



**Department of
Environmental
Conservation**



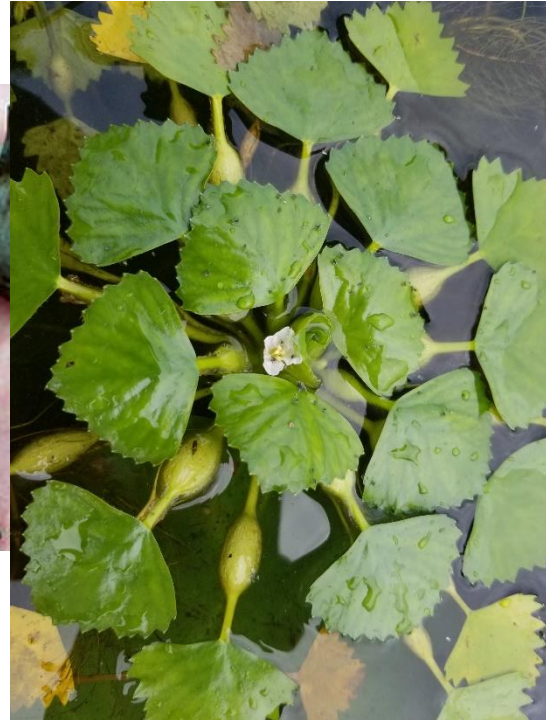
Water chestnut in New York State

**Northeast aquatic Plant Management Society Plant Camp
September 14, 2022**

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Water chestnut biology

- Annual, Rooted Floating Plant
 - Rosette surrounds central stem
 - Inflated petioles enable floating
- Breaches surface
 - Late May to Mid June
- Fecundity
 - Up to 20 seeds/plant
 - Seeds have four sharp points
 - Mature fruits drop and sink
 - Floating seeds are no longer viable
- Mature by late July
 - Regional and weather dependent
- Seed longevity
 - Up to 12 years



Water chestnut ecology



- Grows in littoral zone
 - <5 m depth
 - Prefers 0.3m – 2m
- Forms dense monocultures
 - Up to 96 rosettes/m²
 - Alters aquatic community
 - Shades understory
 - Alters submersed plant and animal communities
 - Significant decreases in dissolved oxygen
 - Measured near 0 on Lake Champlain
- Outcompetes floating plants

