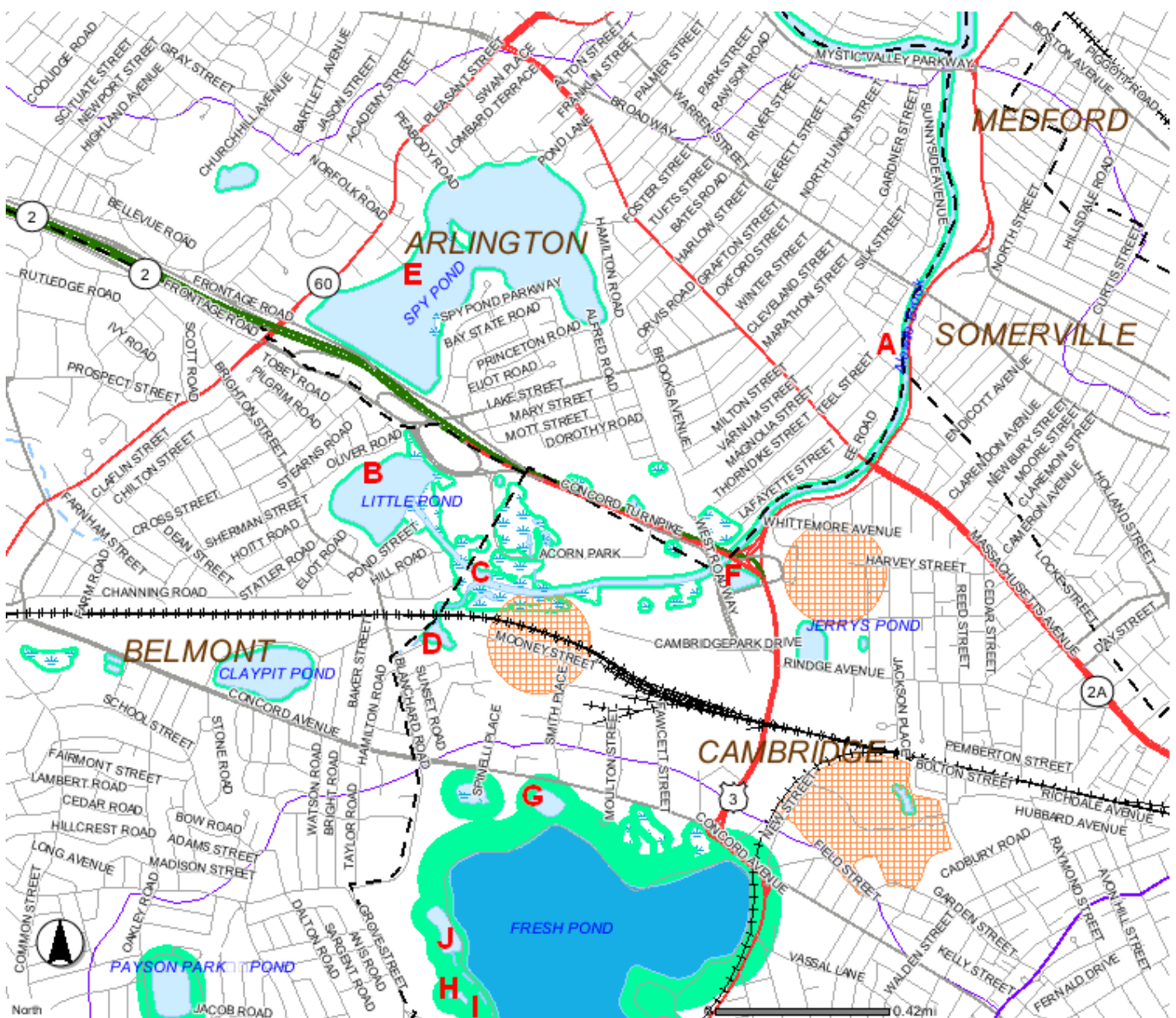


Tenth Year Project Review
Alewife Brook Subwatershed Water Chestnut Eradication
May 5, 2010

