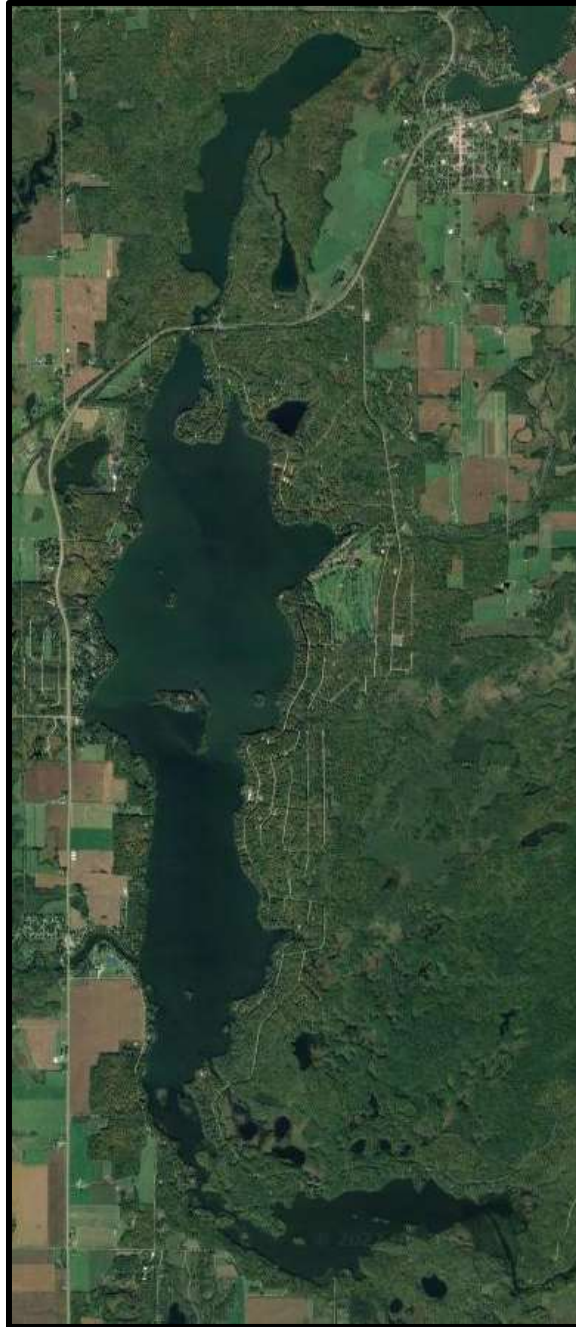


LAKE EDUCATION AND PLANNING SERVICES, LLC

RED CEDAR LAKES

2021 MANAGEMENT SUMMARY REPORT

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RED CEDAR LAKES ASSOCIATION

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INTRODUCTION

This report discusses lake management activities completed by the Red Cedar Lakes Association (RCLA) and Lake Education and Planning Services (LEAPS) throughout 2021 in Hemlock, Red Cedar, Bass, and Balsam Lakes. The following actions were completed by LEAPS and additional contractors to assist the RCLA in aquatic plant management and lake stewardship education.

02/26/2021 – Lake management discussion with RCLA and LEAPS
03/31/2021 – CLP chemical treatment plan for Balsam Lake submitted by LEAPS
04/07/2021 – Public notice of chemical treatment published in Rice Lake Chronotype
05/06/2021 – CLP Balsam chemical treatment permit granted by WDNR
05/07/2021 – LEAPS and RCLA volunteer CLP bed mapping survey
05/14/2021 – LEAPS and RCLA volunteer CLP bed mapping survey (cont.)
05/15/2021 – RCLA board meeting
05/26/2021 – Balsam Lake CLP treatment by Northern Aquatic Services LLC
06/19/2021 – RCLA board meeting
07/10/2021 – RCLA annual meeting
08/05/2021 – RCLA meeting with LEAPS
08/07/2021 – RCLA board meeting
08/28/2021 – RCLA Lake education meeting
09/11/2021 – RCLA board meeting
09/13/2021 – LEAPS wild rice survey
09/25/2021 – RCLA board meeting
09/25/2021 – CLP turion survey conducted by Freshwater Scientific Services LLC
09/27/2021 – Hemlock and Bass Lakes shoreline habitat assessment with LEAPS and RCLA volunteer
10/09/2021 – RCLA board meeting
11/26/2021 – Grant extension received

