Long Term Hydrilla Management at Cleveland Metroparks

Year Seven
An addendum to the annual report prepared for Cleveland Metroparks staff

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Introduction

A comprehensive, consistent management strategy for hydrilla does not yet exist. Many states have experience controlling hydrilla, and those with the monoecious type – notably Indiana, New York, Pennsylvania, California, Washington, Maryland, and Maine - are more applicable to Cleveland Metroparks. Recommendations for the best current options for long-term management of hydrilla are proposed in this document.

Tuber bank

The number of tubers that remain in the sediment, called the tuber bank, is a measure of treatment effectiveness commonly used throughout the United States. Tubers are particularly troublesome since they serve as a source of regrowth in areas where the hydrilla shoots have been controlled by chemical or mechanical methods. Tubers are the "key target in breaking the life-cycle of hydrilla" (Netherland, 1997). Monoecious hydrilla tubers have been shown to remain in undisturbed soil for more than four years after production in southern Florida (Van and Steward, 1990), and six year old tubers have still been viable in North Carolina (Nawrocki JJ, RJ Richardson, ST Hoyle, 2016.). In Cleveland Metroparks, the tuber bank has been reduced to non-detectable numbers in all sites but the upper Greathouse wetlands (Figure 1). With tuber banks at or near undetectable numbers, Cleveland Metroparks will take steps to confirm apparent eradication and end proactive treatment in the Park District.

The End of Proactive Treatment in Cleveland Metroparks

Since 2012, Cleveland Metroparks has used a proactive herbicide treatment regime to manage monoecious hydrilla. Fluridone concentrations above 6ppb have been maintained for the entire growing season, (May – October) in addition to Galleon/penoxsulam for some spot treatments for one year. One site, the Greathouse Wetlands, had hydrilla vegetation in 2016. In 2017, no new vegetative hydrilla was detected at any site in Cleveland Metroparks.

The decision to end proactive treatment is based on each site and management staff's confidence in eradication. A waterbody's size, flow rate, connectivity to other waterbodies, human access and uses, waterfowl habitat, years of treatment, funding for treatment and staff surveys, and staff ability to sample tubers and vegetation must be taken into account. Based on field observations, 7-10 years of herbicide treatment is often required to reduce tuber concentrations to undetectable numbers (Nawrocki, 2011). It may take longer to deplete the tuber bank, as in Washington State's King County where treatment continued for over a decade before all tubers were depleted and no new populations of hydrilla emerged (King County, 2017). Once a tuber bank is depleted, there is an emerging consensus on when to stop herbicide treatment.

In successful hydrilla eradication efforts in Indiana, New York, California, and Washington, treatment may continue at a site for three to five years after the last tuber has been detected. In Indiana, Lake Manitou management staff ended treatment three years after the last tuber was found. Hydrilla was last seen in Cayuga Lake's inlet in 2015 and the Hydrilla Task Force decided to halt treatment in 2017 (Hydrilla Task Force of the Cayuga Lake Watershed, 2017). In both Lake Manitou and Cayuga Lake, intensive surveillance continued and funding was available to immediately initiate treatment in the event hydrilla was detected again. In California, a technical advisory board determined, "three years of follow up treatment [after the last tuber was detected] was probably not long enough," to end treatment on monoecious hydrilla (Kratville, 2013). After treatment has ended, intensive tuber sampling and vegetative surveys should continue. See Park District annual hydrilla

report for methods of intensive surveillance and monitoring (Warman and Weldon, 2018). Although there is an "industry average" timeline to end proactive treatment, there is not a consensus on precisely when to reduce or halt monitoring activities. Cleveland Metroparks will adopt a conservative model for winding down treatment and monitoring.

Recommendations

The following is a list of recommended actions and criteria for 2018 and beyond to confirm apparent hydrilla eradication in Cleveland Metroparks:

1. To account for tuber viability over time, Cleveland Metroparks should continue to treat for four consecutive seasons after the last tuber has been detected. Intensive monitoring, including tuber sampling and vegetation surveys, should continue for another four years after treatment has ended (Table 1).
    a. Criteria for ending chemical treatment
        i. No hydrilla detected for four consecutive years
    b. Criteria for ending intensive surveillance
        i. No hydrilla detected for eight consecutive years

2. Annual surveillance of all waterbodies in Cleveland Metroparks should continue after treatment and intensive surveys for hydrilla have ended. These surveys will help confirm eradication of hydrilla and will help detect new hydrilla and other AIS. The Park District has experience from a variety of professionals in the Natural Resources division who could conduct surveys for aquatic vegetation. Newly acquired properties should be assessed for AIS presence and treatment options. John Reinier, Wetland Ecologist, includes aquatic plants assessments for all new properties.

3. Exercise due diligence when installing purchased wetland plants. Greenhouses that specialize in aquatic plants may hold unwanted propagules of noxious plants, invasive snails, or other non-target wildlife. A pickerel weed root wad with mud is an example of a prime vector for aquatic invaders. Purchased aquatic plants should be assessed for hitchhikers prior to installation. Furthermore, it is recommended that each aquatic plant provider be vetted by Cleveland Metroparks staff with a phone call or, ideally, a visit to the greenhouse.

