Appendix L

2012-2013 CLP Survey Results

Memorandum

To: Beaver Dam Lake Management District (Board of Commissioners)
From: Barr Engineering Company (Meg Rattei)
Subject: June 2012 Curly-leaf Pondweed (CLP) Survey Results
Date: August 6, 2012
Project: 49030011.11
c: Kevin Kretsch, John Skogerboe, and Mark Sundeen

The purpose of this memorandum is to present the results of the June 2012 curly-leaf pondweed (CLP) survey of Rabbit Island Bay, Norwegian Bay, and City Bay. A whole bay point intercept plant survey as well as CLP bed mapping was completed in each bay on June 9 through 10, 2012.

1.0 June CLP Survey Results

Results of the June CLP surveys of Norwegian Bay, City Bay, and Rabbit Island Bay indicate CLP extent was approximately 16 acres in City Bay, 10 acres in Norwegian Bay, and less than half an acre in Rabbit Island Bay (Table 1). The CLP extent in Norwegian Bay and City Bay was substantially higher than observed during fall plant surveys during 2006 through 2011. The June CLP extent in Rabbit Island Bay was less than the fall 2011 CLP extent (Table 1).

Table 1 2006-2012 Beaver Dam Lake CLP Extent Estimated from Plant Surveys

Treatment Area	Acreage of CLP per year (based on fall survey)						Acreage of CLP per year (based on June survey)
	2006	2007	2008	2009	2010	2011	2012
Norwegian Bay	2.69	0.91	1.34	2.35	0	0.26	9.62
City Bay	0.33	0.81	2.33	8.79	0	2.87	16.22
Rabbit Island Bay	0.43	0	0.28	0	0	0.77	0.43

1.1 Rabbit Island Bay

Rabbit Island Bay CLP beds were limited to the channels on each side of the bay (Figure 1). Bed 1, located on the West Channel of Rabbit Island Bay, noted a high density of CLP. Plants were scattered along the shoreline. CLP was canopied, but fragmented due to boat traffic in the area.

Bed 2, located in the Plum Street Channel, noted a high CLP density. The channel here is little more than a foot deep. CLP lines the channel where boat traffic has disturbed the area. This CLP bed is pictured in Figure 2.