Ten years feels like a good time to more fully analyze this project with details for each waterbody affected. Overall, the project is achieving success in eradication of Water Chestnuts though the battle is significantly longer than originally hoped. As seen in the table on page two, no plants were found last year in six of the ten waterbodies where infestations had been found. Throughout the Alewife watershed, only 493 plants were found in 2009, totaling just 77 pounds - new lows in both categories! The one anomaly seen in the 2009 harvest was an order of magnitude jump from 27 to 240 plants found in the North Pond between the First and Ninth golf holes at Fresh Pond Reservation. The other three ponds with remaining infestations saw further drops in the number of plants found.



Number of Water Chestnut Plants Removed from the Alewife Brook Subwatershed

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	
Body of Water											
Alewife Brook	14	0	1	0	0	0	0	0	0	0	A
Little Pond	24	0	0	0	0	0	0	0	0	0	B
Little River and Perch Pond	156	23	12	2	3	7	3	4	1	0	C
Blair Pond	*10000	31000	1094	264	18	8	*11	98	47	34	D
Spy Pond	*	783	1	1	1	0	0	0	0	0	E
Yates Pond	*	*13	12	1	4	0	0	0	0	0	F
Blacks Nook	*	*	*32000	65600	21400	5300	*1892	3379	672	214	G
North Golf Pond	*	*	*	*	16500	3300	1341	37	27	240	H
South Golf Pond	*	*	*	*	7	7	0	1	0	0	I
Little Fresh Pond	*	*	*	*	3	1	0	133	21	5	J
* no harvest or partial harvest											
Total Pounds per Year	12000	800	3300	4000	2000	400	165	229	155	77	
Total Plants per Year	10.2K	31.8K	33.1K	65.9K	37.9K	8.6K	3.2K	3.6K	0.8K	0.5K	

Bold Red letters A thru J refer to infested waterbodies on the page one map.

A) Alewife Brook was the original impetus for this project. As I conducted bacterial sampling in 1999 I noticed two 50-100 square foot patches of Water Chestnut downstream of the Broadway Bridge in Arlington and Somerville. These were indeed easy to hand-pull the next year, and only one further plant was found in the third year, just downstream of Little River where it had likely washed downstream from another infestation.

B) Little Pond in Belmont was another early success story, and after the first year saw no further plants. The only other infestation upstream of Little Pond was Spy Pond, and luckily this was also quickly eliminated.

C) Little River runs between Little Pond and Alewife Brook, with a small widening midway at Perch Pond - the confluence with Wellington Brook from Blair Pond. While the infestation was largely eliminated that first year, the large upstream problem in Blair Pond has regularly been a source for plant fragments washed downstream. The large silt deposits in Perch Pond also may be a long-term seed repository as most years have seen at least one rooted plant. Especially after this spring's floods may have rearranged sediment, new layers of well-preserved seeds could now be exposed and viable.

D) Blair Pond in October 1999 was seen with a few dying plants and added to the original eradication plan just to remove the last known upstream source of renewed infestations. What I didn't realize was that the few plants seen were just the remains of almost 2 acres of solid infestation. Though warned during permitting that this might not be feasible, I decided to try anyway. Unfortunately, the last of multiple permits required for this project did not get approval until July when plants were already large. Eight weeks of full-time

