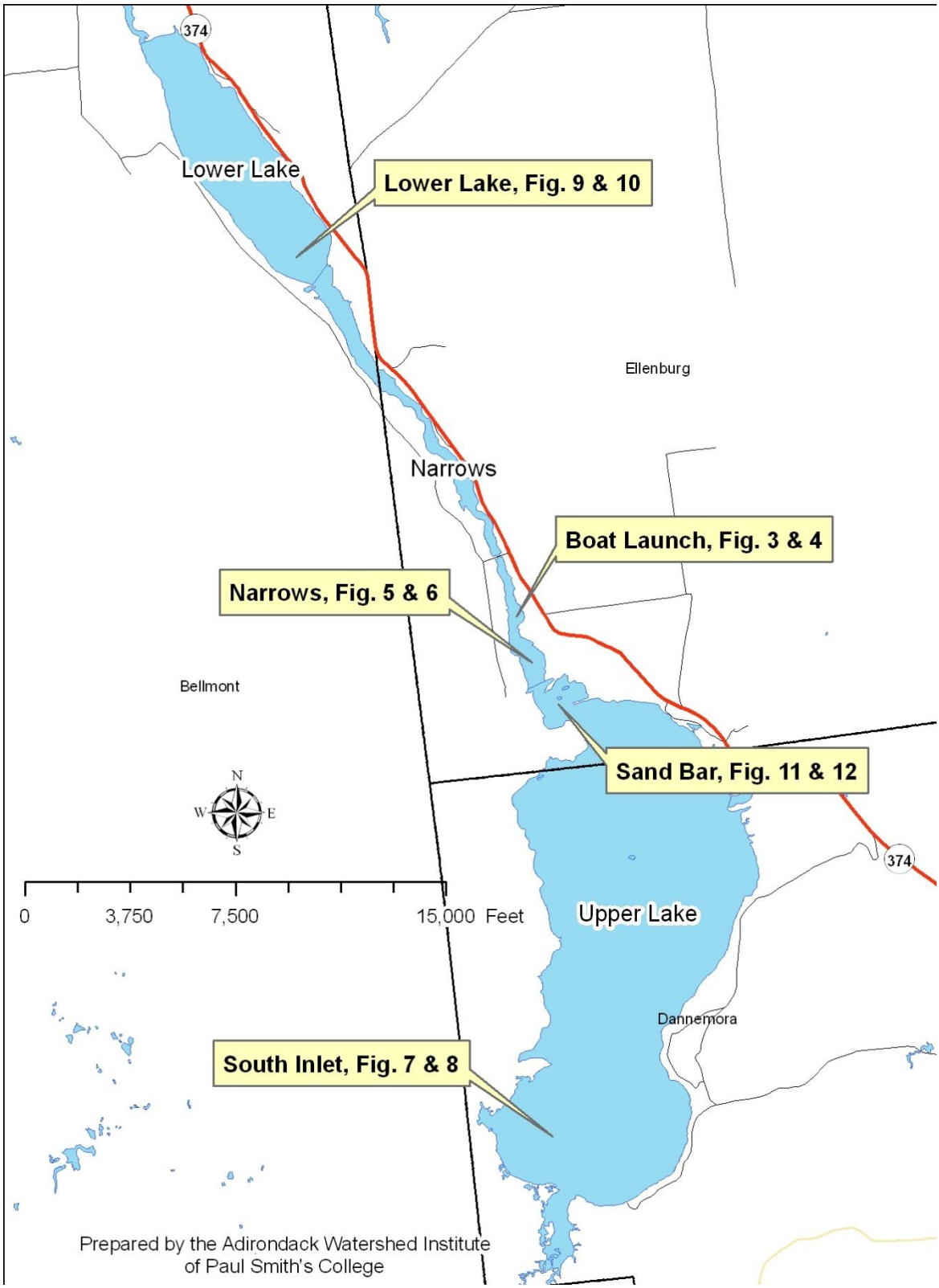

Figure 2. Locations of underwater plant monitoring transects in the Chateaugay Lakes. Each location shows the corresponding figures where the results can be viewed.

