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APPENDIX G

**2018 Manitowish Waters Chain of Lakes Curly-leaf Pondweed
Monitoring Report**

INTRODUCTION

The Manitowish Waters Chain of Lakes includes 10 lakes located in the Towns of Manitowish Waters and Boulder Junction in Vilas County as well as three lakes located below the Rest Lake Dam. Curly-leaf pondweed was first discovered in the Manitowish Waters Chain of Lakes in June 2010 in the northwestern area of Island Lake. In 2011, monitoring conducted by NLDC staff, MWLA volunteers, and Vilas County staff mapped approximately 22 acres of curly-leaf pondweed in Rice Creek and located additional occurrences in southeastern Island Lake and in the channel between Island and Spider lakes.

The curly-leaf pondweed discoveries in 2010 and 2011 spurred the NLDC's first AIS-Early Detection and Response (AIS-EDR) Grant in February 2012. AIS-EDR Grants were also received in 2013 and 2014, followed by a 3-year AIS-Established Population Control (AIS-EPC) Grant in 2015. These grants helped to fund the management of curly-leaf pondweed on the chain from 2012-2017, which are elaborated on below. Continued and expanded monitoring of all chain lakes was completed by professionals and volunteers as a part of this multi-phased management planning project. These efforts located additional curly-leaf pondweed occurrences in Manitowish and Stone lakes during 2013, Rest Lake in 2015, and Fawn Lake during 2017 (Figure 1).

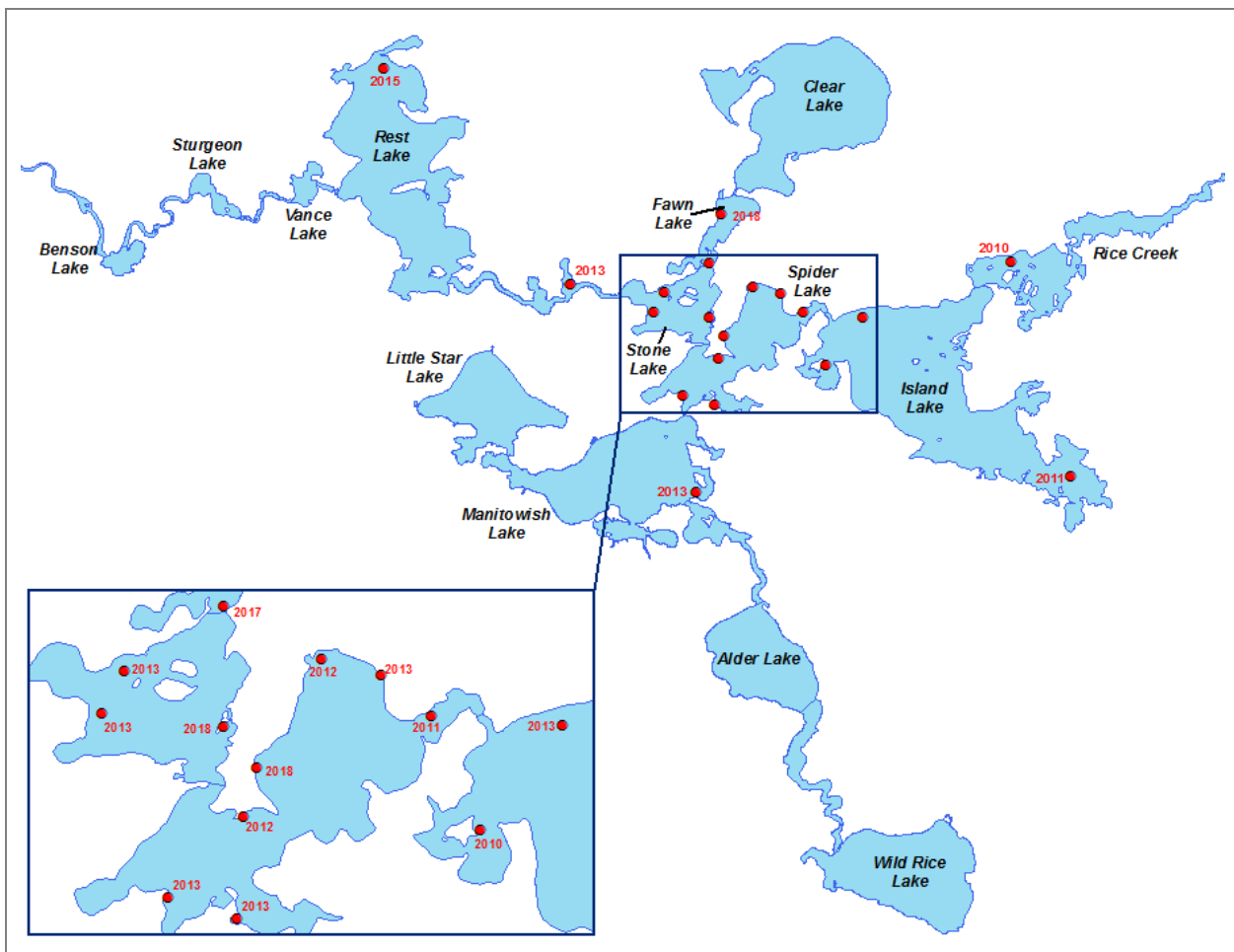


Figure 1. Curly-leaf pondweed discoveries in the Manitowish Waters Chain of Lakes. Initial discovery of curly-leaf pondweed throughout the chain, created using data from Onterra, MWLA volunteers and the NLDC.