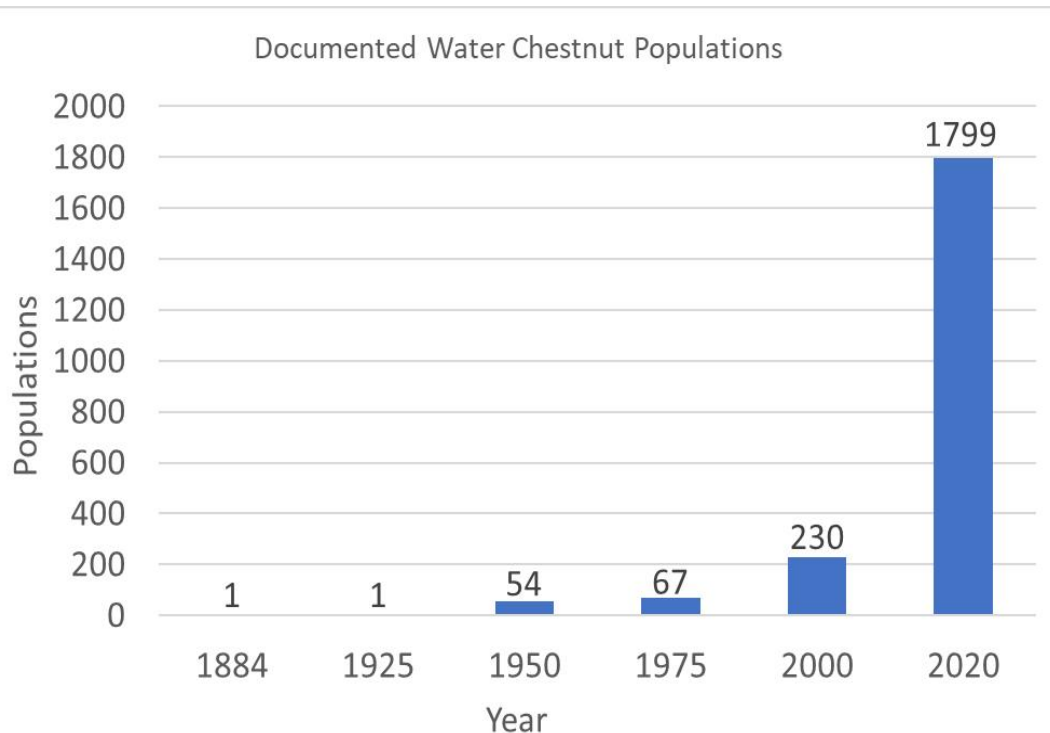
Water Chestnut introduction to New York

- First N. America plantings
 - Cambridge Botanical Gardens ~1877
- First escaped report in NY
 - 1884, Scotia, NY, Collins Lake with Mohawk drainage
 - Unknown vector
- Introduction and dispersal
 - Water garden escapee
 - Floating dispersal
 - Waterfowl
- Regulation
 - Part 575 as prohibited
 - No possession or transport



Water chestnut spread and distribution

Spread over time



Introduced 1884
Initial spread along
Hudson River, then
Mohawk River
By 2020 most NY
counties have
populations
Improved records
since 2000?

- iMap mapping challenge
- Well established PRISM networks



Understanding the problem

iMap Invasives

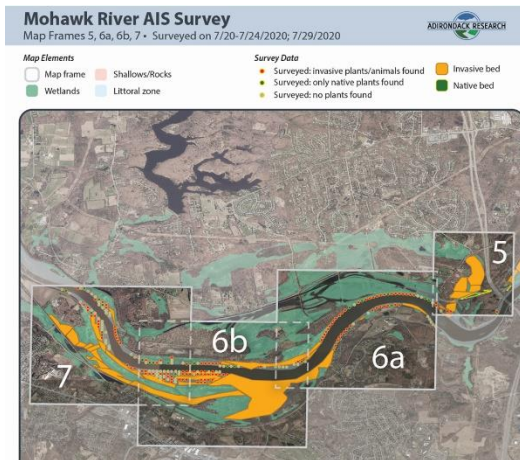
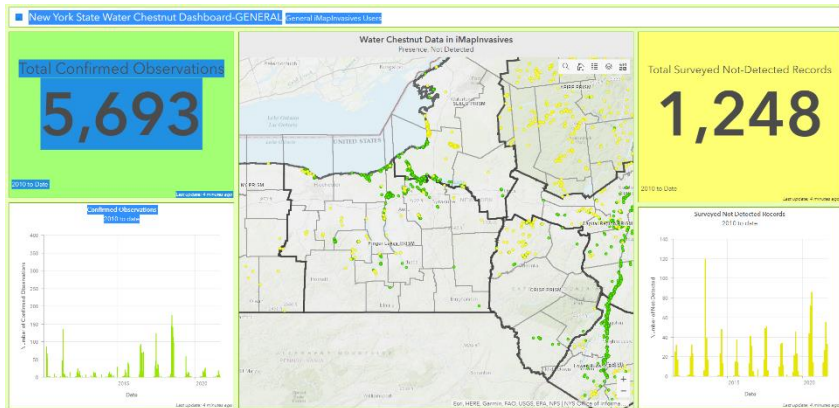
- Tracking reports
- 2 portals
- Public
- Managers

Hudson/Mohawk Rivers

- Mapping efforts
- Stakeholder taskforce

PRISMs

- Working regionally
- Engaging stakeholders



Water chestnut management strategies

- Long term commitment
 - Seed longevity = 12 yrs
 - Downstream dispersal
- Dependent on
 - Infestation size
 - Waterbody characteristics
 - Riverine vs. pond/lake
 - T&E species
 - Beneficial uses
 - Source water protection
 - Recreation