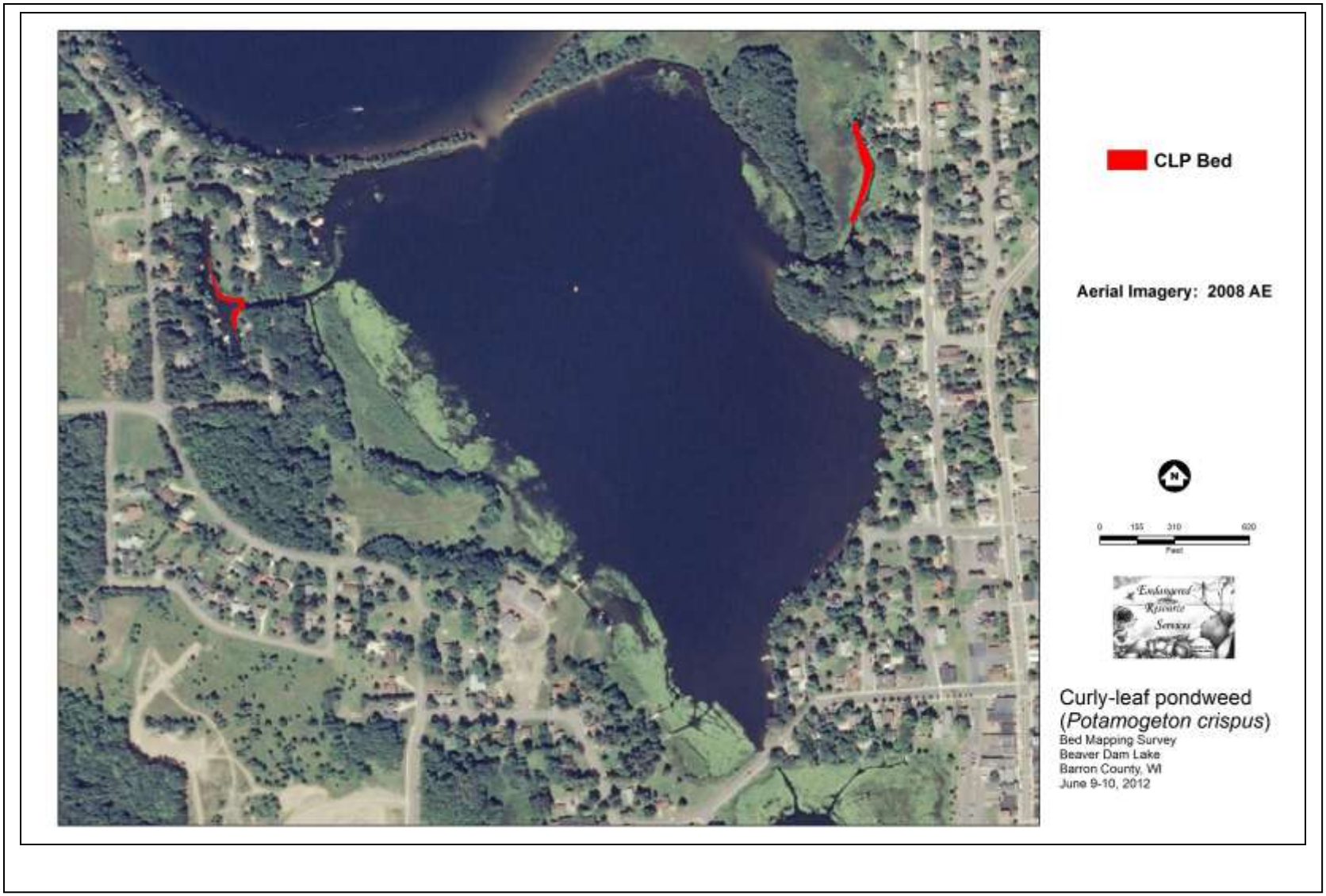

Figure 1 Map of Rabbit Island Bay CLP Beds in West and Plum Street Channels

Figure 2 Rabbit Island Bay: CLP Bed in Plum Street Channel

Although CLP beds were only observed in channels adjacent to Rabbit Island Bay, CLP was visually observed at three sample locations within the bay. CLP was collected from one location within the bay and CLP density at this location was one (lowest density in the one through 3 range of rake fullness used to depict density). CLP within Rabbit Island Bay is pictured in Figure 3.

Although little CLP was observed in Rabbit Island Bay, a dense growth of native vegetation was observed in the bay. Canopied white stem pondweed is pictured in Figure 4.

Figure 3 CLP in Rabbit Island Bay

Figure 4 Canopied White Stem Pondweed in Rabbit Island Bay

1.2 City Bay

Three CLP beds were observed in City Bay (Figure 5). The CLP bed on the north side of City bay had been heavily impacted by boat traffic prior to the survey and plants were ripped up throughout the bay. Hence, it is likely that the CLP was denser in May. Plants were canopied (i.e., reached the surface of the water) throughout the bed in water less than 7feet deep (Figure 6). Mean rake fullness at the time of the survey was only one to two, but CLP made up just over 50 percent of the total plant community in the majority of the area.

Figure 6 Canopied CLP bed on the North Side of City Bay

The large CLP bed that occupied the central and southern parts of the bay noted a high density of CLP. CLP was canopied throughout, but it was very patchy. Some areas were 100 percent CLP and a solid rake fullness of three (i.e., maximum density per the 1 through 3 range of rake fullness used to determine density) (Figure 7). However, solid beds of natives were interspersed creating a mosaic (Figure 8). Areas vacated by CLP when it senesced in late June appeared to be quickly invaded by EMW in July.