Past CLP Management Summary

Over the course of the six years between 2012 and 2017, two methods have been used to control curly-leaf pondweed in the Manitowish Waters Chain of Lakes; herbicides and hand-harvesting. The latter method has included volunteer, NLDC staff, and professionals using traditional hand-harvesting techniques (no DASH). Herbicide treatments have been completed on five sites on the chain, including the Spider-Island channel (2012-2016), Manitowish River (2014), and three areas on the western side of Island Lake (2012-2013). Two areas on the chain that contain curly-leaf pondweed have been monitored by professionals since 2012, but have had no control actions completed on them. These areas include Rice Creek near its entrance to Island Lake and an area in far eastern Island Lake. Specifics regarding the year-to-year efforts can be found in the annual reports produced as a part of the AIS grant projects. No herbicide control actions were recommended in 2017 or 2018, however a coordinated hand-harvesting effort was undertaken to manage the population in select areas of the system.

2018 MONITORING RESULTS

The CLP population was monitored in 2018 through a combination of efforts by Onterra and by the NLDC staff. Onterra staff visited the Manitowish Chain on June 18 & 19, 2018 to complete the Early Season AIS survey (ESAIS). Water levels appeared to be slightly higher than usual at the time of the survey. The results of the survey are displayed on Map 1. All of the CLP occurrences that were located consisted of either *single or few plants* or *clumps of plants*. No large colonized areas of CLP that required area-based mapping methodologies were located during the survey. The crew attempted to map the known CLP colony in Rice Creek, however, high water levels, high water flows, and dark stained water made mapping CLP in the area difficult and the survey was discontinued in this particular area.

The NLDC also conducted CLP monitoring in areas of the Chain in spring 2018 including the known CLP waterbodies of Rest Lake and the Manitowish River between Rest Lake and Stone Lake. No CLP was initially located in Rest Lake in the area in which it had been present in previous years. Several CLP plants were identified NLDC staff in Fawn Lake in June 2018 (Map 1). Following the discovery in Fawn Lake, Onterra staff also searched the area and mapped two *clumps of plants* and a *single plant* on the west side of the lake.

2018 CLP MANAGEMENT ACTIONS

The NLDC contracted with Aquatic Plant Management, LLC (APM) to conduct professional hand-harvesting services of CLP in 2018. Onterra and the NLDC provided the spatial data for the CLP locations to APM to aid in the removal efforts. Plant removal specialists from APM visited the Manitowish Waters Chain of Lakes on June 25th-27th & July 2nd 2018. Over a combined 24 hours of diver time, approximately 10 cubic feet of CLP was harvested (Table 1). Two days of the professional harvesting efforts took place in the sites C-18, D-18, and E-18 of which the majority of time was spent in the channel between Spider and Island Lake around site E-18. One day of professional harvesting targeted the newly found population in Fawn Lake and one day was devoted to searching for and removing CLP from the previously known sites in Rest Lake. Details of the professional hand-harvesting efforts as reported by APM are included with this report as Appendix A.

Table 1. Summary of 2018 Professional Hand-Harvesting Efforts. Data computed from APM, LLC Dive Summary Report.

