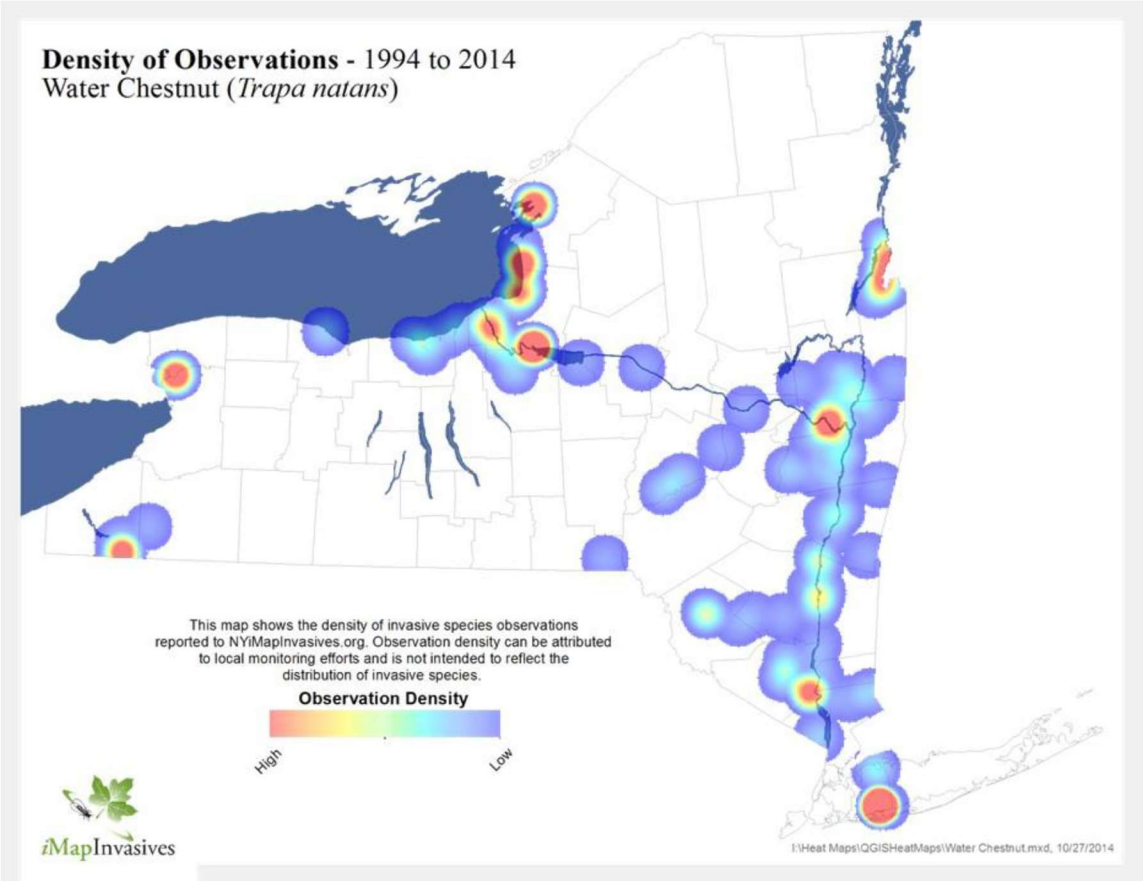
Special Water Chestnut Management Plan

A Roadmap to Eradicate Water Chestnut in Onondaga County using EBP Funds



I. Background

A. History

Over the course of the last several decades, Onondaga County has experienced a gradual but steady increase in its waterways of an aquatic invasive species known as *Trapa natans*, or water chestnut. Believed to have been brought to New England from outside the country in the 1870s, it spread to upstate New York over time, becoming a nuisance to transportation and recreation on lakes and rivers throughout central New York and a threat to the local aquatic wildlife.

Water chestnut is an aquatic plant that floats on the water's surface in the shallower parts of water bodies around two to five meters deep. It is anchored by a long, dark stem that reaches down into the sediment on the floor of the water body. The leaves of rosettes at the top shield a nut that bears four sharp barbs which can cause injury if stepped on barefoot and can even breach footwear. The leaves themselves account for the most significant nuisance of the water chestnut. The plant can reproduce at an overwhelming rate which creates a dense

Trapa, showing floating leaves (top), submerged leaves (bottom left) and nut (right) (after: CTRIVCOORD)

and extensive mat made up of individual plants that float in close proximity to one another on the top of the water. This prohibits boaters, swimmers, and other recreational users from being able to enjoy the water body. It can also prevent over 95% of the sun's rays from reaching other aquatic plants and can inhibit the concentration of dissolved oxygen in the water, which negatively affects both plants and fish.