The RCLA participated in CLP management in 2021 as approved by the Wisconsin Department of Natural Resources. The proposed area for chemical treatment was delineated from bed mapping surveys conducted by LEAPS with the assistance of a volunteer in early May. On 5/11/2021, an area of 2.55 acres near the channel from Red Cedar to Balsam Lake was treated by Northern Aquatic Services LLC using 5.10 gallons of Diquat (Tribune) (Figure 1).



2021 CITIZEN LAKE MONITORING

Volunteers following Citizen Lake Network Monitoring protocol collected water quality data in Balsam (Station ID: 663045), Red Cedar (Station ID: 033140), and Hemlock Lake (Station ID: 033142) in 2021 (Table 1; 2; 3). The results of the summer water quality sampling showed that the three lakes were eutrophic. This suggests that the lakes had decreased water quality, fewer algal species, oxygen-depleted bottom waters during the summer, evident plant overgrowth, and a warm-water fisheries.

LEAPS supports the collection of these data and uses it to inform management decisions and educate RCLA members and lake users about the lake.

Table 1. 2021 Balsam Lake water quality data

Sample Date	Secchi (ft)	Chl- <i>a</i> (ug/L)	TP (ug/L)	
06/07/21	10.5	-	-	
06/21/21	11.0	-	-	
06/28/21	-	11.1	21.2	
06/29/21	8.0	-	-	
07/09/21	7.0	-	-	
07/13/21	10.0	-	-	
07/22/21	11.0	4.3	14.7	
07/30/21	4.8	-	-	
08/04/21	3.5	-	-	
08/12/21	4.0	-	-	
08/22/21	-	17.7	22.3	
08/23/21	5.0	-	-	
Average	7.5	11.0	19.4	
Average TSI	49.4	48.7	51.0	= 49.7

Table 2. 2021 Red Cedar Lake water quality data

Sample Date	Secchi (ft)	Chl- <i>a</i> (ug/L)	TP (ug/L)	
05/09/21	9.5	-	20.6	
05/24/21	9.0	-	-	
06/03/21	12.0	-	-	
06/11/21	14.5	-	-	
06/19/21	15.3	-	-	
06/28/21	11.5	7.99	16.8	
07/05/21	10.5	-	-	
07/22/21	11.8	-	-	
07/30/21	8.0	8.58	16.4	
08/04/21	8.5	-	-	
08/16/21	7.0	9.54	17.4	
09/07/21	8.0	-	-	
09/15/21	7.5	-	-	
09/23/21	6.5	-	-	
10/01/21	6.5	-	-	
Average	9.7	8.7	17.8	
Average TSI	44.8	51.3	50.5	= 48.9

Table 3. 2021 Hemlock Lake water quality data

Sample Date	Secchi (ft)	Chl- <i>a</i> (ug/L)	TP (ug/L)	
06/27/21	-	25.4	-	
07/29/21	-	20.0	-	
09/01/21	-	25.2	-	
Average	-	23.5	-	
Average TSI	-	58.3	-	= 58.3

2021 CLEAN BOATS, CLEAN WATERS

LEAPS assisted the RCLA in organizing Clean Boats, Clean Waters (CBCW) in 2021. The group was approved for a CBCW grant to support these efforts. Several paid employees (hired by LEAPS) and volunteers (from the RCLA) spent nearly 500 hours divided among the Hemlock, Waldo Carlson, and Loch Lomond boat landings (some additional time was spent at other secondary landings as well). Inspectors hired by LEAPS spent a combined 472 hours monitoring the lakes – 46 hours in May, 130.5 hours in June, 176.5 hours in July, and 118.5 in August. There were 254 hours spent monitoring on weekends and 218 hours spent monitoring on week days.