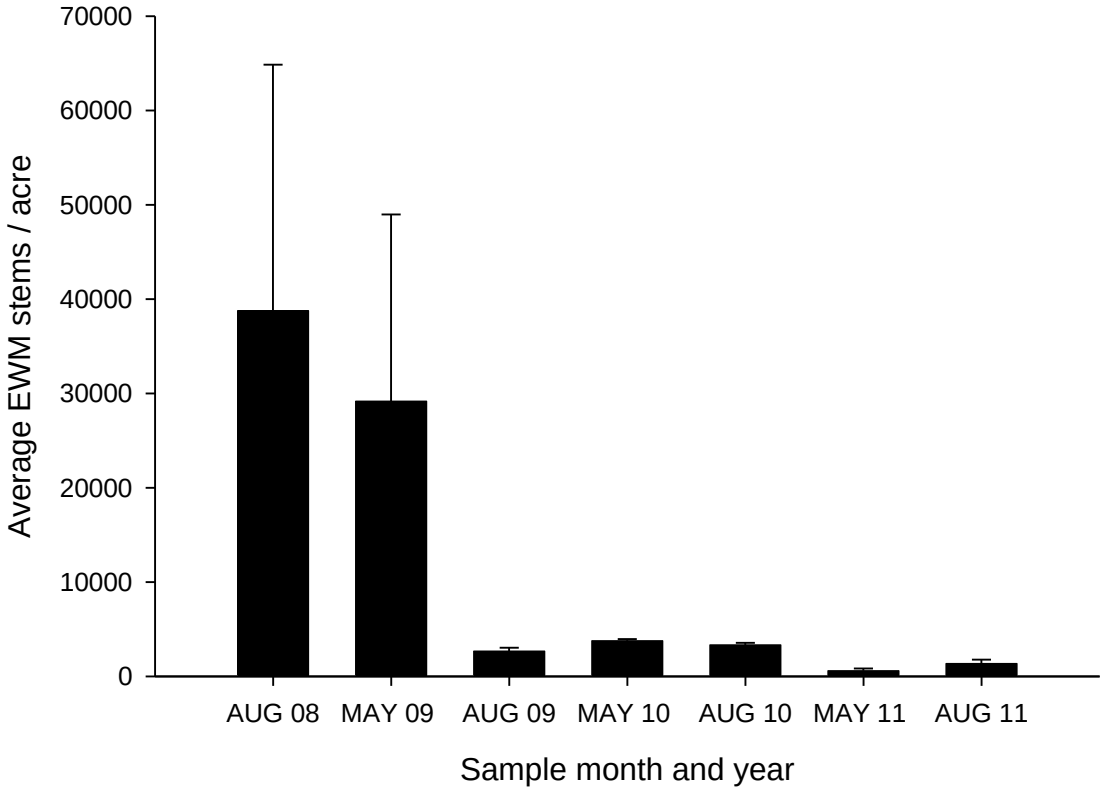

Figure 3. Average Eurasian water-milfoil density at the Chateaugay Lake Boat Launch site during May and August, 2008-2011. Error bars represent standard error of the mean (n = 3).

