



Department of  
Environmental  
Conservation

Little Bear  
Environmental



# Croton River Hydrilla Control Project

2022 Update

Nicole White, CLM – Croton Hydrilla Control Project Manager  
New York State Department of Environmental Conservation

# Agenda

- Background Info on Hydrilla & Infestation History
- Summary Data from Treatment (2017-2022)
  - Aquatic Plant & Tuber Survey Results
  - Additional Survey Methods / Non-target Species Monitoring
  - Surface Water & Drinking Water Monitoring
  - NYCDEP – New Croton Reservoir Treatment Status
- Future Plans (2023 & Beyond)
- Question & Answer

# *Hydrilla verticillata*

- Federally-listed noxious weed
- Prohibited in NYS - 6 NYCRR Part 575 Prohibited and Regulated Invasive Species.
- Produces dense mats and displaces native plants that provide food and shelter for native aquatic wildlife.

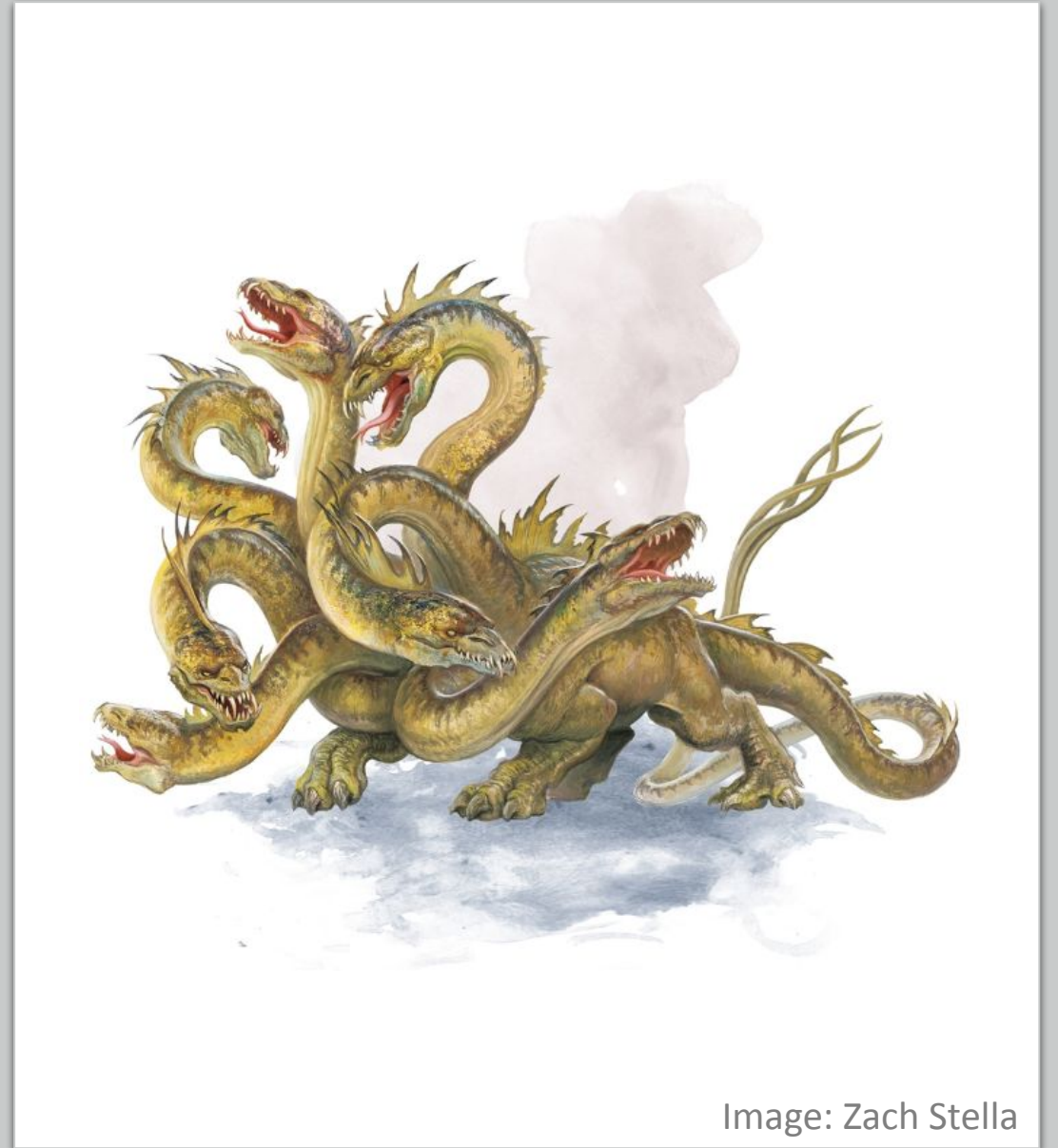


Image: Zach Stella

# Hydrilla Impacts

- Forms dense mats
- Displaces native plants
- Impedes recreation
- Can impact tourism / property value<sup>1,2</sup>
- Impacts water quality
- Breakdown causes oxygen crashes (fish kills)
- Cannot be eradicated by pulling/cutting etc.



Image: NYSDEC

1. Bell, F.W., Bonn, M.A. 2004. Economic sectors at risk from invasive aquatic weeds at Lake Istokpoga, Florida, Bureau of Invasive Plant Management, Florida Dept. Environ. Protection, Tallahassee, FL.

2. Driscoll, P., Deveny, G.R., Henderson, J., Shabman, L., et al. 1994. The effect of aquatic plants on residential shoreline property values at Guntersville Reservoir. TVA/RG/WM-94-007, Joint Agency, Guntersville Project.