LEAPS summarized the CBCW data that was uploaded to the SWIMS database. Boats came from lakes as far as Minnesota and as close as within 10 miles within 5 days prior to visiting the lakes (Table 4). Boats visited the Red Cedar lakes from other lakes infested with curly-leaf pondweed, hybrid watermilfoil, Eurasian watermilfoil, spiny water fleas, zebra mussels, in addition to other AIS species (Table 4). These findings justify continuing CBCW and AIS monitoring in and around the lakes.

Table 4. Red Cedar Lakes 2021 Clean Boats Clean Waters visiting boats summary

Lake	County	# of Times Visited	AIS
Long Lake	Washburn	15	CLP
Rice Lake	Barron	12	CLP, HEWM
Big Chetac	Sawyer	8	CLP
Lake Amacoy	Rusk	3	CLP
Sand Lake	Sawyer	3	
Lake Vermillion	MN	2	SWF
Shell Lake	Washburn	2	CLP
St Croix River	Douglas	2	CLP, EWM
Upper Turtle Lake	Barron	2	CLP
Whitefish	Douglas	2	
Bear Lake	Barron	1	CLP
Beaver Dam	Barron	1	CLP, EWM
Big McKenzie	Washburn	1	ZM, CLP
Big Sissabagama	Washburn	1	
Birch Lake	Sawyer	1	CLP
Chippewa Flowage	Sawyer	1	EWM
Como Lake	Chippewa	1	CLP
Coon Lake	Anoka MN	1	EWM
Doctor Lake	Burnette	1	
Elbow Lake	Washburn	1	
Flambeau River	Price	1	
Grindstone Lake	Sawyer	1	CLP
Lake of the Woods	MN	1	SWF, ZM
Long Lake	Chippewa	1	
Miller Lake	Washburn	1	
Perch Lake	Washburn	1	
Pipe Lake	Polk	1	
Prairie Lake	Barron	1	CLP
Rainy River	MN	1	SWF, ZM
Red Lake	Washburn	1	
Sand Lake	Barron	1	EWM
Spider Lake	Washburn	1	
Twin Lakes	Barron	1	
Vermillion Lake	Barron	1	CLP, EWM
White Pine Lake	MN	1	ZM

2021 SHORELINE HABITAT ASSESSMENT

LEAPS, assisted by an RCLA volunteer, performed a shoreline habitat assessment on Bass Lake and Hemlock Lake to finish the system-wide shoreline assessment. It was found that Bass Lake has very low development and generally low potential for shoreline improvements (Figure 2). Hemlock Lake had similar results where most parcels had very low potential for improvements (Figure 3). This information was used to finish the shoreline habitat assessment book written by LEAPS that contains information on shoreline parcels and recommendations for reducing impervious surface, increasing native plantings, improving habitat, etc. The habitat assessment book will be used to inform management and restoration on the lakes and will be incorporated into the comprehensive plan and future management efforts by LEAPS and the RCLA.