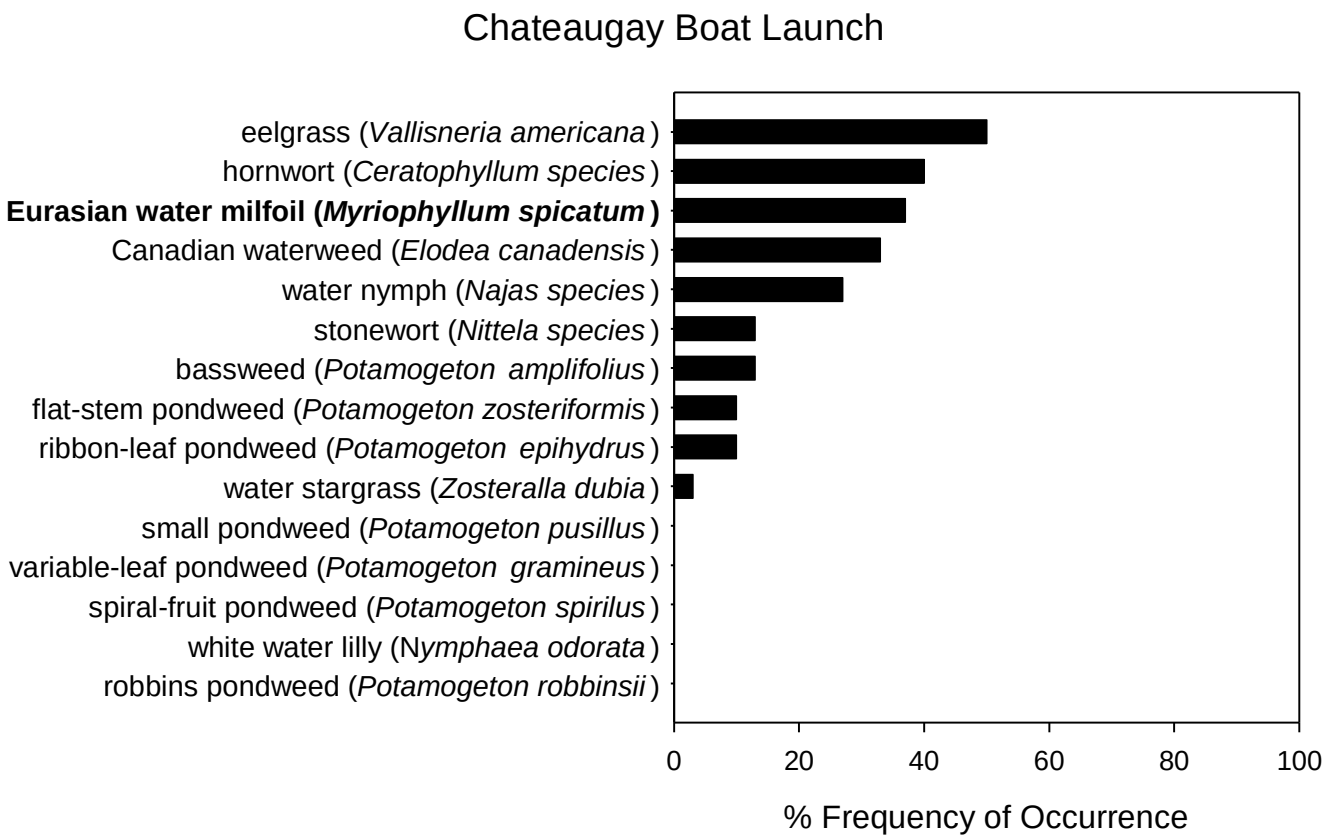

Figure 4. Percent frequency of occurrence of aquatic plant species and overall dominance ranking or Eurasian water-milfoil at the Chateaugay Lake Boat Launch site, August 2011.

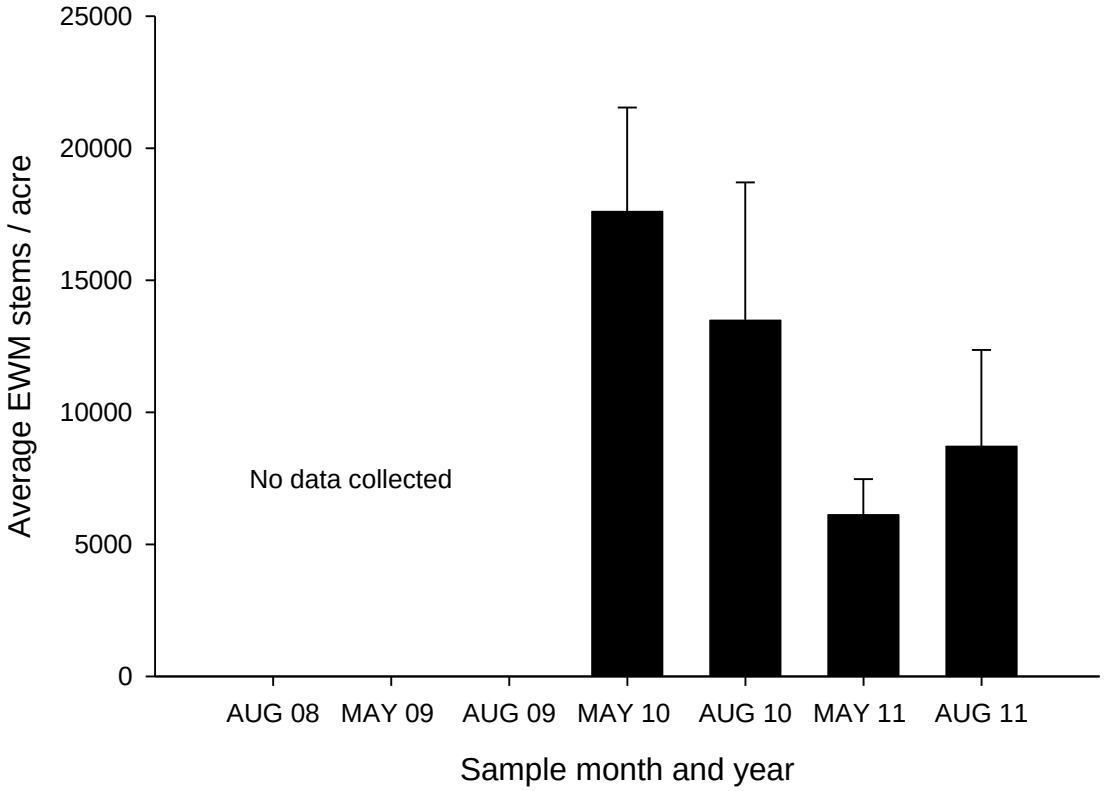

Figure 5. Average Eurasian water-milfoil density at the Chateaugay Lake Narrows site during May and August, 2010-2011. Error bars represent standard error of the mean (n = 4).

