Curly Leaf Pond Weed Nuisance Potential in the White River Watershed

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Abstract

Potamogeton crispus also known as Curly Leaf Pondweed (CLP) is a widespread aquatic invasive species capable of growing in highly variable conditions. CLP grows aggressively (Wandell & Wolfson, 2007, p. 49) and sometimes becomes a nuisance (Guard). Few sources offer information regarding which factors contribute to its nuisance potential. Waterways in the White River Watershed of West Michigan previously reported to contain CLP were surveyed to identifying factors which contribute to CLPs nuisance potential. Our findings suggest that healthy aquatic habitats in the White River Watershed are not at risk for nuisance levels[1] of CLP. Therefore, eradication efforts may not be necessary in healthy ecosystems and efforts may be more fruitful if spent on restoring disturbed habitats.

Background

Habitat

Curly Leaf Pondweed (CLP) is a European freshwater plant which has grown in the United States for over 100 years. (Crow & Hellquist & Fassett, 2005, p. XVI). CLP is found in many different types of freshwater aquatic habitats, and it has no water type preference (Skawinski, 2014, p. 74). For example, it can thrive in waters that are highly polluted or extremely alkaline (Hellquist, 1980). Since CLP can survive in many different conditions, nearly every waterway in the continental United States has the potential to become invaded, by CLP.

Despite some nuisance properties, according to Wang et al., CLP provides a food source for fish species (As cited in Mikulyuk and Nault, 20090, as well as waterfowl (Stuckey, 1979). CLP's spread has correlated with waterfowl movements and introduction of hatchery fish and therefore may be spread by either (Stuckey, 1979).

Identification

CLP has flattened, lance-shaped, blunt-tipped leaves which have a prominent midvein, serrated edges, and are wavy when mature (Skawinski, 2014, p. 74). The leaves each have their own semi-flattened stems which attach to a thin rhizome without a petiole (Skawinski, 2014, p. 74). The plant is easily mistaken for clasping leaf pondweed and white stem pond weed, but can be distinguished by the fine teeth around the leaf edges.

1 Close-up of CLPW leaves

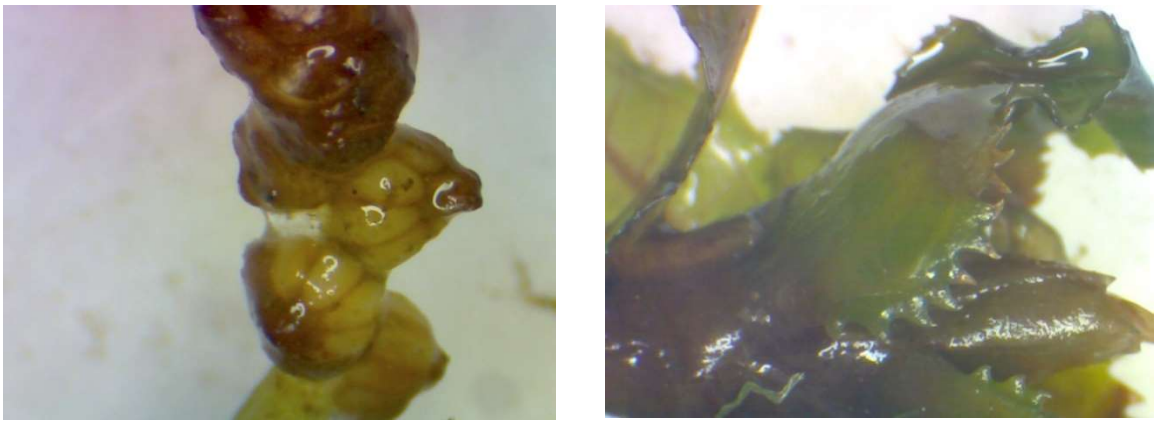
1. In this report, nuisance level is defined as a population density which either disrupts the ecological balance, interferes with human recreation, or both.

2 CLP from Robinson Creek

Life Cycle

CLP is one of the first plants to begin growing in the spring, which gives it the potential to overcrowd native plants before they germinate (Wandell & Wolfson, 2007, p. 49). It reaches maximum development in early June (in the northeast US) and it produces a turions at this stage (Crow & Hellquist & Fassett, 2005, p. XVI). Turions are "special reproductive pine cone-like structures . . . which are highly resistant to herbicidal damage and help spread the plant" (Wandell & Wolfson, 2007, p. 49). Turions are the main source of CLP propagation because the seeds it produces rarely germinate (Heuschele & Gleason, 2014).