Water chestnut has been declared an invasive species throughout the northeastern United States as far south as Virginia and also in some parts of Canada. Various local and regional governmental bodies have attempted to develop plans and strategies to combat this invasive species, with varying results. In Onondaga County, the struggle to limit water chestnut in our local waterways has largely been overseen by the Onondaga County Soil and Water Conservation District (OCSWCD), but its increased proliferation in recent years has called for a greater and more sustained effort to limit and extinguish it in local waters.

B. Biology

Water chestnut is a difficult plant to eradicate entirely in any given area however. *Trapa natans* is an annual, growing from a seed, or nut, each spring. Once pollination has occurred, a new nut forms below water where, once mature, it falls off and either sinks to the bottom of the water body where it becomes embedded in the soft sediment or is carried by currents and eddies to a new location in which it can take root. Each plant may produce as many as ten to fifteen nuts before in autumn, when temperatures become cold enough, it dies off. The volume of decaying plants in the water body contributes to what is called nutrient loading, which adds large amounts of nutrients to the water and makes conditions for the species' continued presence in the water body that much more favorable. The dense, decaying mats of water chestnut have also been known to produce unpleasant odors, further adding to its undesirability.

The nuts that each plant produces embed themselves in the soft sediment along the bottom of the water body before a number of them sprout anew each spring and renew the cycle. The nuts that do not sprout the following spring however remain embedded in the sediment and create a seed bank for water chestnut to rely on each year. Each new nut that is produced can remain viable for ten to fifteen years, adding to the difficulty of completely eradicating water chestnut from a particular water body.

II. Management Options

A number of different options exist to attempt to keep water chestnut at bay, but to have any hope of someday completely eradicating it, a comprehensive, multi-pronged management plan must be put into place. In order to formulate such a plan, a number of the strategies that have been adopted by other localities have been examined and weighed based on a number of different factors including their rate of success in their respective regions, their likely rate of success in affected Onondaga County water bodies, their estimated costs, and their feasibility. The pros and cons of these strategies are outlined below and a conclusion is drawn as to which are the most likely to have success in alleviating the problem.

A. Mechanical Harvester/Hydrorake

The first and most widely effective method of ridding water bodies of water chestnut is using a mechanical harvester or a hydrorake to drive through the mats and harvest the plants right onto the boat and that way remove them from the water. Each type of harvesting boat can manage to harvest 1.5 acres of water chestnut per day, or approximately 0.2-0.6 acres per hour. Their slow pace is due in part to the need to periodically drive the boat to a designated location where the harvested plants may be offloaded to make room for further harvests. The offloaded plants will then need to be taken to a predetermined location and either composted (for use at area farms) or incinerated.

The mechanical harvester's method of removal of the plants from the water is by cutting through the stems and loading the leaves onto the boat, thus removing the most troublesome aspect of the plants. This method, though effective, may necessitate the harvester making multiple cuttings at the same locations at different times of the year if the cut stems regrow their leaves. The harvesters are only operable in depths of six feet or greater, so if no point of access with the necessary depth exists where it can be loaded into the water body, a crane may

be necessary to insert the harvester into a point of appropriate depth. Hydrorakes, on the other hand, require less depth - as little as one foot – in which to operate. Furthermore, hydrorakes pull the entire plant up, including the stem and the roots, so that the plant may not regrow its leaves and re-establish itself. Several permits may be required prior to commencement of harvesting activities, as well as a plan put into place to limit or avoid the disturbance of any non-invasive plant or animal species in the target areas.

B. Hand-pulling

Another method that has proven relatively successful at the removal of water chestnut is that of hand-pulling. This is carried out by workers in kayaks or canoes who paddle out into the affected area, don gloves, and pull the water chestnut up out of the water with their hands. As with the hydrorake, the goal is to remove both the leaves floating on top of the water as well as the stem, the roots, and the barbed nut so the plant is unable to regrow its leaves or reproduce by releasing its seeds to settle into the sediment below. When they cannot carry any more of the harvested water chestnut in their boats, the workers must then likewise return to shore to offload their cargo to be allowed to dry and then removed and disposed of.