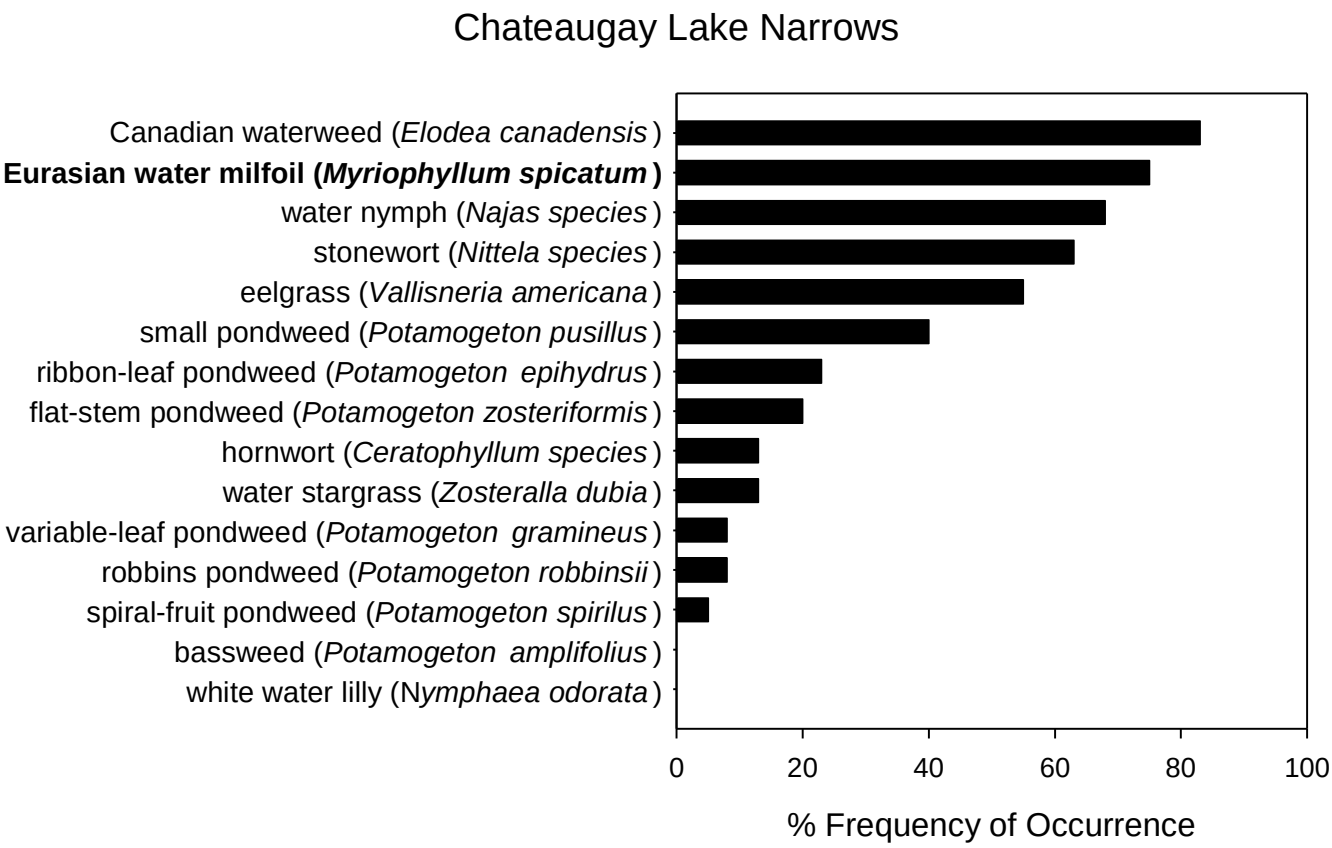

Figure 6. Percent frequency of occurrence of aquatic plant species and overall dominance ranking of Eurasian water-milfoil at the Chateaugay Lake Narrows site, August 2011.