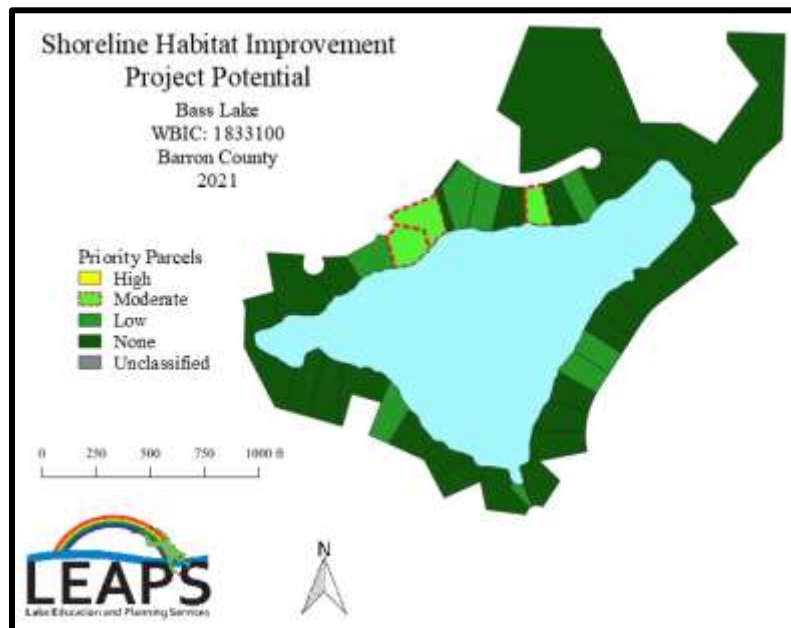


Figure 2. 2021 Bass Lake Shoreline Habitat Assessment

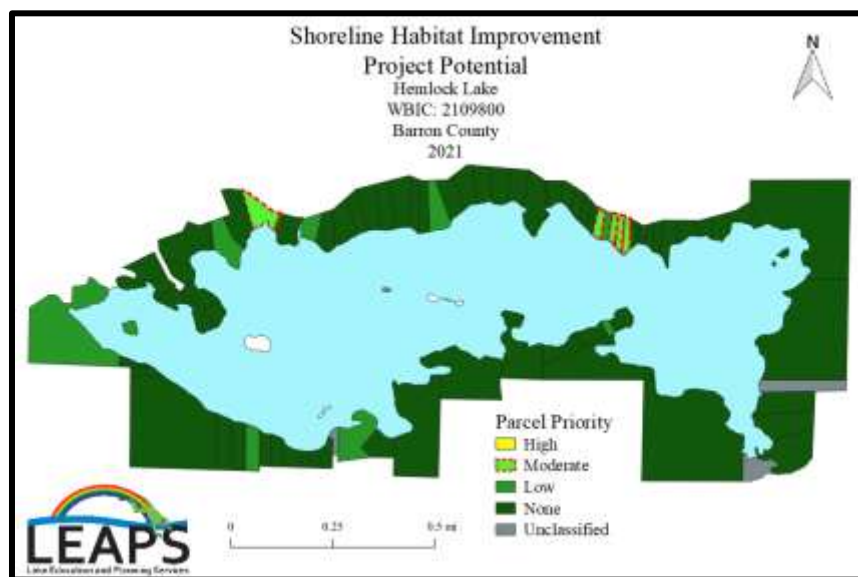


Figure 3. 2021 Hemlock Lake Shoreline Habitat Assessment

2021 AIS MONITORING AND EDUCATION

Volunteers have performed aquatic invasive species (AIS) monitoring on a regular basis in the lakes, and the RCLA has several committees dedicated to AIS monitoring, prevention, education, and removal. To stay ahead of the current infestations, as well as any other future AIS concerns, monitoring and education will continue in the future to prevent new introductions and limit their spread should they occur. LEAPS promotes and provides AIS education through events geared towards education and by attending RCLA meetings. The RCLA and LEAPS presented AIS and lake management information at an educational event on 8/28/21. Constituents were engaged and interested in the information and reported that they felt like they knew more about the lake and AIS and that they would be more likely to be able to identify AIS in the future.

2021 CLP BEDMAPPING AND TURION SURVEYS

The information in this section of the report comes from the report generated by Freshwater Scientific Services in November 2021 (Johnson, 2021).

One of the last actions to be completed under the current three year AIS population control grant was a repeat of the 2012 CLP turion survey of the three main-stem lakes – Balsam, Red Cedar, and Hemlock. This survey was designed to assess the abundance of CLP turions in the sediments of the Red Cedar Lakes after nearly ten years of management. The information gained from this assessment allows managers and the RCLA to (1) evaluate whether past management has substantially reduced the abundance or distribution of CLP turions in the lake, and (2) compare the current CLP infestation to other infested lakes.