Because the speed at which the water chestnut are collected is much slower and the harvest much less voluminous than those with a mechanical harvester or hydrorake, the method of hand-pulling is better suited to areas where the water level is more shallow and the sprawl of water chestnut less dense. The more selective nature of this method is also better suited to areas in which the avoidance of disturbances to non-invasive species is desired. Some

permits may be required in wetland areas and some shorelines where threatened or endangered species may have habitats.

Onondaga County has focused its efforts on mechanical harvesting over the past few years. In 2024, the Onondaga County Soil and Water Conservation District harvested roughly 184 acres – an estimated total of 3.9 million pounds – of water chestnut. The harvesting season began at the western boundary of Onondaga Lake on the Seneca River and activity was started earlier in the season than in previous years. This greatly stunted the typical second growth of the summer minimizing seed production.

C. Herbicides

A third method that has met with various levels of success is that of herbicide treatment. Several different brands of herbicide have been registered with the Environmental Protection Agency (EPA) and approved for use by New York State in its waterways. Some of these pesticides have demonstrated great promise in decreasing the acreage occupied by water chestnut. In 2012, the Oswego County Soil and Water Conservation District used an herbicide called Clearcast to treat over 220 acres of water chestnut in the Oswego and Seneca Rivers. With regular treatment over the following years, the water chestnut were reduced to approximately 20 acres by 2016 (OARS, 2017). Oswego County currently continues its spraying program on the Oswego River, as spraying does not ensure eradication.

Unlike hand-pulling or even mechanical harvesting, permission to apply a particular pesticide in any water body in New York State requires a series of permits. Pesticides are not particularly

selective, and so must be applied carefully or avoided altogether in places in which other plants exist which are specifically not being targeted. Also, once it has been approved and the pesticide applied over a vast area, the water chestnut in that area may begin to emit a foul-smelling odor as they decay, similar to that emitted when they die en masse at the end of their growing season in the fall. At that point, the only option is to remove them from the water by harvesting them with a mechanical harvester or a hydrorake and hand-pulling (which would avert the odor and prevent nutrient loading). If left unharvested, there is the chance they could break up naturally, but their gradual decomposition would add significant amounts of nutrients to the habitat that would encourage the re-establishment of water chestnut in the water body. The application of herbicides limits the options for disposal of harvested plants, since they cannot be composted due to their invasive characteristics. The New York State Canal Corporation maintains and manages water levels on the New York State Barge Canal.

D. Drawdowns

Another method that has been considered for eradicating water chestnut is that of drawdowns. This requires the level of the water body to be lowered, or "drawn down," by artificial means so that it is low enough for the sediment to dry out and kill the plants living within the water body. Although this method has met with some limited amounts of success, it is considered a very disruptive option. Drawdowns would need to be carried out once the water chestnut have begun to sprout in late May/early June, but not so late that pollination has begun to take place and they have begun to drop their seeds (late July/early August). This would restrict normal recreational opportunities in the water body at a time of year when they are greatly desired by the public. Furthermore, it would create a great disturbance to other species within the ecosystem – one it may or may not be able to absorb. Accurate costs associated with drawdowns are difficult to anticipate, as labor, fuel and monitoring costs vary, as do those of the pumps, siphons, and other materials requisite in drawing down the levels of water bodies.

E. Dredging

Hydraulic dredging is another option that has been used elsewhere to control the growth of water chestnut. It aims to reduce the seed bank lying dormant in the soft sediment on the bottom of the water body which sustains water chestnut in that area from year to year. Hydraulic dredging works by agitating the sediment with the dredge head, thus creating a slurry made up of the sediment and the various aquatic plants growing out of it, which is then suctioned through a tube or pipe to a handling location. Once the slurry is suctioned off the floor, it would lengthen the depth of the water body. This method is considered feasible only for water bodies which do not see a regular re-accumulation of sediment at a rapid pace.

Furthermore, large-scale dredging is not selective, meaning non-target plant species living in the sediment would be suctioned up along with the target one.