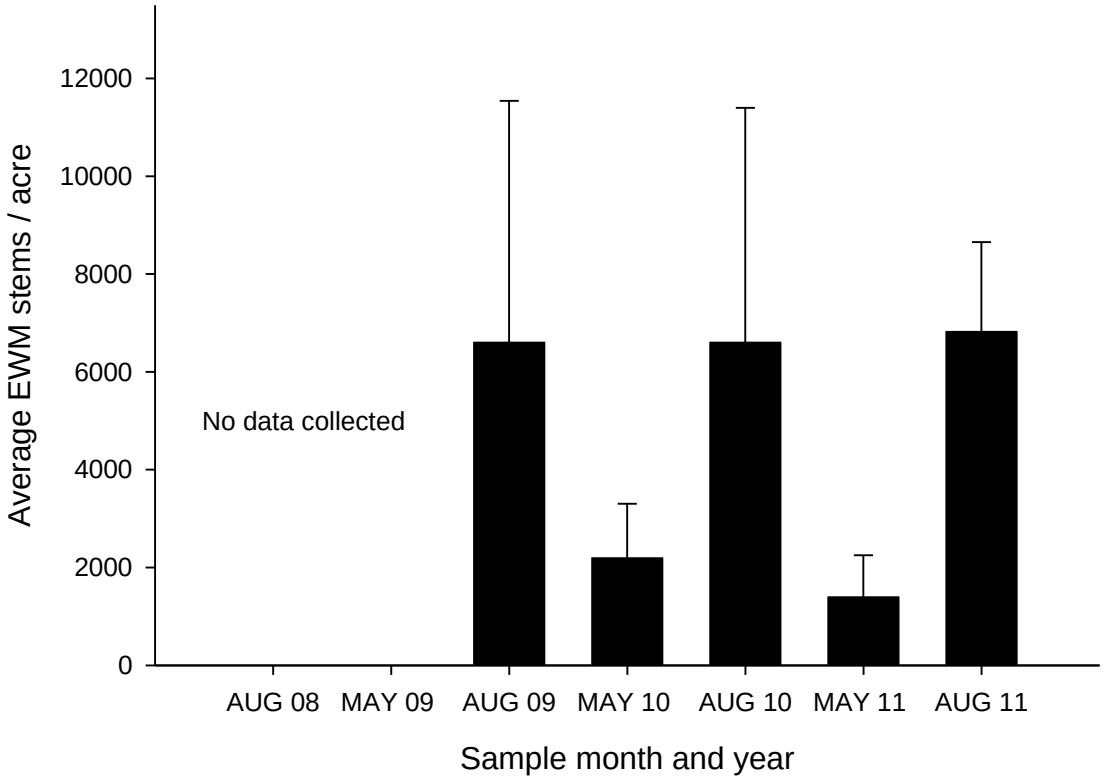

Figure 7. Average Eurasian water-milfoil density at the Chateaugay South Inlet site during May and August, 2009-2011. Error bars represent standard error of the mean (n = 4).

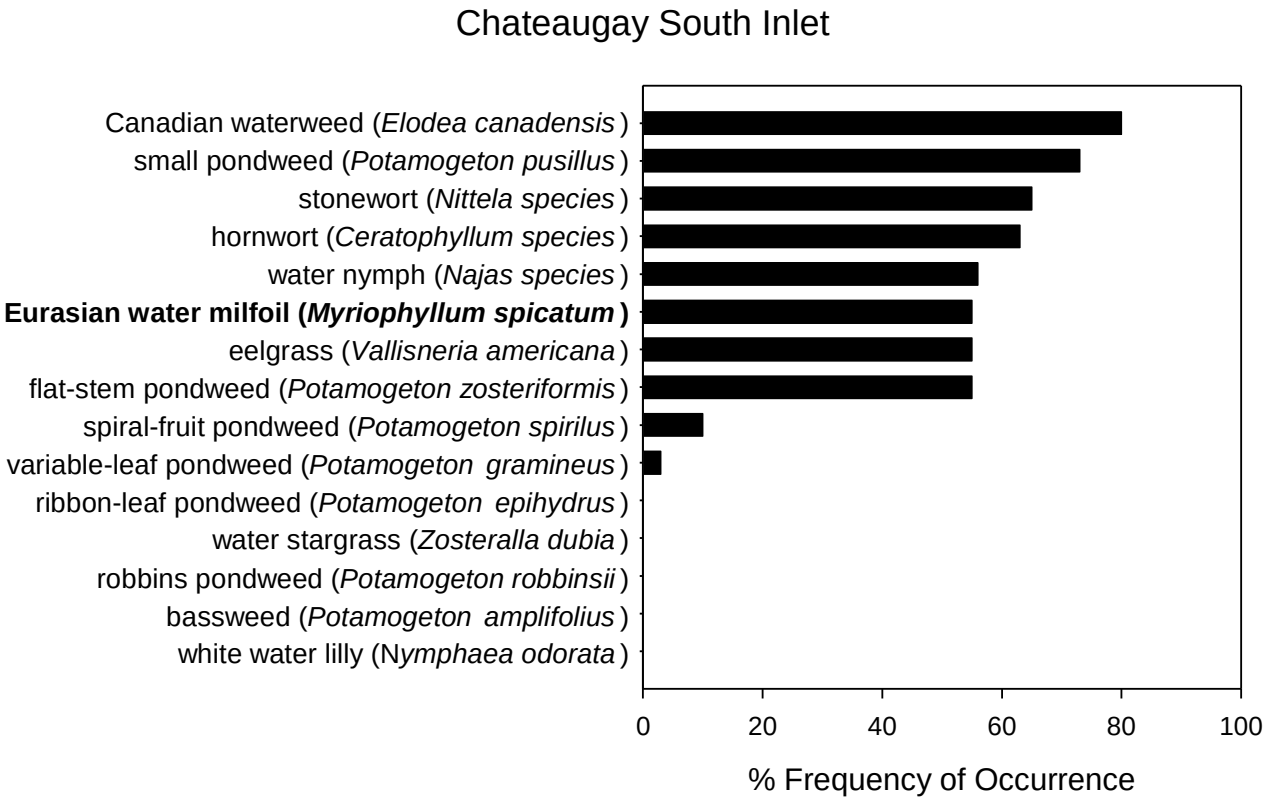

Figure 8. Percent frequency of occurrence of aquatic plant species and overall dominance ranking of Eurasian water-milfoil at the Chateaugay Lake South Inlet site, August 2011.