4. If any surveys detect hydrilla, a rapid-response plan should be implemented. This plan should involve immediate treatment of the infestation with a fast-acting herbicide such as Reward, Aquathol, and ProcellaCOR. ProcellaCOR received USEPA approval in 2018, degrades quickly in sunlight, and may be a good option for rapid hydrilla control if a new infestation is discovered, especially where native vegetation resides (Netherland, 2016). Complexed (chelated) copper, diquat, penoxsulam, and endothall are also serviceable herbicide options for rapid response (Table Two). Depending on the time of year of the find and its initial treatment, an application of fluridone product may limit the risk of potential regrowth. Funding and ability to mobilize will determine whether treatment is conducted by Cleveland Metroparks or an approved contractor. Recommendation modified from Lake Manitou Aquatic Vegetation Management Plan Update, 2016.

5. The investment in hydrilla eradication effort in Cleveland Metroparks has been significant and its value should be protected through enhanced prevention strategies where feasible. The current project status represents an opportunity for revisiting broader AIS prevention and response strategies for the Park District, such as enhanced boat ramp signage and volunteer ramp 'stewards' or inspections. Continuation and expansion of the following initiatives will help guard the Park District from AIS: the discounted dock fee program for Clean Boaters, Outdoor Education programming, publishing AIS records to national databases, and enabling interdepartmental use of decontamination procedures. Recommendation modified from Lake Manitou Aquatic Vegetation Management Plan Update, 2016.

6. Cleveland Metroparks must consider funding sources for hydrilla treatment should regrowth or new infestations be discovered. In 2018, the GLRI hydrilla grant GL-00E01923 and Cleveland Metroparks operating budget will provide the funds for treatment. In 2019, Cleveland Metroparks will use a subsidy awarded by the Ohio Department of Natural Resources through GLRI to continue treatment.

7. Cleveland Metroparks should continue to provide leadership in early detection and rapid response to AIS in northeast Ohio. Should hydrilla be detected in a shared or adjacent watershed, the Park District should take an active role to assess and monitor the population because it poses a proximal threat to the Cleveland Metroparks. The nature of the active role should be defined to include assessment and monitoring efforts, whether this be on-the-ground such as tuber sampling or provided as training, resources, and advice to partner agencies. Threat and site assessment, tuber monitoring, and vegetative surveys are low-investment services the Park District could provide to neighbors battling hydrilla. The nearest known hydrilla infestations are in Summit County, the Ohio River, and in Ashtabula County in Pymatuning Lake. Cleveland Metroparks is committed to educating and enabling partner organizations to manage hydrilla toward eradication.

8. An alternative treatment strategy to confirm apparent eradication was proposed by Mike Netherland during a phone conversation with the Hydrilla Project Coordinator. A delayed herbicide treatment may help gather evidence about viable hydrilla by allowing tuber germination in a limited growth window (M. Netherland, personal communication, November 2, 2017). For example, in Cleveland Metroparks, plants could be allowed to grow during the months of May and June and sites would be surveyed for vegetation twice monthly. Wader surveys, rake tosses, boat surveys, and use of a bathyscope would aid the hunt for hydrilla. If plants are detected, immediate application of fluridone will be initiated. This limited growth period would end on July 1st, before tubers and turions are expected to form, thus reducing the threat of reproduction. While a delayed treatment option may expose the Park District to risk of hydrilla spread via fragmentation, the payoff for this increased risk is a better chance of detecting hydrilla growth and lower costs for treatment, though staff time for surveys would likely increase. The park district will not adopt this alternative strategy in 2018, but it may be considered for the future, especially if funding is tenuous.

9. Digital record keeping and physical copies of materials
    a. All of the hard copy maps are stored at the Rocky River Management Center. Maps are created in QGIS. All of the GPS data is stored on Mjw1's U drive under the GIS sandbox organization.

Conclusion

The decisions to end treatment and annual monitoring for hydrilla tubers and vegetation must be made thoughtfully and with evidence. A waterbody's size, flow rate, connectivity to other waterbodies, human access and uses, waterfowl habitat, years of treatment, funding for treatment and staff surveys, and staff ability to sample tubers and vegetation must be taken into account. For every hydrilla management plan, it is imperative to have an intense monitoring effort in place to detect a resurging population once treatment has ended. To safeguard the investment in hydrilla eradication, annual surveillance of the Park District should continue. Early detection and rapid response is a model that has worked to date for managing hydrilla; Cleveland Metroparks should continue to invest in detection of it and other non-native aquatic vegetation.