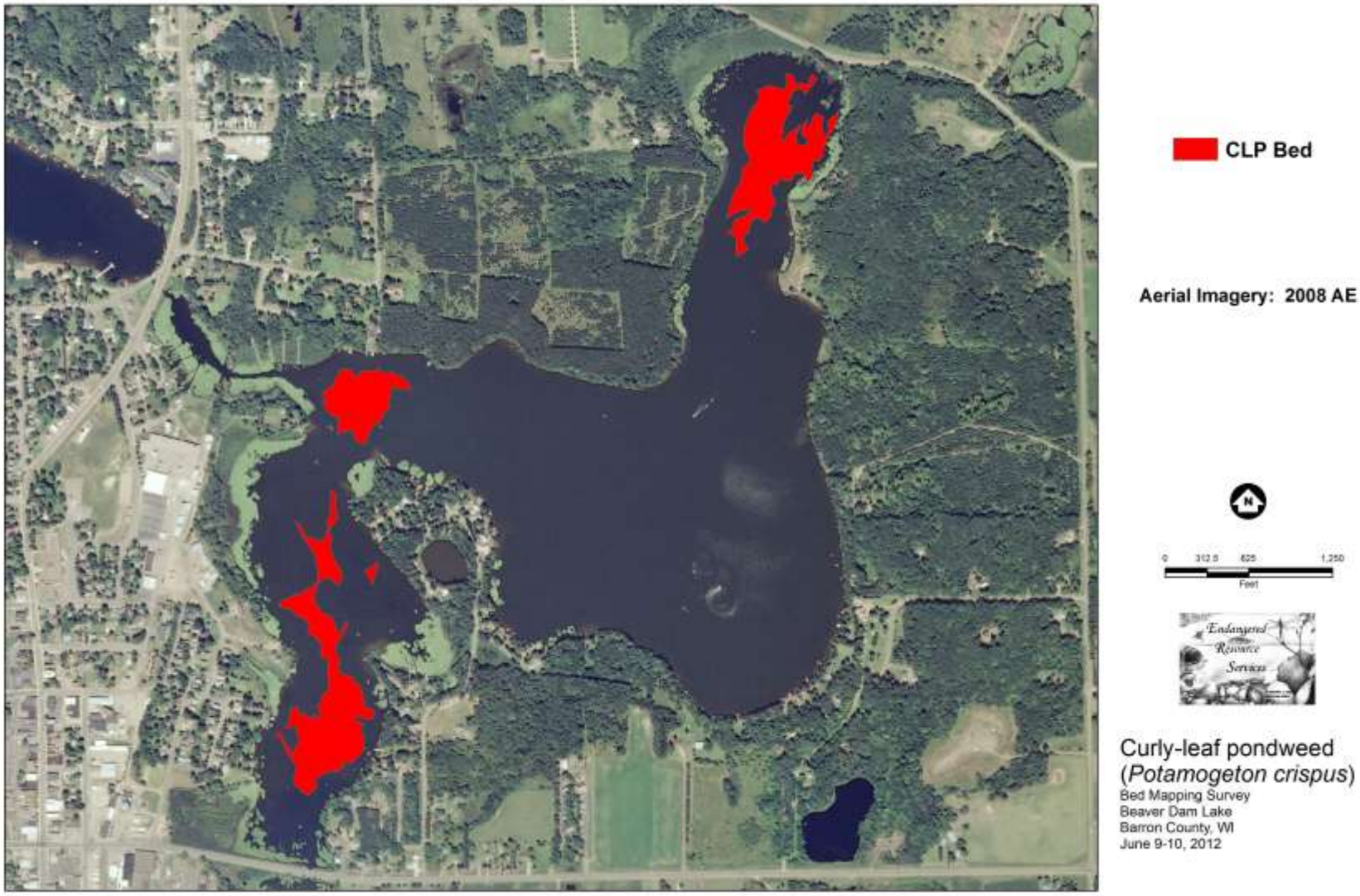

Figure 5 Norwegian Bay and City Bay CLP Beds

Figure 7 Canopied CLP in City Bay

Figure 8 Canopied Large Leaf Pondweed (Native Plant) in City Bay

A tiny CLP bed was located on the east side of City Bay. This area was solid canopied CLP.