In temperate climates, the turions either prepare for a prolonged dormancy or prepare to sprout in the early autumn (Crow et al., 2005, p. XVI). By early July, the turions dislodge and the plant begins to die (Crow et al., 2005, p. XVI). By mid-August, the turions that do not enter a prolonged dormancy begin to grow (Crow et al., 2005, p. XVI). The turions that enter prolonged dormancy are capable of remaining viable for up to four years (Heuschele & Gleason, 2014). The prolonged viability makes CLP extremely hard to eradicate because herbicides do not kill the turions. In fact, CLP seems to do well in disturbed habitats and in lakes where large-scale aquatic plant control is conducted (Wandell & Wolfson, 2007, p. 49).



3 Possible bud or turion formation from Robinson Creek specimens

Procedures

We surveyed seven locations where CLP had been reported to determine the relative abundance of the plant and to determine if relative abundance correlated with certain habitats or water conditions. If we identified CLP in an area, we referenced the Midwest Invasive Species Network (MISIN) website and reported our findings if CLP was not previously reported on the website. Overall, our sampling methods gave us a good measure of whether CLP was present in a body of water and whether it had reached nuisance levels. The benefits and limitations of our procedures are as follows.

Rake Samples

Most locations were sampled using a rake on a rope to scrape the bed of the river, lake, or stream, and inspect the plants retrieved to examine the relative abundance of CLP. Rake sampling is the least accurate method of sampling because we only viewed whichever small spot our rake landed instead of the ecosystem as a whole. We threw the rakes at multiple angles and distances from each spot sampled to get the best representative sample our equipment allowed.

Wading and Visual Inspection

Wading and visual inspections have a higher accuracy because we could see the plants and take multiple samples of the plants instead of blindly casting the rake. We used this method at the locations where we waded and where we could visually inspect the plants from the surface. In these locations, Long-leaf plants were easily differentiated from other plant species and then sampled them to confirm identification. Alternately, if we were unable to identify the plant type from the surface, we would sample the plant to confirm the plant species.

Sampling by Boat vs. From Shore

Rake sampling by boat is more accurate than sampling from the shore. When we sampled by boat, we both visually inspected the plants while they were under the water and took samples from around entire lake instead of being limited to areas we could reach by foot.

Water Body	Methods Used to Sample
White River	Rake Sampling from the shore
Robinson Creek	Rake Sampling from the shore above the dam at the Echo Drive road crossing. Below the dam: rake sampling while wading and visual inspection.
Little Flower Creek	Visual Inspection from the shore at the mouth. Visual inspection of the creek just above the mouth and at various waterway crossings.
Stony Lake	Rake samples and visual inspection by boat.
Lake Tahoe	Rake samples and visual inspection by boat.
White Lake	Rake samples from the shore at various points and from wading close to the shore.

Findings

Water Body	Other Plants Found
White River	Eel Grass
Robinson Creek	Coontail, Elodea Waterweed, Large Leaf Pond Weed, Native Milfoil
Little Flower Creek	Elodea Waterweed, Filamentous Algae
Stony Lake	Elodea Waterweed, White water Lilly
Lake Tahoe	Elodea Waterweed, Large Leaf Pond Weed, Stonewort, Red Water Lilly
White Lake	Eel Grass, Duckweed, Coontail, Elodea Waterweed, Native Milfoil
MCC Pond	Elodea Waterweed, Duckweed, Filamentous Algae

Name	Section	Clarity	Flow	Depth	Substrate	Light	CLP Found	Notes	CLP Relative Abundance
White River		Clear	High	1-2ft	Packed Pebbles	High	Yes	CLP had been reported at this location previously.	Highly Abundant
White River	Downstream From CLP	Clear	High	6-12ft	Packed Pebbles and Sand	High	No	This location was surveyed to assess how much CLP spread from upstream if at all.	N/A
Robinson Creek	Above Dam	Moderate	Moderate	6ft	Sand	High	Yes		Moderate
Robinson Creek	Below Dam	Moderate	Moderate	2ft-4ft	Sand and Silt	Moderate	Yes	CLP was scooped up during a macroinvertebrate sample and identified. Sections Below the dam that did not contain CLP had few to no other plants and low light.	Moderate
Little Flower Creek	Road Crossings	Clear	Moderate	1ft	Sand	Low	No	No living aquatic plants found	N/A
Little Flower Creek	At the Mouth	Unclear	Very Slow	2ft-3ft	Sand and Silt	High	Yes	Water Quality was deplorable with posted warnings prohibiting swimming.	Highly Abundant
Stony Lake	Around perimeter	Moderate	Slow	5ft-10ft	Sand and Silt	High	Yes		Moderate
Lake Tahoe	Around perimeter	Moderate	Slow	5ft-10ft	Sand and Silt	High	No	CLP had been reported as a nuisance here however poison already killed most plant life.	N/A