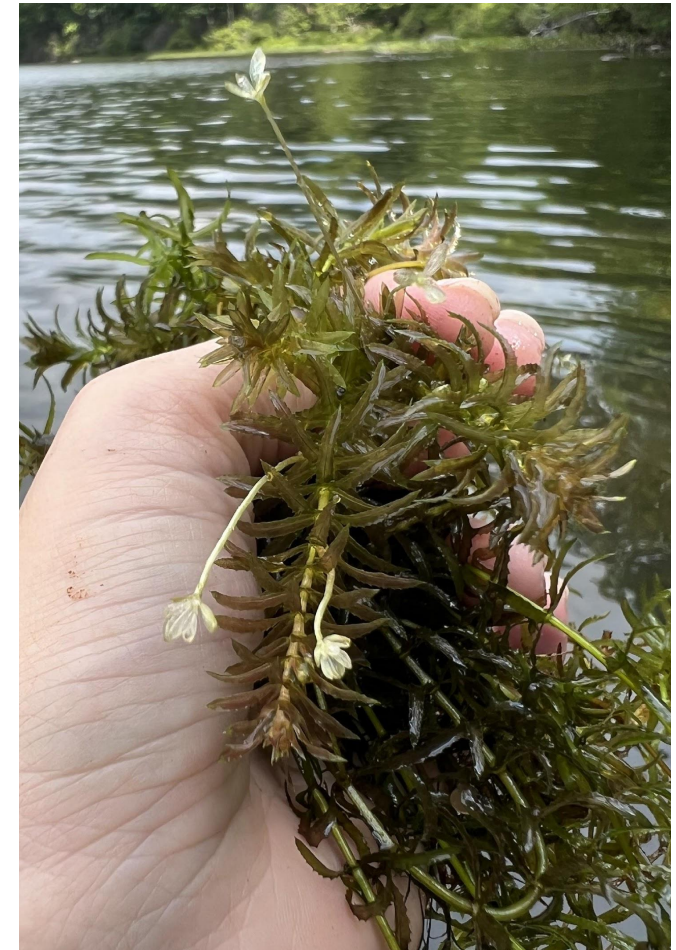
# Reproduction



New growth from viable fragments



Overwintering structures



Flowers

# Methods of Spread



Aquarium dumping



Hitchhiking on watercraft

# Croton Infestation Overview

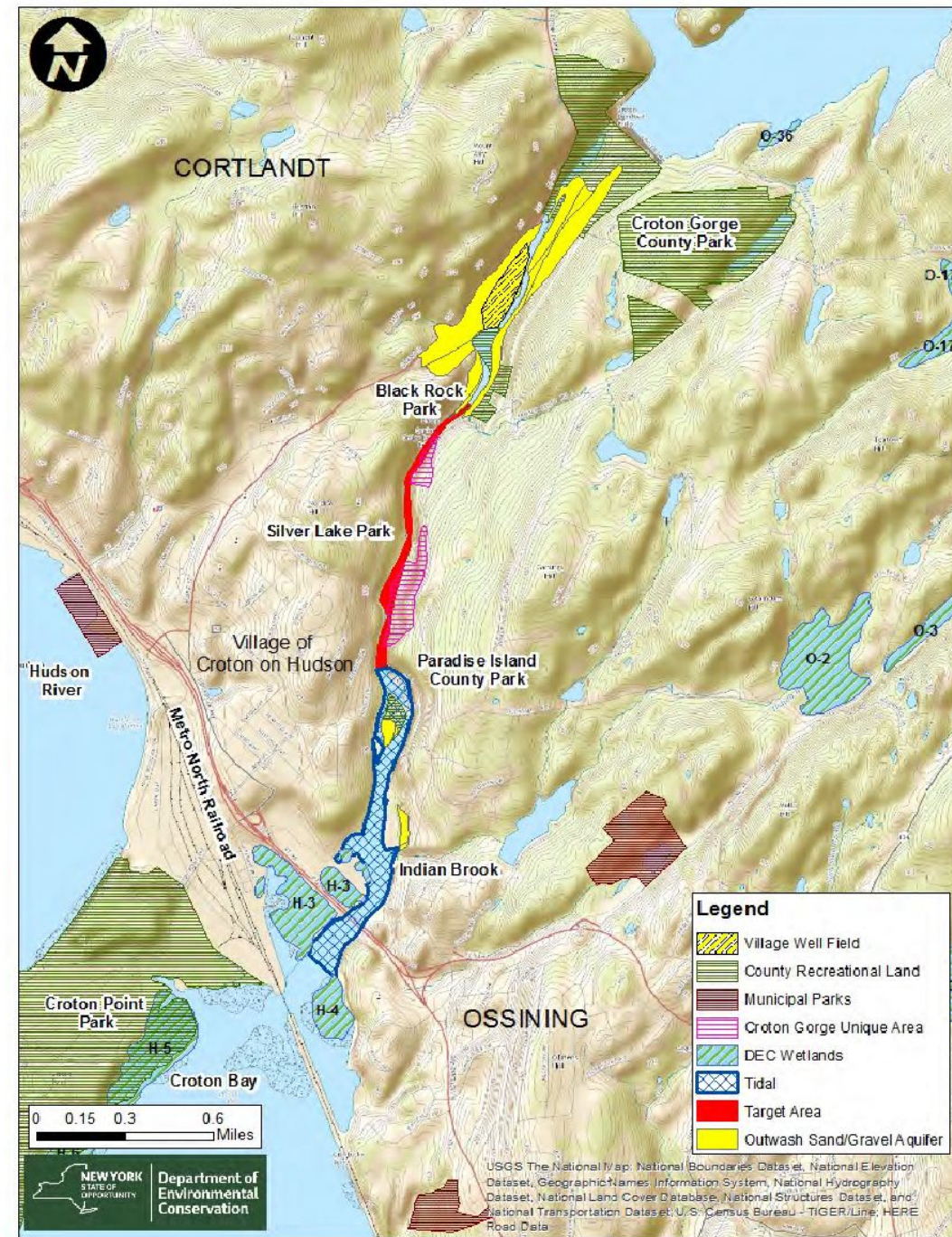
- Hydrilla discovered in Croton in 2013
- Management Plan created by DEC for Croton River
- CR Treatment began 2017
- Hydrilla was topped out and infested 43% of the Croton River



- Hudson River Estuary surveys began – no hydrilla had yet established

# Project Variables

- Discharge highly variable
- Tidal influence in lower 1/3 of treatment area
- Drinking water impacts
- Trout stocking & migratory herring
- Rare plant species
- Recreational uses (watercraft, swimming beach etc.)
- DEC managed wetland





# Treatment



Herbicide Treatment: Entire Croton River (158 Acres)



In-water application: Sonar Genesis<sup>®</sup> (Fluridone)



Maintained 2-4 ppb concentration for 60-90 days during growing season for 6 seasons



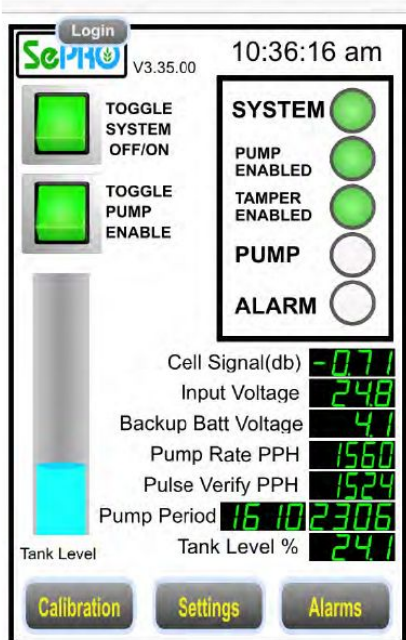
Post-treatment aquatic plant surveys will assess success and monitor for non-target impacts



