AQUATIC CONTROL TECHNOLOGY
POND AND LAKE MANAGEMENT SPECIALISTS

November 1, 2013

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

Re: 2013 Year End Report for the Nashua River Water Chestnut Harvesting Project

Dear Mr. Caggiano:

During the summer of 2013, the City of Nashua funded a mechanical harvesting program to control invasive water chestnut (*Trapa natans*) in the Nashua River. Aquatic Control Technology was contracted again for this harvesting project in 2013, having performed the harvesting in 2011 and 2012. The City has handled the shore based disposal operations throughout the program. The primary objective of the Nashua River harvesting project was complete removal of the water chestnut before the plants produced and dropped mature nutlets (seeds). The following report summarizes the work that was performed in 2013 and provides recommendations for ongoing management in the future.

INTRODUCTION

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. 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. 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. Controlling invasive aquatic plants such as water chestnut, helps to preserve a diverse native plant assemblage, improves water quality and habitat for aquatic organisms, and maintains suitable access for recreational pursuits.

For the 2013 season, a two-cutting harvesting program was again recommended, with the first cutting planned for early June and the second cutting planned for late July or early August. Reasoning for the two-cutting approach was to remove water chestnut when it was less mature and had considerably lower biomass, in order to increase removal efficiency and reduce the amount of material being handled by the shore-based disposal operations. Positive reductions were seen from 2012 to 2013 using the two-cutting approach. Continual germination from the water chestnut seed bank has been documented after the surface canopy is removed, so a second cutting was expected to be necessary. Promoting multiple germination cycles during one season may help to accelerate depletion of the seed bank. It was also hoped that an earlier harvest would yield open-water conditions for more of the summer season and improve conditions for recreation.

2013 HARVESTING PROJECT DESCRIPTION

Between mid to late May and early June multiple inspections were performed by ACT Biologists of the proposed harvest area in the Nashua River to determine the stage of water chestnut growth and to finalize timing for the initial cutting. By early June, the water chestnut coverage in the Nashua River was at the appropriate stage for cutting and estimated to encompass approximately 8 acres, which was a significant decrease in area from what was seen in 2012 (17 acres). The majority of the 8 acres proposed to be harvested supported a reduced density of water chestnut from what was seen during the past two years.

On June 5th, our H10-400 harvester was launched and the initial cutting proceeded on June 6th. The harvester cut, collected and transported the water chestnut to the shoreline disposal site, located at the boat ramp. The initial cutting effort proceeded smoothly and was completed on June 12th. A total of 5 harvesting days were performed and an estimated 9.5 tons of water chestnut were removed from the Nashua River.

Inspections resumed in early to mid July to determine timing for the second cutting. Although a second harvesting operation was proposed for early August, it was decided that it was not necessary due to the efficacy of the initial cutting and the follow-up hand pulling performed John Fisher and a group of citizen volunteers.

The 2013 Nashua River water chestnut harvesting program proceeded smoothly. 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 for the entire project to coordinate the harvesting operation and assist with any disposal or mechanical problems.

TABLE 1: HARVESTING PROGRAM PRODUCTIVITY / SUMMARY

	2011	2012		2013
Timing	late August	mid June	mid August	early June
Harvester(s) Used	H10-400 & H300	H10-400	H10-400	H10-400
Days Worked (# chargeable days)	25	16	12	5
		28		
Total Hours	168	124	51	36
		175		
Total Harvester Loads	363	133	75	6
		208		
Total Wet Weight[1] (tons)	403	212	119	9.5
		331		
Total Wet Volume[2] (cu. Yrds.)	2,692	1,410	795	64
		2,205		
Total Acreage Harvested	14	15	17	8
		32		

[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).

[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).

In 2011, with a single cutting and two machines running for much of the time, less than 0.6 acres was harvested per day, per harvester. In 2012, with a single harvester and the two rounds of harvesting, more than 1.1 acres were cut per day on average. With the “two cutting” approach, the plant biomass during each cut seemed to be reduced significantly. In 2013, with a single harvester and only one cutting necessary, more than 1.6 acres were cut per day on average. The travel distance to the shoreline off-loading site continues to be a limiting factor to achieving greater efficiency.

2014 MANAGEMENT RECOMMENDATIONS

The majority of water chestnut growth has now been harvested from the Nashua portions of the Nashua River for three consecutive seasons, prior to the seed drop occurring. We typically find that three or four consecutive seasons of harvesting prior to seed drop are needed to see appreciable reductions in water chestnut densities, but we already saw a marked drop in acreage covered and water chestnut density in 2013.

Continuing water chestnut harvesting efforts in the Nashua River is strongly recommended for the 2014 season. We recommend continuing with the two-cutting approach, if necessary. This approach would attempt to reduce the amount of plant biomass that needs to be handled by targeting the plants earlier in their growth cycle when there is less plant biomass. This multiple cutting approach may also accelerate the depletion of the water chestnut seed bank, by forcing germination to occur throughout the summer. When the chestnut is left unmanaged, ongoing germination ceases during the summer months once the dense surface canopy is established.