1.3 Norwegian Bay

A large CLP bed occupied much of Norwegian Bay (Figure 5). CLP in Norwegian Bay was also highly fragmented with plants ending at the edge of the lilypads, and patches of native pondweeds, especially ribbon-leaf and variable pondweeds (*Potamogeton epihydrus* and *Potamogeton gramineus*) interspersed throughout. Similar to the large bed in City Bay, some areas of the Norwegian Bay CLP bed were 100 percent CLP and a solid rake fullness of three, patched into a mosaic of natives. Canopied CLP is pictured in Figure 9.

Figure 9 Canopied CLP in Norwegian Bay

2.0 Recommendation

Treatment of Rabbit Island Bay channels and whole bay treatments of Norwegian Bay and City Bay with Endothall in the spring of 2013 is recommended. A June 2013 survey of the Rabbit Island Bay channels, Norwegian Bay, and City Bay is recommended to evaluate CLP treatment effectiveness.

As detailed in the Beaver Dam Lake Aquatic Plant Management Plan (APMP), CLP in Beaver Dam Lake is managed to contain it to a low occurrence (i.e., less than 5 percent of the littoral zone). Treatments of CLP will occur to not only contain CLP, but to prevent accumulation of turions. Turions are CLP winter buds that act like seeds. Each CLP plant can produce up to 900 turions annually and each turion can grow into a new CLP plant. The turions can remain viable for several years. Controlling CLP with early spring treatment not only removes CLP plants from the lake, but also prevents the plants from producing turions. This approach prevents CLP dominance and the subsequent required long-term annual control to hold the plant back from a resurgence to dominance. It appears that many aquatic invasive species, including CLP, may languish at a low level until a favorable environmental circumstance happens that allows it to expand rapidly. This seems to fit the theoretical concept that an organism can make itself established and then only needs the right trigger to expand into a problem. Consistent management of CLP to contain it to the low levels in the lake will prevent its rapid expansion to problematic conditions.

CLP treatment of Norwegian Bay and City Bay in the spring of 2013 is expected to not only contain CLP to a low occurrence, but also support the District's efforts to curtail the spread and proliferation of EWM. Because CLP dies off at the end of June (Figure 10), EWM has an opportunity to occupy areas vacated by CLP and spread rapidly during the June through July period. Plant surveys of Norwegian Bay and City Bay during June and July of 2012 documented the rapid spread of EWM following die-off of CLP (Table 2). Treatment of CLP in spring, before natives begin their growing season, will encourage the growth of natives rather than CLP. Because natives are present throughout the growing season, their presence would curtail EWM expansion since EWM would no longer have open areas vacated by CLP available for rapid expansion during the growing season.

