

October 4, 2011

Nick Caggiano, Superintendent
Nashua Parks and Recreation Department
Greeley Park
100 Concord Street
Nashua, NH 03064

Re: 2011 Year End Report for the Harvesting Project at the Nashua River and Mine Falls Pond

Dear Mr. Caggiano:

During the summer of 2011, the City of Nashua funded a mechanical harvesting program to control invasive water chestnut (*Trapa natans*) in the Nashua River and other nuisance invasive aquatic plants in Mine Falls Pond. The following report summarizes the work that was performed in 2011 and provides recommendations for ongoing management.

The primary project objective of the Nashua River project was complete removal of the water chestnut before the plants produced and dropped mature nutlets (seeds). Water chestnut is a true annual plant that grows from seed each year. The seeds can remain viable for up to 10 years, so several consecutive years of harvesting are usually required to achieve significant reductions in water chestnut density. In Mine Falls Pond, the objective was more to remove invasive aquatic plant from the pond, to restore open water conditions. Controlling invasive aquatic plants helps to preserve a diverse native plant assemblage, improves water quality and habitat for aquatic organisms, and maintains suitable access for recreational pursuits.

Aquatic Control Technology, Inc. was contracted for this harvesting project in 2011. In early June, a pre-harvest survey was performed by Marc Bellaud, ACT Vice-President/Aquatic Biologist, to assess the growth of the water chestnut plants and nuisance aquatic plants. The gathered data was used to produce harvesting area maps for both sites. A second survey was performed in late June by Marc Bellaud and Amy Smagula (NH DES Limnologist/Exotic Species Program Coordinator) to assess and confirm the areas of nuisance invasive plant growth to be harvested and to

A chronology of the 2011 Nashua River project activities and tasks follows:

- ACT pre-harvest aquatic plant survey June 6
- NH DES and ACT pre-harvest aquatic plant survey..... June 29
- Submittal of NH DES permit application July 11
- NH DES permit approved (#2011-01673) August 3
- Mechanical harvesting operations (Nashua River) August 10 – September 1
- Mechanical harvesting operations (Mine Falls Pond)..... September 2 - 9

HARVESTING PROJECT DESCRIPTION

The pre-harvest survey was performed on June 29, 2011. In the Nashua River, water chestnut coverage was dense and estimated to encompass approximately 14 acres. Water chestnut is considered to be an exotic and invasive species in New Hampshire. It is an annual, seed producing plant that is capable of exponential growth. Once introduced to an area, water chestnut rapidly displaces other plants and forms dense, monotypic stands that eliminate open-water. Adverse impacts associated with water chestnut infestations include water quality deterioration, loss of fish and wildlife habitat, accelerated eutrophication and severe access impairments for

recreational activities. During the inspection, we did determine that water depths were sufficient for the harvesters to operate in, although a few shallow sand bars were noted, along with several submersed logs and stumps.

Both the Nashua River and Mine Falls Pond contained several invasive aquatic plants including fanwort (*Cabomba caroliniana*), variable milfoil (*Myriophyllum heterophyllum*), Eurasian watermilfoil (*Myriophyllum spicatum*) and water chestnut (*Trapa natans*). In Mine Falls Pond, nuisance invasive weed growth was moderate to dense with many of the plants to the surface by the time of the initial survey.



Water chestnut (*Trapa natans*) on the Nashua River
(Photo courtesy of Amy Smagula, NH DES)

The harvesting operation on the Nashua River started on August 10th with our H10-400 harvester which would cut, collect and transport the water chestnut to the shoreline disposal site located at the old boat ramp.

The City of Nashua handled the shore-based disposal operations. The harvested plants would be offloaded into a roll-off dumpster that was placed on the boat ramp. A backhoe was used to distribute and pack the plants into the dumpster. Once the dumpster was full it would be loaded back onto the truck and the harvested weeds would be transported to a permanent upland disposal site.

On August 23rd, during the third week of work, we added a second harvester, the H6-300 to increase the removal efficiency prior to seed drop. Two harvesters were used for the remainder of the project. Prior to Tropical Storm Irene arriving in Nashua, it was decided that the “chestnut barrier” which is left uncut to capture any loose rouge chestnut plants, would be harvested in order to keep high water levels and strong currents from washing the collection of loose plants downstream. The harvesting operation progressed smoothly and the Nashua River project was completed on September 1st.



Launch site and offload operation at the Nashua River
(Photo courtesy of Amy Smagula, NH DES)



Harvesting water chestnut on the Nashua River
(Photo courtesy of Amy Smagula, NH DES)

On September 1st both of the harvesters were hauled out of the Nashua River and were re-launched into Mine Falls Pond. Actual harvesting in the pond commenced on September 2nd. Certain areas of the pond were more difficult to harvest due to numerous subsurface stumps, but overall the harvesting in the Mine Falls Pond and the portion of the Canal to the first footbridge proceeded smoothly and was completed in five working days. The H6-300 harvester was removed from the pond on September 8th and the other was removed the next day.