Water chestnut management strategies: Manual Removals

- Advantages
 - Widely practiced
 - Small scale removals
 - Limited impact to other plants
 - Can involve volunteers
 - Follow up to mechanical
 - Continued maintenance
- Disadvantages
 - Labor intensive
 - Not good for large infestations
 - Not good for spotty infestations
 - Surveying/removal of scattered plants
 - Higher level plant ID



Photos: Steven Pearson, Kate Monacelli, Fred Dunlap

Water chestnut management strategies: Mechanical Harvester

- Advantages
 - Large infestations
 - Repeated mechanical harvesting
- Disadvantages
 - Depth limitations ~3 ft
 - Fragmentation of plants
 - Limited access points
 - Not selective
 - Increased cost
 - Best Practice
 - Leave a ring of WC
 - Harvest interior of bed
 - Harvest outer ring last
 - Manual harvest follow up
 - >25% density cover



Water chestnut management strategies: Mechanical Harvester – Small

- Advantages
 - Small infestations
 - Area maintenance
 - Shallow water
 - Remote controlled
- Disadvantages
 - Fragmentation of plants
 - Not selective
 - Protected waters



<https://weedersdigest.com/waterbug-aquatic-weed-harvester-remote-controlled-solar-battery-powered/>

Water chestnut management strategies: Chemical Control

Foliar Applications

- Advantages
 - Large infestations
 - Selective application
 - Area maintenance
 - Shallow water
- Disadvantages
 - Permitting
 - Repeated applications
 - Dissolved Oxygen Crash
 - Potential impacts to natives



Herbicides used

- Florpyrauxifen-benzyl, 2,4-D, imazomax and glyphosate



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Water chestnut management strategies: Dredging

- Advantages
 - Sediment removal
 - Reduces seed bank
 - Reduces nutrient loads
 - Increases water depth
- Disadvantages
 - Non-selective
 - Alters water flow while occurring
 - Releases sediments/stored pollutants
 - High costs
 - Permitting?



Photos: <https://dredgewire.com/nys-canals-has-acquired-a-watermaster-aquamec-ltd-amphibious-dredge-a-multipurpose-vessel-that-helps-churn-and-move-ice-downstream-to-reduce-the-risk-of-spring-flooding/>

Water chestnut management strategies: Mechanical Rake (aka. Hydroraking)

- Advantages
 - Large infestations
 - Shallower water than harvester
 - Removes stumps and debris
- Disadvantages
 - Fragmentation of plants
 - Limited access points
 - Not selective
 - Increased cost



Photos: <http://www.hopatcong-lake-regional-news.com/index.php/news/lake-information/1002-lake-hopatcong-foundation-provides-informative-update-to-the-hopatcong-borough-council>

Water chestnut management strategies: Drawdown

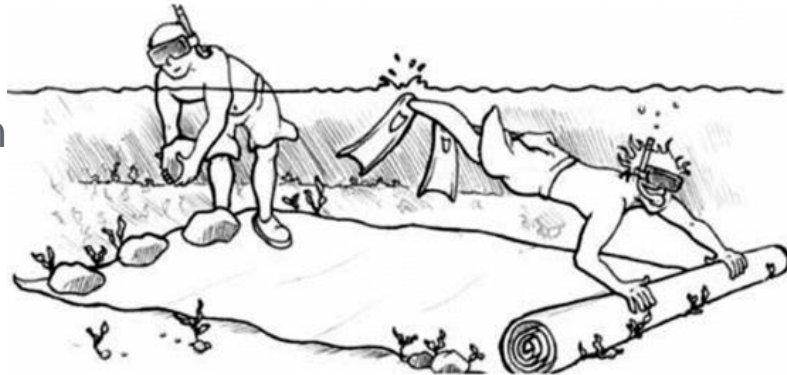
- Timing is important
 - Winter: Freeze seeds
 - Summer: Prevent seeds
- Advantages
 - Low cost
 - Deferred maintenance
 - Structural repair
 - Shoreline trash
- Disadvantages
 - Non-selective
 - Alters downstream water flow
 - Requires water control structure