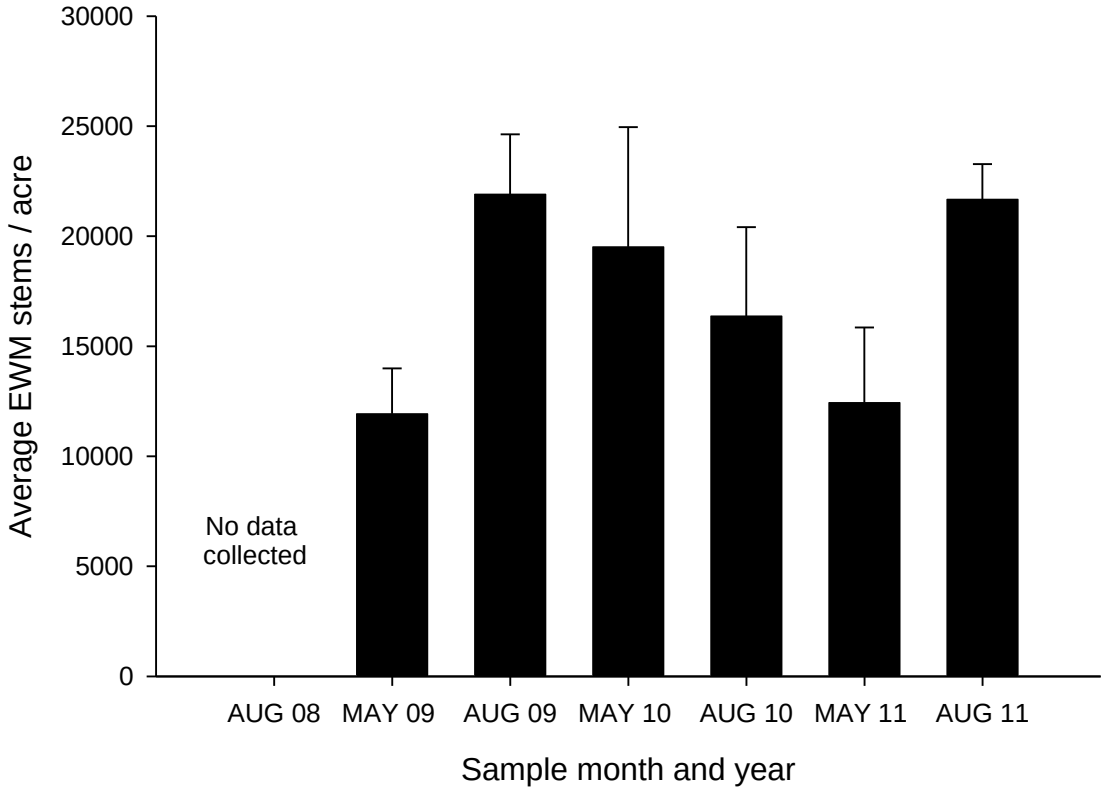

Figure 9. Average Eurasian water-milfoil density at the inlet to Lower Chateaugay Lake site during May and August, 2009-2011. Error bars represent standard error of the mean (n = 4).