# Treatment

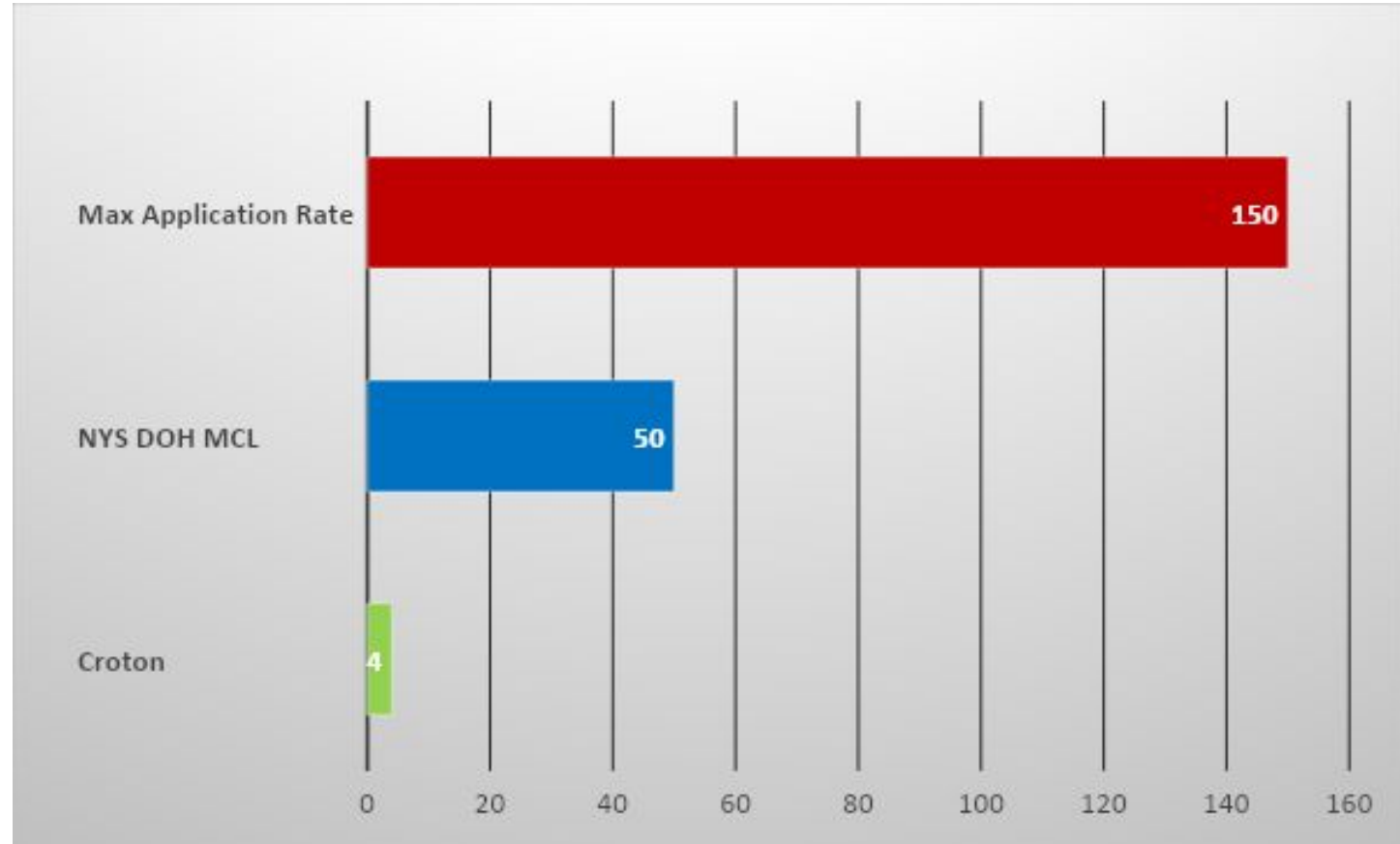
Cellular-controlled herbicide injection system designed by SePRO

Certified Applicator  
SOLitude Lake Management



# Sonar Genesis (liquid fluridone)

- No water use restriction for swimming, boating, fishing
- Well below established drinking water benchmarks



# Permits



SEQR Negative Declaration issued November 3, 2021



DOS - Coastal Assessment Form (DOSCAF)



SPDES NOI – Permit ID NYP160548



NYSDEC Article 24 Freshwater Wetlands Permit



NYSDEC Article 15, Title 27 Wild, Scenic & Recreational Rivers Permit



NYSDEC Article 15 Aquatic Pesticide permit for Sonar Genesis



Part 575 Permit (Collect & Possess)



NYCDEP Land Use Permit



Westchester County Land Use Permit

# Treatment Goals

- Prevent biomass formation
- Suppress reproductive potential
- Prevent spread
- Minimize impacts to native species



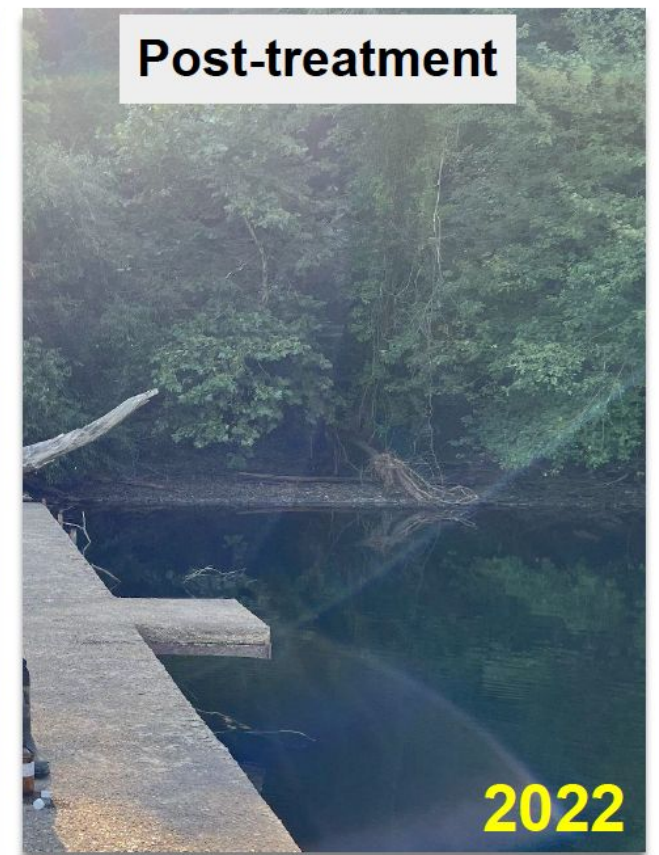
# Survey Results



Prior to treatment (2016), thick mats of hydrilla grew to the surface of the water in dense and moderate abundance throughout the Croton River (top left).