Photos: Thomas Copolla, <https://mohawk.substack.com/p/well-field-woes>

Water chestnut management strategies: Benthic Barriers

- Advantages
 - Smothers rooted plants
 - Prevents seed germination
 - Maintain cleared areas
- Disadvantages
 - Non-selective
 - Seasonal maintenance
 - Annual maintenance
 - Small areas
 - Difficult installation
 - Costly installation
 - Barrier removal



Photos: Chris Cooley, Diet for a Small Lake



Photos: <https://nystateparks.blog/2014/08/05/benthic-barriers-in-rudd-pond/>

Water chestnut management strategies: Biological Control

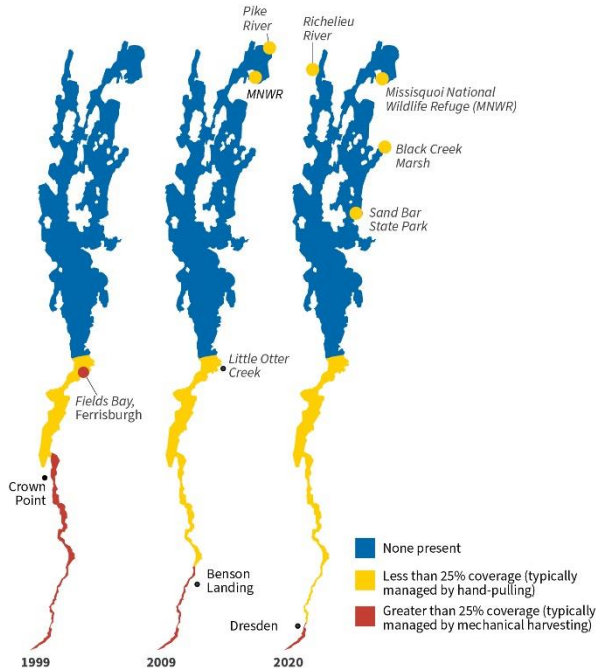
- Long term goal
 - Development of species-specific biocontrol
 - *Galerucella birmanica*
- Advantages
 - Low cost to apply
 - Potential long term/widespread control
- Disadvantages
 - Not-yet available
 - High cost to develop
 - Introduces a non-native species
 - Site specific success
 - Dependent on local ecology