Name	Section	Clarity	Flow	Depth	Substrate	Light	CLP Found	Notes	CLP Relative Abundance
Lake Tahoe		Moderate	Very Slow	3ft-4ft	Sand and Silt	Moderate	Yes		Moderate
White Lake	Around perimeter	Moderate	Slow	3ft-8ft	Sand and Silt	High	Yes		Sparse
MCC Pond	Around perimeter	Unclear	Very Slow	1ft-7ft	Sand and Silt	High	Yes		Highly Abundant
MCC Pond Creek	Above and below pond	Clear	Slow	1ft	Sand	Low	No	The only plants found had floated downstream from the pond	N/A

Location Maps

X – Plants found without CLP

X – No plants found

X – CLP Found

Map 1 The White River at Pines Point Campground
Oceana County

Map 2 Robinson Creek at Echo Dr.
Newaygo County

Map 3 Little Flower Creek at the Mouth
Muskegon County

Map 4 Lake Tahoe
Oceana County

Map 5 The Mouth of White Lake
Muskegon County

Map 6 Stony Lake
Oceana County

Map 7 The MCC Pond and Creek
Muskegon County

Photographs

Robinson Creek and Stony Lake

4 The CLP plant found in the Robinson Creek Macroinvertebrate Sample

5 CLP in Stony Lake

Little Flower Creek

6 A bed of filamentous algae with dense CLP

7 CLP rises above the other plants and the algae layer

Lake Tahoe

8 Emily holds a water lily for plant height reference

9 Lake Tahoe's most abundant surviving plants above a bed of dead plant matter

10 A section of Lake Tahoe that appears to have evaded herbicide treatment

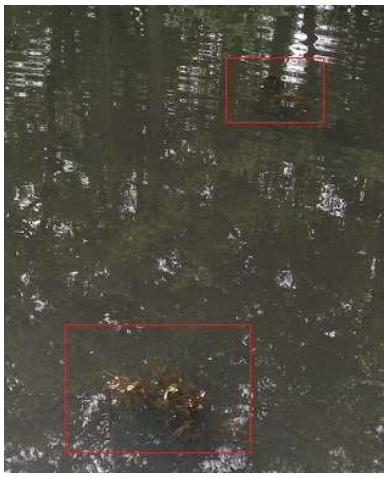
11 Close-up of CLP specimen found in the spot with abundant aquatic plants

12 CLP specimen from Lake Tahoe height reference

MCC Pond

13 CLP found accidentally in the MCC Pond

15 The MCC creek below the pond with floating duckweed



1 CLP in the MCC pond as seen from the surface

16 More CLP from above the MCC pond

White Lake

17 The mouth of the White River. CLP was found close to the shore line

18 An algae-rich section of the lake where CLP was not found.

19 The mouth of the White River where CLP was also found. The surface is covered in duck weed.

White River

21 Emily casting a rake in the shallow section of the White River

22 A dark patch of CLP as seen from the shore of the White River

23 A mat of dark CLP with light green eel grass

24 CLP in the river bed

Discussion

We confirmed that CLP is widespread in the White River Watershed and that it thrives in a wide variety of conditions with no clear preference. Our findings suggest that in the White River Watershed CLP will only become a nuisance in disturbed or unhealthy aquatic ecosystems. In our findings, relative CLP abundance did not correlate with any specific water condition, nor with other plant species found near CLP. CLP was only observed at nuisance levels at Little Flower Creek, which had deplorable water conditions. The conditions at the mouth of Little Flower Creek were likely incapable of supporting sensitive aquatic plants. While CLP was reported to be at nuisance level in Lake Tahoe, we were unable to confirm reports because herbicidal treatments had killed most plant life by the time we took our samples. However, the Lake Tahoe reports are consistent with Wandell & Wolfson's claim that CLP can become a nuisance in "lakes where large-scale aquatic plant control is conducted" (2007, p. 49). CLP was not at nuisance level in all areas where we observed a healthy mix of native plants. Our findings suggest that CLP is not a threat to healthy ecosystems, therefore CLP infestations in the White River Watershed may be prevented by establishing or maintaining healthy aquatic ecosystems.

This study is not comprehensive enough to confirm with certainty that CLP will not become a nuisance in non-disturbed habitats. It would be fruitful for future studies to examine areas where CLP has become a nuisance and determine if the area was disturbed prior to CLP becoming a nuisance, and to examine activity of waterfowl to determine if waterfowl populations affect CLP abundance.

Update

After the conclusion of our field work, Dr. Tisue found nuisance levels of CLP in Duck Creek near an old sand mine. This location is thought to have good water quality; however, the water has not been tested that far downstream and may contain contaminants from the old sand mine. The water lever in that area were unusually high this year and it is unclear if native plants are usually able to survive at that spot. The nusasance levels of CLP at Duck Creek contradict our conclusion if the area has a healthy ecosystem and good water quality. Duck Creek needs to be tested and monitored before accepting or rejecting our conclusion.

Map 8 Duck Creek approx. ¾ mile upstream from the mouth
Muskegon County

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