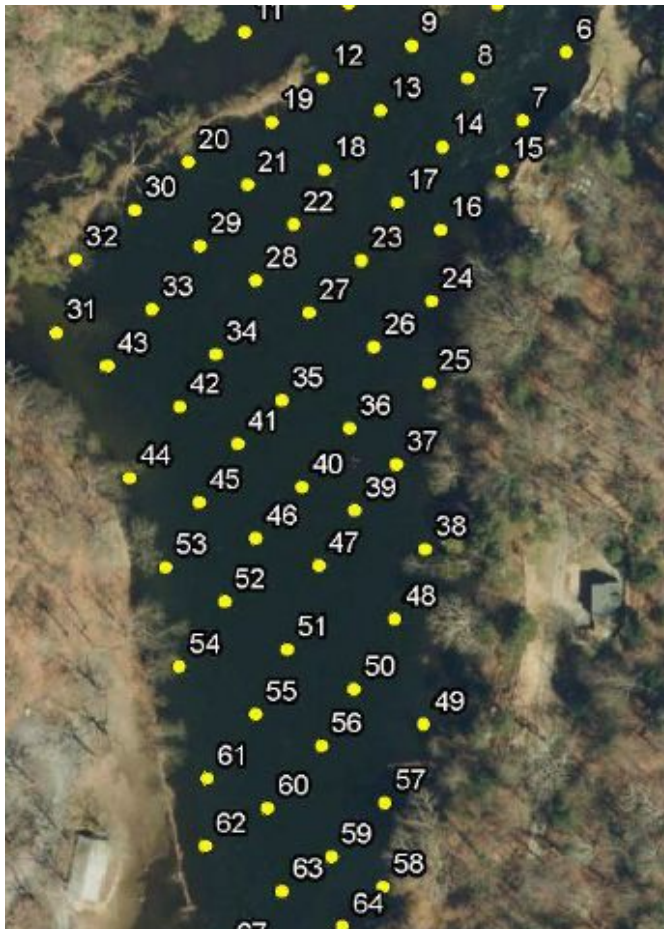
Following two seasons of treatment (2017 & 2018), hydrilla was reduced to sparse or trace abundance. No dense or moderate patches remained within the Croton River (top center)



No hydrilla plants were observed in snorkel surveys or point intercept surveys following the sixth year of treatment in 2022 (top right).

# PIM Survey

- Point Intercept Method



**Trace**



**Sparse**



**Medium**



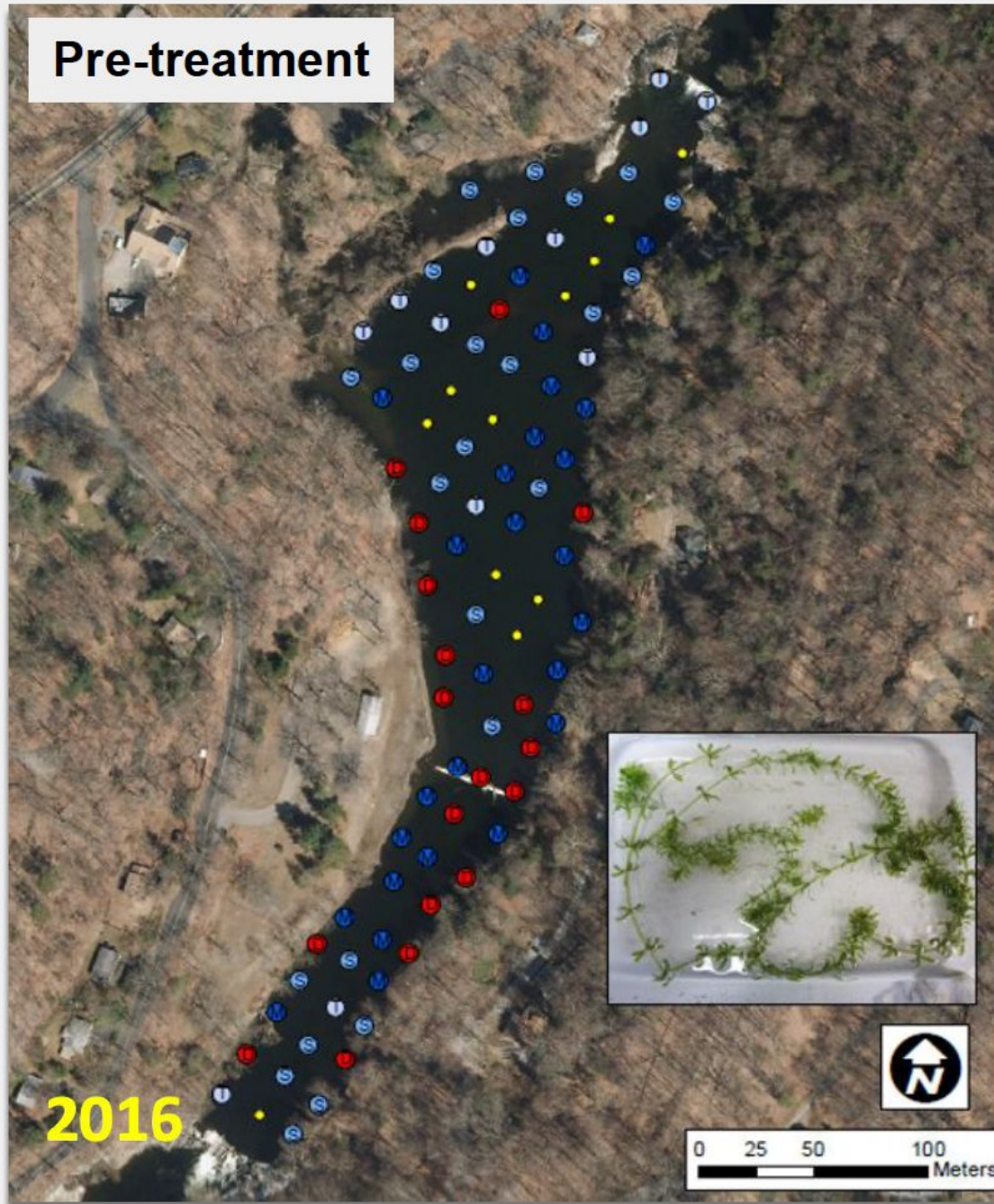
**Dense**

# Survey Results

446 points surveyed annually in Croton River

43% infested with hydrilla in 2016

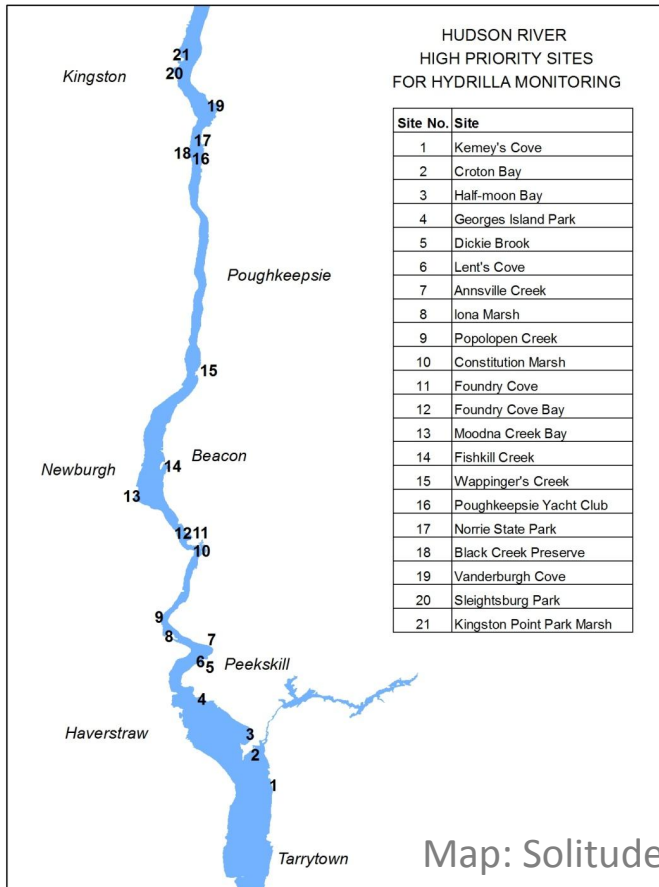
2022: no hydrilla was present (6<sup>th</sup> season of treatment)