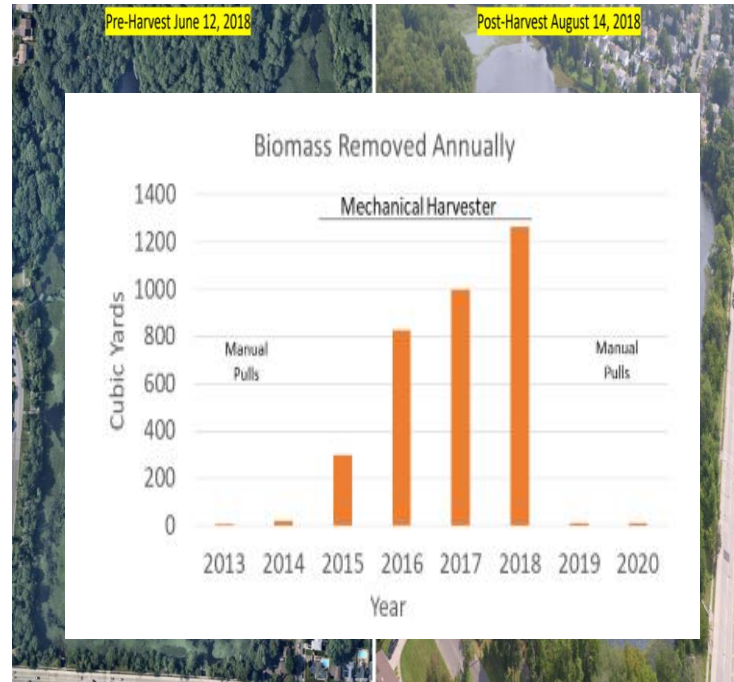
Photos: Wade Simmons

Ongoing management greatly decreases abundance in large populations - Lakes

Lake Champlain



Massapequa Reservoir



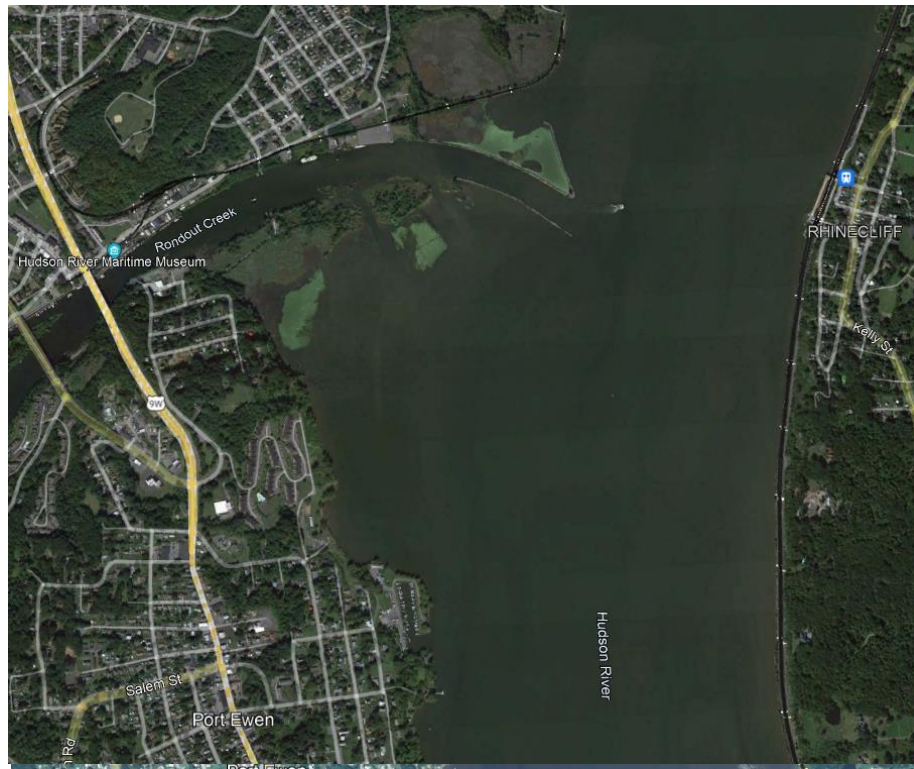
Ongoing management greatly decreases abundance in large populations - Rivers

September 2019

Hudson River: Town of Esopus

~80 acre WC Patch

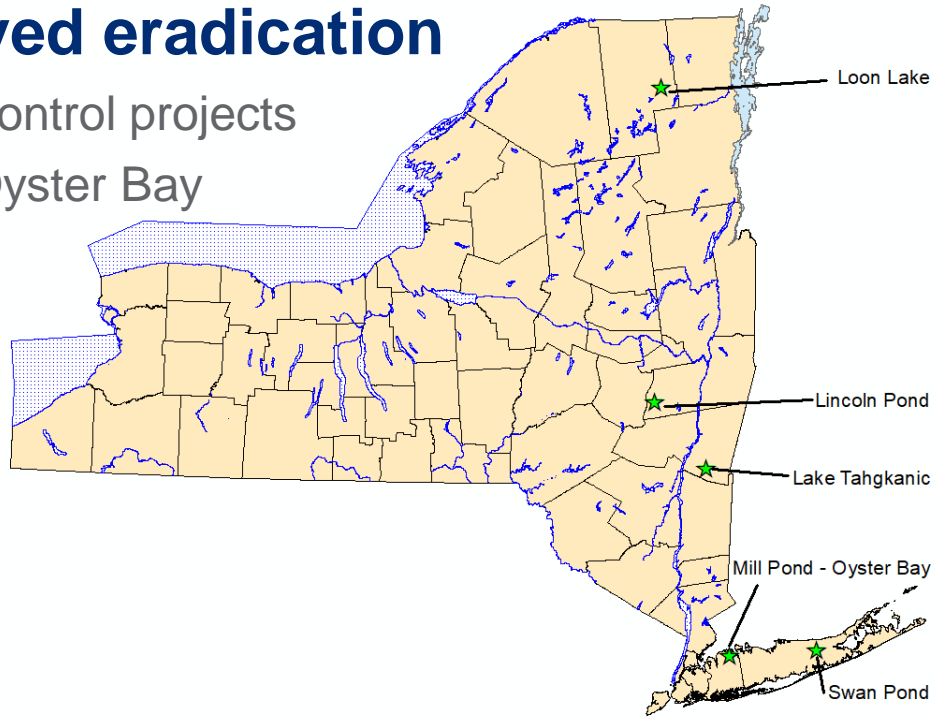
- Purchased weed harvester (2011)
- Volunteer operators
- Town staff for support
- Annual hours
 - 116-145