F. Benthic Barriers

Benthic barriers are anything that can be placed along the bottom of a water body to prevent aquatic vegetation from taking root and proliferating. These can include silt, sand, clay, gravel, or artificial materials such as sheets of polyethylene. Benthic barriers have met with great success in limiting and in some places eliminating water chestnut altogether, but they would also eliminate any other native vegetation that grows in the vicinity. Though this management option can be effective in small areas, benthic barriers are not recommended for larger areas where there are significant water currents or waves due to difficult and costly installation and maintenance.

G. Biological Control

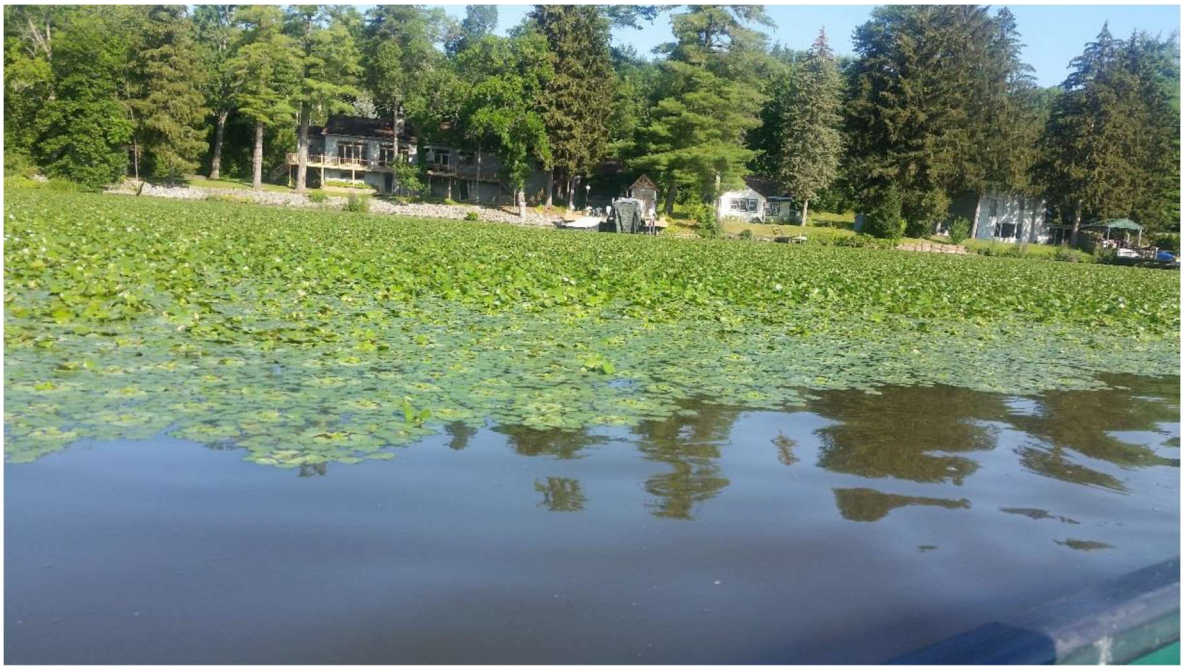
A final method to arrest the spread of water chestnut is that of biological control. It involves introducing a species that is known to feed on water chestnut into the area and

allowing the predator species to consume it and in that way keep it from proliferating in great numbers and becoming a nuisance. While this would be a very cost effective option, and several promising species have been suggested, including a beetle called *Galerucella birmanica*,there are still issues with this control measure at this time. It would involve introducing a non-native species to a foreign environment, therefore further research is needed to evaluate what the species' effect on the wider ecosystem would be. In particular, Dr. Bernd Blossey of Cornell University has been leading the way on some promising research with leaf beetles and their effect on water chestnut. If leaf beetles are approved for release into the environment, or a more suitable species is identified and approved, biological control may become a more feasible option in the future. However, biological control for the eradication of water chestnut is not currently permitted, so this option is not available at this time.

III. Strategy

Summary: The Onondaga County Soil & Water Conservation District (OCSWCD) has been steadily working to manage the water chestnut nuisance in Onondaga County since 2021, following the workplan outlined in *Water Chestnut: A Management Plan for Onondaga County*. That plan focuses on the use of mechanical harvesting and hand pulling to remove water chestnuts where the plant has invaded County waters.