This process started with CLP bedmapping completed in June 2021. In that survey, Freshwater Scientific Services, the sub-contractor hired to complete the surveys, conducted a lake-wide search for CLP on June 3, 2021, with a focus on those areas that had supported CLP growth in the past. During this survey, a winding search path over nearshore areas was completed while using a combination of surface observations, rake tosses, and sonar readings to locate any areas of CLP. For locations where CLP was found GPS locations, water depth, and CLP growth density (0 to 3 scale based upon stem density) were recorded. These recorded locations and site data were entered into desktop GIS software for detailed mapping of CLP beds (Figure 4).

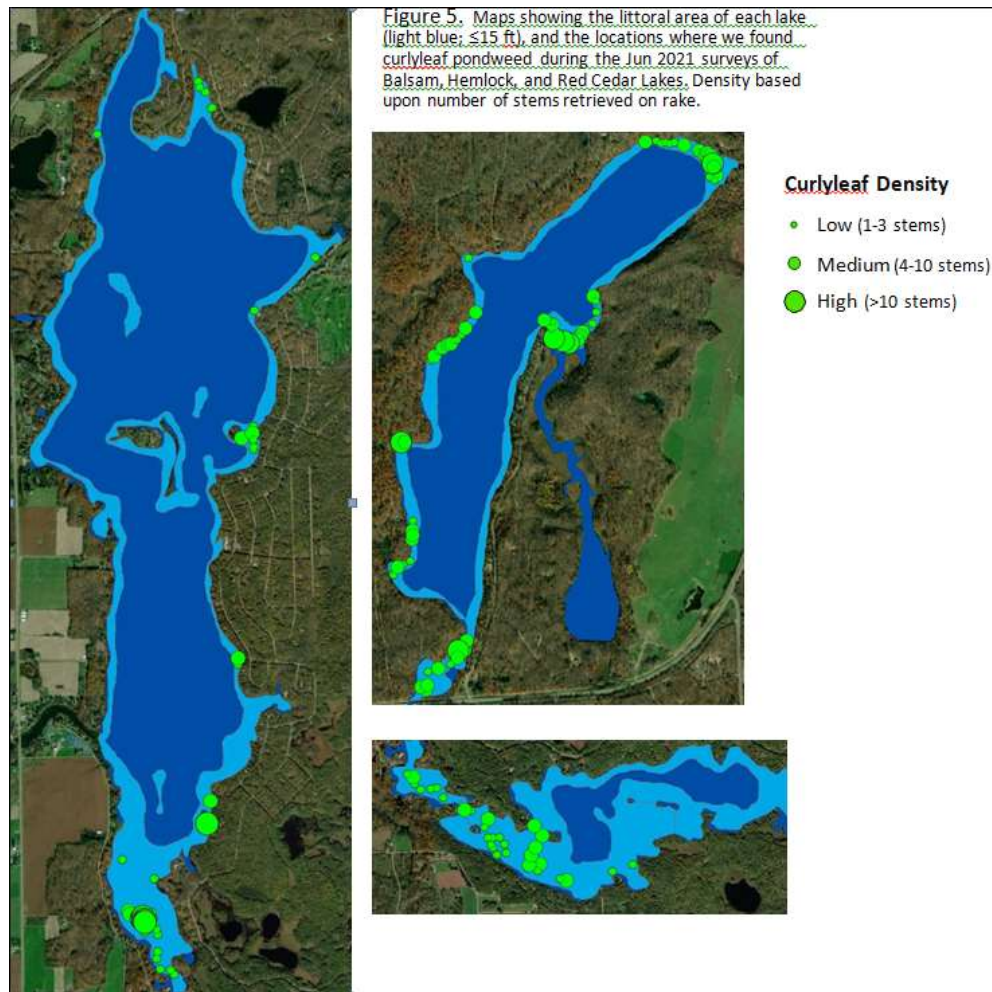


Figure 4. 2021 CLP Bedmapping Results

From that initial survey, and using sites and data from the 2012 survey, 170 sampling points were generated to complete the turion survey (Figure 5).