Finally, education about AIS should continue to be improved to help prevent the spread of invaders. Cleveland Metroparks should support regional AIS prevention, education, and management programs as well as organizations affiliated with this work. This may include: GLRI initiatives for AIS prevention, the Crooked River Cooperative Weed Management Area, Ohio Sea Grant, the Ohio AIS Committee, the Great Lakes Hydrilla Collaborative, and the Binational Forum on Aquatic Nuisance Species, and other interagency cooperations to study and prevent the spread of aquatic invasive species. To support interagency cooperation, occurrences of AIS should continue to be uploaded to national databases such as USGS-NAS, GLANSIS, and EDDMapS. Two challenging AIS, starry stonewort (*Nitella obtusa*) and European frogbit (*Hydrocharis morsus-ranae*), are near Cleveland Metroparks and may require management in the future. Starry stonewort is in Sandusky, southeast of Cedar point and northwest of Sheldon Marsh, about 40 miles from Huntington beach. European frogbit is in Sandusky at Sheldon Marsh and at Old Woman Creek, which is approximately 35 miles from Huntington beach. The GLRI grant GL-00E01923 will close in 2018, but the educational, preventative, and surveillance work will continue at Cleveland Metroparks. It is hoped that these recommendations are beneficial to future hydrilla hunters in the Park District and the Great Lakes region.

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Tables

Table One. Timeline for hydrilla management activity ending.

Site	Date of last detection and type of plant material	Year proactive treatment ends (4 years after last hydrilla detection)	Annual tuber and vegetative surveillance ends (8 years after last hydrilla detection)
OEC , Blue Heron	2014 (vegetation)	2019	2022
Greathouse Wetlands	2018 (tuber, upper wetland only)	2023	2027
Washout Wetlands	2014 (3 tubers)	2019	2023
Sunset & Sanctuary	2014 (vegetation, sanctuary)	2019	2023
Wallace Lake	2014 (tuber)	2019	2023

Notes: Cleveland Metroparks staff or contractors intensively treat and survey an infested site for a minimum of four growing seasons after the last hydrilla detection, followed by a minimum of another four seasons of intensive survey without treatment. Therefore, Cleveland Metroparks considers hydrilla eradicated from a site only after a minimum of eight years without finding any plants. Longer periods of treatment and negative surveys may be warranted, depending upon the circumstances. Recommendation modified from California Department of Food and Agriculture Hydrilla Eradication Program, 2013.

Table 2. Use Suggestions for Selected Aquatic Herbicides (Modified from Getsinger, et al 2004, and Madsen, 2000)

Herbicide	Activity	Systems Where Effectively Used	Exposure Time	Plant Species Response
Complexed Copper	SYSTEMIC Plant cell toxicant	Higher exchange areas; moving and still water	Intermediate, 18-72 hr	Broad-spectrum, acts in 7-10 days or up to 4-6 weeks
2,4-D	SYSTEMIC Selective plant growth regulator	Lakes and slow-flow areas; moving and still water	At higher concentrations: Short, 8-24 hr At lower concentrations: Medium, 3-5 days	Selective to broadleaves, acts in 5-7 days up to 2 weeks
Penoxsulam	SYSTEMIC Selective plant growth regulator. Inhibits enzyme production	Large-scale control, lakes and slow-flow areas; moving and still water	Long, 60 days. Bump treatments common	Broad-spectrum, plant death occurs over several weeks to months
Diquat	CONTACT Disrupts plant cell membrane integrity	Shoreline, localized treatments, higher exchange rate areas; moving and still waters	Short, 4-24 hr	Broad-spectrum, acts in 5-7 days
Endothall	CONTACT Inactivates plant protein synthesis	Shoreline, localized treatments, higher exchange rate areas; moving and still waters	Short, 4-24 hr	Broad-spectrum, acts in 7-14 days
Fluridone	SYSTEMIC Disrupts carotenoid synthesis	Localized (with limnocurtain and/or in granular form) or whole lake treatments	At lower concentrations (<40ppb) Long, 60-90 days; may get desired results in 45-60 days if >10ppb	Broad-spectrum, acts in 30-90 days at > 10 ppb; more selective at < 10ppb
Triclopyr	SYSTEMIC Selective plant growth regulator	Lakes and slow-flow areas; moving and still water	Intermediate, 12-72 hr	Selective to broadspectrum, acts in 7- 10 days, up to 2 weeks
ProcellaCOR	SYSTEMIC Mimics Auxin hormone and makes plants brittle	Submersed spot/partial use	Intermediate, 24-72 hr Low concentration 9ppb	Selective, acts in 1-2 days, photodegradation in 1-5 days, long term effect on plants

Notes: Use of diquat or endothall is mainly to minimize spread of the plant; eradication is not expected. Fluridone use may include liquid, pellets, sequestration and repeat (boost or bump) treatments to maximize exposure, with treatments at >6 ppb potentially eradicating hydrilla but also damaging some native plant species. Drawdown use is dependent on many factors, including hydrology and use as a water supply. Due to the rapid growth rate of hydrilla, multiple treatments with contact herbicides are usually required to obtain adequate control for one growing season.

Figures

Figure 1. Tubers detected in Cleveland Metroparks sites via tuber sampling by year. One tuber was detected at the Upper Greathouse wetlands in 2017.