pulling - almost 400 hours' effort - barely cleared one third of the pond. Six tons estimated at about 10,000 plants was basically wasted effort because harvesting was too late in the year. Plant mass was increasing faster than I could pull it from the pond. With multi-year permits in place, and determined not to fall behind the second year, harvesting began as soon as plants could be seen sprouting from the bottom of the pond. Consequently, in ten short (~4-hour) days over two weeks the pond was totally cleared! Each day I removed 3000 plants - about 75 pounds or one garbage can full. Repeat visits later that summer got another couple thousand late sprouters and regrowth from those harvested plants which had broken rather than cleanly pulled from the roots. But the thesis that even large infestations could fall to hand-pulling IF attacked while plants were still small had been proven! Blair Pond had one rare feature which made harvesting easier than expected - the monoculture of Water Chestnut resulting from long-term infestation meant no tangling with other plants and no hiding of fragments under water lily leaves or other aquatic plants. However, the long-term infestation here has deposited a huge seed repository which has proven the point seen in literature that seeds may remain viable for twelve to twenty years. A couple of times large storms rearranged sand bars and other sediment deposits in the pond, and clusters of plants were found in previously cleared parts of the pond the following spring. In 2006, I mistakenly cleared the pond only once with no return visit, and later growth or re-growth dropping new seeds led to a jump in plants from 11 to 98 the following year. This also reset the seed-bank apparent age as seen in subsequent harvests. So a very small apparent lapse of missing likely only 3-5 plants led to a drop of an estimated 200 new seeds which will sprout over several more years - - extending time to eradication in this pond by at least 5 years! Vigilance and COMPLETE harvesting before seed drop is key to the success of Water Chestnut eradication.

E) Spy Pond in Arlington was first harvested in the second year of the project after I was sure that early harvesting could clear Blair Pond and leave time to broaden the project. The infestation was found as part of a survey of the entire watershed conducted in the first year. This infestation was dense but constrained to a VERY small spot along the West shoreline just south of the island. Because of extreme eutrophication, other plants were physically blocking the spread of fragments from the area. Arlington treated the pond with Sonar and multiple other herbicides the same year as harvests began. The Water Chestnuts survived just fine, and fragments were found all around the periphery so if harvesting had not proceeded, the entire pond might have simply converted to Water Chestnuts - at least in shallower areas along the shore. The seedbank effect was minimal here, so either the infestation was very young, or the bottom substrate was not conducive to seed storage, or one of the herbicides had an effect on seeds. Since this infestation was near shore and centered on one waterfront property, it is possible this patch was intentionally put here as an ornamental plant.

F) Yates Pond by Alewife T station was also found infested during the first-year survey. This was the last Pond harvested in year two and is even more hyper-eutrophic than was Spy Pond. The water is also shallow, stagnant, and very warm so the plants were already dropping seed when harvested. For this reason, there was no significant drop the next year, but this pond has now been completely Chestnut-free for five years.

G) Blacks Nook in Cambridge's Fresh Pond Reservation was not begun until the third year of this project - partly to ensure earlier water bodies continued to be completely harvested, and partly because I was awaiting the formation of an oversight committee for the Fresh Pond Master Plan to give approval to the eradication project there. This pond is larger and had a larger infestation than Blair Pond! Consequently, in the first year I only attacked this after other targets were cleared. It was clear the pond would not be cleared the first year with such a late start, so I only attacked the periphery of the infestation trying to remove any new, small patches and migrating fragments then slowly pushing back margins of the main infestations. Once seed began to drop, I only patrolled for fragments trying to transport fresh seed into cleared sections. The second and subsequent years, harvesting was as complete as possible, leading to a rapid drop in plant numbers. Unlike Blair Pond, other aquatic plants dominate this pond, both emergent and submerged. Consequently, harvesting is much slower being subject to entanglement and discrimination slowdowns. Also, plants and fragments can hide in the other vegetation so one is never sure when a harvest is complete. Finally, plants can be pulled and held underwater out of sight and thus avoid harvest. These are just some of the reasons the pace of clearance has been slower here than in Blair Pond. Still, with diligence, eradication should be possible. In 2006, similar to Blair Pond, this was only cleared once with no repeat visits, and there was a corresponding jump in the number of plants in 2007. This will have relatively less long-term effect than in Blair Pond partly because the other aquatic plants were already causing some degree of hiding plants for future seeding. My understanding is that another project may address general eutrophication here later this decade thus giving a boost to my efforts.