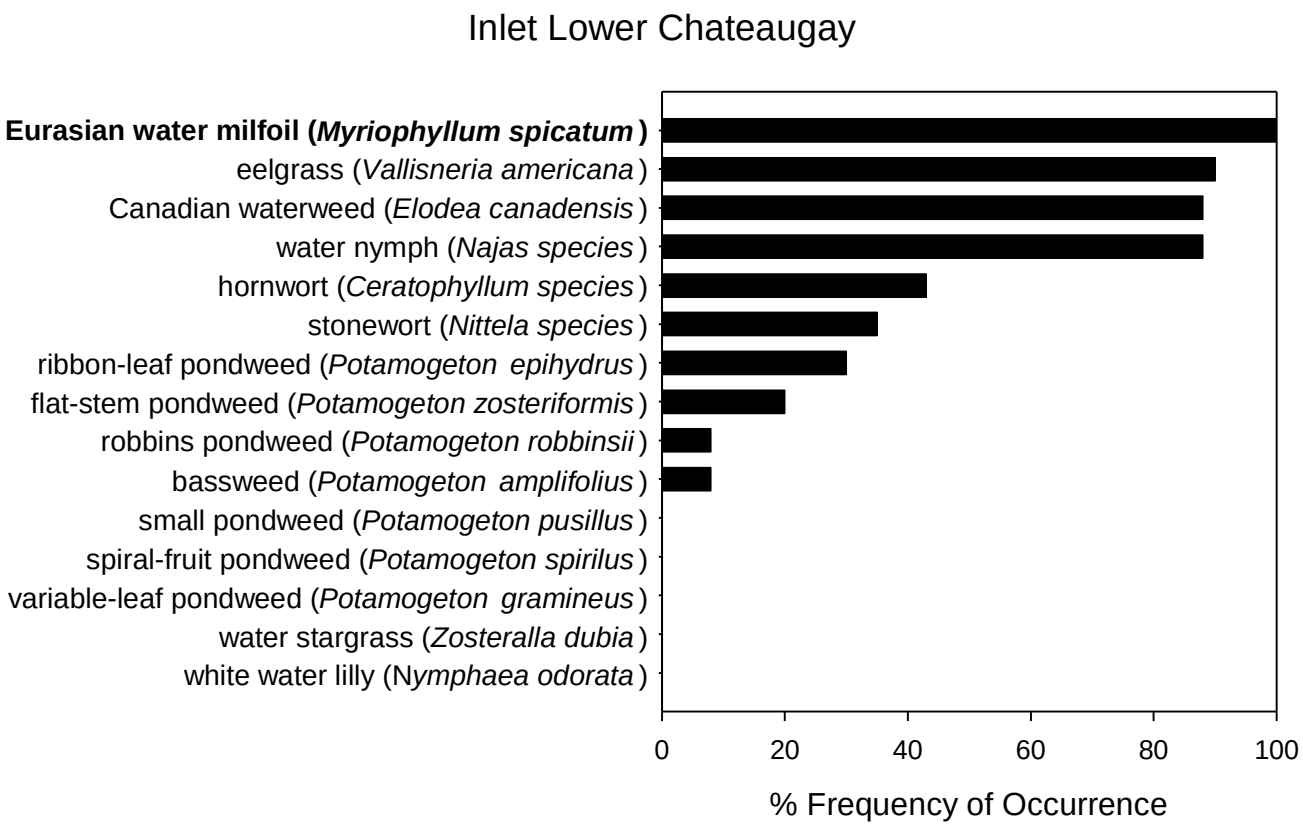

Figure 10. Percent frequency of occurrence of aquatic plant species and overall dominance ranking of Eurasian water-milfoil at the Lower Chateaugay Lake site, August 2011.