Populations managed to annual maintenance and perceived eradication

Small ongoing control projects

- Mill Pond – Oyster Bay
- Lincoln Pond

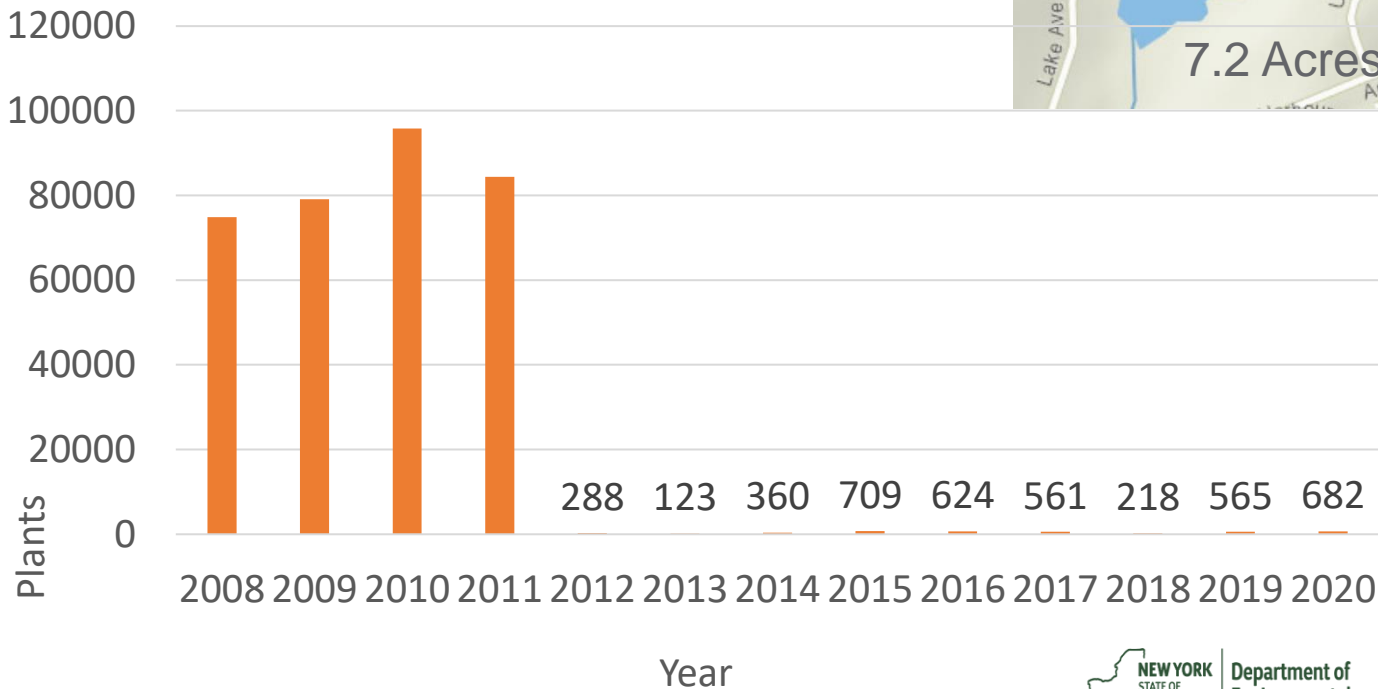


Cautionary Tails

- Loon Lake
- Swan Pond
- Lake Tahgkanic

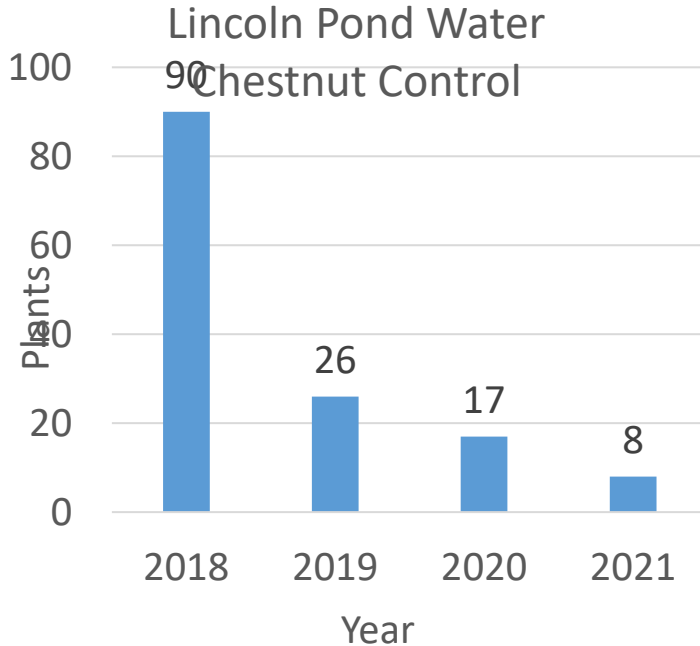
Mill Pond – Oyster Bay NWR

Mill Pond Water Chestnut Control



Lincoln Pond – Huyck Preserve

10 acres



Loon Lake

581 Acres

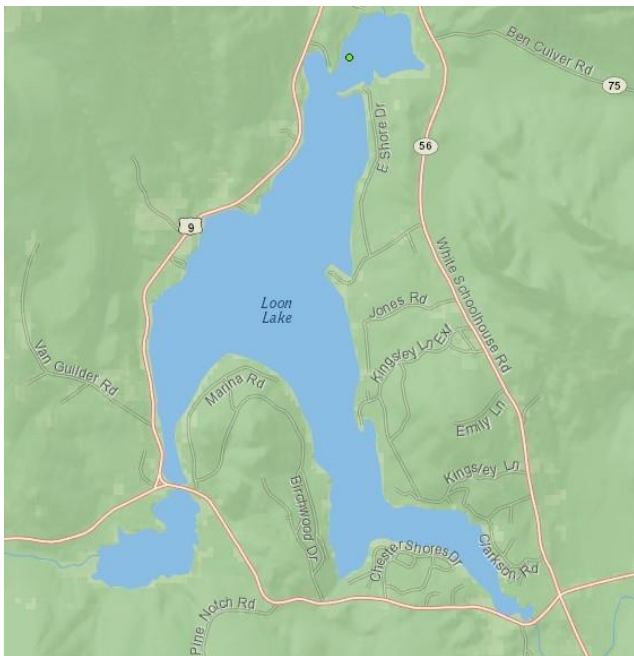
Loon Lake Water Chestnut Control