Throughout the entire project, a harvester operator maintained daily logs of machine (engine) hours and number of loads collected. These logs were used to estimate the project's overall productivity (See Table 1). Project

oversight was conducted by Pete Beisler, Biologist/Operator, who was onsite almost the entire time to coordinate the harvesting operation and assist with any disposal or mechanical problems. Overall, only minimal “downtime” was experienced during the harvesting process at both sites. The City of Nashua crews proved to be very efficient in handling the shore-based disposal operations.

HARVESTING PROGRAM PRODUCTIVITY

A complete summary of the 2011 Nashua River and Mine Falls Pond harvesting operation is presented below in Table 1.

TABLE 1 - NASHUA RIVER / MINE FALLS POND HARVESTING SUMMARY - 2011

Area Description	Harvester Used	Dates Worked (# days)	Total Hours	Total Harvester Loads	Total Wet Weight ¹ (tons)	Total Wet Volume ² (cu. yds.)	Total Acreage Harvested
Nashua River	H10-400	8/10 - 9/1 (17 days)	124	254	~403	~2,692	~14
	H6-300	8/23 - 9/1 (8 days)	44	109	~104	~693	
Mine Falls Pond	H10-400	9/2 - 9/9 (5 days)	35	23	~36	~244	~22
	H6-300	9/2 - 9/8 (4 days)	23	16	~15	~101	
TOTALS	Nashua River		168 hours	363 loads	507 tons	3,385 cu. yds.	~14 acres
	Mine Falls Pond		58 hours	39 loads	51 tons	345 cu. yds.	~22 acres

¹ Total Wet Weight (tons) – estimates based on weight measurements taken in 1995 at the Charles River once the water chestnut was loaded onto MA MDC trucks (3,180 lbs/load H10- 400). The H6-300 was not measured but assumed to be 60% the capacity of the larger H10-400, based upon manufacturer’s specifications.

² Total Wet Volume (cu. yds.) - estimates based on volume measurements of water chestnut removed from the Charles River in 1995 off of an H-400 harvester (10.6 cu. yds./load). The H6-300 was not measured but assumed to be 60% the capacity of the larger H10-400, based upon manufacturer’s specifications.

The Nashua River water chestnut harvesting proceeded relatively smoothly. There were a few shallow water areas that had stumps and other obstructions that limited harvester access, but for the most part, the majority of the water chestnut beds were accessible. The considerable plant biomass and travel distance to the shoreline off-loading location proved to be the major challenges that reduced the removal efficiency to less than 0.6 acres per day per harvester. Hand-pulling (volunteer and paid) should continue to remove scattered water chestnut growth from other sections of the Nashua River.

Harvesting removal efficiency in Mine Falls Pond and Canal was considerably better (approaching 2.5 acres per day per harvester), which was due to the much lower plant biomass associated with the submersed invasive species as compared with water chestnut.

2012 MANAGEMENT RECOMMENDATIONS

Continuing with water chestnut harvesting on the Nashua River is strongly recommended in 2012. Some reductions in water chestnut coverage and density may occur, but usually 3-4 consecutive years of complete harvests are needed to achieve significant reductions in water chestnut density.

In 2012 it may be beneficial to consider different approach for the harvesting of the Nashua River. A two-cutting approach may reduce the amount of biomass being removed and reduce costs. For the two cutting approach, the area should be surveyed in early June to document the amount of water chestnut regrowth. We propose cutting the water chestnut once in mid-late June and then again in late July – mid August. This two-cutting approach may should reduce the total time spent harvesting, due to the smaller, less dense plants that would that would be found earlier in the year. Then in late July/August any regrowth would again be harvested before the plants reach their peak biomass. We would expect that using the 2-cutting approach, only one harvester would be necessary and overall hours spent harvesting would be reduced because of the reduction in biomass being removed.

In Mine Falls Pond and Canal, an herbicide treatment in both may provide for more cost-effective control (approximately \$5,000 reduction in cost), than harvesting. In addition, portions of the Canal cannot be accessed by the Open-water conditions in the Pond and Canal system could be maintained for the majority of the summer season if treatment were performed in mid-late June. Clipper herbicide, active ingredient flumioxazin, was registered by the EPA for aquatic use in late 2010. It showed effective control of milfoil, fanwort and other submersed species. There are no potable water use restrictions and the irrigation restriction only lasts 5-days following treatment. It is a contact-acting herbicide, so summer-long control is expected, but it is unknown if reduced plant densities will last longer than one year. Of course, the major challenge to performing an herbicide treatment will be securing permit approval through various state agencies in New Hampshire.