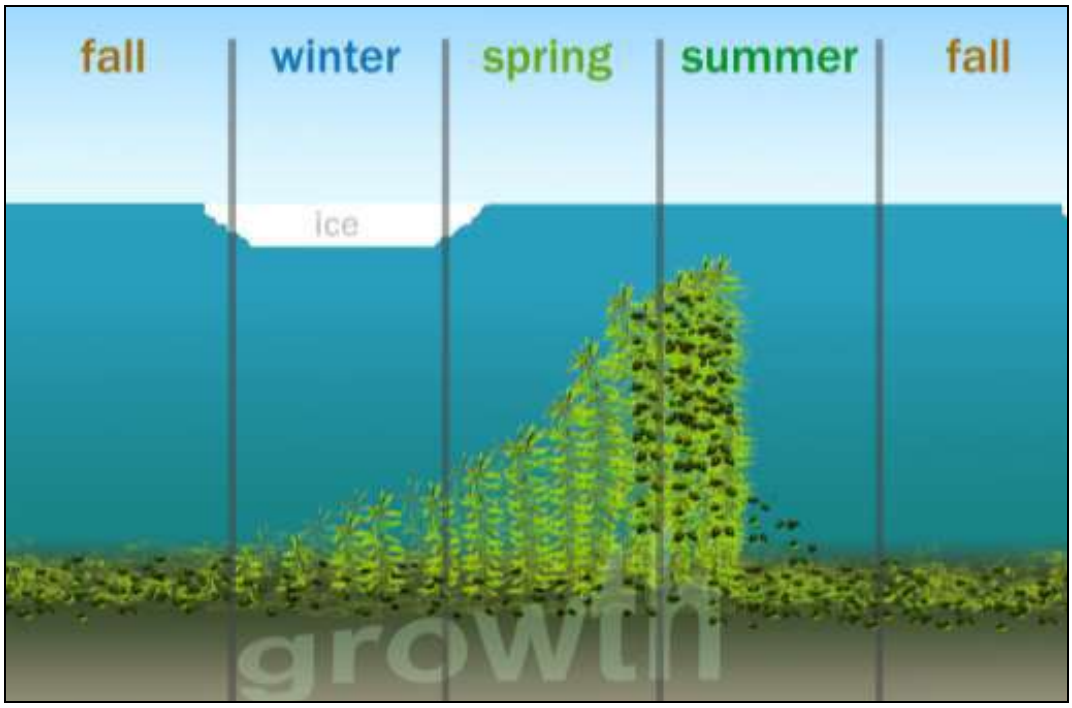

Figure 10 Curly-leaf Pondweed Growth Cycle

Table 2. 2012 Beaver Dam Lake EWM Extent in Norwegian Bay and City Bay Estimated from Plant Surveys

Treatment Area	Acreage of EWM (based on plant surveys)	
	June 2012	July 2012
City Bay	7.65	48.76
Norwegian Bay	3.36	21.21

Memorandum

To: Beaver Dam Lake Management District (Board of Commissioners)
From: Barr Engineering Company (Meg Rattei)
Subject: 2013 CLP Treatment and Monitoring Results
Date: August 21, 2013
Project: 49030011.12
c: Kevin Kretsch (Lake Restoration, Inc.), Alex Smith (WDNR), Mark Sundeen (WDNR), and John Skogerboe (Research Scientist)

Curlyleaf pondweed (CLP) has generally not been problematic in Beaver Dam Lake. However, reports of potential problematic CLP growth were provided to the District in 2011 and during the spring of 2012. Whole bay CLP surveys in Rabbit Island Bay, Norwegian Bay, and City Bay were completed by the District during June of 2012. The results indicated problematic beds of CLP were found in two channels adjacent to Rabbit Island Bay and in Norwegian Bay and City Bay. A detailed discussion of the results of the June 2012 CLP surveys is found in Appendix L of the Beaver Dam Lake Aquatic Plant Management Plan. Based upon the data, a May 2013 plant survey was scheduled to determine whether management of CLP in Norwegian Bay, City Bay, and the two channels adjacent to Rabbit Island Bay in 2013 was necessary.

The May plant survey results indicated CLP management was needed in Norwegian Bay and City Bay. However, the long winter and late ice-out caused the demise of curlyleaf pondweed in the two channels adjacent to Rabbit Island Bay and CLP was not found during May.

The purpose of this memorandum is to (1) present the results of spring herbicide treatment to control CLP in Norwegian Bay and City Bay (2) present the results of May and June plant surveys of the channels adjacent to Rabbit Island Bay, and (3) present the results of June plant surveys of Cemetery Bay and an area adjacent to the Eagle Point Boat Landing (i.e., parts of West Lake and Williams Bay) to determine whether CLP management would be necessary in 2014.

1.0 2013 CLP Treatment Results

As shown in Figures 1 and 2 and Table 1, Norwegian Bay and City Bay were treated with Endothall herbicide to control CLP during 2013. The treatment areas shown in Figures 1 and 2 were based on the results of the May plant survey. The successful treatment attained complete control of CLP. Hence, CLP was not observed in Norwegian Bay or City Bay during a post-treatment plant survey completed in June (Table 2).