# Project Survey Results

- 5,000+ points at 47 sites within Hudson River Estuary
- No Hydrilla found



Images: NYSDEC

# SAV Survey Results



<u>Year</u>	<u>Trace</u>	<u>Sparse</u>	<u>Moderate</u>	<u>Dense</u>	<u>Overall</u>
<b>2016</b>	58 (13.00%)	56 (12.60%)	46 (12.60%)	30 (6.73%)	190 (42.60%)
<b>2017</b>	39 (8.74%)	21 (4.71%)	8 (1.80%)	0 (0.00%)	68 (15.25%)
<b>2018</b>	23 (5.16%)	6 (1.40%)	0 (0.00%)	0 (0.00%)	29 (6.56%)
<b>2019</b>	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)
<b>2020</b>	4 (1.36%)	1 (0.34%)	0 (0.00%)	0 (0.00%)	5 (1.70%)
<b>2021</b>	2 (0.45%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	2 (0.45%)
<b>2022</b>	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)

2016 – 2022 Croton River – Hydrilla Vegetative Biomass Reduction Summary

# Survey Results

65+ Person hours of  
snorkel and SCUBA  
surveys in Croton River

Hundreds of hours of  
wading surveys

Underwater Camera  
Surveys



# Tuber Survey Results

950 + cores at 8 sites since 2016

No tubers or turions found since 2019



Sample Location	Site	2016			2017			2018			2019		
		# of Cores	Tubers (m <sup>2</sup> )	Turions (m <sup>2</sup> )	# of Cores	Tubers (m <sup>2</sup> )	Turions (m <sup>2</sup> )	# of Cores	Tubers (m <sup>2</sup> )	Turions (m <sup>2</sup> )	# of Cores	Tubers (m <sup>2</sup> )	Turions (m <sup>2</sup> )
Black Rock Park	BRP-3	3	1,637.6	35.6	6	35.6	8.9	NA	-	-	20	0.0	0.0
	BRP-4	3	498.4	0.0	3	516.2	160.2	NA	-	-	20	0.0	0.0
Silver Lake Beach	SLB-1	3	2,082.6	53.4	3	231.4	35.6	NA	-	-	30	0.0	0.0
Croton River	CR-1	3	872.2	231.4	3	0.0	0.0	15	0.0	0.0	NA	-	-
	CR-2	4	495.8	321.6	5	96.3	21.4	15	0.0	0.0	20	0.0	0.0
	CR-3	4	174.2	67.0	3	106.8	89.0	15	0.0	0.0	NA	-	-
	CR-4	5	0.0	32.1	3	35.6	0.0	15	39.2	3.6	20	0.0	0.0
	CR-5*	-	-	-	-	-	-	-	-	-	-	-	-

2016 – 2019 Tuber Density Results \*Site added in 2020

Sample Location	Site	2020			2021			2022		
		# of Cores	Tubers (m <sup>2</sup> )	Turions (m <sup>2</sup> )	# of Cores	Tubers (m <sup>2</sup> )	Turions (m <sup>2</sup> )	# of Cores	Tubers (m <sup>2</sup> )	Turions (m <sup>2</sup> )
Black Rock Park	BRP-3	25	0.0	0.0	30	0.0	0.0	30	0.0	0.0
	BRP-4	25	0.0	0.0	30	0.0	0.0	30	0.0	0.0
Silver Lake Beach	SLB-1	35	0.0	0.0	35	0.0	0.0	35	0.0	0.0
Croton River	CR-1	25	0.0	0.0	30	0.0	0.0	30	0.0	0.0
	CR-2	25	0.0	0.0	30	0.0	0.0	30	0.0	0.0
	CR-3	25	0.0	0.0	30	0.0	0.0	30	0.0	0.0
	CR-4	25	0.0	0.0	30	0.0	0.0	30	0.0	0.0
	CR-5*	25	0.0	0.0	30	0.0	0.0	30	0.0	0.0

2020 – 2022 Tuber Density Results \*Site added in 2020

# Watercraft Inspections

## Echo Boat Launch – Non-motorized watercraft

- 2018: 662 inspections
- 2019: 584 inspections
- 2020: 2233 inspections
- 2021: 1104 inspections
- 2022: 648 inspections

No Hydrilla found!



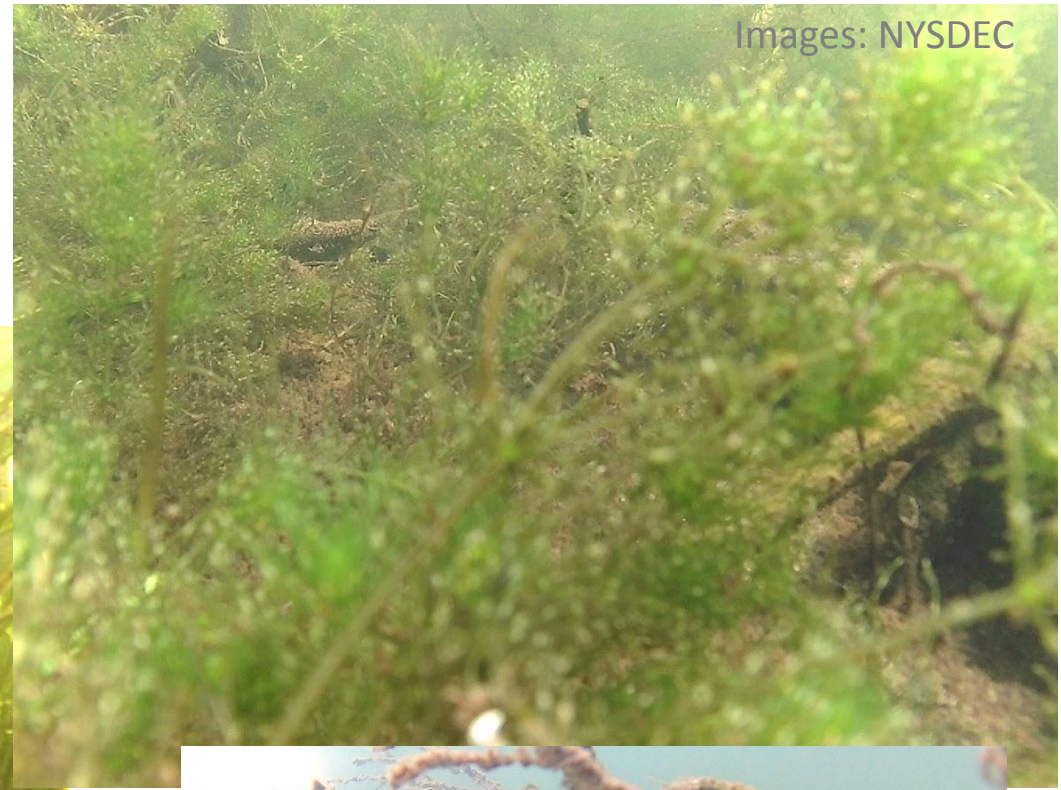
# Non-target impacts

- Plants collected same day from same treatment site within Croton River
- Both plants show defoliation of lower leaves
- 2 hydrilla plants (left) show more chlorosis than 2 native elodea plants (right) 44 days into 3<sup>rd</sup> treatment season