2012 ESTIMATED MANAGEMENT COSTS

Nashua River Harvesting

- Option 1
 - Two-cuttings during the season (recommended)~\$25,000
- Option 2
 - One round of harvesting (similar to last year)~\$32,500

Mine Falls Pond and Canal Management

- Option 1
 - Harvest the Pond only 1-cutting (concurrent with Nashua River).....~\$12,500
- Option 2
 - Herbicide treatment of both Pond and Canal system~\$21,000
- Option 2
 - Harvesting of the Pond and herbicide treatment of the Canal~\$26,000

We trust that this report sufficiently summarizes the aquatic vegetation control work that was completed in the Nashua River and Mine Falls Pond in 2011. Again, we thank the City for hiring us for this project and handling the shore-based disposal operations. Please feel free to contact our office if you have any questions or require additional information.

Sincerely,

AQUATIC CONTROL TECHNOLOGY, INC.

Peter Beisler
Biologist

Marc Bellaud
Vice President/Aquatic Biologist

Enclosures



*Photo courtesy of Amy Smagula, NH DES



*Photo courtesy of Pete Beisler, ACT, Inc.



*Photo courtesy of Amy Smagula, NH DES



*Photo courtesy of Amy Smagula, NH DES

2011 Nashua River / Mine Falls Pond Harvesting Log

DAY	M	T	W	TH	F	M	T	W	TH	F
DATE	8/8/11	8/9/11	8/10/11	8/11/11	8/12/11	8/15/11	8/16/11	8/17/11	8/18/11	8/19/11
START	n/a	11:00	6:45	7:00	7:00	7:00	7:00	7:00	7:00	7:00
FINISH	n/a	2:00	3:00	3:00	2:30	3:00	3:00	3:00	3:00	3:00
DOWNTIME	n/a	0	0	2	0	0	0	0	0	0
TOTAL BILLABLE HOURS	n/a	launch	8.25	6	7.5	8	8	8	8	8
DAILY LOADS: H10	n/a	n/a	18	12	16	20	18	18	18	15
H300	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

NOTES: H10 was launched on 8/9/11

DAY	M	T	W	TH	F	M	T	W	TH	F
DATE	8/22/11	8/23/11	8/24/11	8/25/11	8/26/11	8/29/11	8/30/11	8/31/11	9/1/11	9/2/11
START	7:00	7:00	7:00	7:00	7:00	7:00	7:00	7:00	7:00	7:00
FINISH	2:30	2:30	2:30	2:30	2:30	2:30	3:00	3:15	2:00	2:30
DOWNTIME	2	0	0	0	0	0	0	0	0	0
TOTAL BILLABLE HRS: H10	5.5	7.5	7.5	7.5	7.5	7.5	8	8.25	7	7.5
H300	n/a	1	5	5	5	7	7.5	7.5	6	7
DAILY LOADS: H10	12	15	15	16	14	14	13	12	8	4
H300	n/a	3	17	19	17	15	13	13	12	4

NOTES: H300 was launched on 8/23/11; Both machines moved to Mine Falls Pond on 9/1/11

DAY	M	T	W	TH	F
DATE	9/5/11	9/6/11	9/7/11	9/8/11	9/9/11
START	n/a	7:00	7:15	7:00	7:15
FINISH	n/a	2:30	2:45	2:30	12:15
DOWNTIME	n/a	0	0	0	0
TOTAL BILLABLE HRS: H10	n/a	7.5	7.5	7.5	5
H300	n/a	5	7	4	n/a
DAILY LOADS: H10	n/a	7	5	4	3
H300	n/a	5	5	2	n/a

NOTES: H300 was pulled on 9/8/11; H10 was pulled on 9/9/11

River Totals		Pond Totals	
Days: H10	17	Days: H10	5
Days: H300	8	Days: H300	4
Downtime	4	Downtime	0
HRS: H10	124	HRS: H10	35
HRS: H300	44	HRS: H300	23
Loads H10	254	Loads H10	23
Loads H300	109	Loads H300	16
Combined Hours:	168	Combined Hours:	58
Combined Loads:	363	Combined Loads:	39

Average Billable Hours per Day:	H10	7.4
	H300	5.6



AQUATIC CONTROL TECHNOLOGY, INC.
 11 JOHN ROAD
 SUTTON, MASSACHUSETTS 01590
 PHONE: (508) 865-1000
 FAX: (508) 865-1220
 WEB: WWW.AQUATICCONTROLTECH.COM