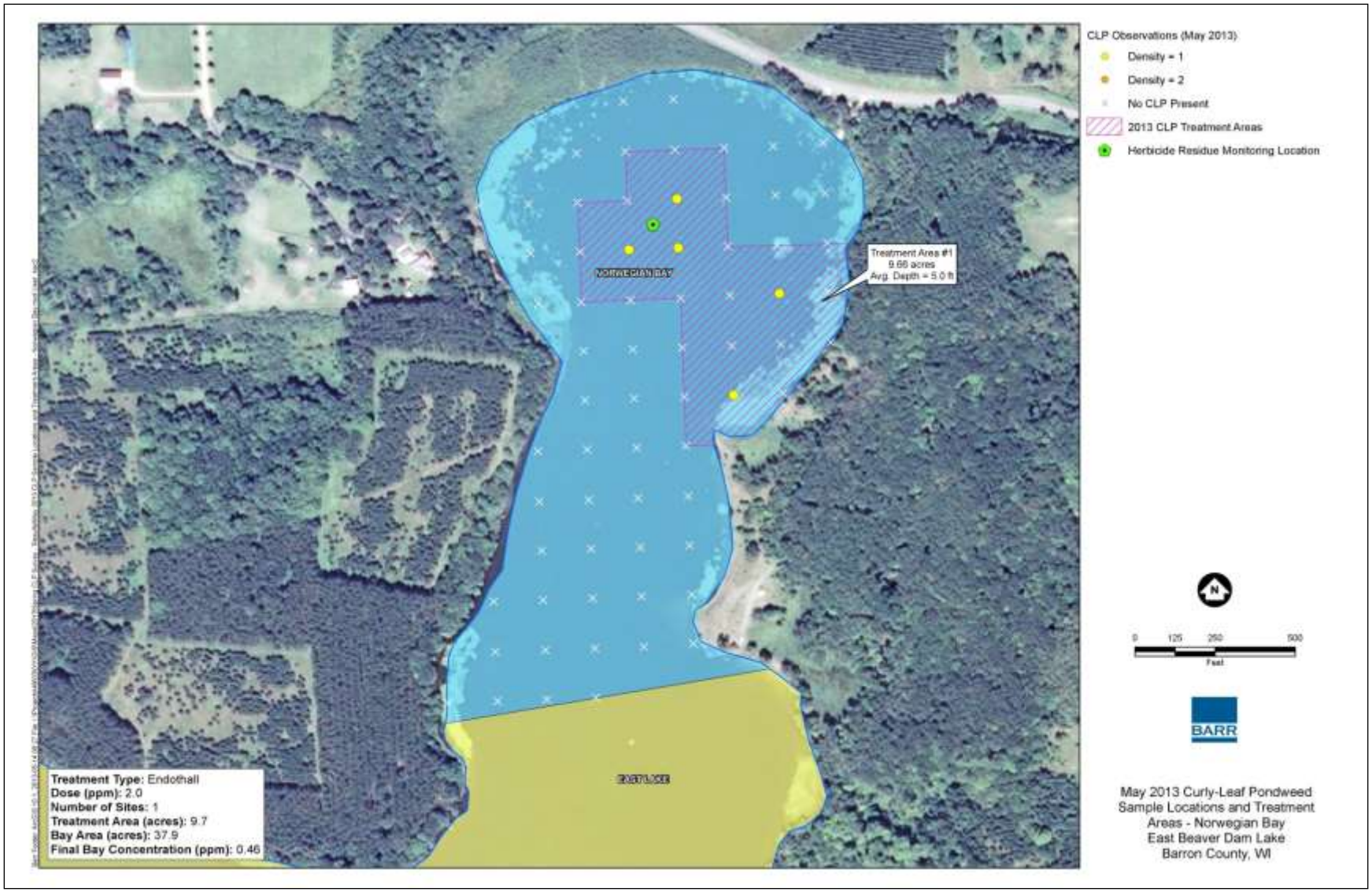

Figure 1 2013 Norwegian Bay CLP Treatment Area

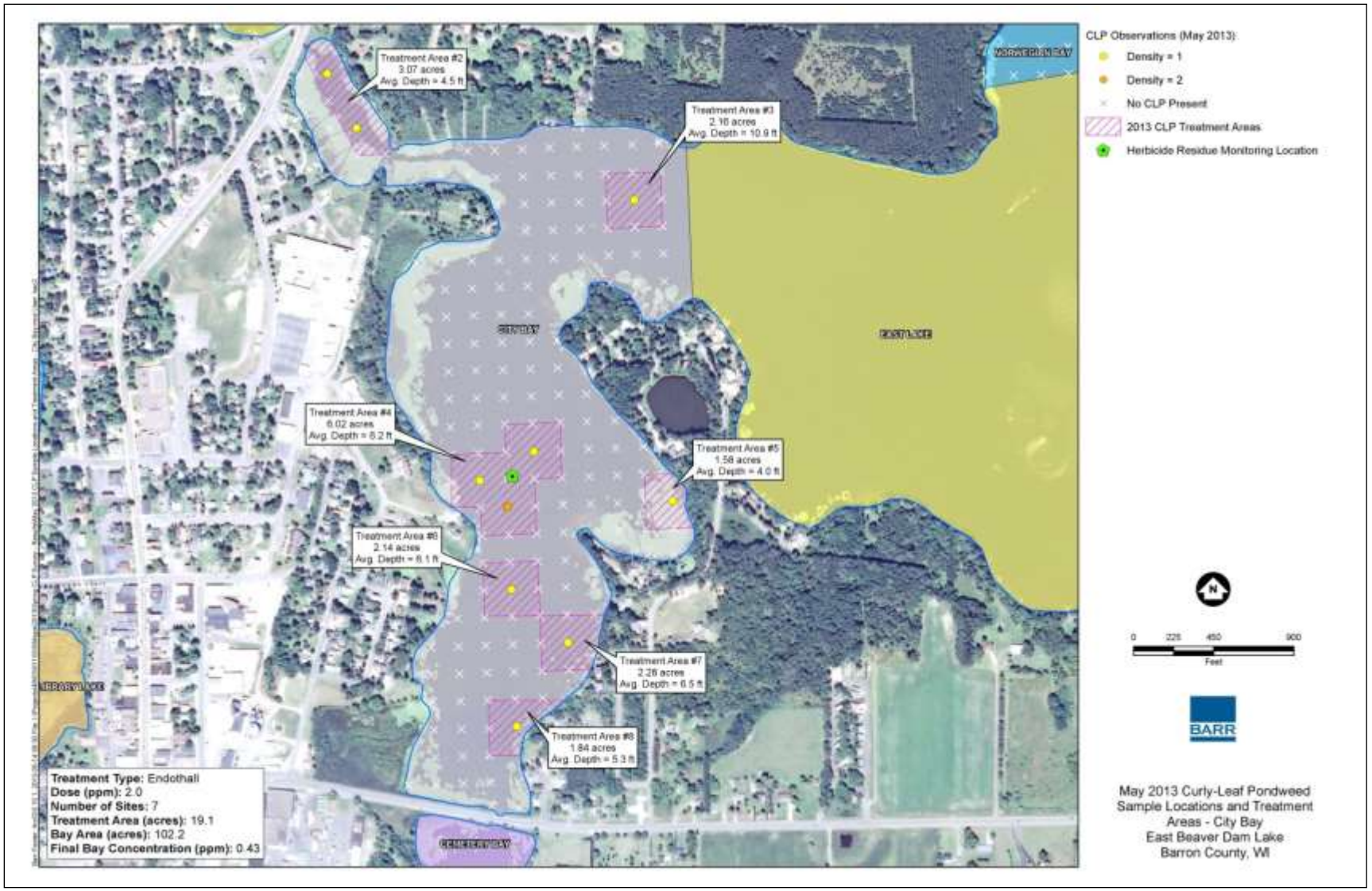

Figure 2 2013 City Bay CLP Treatment Area

Table 1 2013 Beaver Dam Lake CLP Treatment Plan from May 2013 Plant Surveys

Treatment Area (Treatment Site ID)	Acres Treated	Endothall Concentration Applied to Each Treatment Area (ppm)	Expected Post-Treatment Whole Bay Concentration of Endothall (ppm)
East Lake Treatment Areas			
Norwegian Bay (ID 1)	9.7	2	0.46
City Bay (ID 2-8)	19.1	2	0.43