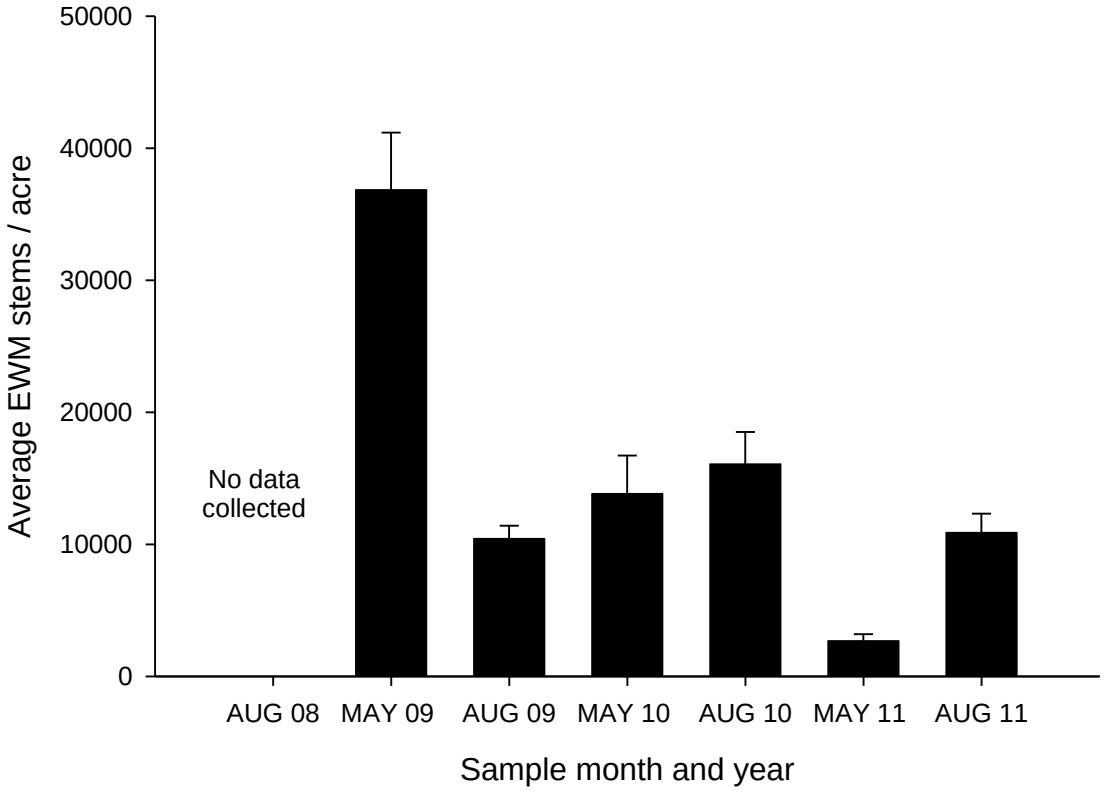

Figure 11. Average Eurasian water-milfoil density at the Chateaugay Lake Sandbar site during May and August, 2009-2011. Error bars represent standard error of the mean (n = 4).

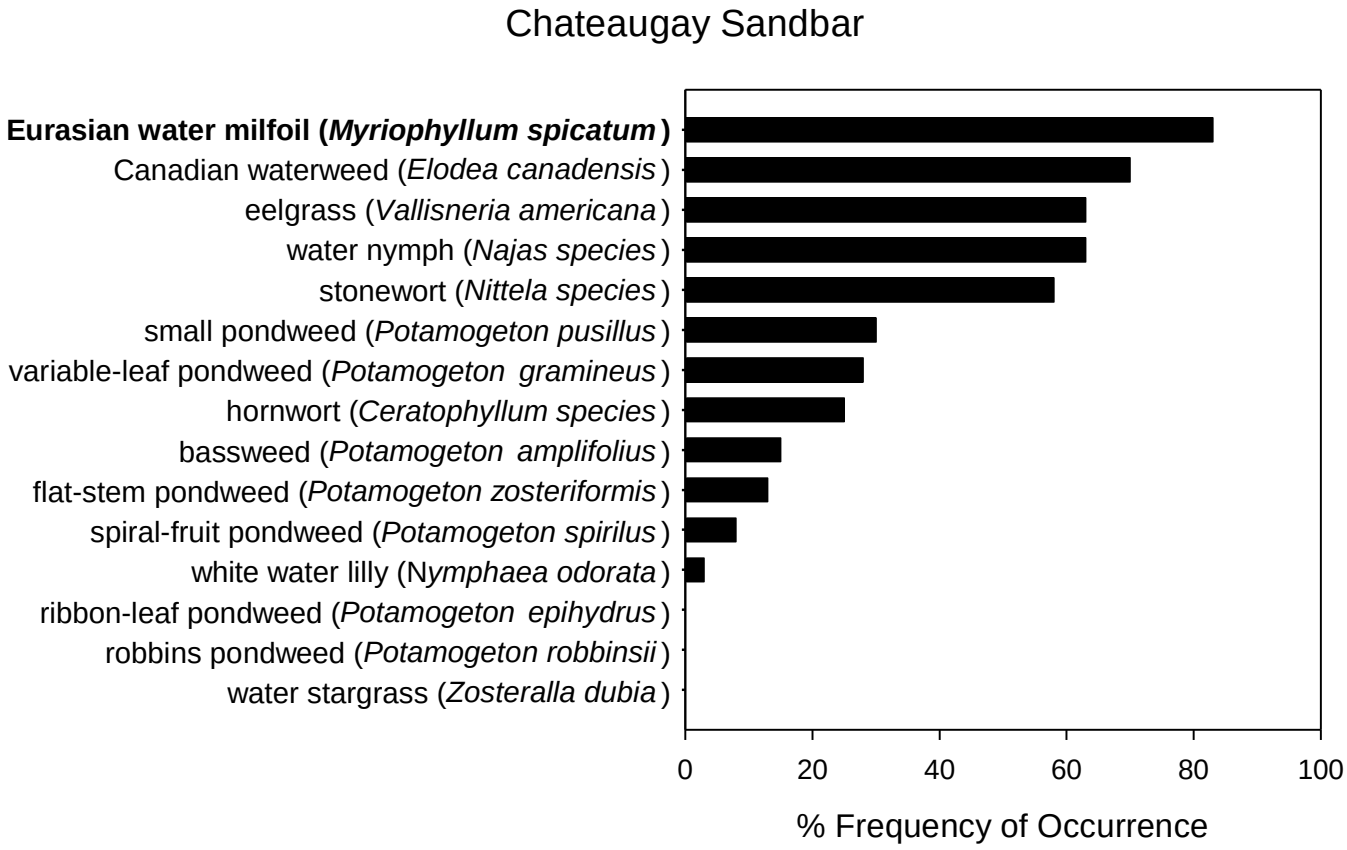

Figure 12. Percent frequency of aquatic plant species and overall dominance ranking of Eurasian water-milfoil at the Chateaugay Lake Sandbar site, August 2011.