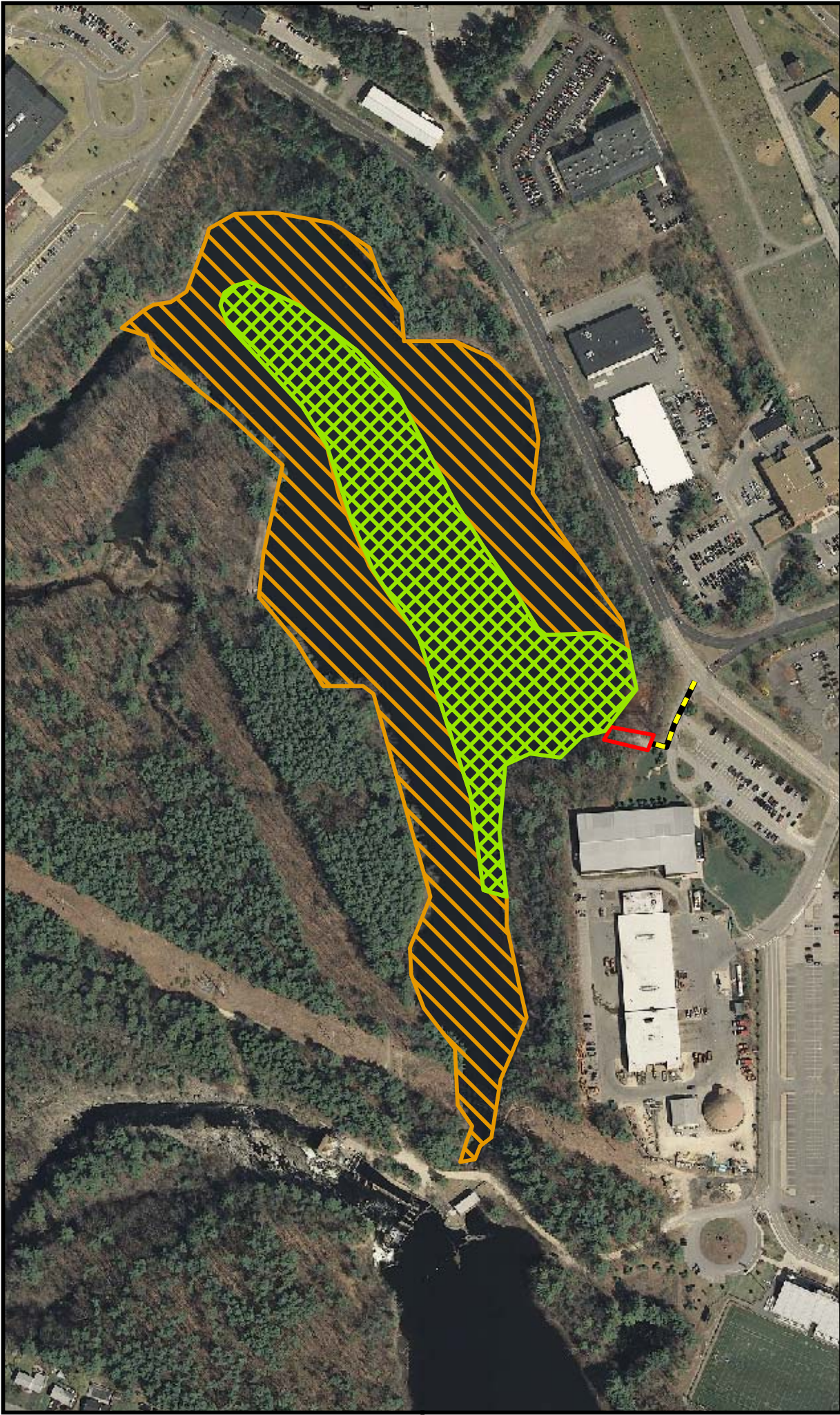
Legend

- Water Chestnut Harvesting Area (~14 acres)
- Launch and Offload site
- Access Route

N

0 250 500 1,000 Feet

Nashua River Nashua, NH		MAP DATE: 7/5/11	
Harvesting Site Plan		SURVEY DATE: 6/29/11	
FIGURE: 2			



AQUATIC CONTROL TECHNOLOGY, INC.
 11 JOHN ROAD
 SUTTON, MASSACHUSETTS 01590
 PHONE: (508) 865-1000
 FAX: (508) 865-1220
 WEB: WWW.AQUATICCONTROLTECH.COM

Legend

- Primary Harvesting Area (~8 acres)
- Secondary Harvesting Area (~14 acres)
- Launch and Offload site
- Access Route

N

0 250 500 1,000 Feet

Mine Falls Pond
 Nashua, NH

Harvesting Site Plan

FIGURE:	SURVEY DATE:	MAP DATE:
3	6/28/11	7/15/11