Water Chestnut Plants

15
10
5
0

2015 2016 2017 2018 2019 2020

Year



Water Chestnut Plants

15
10
5
0

2015 2016 2017 2018 2019 2020

Year



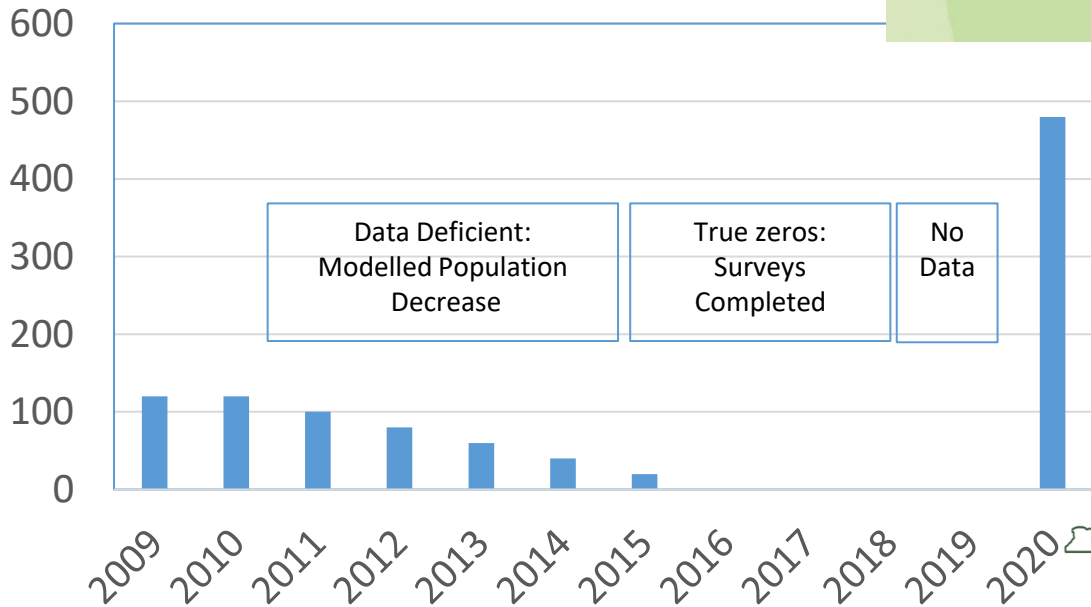
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Swan Pond

57 Acres

- 2019 – No Survey

Swan Pond Water Chestnut Control



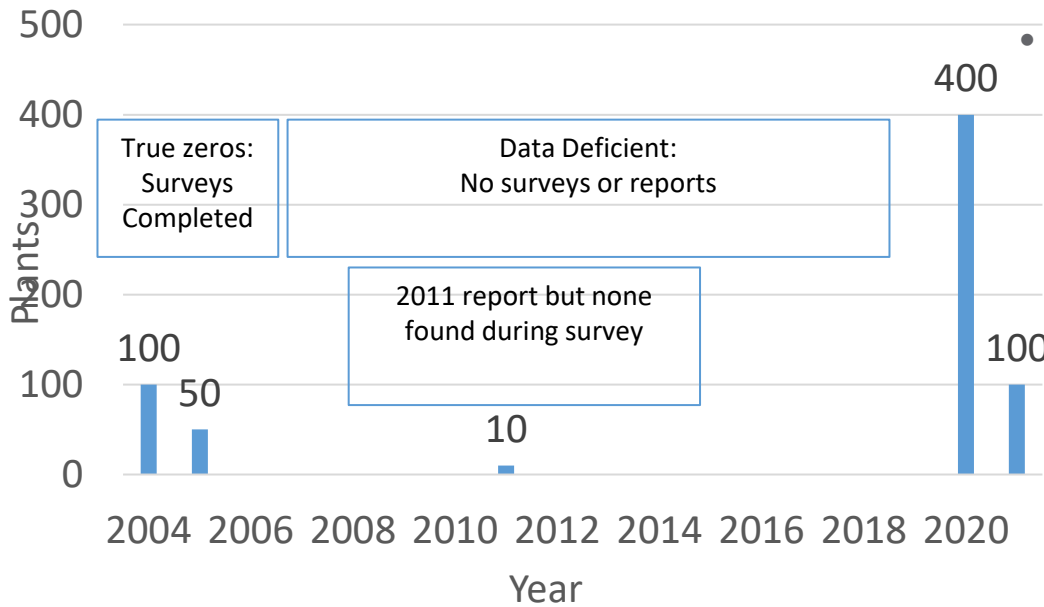


Lake Taghkanic – Lake Taghkanic State Park

168 Acre Lake

- History of WC
- Limited survey after treatment
- By 2020 likely present for several years
- Widespread in E. Bay of lake
- 2020 pull reduced abundance

Lake Taghkanic Water Chestnut Control



Conclusion

- Water chestnut can be managed
 - Eradicated in some locations
 - Annual maintenance
- Long term monitoring is required to prevent population re-emergence
 - Annual survey
 - Annual control as needed
 - Survey and control before seeds mature
 - Cannot skip a year or two
 - Population re-emergence can be rapid





Thank you!

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