# Non-target Impacts

Images: NYSDEC



# Non-target Impacts





# Rare Plant Survey 2020 – Site photos



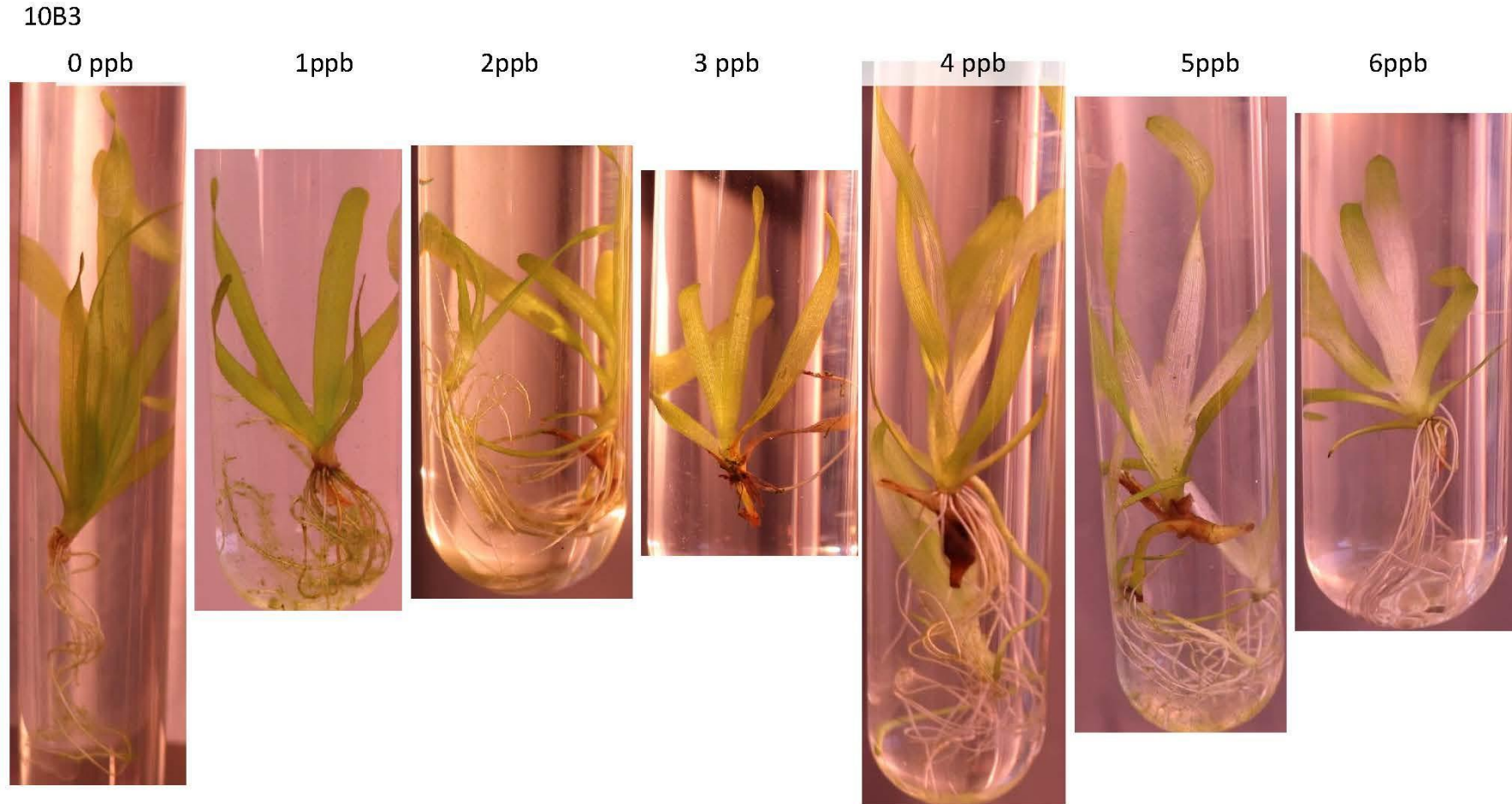
# *Valisneria* considerations...

Katia Engelhardt, PhD  
Research Associate  
Professor  
UMCES Appalachian Lab

## 8 *Vallisneria americana*

genotypes from Croton River

- subjected the genotypes to 7 levels of fluridone and replicated each genotype x herbicide combo 10 times.
- leaves bleaching at 5 and 6ppb.
- chlorophyll analyses on leaf samples in combo with photo imagery.
- None of the herbicide levels appear to be lethal but the herbicide appears to be stressing the plants even at these low herbicide concentrations.



# Water Quality Monitoring



0.29ppb  
Detection limit

## 8 Sites

- CR-1
- CR-2
- CR-3
- CR-4
- RES-1
- FO-1
- EL-(Hi/Lo)

**760+ River Samples Collected**

# Water Quality Monitoring



Image: NYSDEC

**2,500+ Drinking Water Samples Collected**

All Drinking Water Samples posted to DEC's project webpage:

<https://www.dec.ny.gov/animals/106386.html#Results>



# Outreach

- 25 Unique Outreach Initiatives
- Estimated 40,000 People Contacted by Outreach Efforts
  - Hudson River Day (Croton Yacht Club)
  - Clearwater Revival (Croton Point Park)
  - Eagle Fest (Croton Point Park)
  - Croton-Harmon School Programs
  - World Fishing & Outdoor Expo (Rockland CCC)



### What is Hydrilla?

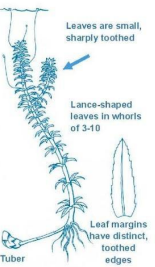
aggressive submerged aquatic native to Korea. It typically roots in and can grow up to 30 feet in five weeks, plants grow vertical branches, at a maximum rate of per day. This growth can form thick mats on the water's surface. Hydrilla also forms small potato-like structures, tubers, for the plant and also allow it to survive the bottom of rivers and lakes and during winter.



### Reproduction

light green but 5/8-inch-long small teeth-like structures. Hydrilla generally grows in whorls of 3-10 stems, and leaves are arranged in whorls. Small white flowers are rarely seen in the United States.

to potato-like tubers, which are attached to the stems.