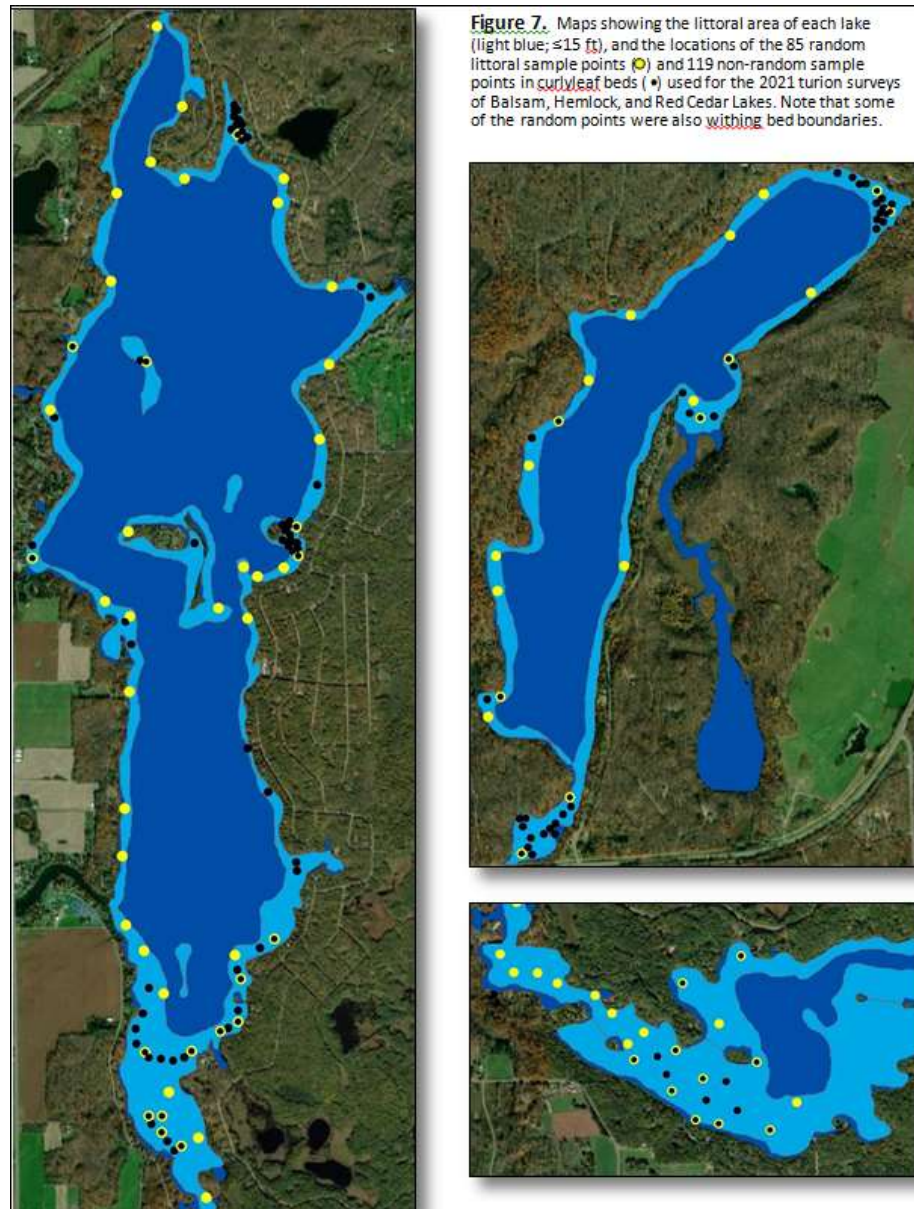


Figure 5. 2021 CLP Turion Survey Points

Some takeaways from the survey include the following. Lake-wide the following is true:

- % occurrence is low in all three lakes
- Mean turion abundance is low in all three lakes, much lower than what is seen in lakes with heavy infestations of CLP
- The type of sediment in the lakes is generally not supportive of dense CLP growth
- The level of CLP infestation overall is very low compared to other lakes with CLP
- Turion density was 2X greater in areas previously identified with CLP than it was in the rest of the lake