Over that time, the County has funded over $300,000 directly to OCSWCD, complimented by a $100,000 funding grant through Onondaga County to OCSWCD secured by Senator Mannion as



well as additional funding from the Finger Lakes-Lake Ontario Watershed Protection Alliance (FLLOWPA).

That is nearly $500,000 spent in three years on the management of water chestnuts in order to halt or slow the spread of this invasive non-native species in the waters of Onondaga County. Yet water chestnuts continue to pose a problem in Onondaga County, particularly along the Seneca River. This new plan will begin to address that in a more conclusive manner.

Funding: $500,000 from the Buckeye Pipe Line Company, LP and BO Products North America Inc. ("Northern Terminals Group") 2017 Settlement Consent Order No. 12-1111-A-SBC

Contractor: Onondaga County Soil & Water Conservation District

Contract Period: From execution (June 5, 2024) for two years (June 5, 2026)

The objectives of this new Water Chestnut Management Plan are as follows:

1. Use the funds from the settlement for a one-time, large-scale attack on the water chestnuts which grow and flow into the waters of Onondaga County, killing and removing the plants in 2025 through aquatic herbicide spraying as well as mechanical harvesting and hand pulling.

2. Use the opportunity the settlement funds have presented to remove any possibility for water chestnuts to germinate and drop their seeds into the sediment layer in the waters of Onondaga County to prevent adding to the seed stock in the Seneca River and other water bodies.

3. Use the funds to employ a dedicated person at OCSWCD for year 1 to design and implement new programs to remove and manage water chestnuts, perform outreach and education, and be responsive to property owners, boaters, and others who are struggling against the problems posed by water chestnuts.

4. Pilot the use of benthic mats, where appropriate, to prevent water chestnuts from rooting or the seed stock from germinating, thus decreasing the number of plants in the year of the program and subsequent years.

5. Develop one or more regional competitions to encourage water chestnut vegetation removal by volunteers and citizen groups.

6. Invite academic researchers to participate and develop measurable outputs of the projects funded through the settlement.

7. Use this opportunity to build a consortium of affected stakeholders, including waterfront residential and business owners, boating groups, municipal leaders and state agencies.

8. Explore opportunities for dredging or for expanding the Canal Corporation's maintenance dredging to serve the dual purpose of removing the seed stock of invasive species, specifically water chestnut seeds.

9. Explore opportunities to use planned drawdowns on the New York State Barge Canal.

10. Indirect administration of the program by Onondaga County Soil & Water Conservation District staff.

A breakdown and budget of these objectives follows:

OCSWCD Work Plan

Objective 1: Herbicide Spraying, Harvesting, Hand-pulling

The tasks in Objective 1 will be funded by the Environmental Benefit Project fund received from the settlement with BP Buckeye in relation to the Cold Springs Terminals in Lysander, New York.

Tasks (expected costs)	Performance Measures
Herbicide Spraying by contractor, including application for permit and all other associated tasks and responsibilities ($200,000)	Request for Proposal for contractor to perform herbicide application drafted, distributed and awarded by OCSWCD.
	Successful permit application for herbicide application of up to 230 acres of surface waters along and in the Seneca River in Onondaga County.
	Herbicide application of up to 230 acres of surface waters along and in the Seneca River in Onondaga County from mid-June to mid-August.
Mechanical harvesting of areas not permitted for spraying ($200,000)	Secure contractors to perform mechanical harvesting drafted, distributed and awarded by OCSWCD. Existing permit application for harvesting and hand pulling efforts for 2025.
	Mechanical harvesting of water chestnut infested areas from May through September 2025.
Utilization of a hand pulling summer crew to remove water chestnuts where herbicide application is not allowed and mechanical harvesting is not appropriate ($40,000)	Onondaga County Soil & Water Conservation District will hire and employ a summer crew from May until August 2025.
Utilization of volunteers to remove water chestnuts by hand where herbicide application is not allowed and mechanical harvesting is not appropriate	OCSWCD will provide continue current efforts to mobilize and encourage volunteers to assist with hand pulling of water chestnut in shallow waters in Seneca River.
OCSWCD will provide field coordination to oversee the multi-faceted approach to water chestnut management in 2025-2026, including benefits ($30,000)	OCSWCD staff will provide program leadership for entire season.
Supplies to support efforts in the office and in the field to address water chestnut ($5,000)	OCSWCD will outfit summer crews with the supplies necessary to address water chestnut.