### How Does it Spread?

- Hydrilla is a popular aquarium plant and was likely released into nearby waterbodies
- Small fragments can get caught on boats and trailers and be transported to other waterbodies
- Just a tiny fragment of hydrilla can sprout roots and establish new populations
- Fragments float and can be spread via wind and water currents



### Why Do We Manage Hydrilla?

- It is one of the world's most invasive aquatic plants
- It can grow at a rate of 191 inches per day
- It forms dense mats that block sunlight and displace native plants
- It decreases dissolved oxygen levels which can lead to fish kills
- It destroys waterfowl feeding areas and fish spawning sites
- It reduces the weight and size of sportfish due to loss of open water and native vegetation
- It impedes boating, fishing, and swimming due to its thick mats
- It can hurt the local economy due to impacts to tourism and waterfront property values

### What Can We Do?

- Clean, Drain, Dry**  
Dry out or disinfect equipment before bodies
- Report any sightings of Hydrilla to the DEC at [info@dec.ny.gov](mailto:info@dec.ny.gov) or call 1-800-456-6343
- How Effective is Treatment?**  
Treatment has been successful within the Croton River since 2017.
- Of the 461 points sampled in 2017, 87% contained Hydrilla. Following the 2017 treatment, in 2018, 20% of the 461 sample points contained Hydrilla. In 2019, no Hydrilla was found at any of the 461 sample points.
- Average tuber density is 1.5 tubers per square meter.



**Where can I get Hydrilla?**  
Project Webpage: <https://www.dec.ny.gov/programs/10242>  
Drinking water sampling: <https://www.dec.ny.gov/programs/10242>  
New York State Hydrilla: <https://www.dec.ny.gov/programs/10242>



# Outreach

## Project Webpage

- 3224 views since 2017

## Water Sample Results Webpage

- 1476 views since 2017

## Riparian Notification Letters & Project Brochures yearly

## Shoreline Signage

## Village Meetings

## Croton River Hydrilla Control Project

- On this page:**
- [Background](#)
  - [Five year management plan and annual project updates](#)
  - [Herbicide information](#)
  - [2022 treatment plan](#)
  - [Permits](#)
  - [Project manager](#)
  - [Contractors](#)
  - [Contact information](#)
  - [Water Sample Analysis Results](#)

DEC and partners control *Hydrilla verticillata* (hydrilla) in the Croton River. Hydrilla grows and spreads rapidly and is one of the most difficult aquatic invasive plants to control and eradicate in the United States. Infestations can have negative impacts on recreation and tourism, as well as severe consequences for aquatic ecosystems.

**2022 HERBICIDE TREATMENT: Croton River herbicide treatment for 2022 is now complete.** The treatment season ran from June through September and successfully reached 85 days of treatment. Village of Croton drinking water wells and finished water will continue to be sampled twice weekly at all locations, as long as fluridone levels are below 1 ppb. If levels are equal to or exceed 1 ppb, but are less than 4 ppb, sampling will occur three times per week. If fluridone levels equal or exceed 4 ppb the project plan will be terminated or modified. After two consecutive samples at "not detected" at all drinking water wells sampling will end. View the [Water Sample Analysis Results](#) section of this page for regular results during the treatment period. End of year surveys for hydrilla will be conducted throughout the month of October and data will be made available once it is received.

**A public stakeholder meeting was held virtually on November 4, 2021.** Project success from treatments in 2017-2021 were summarized. 2021 project details can be found in the [Croton River Hydrilla Control Project Brochure](#) (PDF). The next public meeting summarizing the 6-year Hydrilla treatment project is scheduled to take place at the December 19th Village of Croton-on-Hudson Board Meeting. Details will share once meeting information becomes available.

**DIDYMO NOTE:** In 2018 Didymo (*Didymosphenia geminata*), also known as "rock snot," was found in the Croton River near Silver Lake Park (approximately 1.6 miles downstream from the New Croton Reservoir Dam). Didymo has been reported in the Croton Watershed in the past (West Branch). It is a microscopic algae that prefers cool, clear, nutrient-poor waters and is primarily spread through human activity. [Learn more about didymo.](#)

### Background

Hydrilla was discovered in the Croton River in October 2013 and later found in Croton Bay during a site survey in 2014 (Towns of Cortlandt and Ossining, Westchester County, NY). This survey also revealed that hydrilla is well-established in the Croton River and the New Croton Reservoir. While hydrilla remains in the Croton River and Bay, it threatens habitats in the Hudson River and its tributaries. Fortunately, the results of aquatic plant surveys conducted in 2017-2021 indicate that hydrilla has not yet spread outside of the Croton River and New Croton Reservoir. Public meetings have been held annually to inform the public of the infestation and address concerns about management plans.

**PDF Help**  
For help with PDFs on this page, please call 518-402-9425.

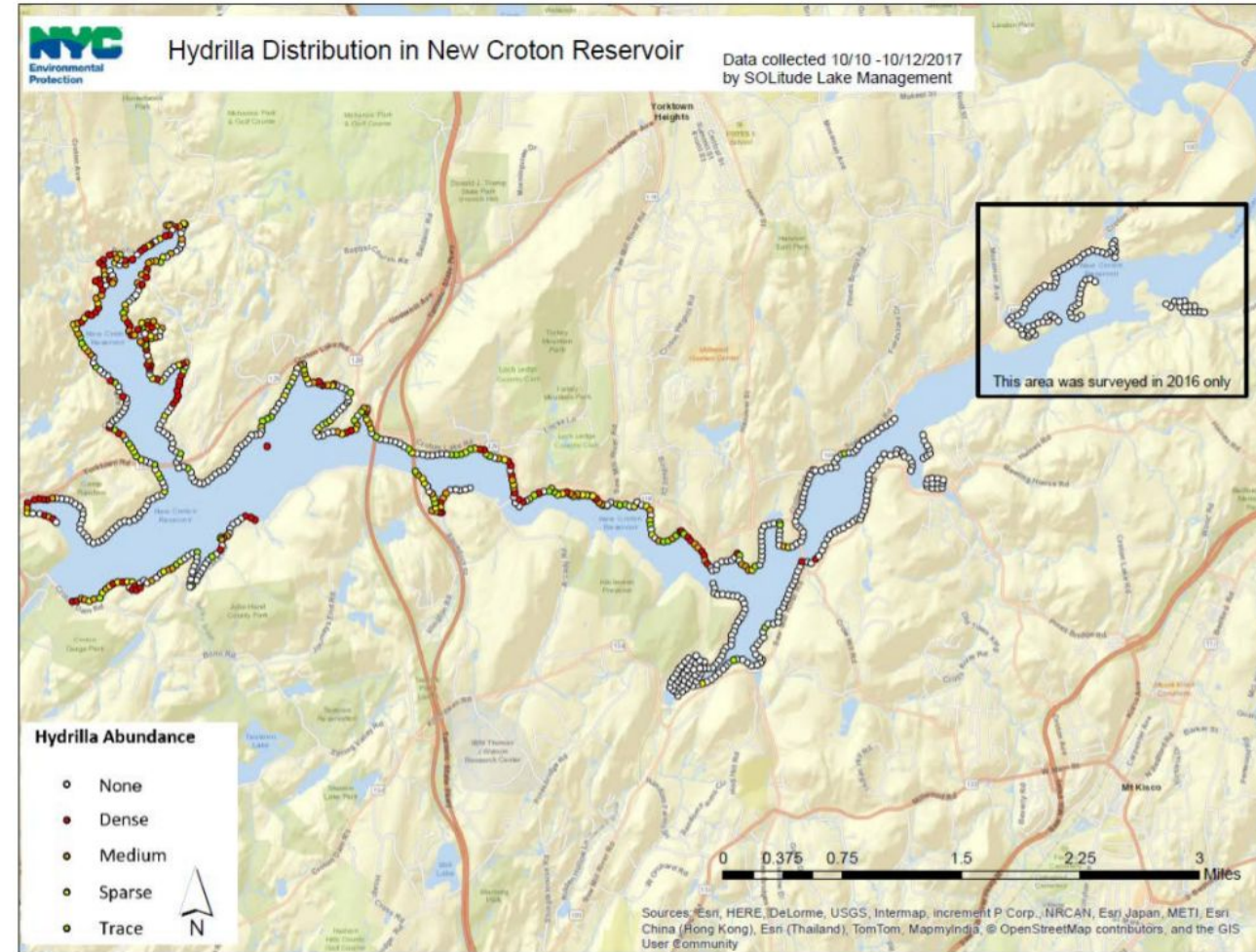
**Contact for this Page**  
Invasive Species Section  
Division of Lands & Forests  
625 Broadway  
Albany NY 12233  
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Send us an email