We would suggest performing the initial cutting at the same plant maturity level as this past year. This approach may further reduce the amount of biomass being removed. The area should be surveyed in mid to late May to document the amount of water chestnut regrowth. We propose cutting the water chestnut once in early June and then again in late July – early August, if necessary. In 2013 only one cutting was needed, only one harvester was used and the total number of loads removed was a fraction of what was needed in 2011 and 2012. Estimated costs for a two-cutting harvesting program in 2014 are provided below:

- First Cutting (early-mid June)
  - Harvesting of < 10 acres of dense water chestnut that is accessible to the harvester – assumes 5 workdays @ $1,550/day $7,750
  - Equipment mobilization / demobilization $1,250

- Contingency Second Cutting (late July – early August (if necessary)
  - Harvesting of dense water chestnut regrowth that is accessible to the harvester – assumes 3 workdays @ $1,550/day $4,650
  - Equipment mobilization/demobilization $1,250

Total Program Cost for two cuttings $14,900

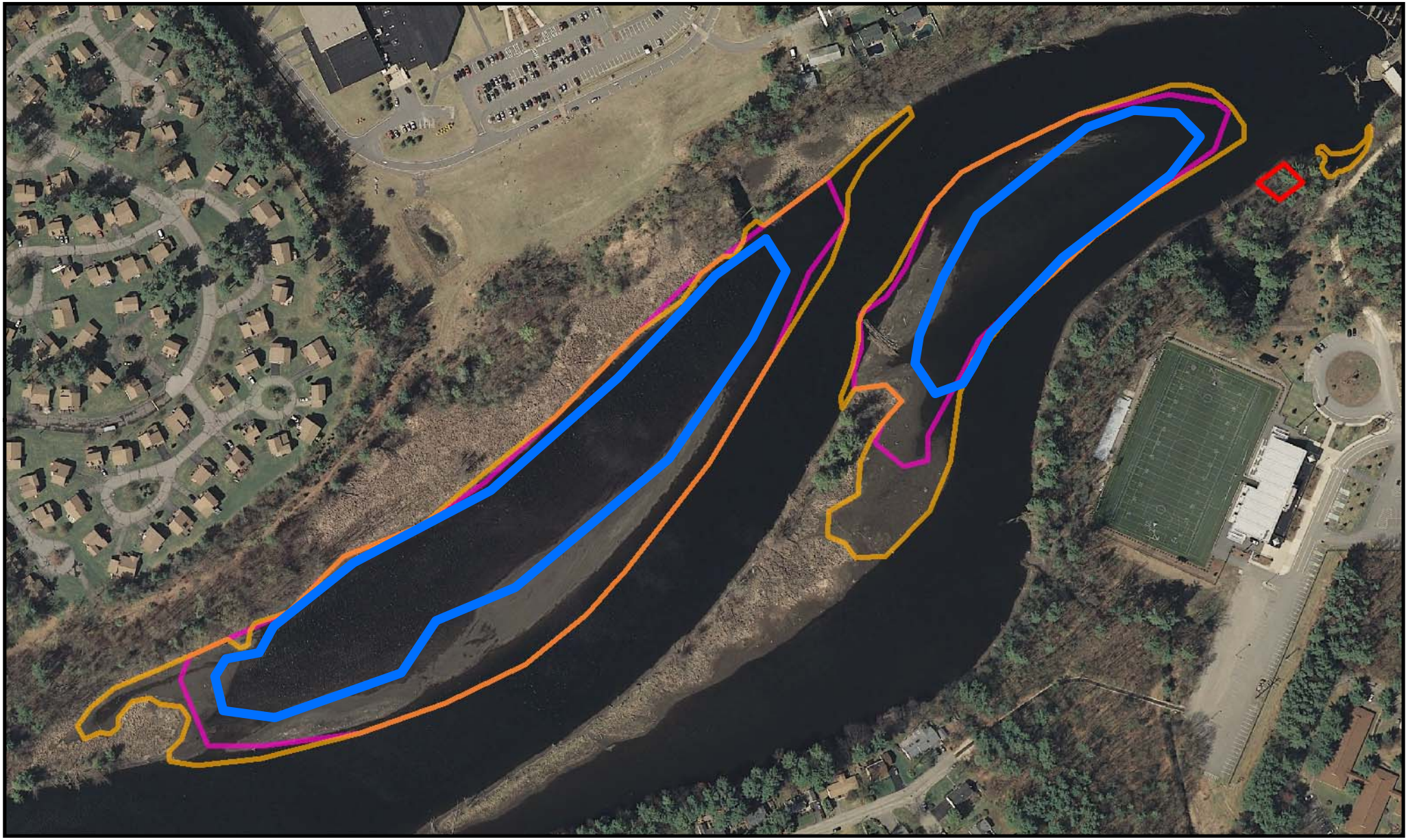
We trust that this report sufficiently summarizes the aquatic harvesting work that was completed in the Nashua River in 2013. Again, we thank the City for hiring us for this project and handling the shore-based disposal operations. Please feel free to contact our office if you have any questions or require additional information.

Sincerely,

AQUATIC CONTROL TECHNOLOGY

Peter Beisler
Biologist

Marc Bellaud
President / Aquatic Biologist



Nashua River

Nashua, NH

2013 Nashua River Harvesting Area Map

FIGURE:	SURVEY DATE:	MAP DATE:
1	---	11/1/13

Legend:

- 2013 Water Chestnut Harvesting Area (~8 acres)
- 2012 Water Chestnut Harvesting Area (~17 acres)
- 2011 Water Chestnut Harvesting Area (~14 acres)
- Launch and Offload site

N

0 250 500 1,000 Feet

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