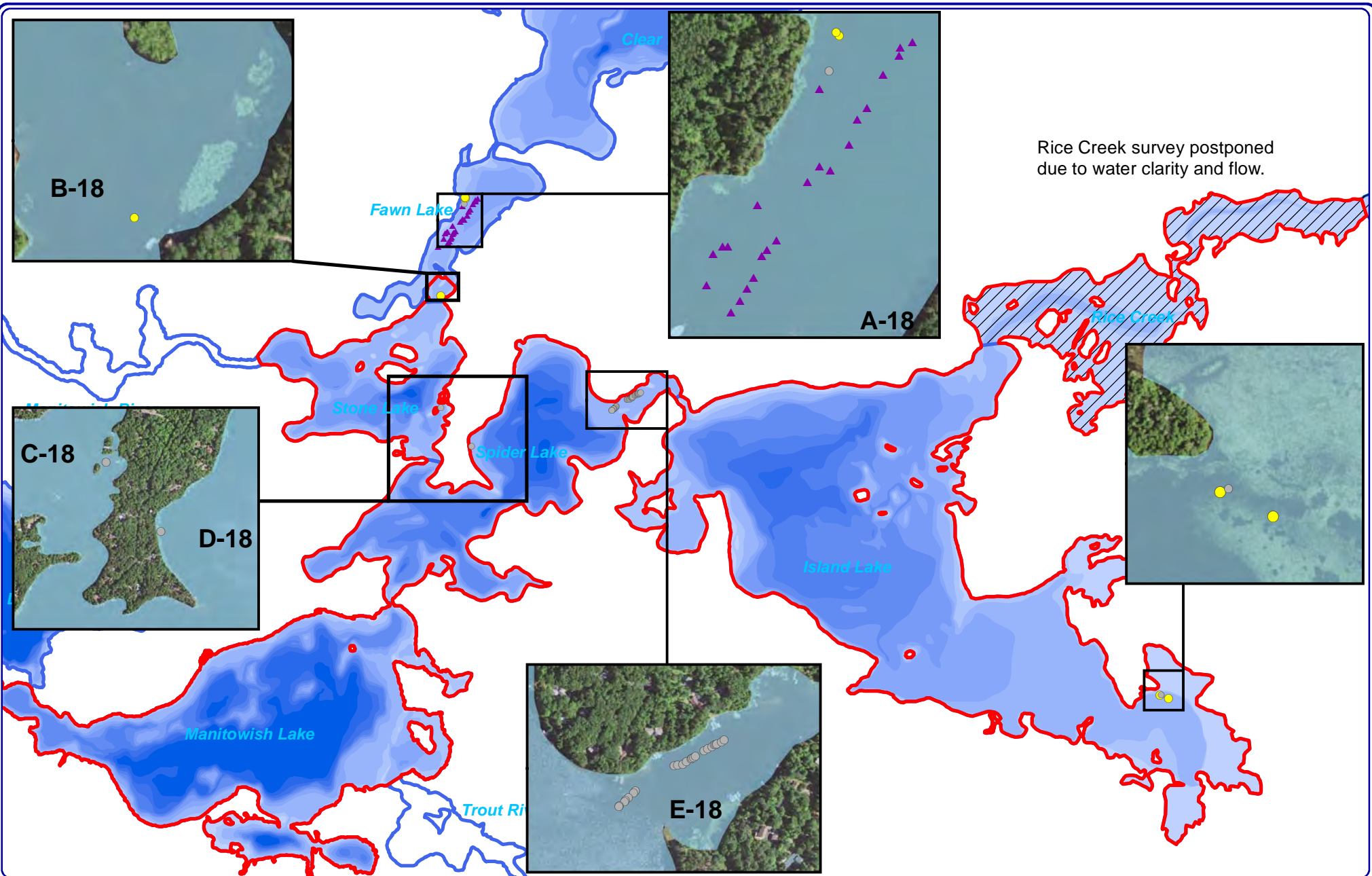
Site	Time	Harvest
C-18	0.6	0.5
D-18	0.4	0.5
E-18	5.61	6
Rest Lake	5	3
Fawn Lake	4.5	0.5
Totals	16.11	10.5

Additional CLP hand-harvesting efforts were undertaken by NLDC staff in 2018 and included 21 person hours harvesting in Fawn Lake as well as 2 person hours pulling CLP in Rest Lake. A summary of the NLDC-led CLP monitoring and pulling efforts is included in a report authored by NLDC and is included as Appendix B to this report.

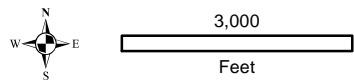
DISCUSSION & CONCLUSIONS

The CLP monitoring surveys completed in 2018 on the Manitowish Chain indicate that the majority of the population is of relatively low densities. A combination of professional and volunteer-based CLP hand-harvesting efforts in recent years has likely helped to maintain the low populations and helped to inhibit CLP from becoming established in new areas of the system. Early detection and swift removal of pioneer CLP plants in the system is critical in limiting the expansion of the species in the Chain.

Based on the known CLP population in the Chain, a coordinated hand-harvesting control program is likely the most appropriate form of management to consider for 2019. The NLDC has solicited professional CLP hand-harvesting services once again for 2019 in the Chain. Similar to 2018, the harvesting efforts will be based on the results of early season surveys that will be conducted by Onterra or NLDC staff. In 2019, Onterra will survey all of the known CLP lakes in the Chain with the exception of Fawn Lake. The NLDC staff will survey Fawn Lake and also search the remaining areas of the Chain where CLP is not currently known to exist. The final 2019 hand-harvesting strategy will be developed following the ESAIS surveys including determining the most appropriate areas to focus professional harvesting actions and any NLDC removal efforts. Following the ESAIS survey, hand-harvesting should occur as early as possible, so that the plants can be removed before they are able to produce and deposit their reproductive structures (turions).



Rice Creek survey postponed due to water clarity and flow.



Onterra LLC
 Lake Management Planning
 815 Prosper Road
 De Pere, WI 54115
 920.338.8860
 www.onterra-eco.com

Sources:
 Roads and Hyrd: WDNR
 Aquatic Plants: Onterra, June 2018
 Orthophoto: NAIP, 2017
 Map Date: June 22, 2018



Legend

- Single or Few Plants
- Clump of Plants
- Small Plant Colony (*none*)
- Onterra Survey Lakes
- ▲ NLDC Survey CLP Location

Map 1
 Manitowish Chain of Lakes
 Vilas County, Wisconsin
**June 2018 Curly-leaf
 Pondweed Survey Results**