**This Page Covers**

Region 3  
Lower Hudson Valley  
Serving the following Counties:  
Dutchess  
Orange  
Putnam  
Rockland  
Sullivan  
Ulster  
Westchester

# New Croton Reservoir

- NCR infestation under active management, excellent control, risk of reintroduction (tubers, turions, untreated fragments) **very minimal**



# Future Plans

- Submersed aquatic plant surveys to be repeated for minimum of 3 years in Croton River
- *Vallisneria americana* restoration in lower coves & mouth of Croton River



Image: Caleigh Millete



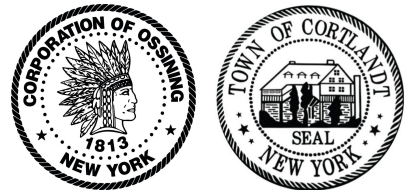
# Stay Vigilant!

- Hydrilla is still very much a threat to our region!
- Take several photos of an individual plant on a white background with an object for scale
- Collect the GPS coordinates for the location where it was found
- Send to: [isinfo@dec.ny.gov](mailto:isinfo@dec.ny.gov)





Department of Environmental Conservation



# Thank You Project Partners!



Little Bear Environmental



US Army Corps of Engineers



Cornell Cooperative Extension | Westchester County

Image: NYSDEC

# Contact Info

Nicole White, CLM

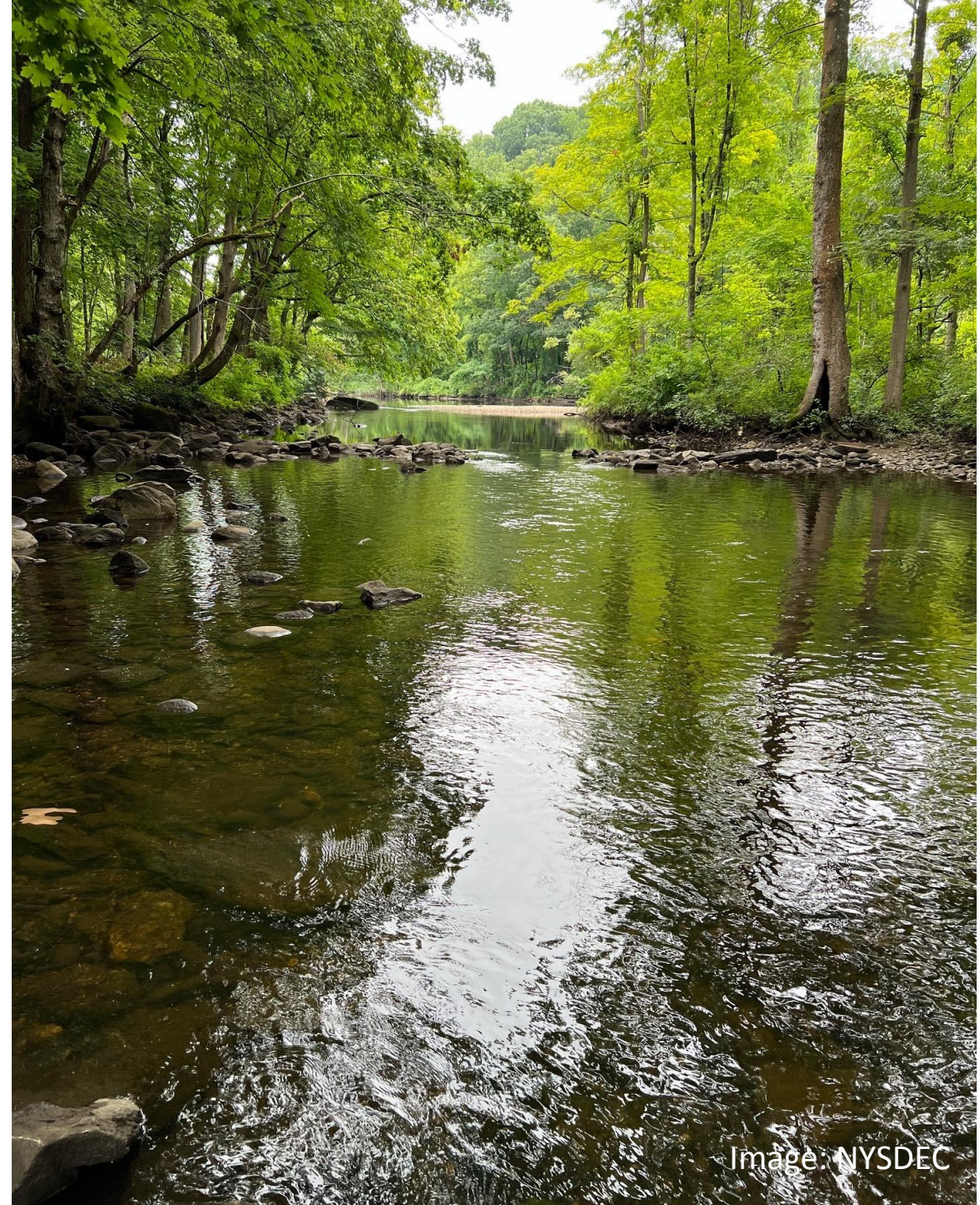
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 @littlebearenvironmental





# Questions?

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DEC Croton Hydrilla Project Webpage

<https://www.dec.ny.gov/animals/106386.html>