When comparing the results from the 2012 survey with the 2021 survey, the following was determined:

- Statistically, turion density did not change in any lake from 2012 to 2021

- CLP management did not get rid of CLP in any lake, but so to, CLP did not expand in any lake between 2012 and 2021.
- Within previously identified CLP beds, there were no significant changes in turion density in Balsam or Hemlock lakes, but there was in Red Cedar
- A few areas still harbor high turion abundance, specifically, the northern end of Balsam Lake and the channel between Balsam and Red Cedar Lake. These areas have been difficult to treat effectively due to flowing water.

From a management perspective, the Freshwater Scientific Services report concluded the following:

- 1) Since the initial turion survey in 2012, there have been substantial efforts to manage CLP in the Red Cedar Chain.
- 2) These efforts have included a combination of hand pulling and targeted herbicide treatments, guided by frequent surveys to map CLP and assess the effects of management on CLP and native aquatic plants. After a decade of effort, there are some clear patterns:
 - a. Herbicide treatment successfully reduced the CLP density and turion abundance in some areas; most notably in the larger plots in the far southern and northern portions of Red Cedar Lake and in the western portion of Hemlock Lake. Larger plots, such as these, are easier to treat effectively, as there is less rapid dispersion of the applied herbicide.
 - b. CLP in the lakes did not expand or increase in density between 2012 and 2021. Although past management likely helped to keep CLP from expanding in some areas, we believe that the sandy and rocky sediments found throughout most of Balsam and Red Cedar would not be able to support dense CLP. These areas of unsuitable sediment have likely acted as a firewall that limited the expansion of CLP to only those areas with softer sediment (bays and channels).
 - c. Many of the managed areas did not show substantial reductions in CLP density or turion abundance. In particular, the far northern portion of Balsam Lake and the channel between Balsam and Red Cedar still supported areas of denser CLP in 2021. These areas experienced a high amount of flow, making it difficult to maintain the target herbicide concentration for long enough to provide control. Furthermore, many of the treated plots throughout the chain were very small (<1 acre). Such small plots next to large areas of open water can be very difficult to treat effectively due to rapid dispersion of applied herbicides.

Based upon the above patterns and observations, the report recommend that rather than trying to manage every small patch of CLP on a lake-wide scale, future management of CLP in the Red Cedar Chain should limit herbicide treatments to dense areas of CLP greater than 2 acres in size (preferably larger). If desired, hand pulling, cutting, or harvesting could also be incorporated on a limited scale to manage small patches that reach nuisance density near homes or in navigation areas. This approach would help to ensure that money was not being wasted on ineffective herbicide treatment of small plots or on areas where sediments are not amenable to dense CLP growth.

The areas with the greatest potential to form large areas of nuisance CLP growth are:

- western Hemlock
- southern portions of Red Cedar and portions of channel to Hemlock
- eastern Red Cedar near the mouth of Pigeon Creek
- two northeastern bays of Red Cedar
- channel between Balsam and Red Cedar
- northern portion of Balsam at the mouth of the incoming river (other areas of denser CLP in Balsam lake are either very narrow and near shore or intermixed with wild rice)

These areas should be the primary focus of future monitoring and management.

2022 PRELIMINARY MANAGEMENT PLANNING

The RCLA, assisted by LEAPS, will continue to manage the lakes into the future. LEAPS was contracted by the group to update their Comprehensive Plan which will be used by the group to inform management decisions related to aquatic plant management, shoreline restoration, nutrient reduction, etc. Spring CLP bed mapping will determine whether the group will pursue CLP chemical treatment, although 2021 levels indicate that a year “off” from CLP management may be warranted. If not, a pre-treatment CLP survey is going to be essential to determine how to move forward.

REFERENCES

Johnson, James, 2021. 2021 Assessment of Curlyleaf Pondweed Turions in the Red Cedar Chain of Lakes. Freshwater Scientific Services November 2021.