H) North Pond of two un-named ponds between the first and ninth holes of the Fresh Pond Golf Course is very small, but was completely covered in a monoculture of Water Chestnuts. Harvests began in 2004 and the pond was completely cleared every year since. A jump in plant numbers from 27 to 240 last year remains unexplained, but theories include a possible hard freeze activating the seedbank, golf ball harvesting stirring up the sediment and seedbank, and unknown factors which simply seem to make some years good and some bad for sprouting old seeds. I favor the hard freeze theory as previously numerous carp completely disappeared the same year.

I) South Pond drains into North Pond and had a very few plants which have now been eradicated.

J) Little Fresh Pond is immediately downstream of North Pond, but had a very few plants which were quickly removed. Also, a new sedimentation forebay was constructed at the North Pond inflow point. The year after this was built, a large spring storm washed a few plant fragments thru the connecting pipe where they rooted and grew in the forebay unnoticed until August. The plants removed then had already begun dropping seed, and the removal statistics since this event are giving a very good idea of seed survival and sprouting over multiple years from a single crop of seeds.

METHODS

All plants in this project are hand-pulled from a kayak into a 14-gallon recycling bin on

the front deck. With a slow gentle pull or vibrating pulsing tug, most young plants come up roots and all - including the seed from which they sprouted. The barbed thorns on these seeds must be carefully avoided as they can cause painful wounds and the barbs make them hard to remove when they break off under the skin. For the most polluted pond - Blair Pond which regularly filled with grey odorous water with every rain the first few project years - I use shoulder-length rubber gloves sold by hunting supply companies for use in skinning game. Otherwise I generally harvest barehanded for better feel while tugging fragile stems unless I have any wounds not completely healed on my hands. Then gloves are again mandatory. Early years' harvests which included viable seeds were always disposed of through a company which disposed of Cambridge's curbside yard waste and ground all waste thru a 1/2" grinder to destroy seeds as well as composting the remains. Care must be taken to ensure harvested plants do not spread their infestation elsewhere. Harvested plants rapidly dessicate and die out of water especially if exposed to sunlight. Recent years have seen almost all harvests from ponds on Fresh Pond Reservation, and disposal has been with other golf course waste which I believe still goes to the same Woburn disposal company for grinding and composting. Before the project started, I visited this company and learned that this waste was actually prized for adding nutrients and enriching the compost otherwise composed mainly of wood chips.

Permits were obtained from Conservation Commissions in Arlington, Belmont, Cambridge, and Somerville; as well as from the MDC - now the DCR. As eradication proceeds, only Cambridge still has Water Chestnut infestations remaining in this subwatershed. All parties continue to receive annual updates even if permitting has lapsed - just to assure that scouting continues so re-infestation will not be allowed.

OBSERVATIONS

One plant was found which was flowering and setting seed which had sprouted from a seed barely the size of a #1 pencil eraser - the size before fertilization occurs! From this I have to assume that seeds are viable immediately upon fertilization and need no further growth/maturation period.

This plant is engineered to spread by plant fragmentation. In Blair Pond the first year, I think I could distinguish three bacterial and three viral diseases which attack leaves and stems of the plants. However, the plants simply outgrow the diseases and use the weak spots generated to separate fragments for propagation. It appears that any section of stem containing one joint/leaf junction has the capability to generate a complete seed-producing plant. I somewhat doubt the waterfowl theory of infestation spread as ripe seeds are dense and drop directly into the bottom silt. Also, the barbed thorns on fresh seeds still have a fleshy outer cover and are not nearly as sharp and grabby until this rots away. While black seed husks are often seen floating and even attached to waterfowl, these are empty shells from prior years' sprouted plants.

The densest infestations show a close correlation with extreme nutrient enrichment - especially from sewage via CSOs, SSOs, and contaminated stormdrains. The fine silts laid down from SSOs especially seem suitable both for fertilizing these plants and preserving a seed bank for multiple years' regrowth.

One additional precaution to take while hand-pulling is a check every hour or two of any skin exposed to water for leeches. I've only had one leech attach itself, and that was to a fingernail instead of skin. However, in at least two ponds I have pulled my kayak from the water and found dozens of leeches on the bottom of my boat.

If I can answer questions, feel free to call or e-mail me anytime.

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