Administration by OCSWCD Director, staff and benefits and indirect costs ($25,000)	Administrative costs to be allowed under the June 5, 2024 contract.
Expected Cost of Objective 1: = $500,000	

OE Work Plan

Objective 2: Remove Seed Stock

Objectives 2-8 outline the priorities of Onondaga County to be administered by the Office of the Environment subsequent to the 2025-2026 efforts funded by the Environmental Benefits Project Fund and concurrent to mechanical harvesting and spraying.

Tasks (expected costs)	Performance Measures
Herbicide spraying by contractor, including application for permit (see task 1) *2027 - ?*	OE will seek funds to continue herbicide spraying for removal of plants early enough in the life cycle to prevent the opportunity for seeds to form and drop into the sediment, reducing the seed stock available for germination in future years.
Mechanical harvesting of areas not permitted for spraying (see Objective 1) *2027 - ?*	OE will seek funds to continue mechanical harvesting for removal of plants early enough in the life cycle to prevent the opportunity for seeds to form and drop into the sediment, reducing the seed stock available for germination in future years.
Utilization of a hand pulling summer crew to remove water chestnuts where herbicide application is not allowed and mechanical harvesting is not appropriate (see Objective 1) *2027 - ?*	Continue hand pulling summer crews for removal of plants early enough in the life cycle and throughout growing season to prevent the opportunity for seeds to form and drop into the sediment, reducing the seed stock available for germination in future years.
Utilization of volunteers to remove water chestnuts by hand where herbicide application is not allowed and mechanical harvesting is not appropriate (see Objective 1) *2027 - ?*	Continue hand pulling volunteer crews for removal of plants early enough in the life cycle to prevent the opportunity for seeds to form and drop into the sediment, reducing the seed stock available for germination in future years.

Objective 3: Pilot Benthic Mats

Benthic mats: Separate from the efforts of OCSWCD, and the EBP funding, the Onondaga County Office of the Environment will pursue opportunities to pilot the use of benthic mats.	Purchase small benthic mats.
	Install small benthic mats, in accordance with permit requirements and conditions, in areas where best suited, using summer crew and volunteers.
	Request for Proposal for landscaper drafted, distributed and awarded.
	Install small benthic mats, in accordance with permit requirements and conditions, in areas where best suited, by contracted landscaper.
	Evaluation of conditions, location, removal, and effectiveness of the use of benthic mats at identified locations .

Objective 4: Develop regional competition to encourage water chestnut vegetation removal by volunteers and citizen groups

The Onondaga County Office of the Environment to: Partner with state and local agencies to develop regional competition for water chestnut removal	Partner with state and local agencies to design, carry-out and promote county or regional competitions to encourage and incentivize the removal of water chestnuts.

Objective 5: Partner with Academic Researchers

OE and OCSWCD will partner with academic researchers to identify best approaches to water chestnut management	Reach out to academic researchers to inform them of the efforts being made to address water chestnuts, changes in the management plan and to act on any interest from such researchers in measuring impacts from efforts.

Objective 6: Partner with Others

OE will establish partnerships for regional approval	Work with the Finger Lakes PRISM, camping associations, waterfront owners' groups, boater groups and municipalities to create a regional consortium.

Objective 7: Explore Opportunities for Dredging

The Onondaga County Office of the Environment to: Work with others to explore opportunities to use dredging to address seed bank	Work with consortium, elected representatives, NYSDEC and Canal Corporation to explore dredging options that will reduce the water chestnut seed load in the Seneca River to prevent the need for long-term water chestnut management.

Objective 8: Explore Opportunities for Drawdowns

The Onondaga County Office of the Environment to: Explore the use of drawdowns as effective and cost-effective methods for limiting the proliferation of water chestnut	Work with consortium, elected representatives, NYSDEC and Canal Corporation to explore opportunities to use planned draw downs to remove seeds and nutrient material - options that will reduce the water chestnut seed load in the Seneca River to prevent the need for long term water chestnut management and improve water quality.

V. References

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All pictures and maps courtesy of Onondaga County Soil and Water Conservation District