Table 2. 2006-2013 Curly-leaf Pondweed Extent Estimated from Plant Surveys

Treatment Area	Acreage of CLP (based on plant surveys)									
	Nov-06	Nov-07	Nov-08	Nov-09	Nov-10	Nov-11	Jun-12	Nov-12	May-13	Jun-13
Norwegian Bay	2.69	0.91	1.34	2.35	0	0.26	9.62	1.45	1.87	0
East Lake	6.73	0	0	3.02	0.28	0	NA	0.00	NA	NA
City Bay	0.33	0.81	2.33	8.79	0	2.87	16.22	1.36	2.96	0
Cemetery Bay	0	0	0	0	0	13.14	NA	5.16	NA	0
Total East Basin	**9.75**	**1.72**	**3.67**	**14.16**	**0.28**	**16.27**	**NA**	**7.98**	**NA**	**NA**
Library Lake	0	0	0	0	0	0	NA	0.08	NA	NA
Rabbit Island Bay	0.43	0	0.28	0	0	0.77	0.43	0.88	*	NA
Williams Bay	0.33	1.04	0.55	0.16	0	0.61	NA	0.96	NA	0.98**
West Lake	2.56	1	0	1.62	0.62	1.28	NA	3.11	NA	0.24**
Total West Basin	**3.32**	**2.04**	**0.83**	**1.78**	**0.62**	**2.66**	**NA**	**5.02**	**NA**	**NA**
Total Beaver Dam Lake	**13.07**	**3.76**	**4.5**	**15.94**	**0.9**	**18.93**	**NA**	**13.00**	**NA**	**NA**

*Rabbit Island Bay channels surveyed, but not Rabbit Island Bay. No CLP observed in West Channel and only a handful of plants were observed in the Plum Street Channel. No CLP plants were collected on the rake.

**Survey area restricted to a small area near Eagle Point Boat Landing

2.0 Results of May and June Plant Surveys of Channels Adjacent to Rabbit Island Bay

As noted earlier, a June 2012 plant survey found problematic beds of CLP in the two channels adjacent to Rabbit Island Bay. However, the long winter and late ice-out caused the demise of curlyleaf pondweed in the channels and CLP was not found during May 2013. During a June 2013 plant survey of the channels, CLP was not collected on the rake in either channel. While CLP was not observed in the west side canals in June, a handful of CLP plants were observed in the Plum Street Canal. Because CLP was absent in the west side canals and not problematic in the Plum Street Canal, it appears that herbicide treatment to control CLP will not be needed in 2014.

3.0 Results of June Plant Survey of Cemetery Bay

During the fall of 2011, 8 acres of CLP were observed in Cemetery Bay (Table 2) and herbicide treatment of the bay was completed in the spring of 2012 with 0.7 ppm endotholl to control the CLP. After the new CLP growing season began in the fall of 2012, a plant survey found 5 acres of CLP in Cemetery Bay (Table 2). To further evaluate CLP during its peak growth period, a plant survey of Cemetery Bay was completed during June of 2013. The survey results indicate the long winter and late ice-out caused the demise of curlyleaf pondweed in Cemetery Bay. Hence, CLP was not observed in Cemetery Bay in June. Based upon these data, it appears that herbicide treatment to control CLP will not be needed in 2014.

4.0 Result of June Plant Survey of an Area Adjacent to the Eagle Point Boat Landing

During the fall of 2012, increased CLP presence was observed in West Lake and Williams Bay adjacent to the Eagle Point Boat landing (Figure 3). The increased presence of CLP in this area was concerning because boat traffic from this busy boat landing can facilitate the spread of CLP to other areas of the lake. Hence, a plant survey of the area adjacent to the Eagle Point boat landing occurred in June of 2013 to evaluate CLP during its peak growth period. Survey results indicate the long winter and late ice-out reduced the presence of CLP in this area. CLP extent decreased from 3.30 acres in the fall of 2012 to 1.22 acres in June of 2013 (Figures 3 and 4). In June, CLP was found in just four sample points in this area. Densities were low at three locations (1 on a scale of 1 to 3) and moderate at the fourth location (2 on a scale of 1 to 3). Based upon these data, it appears that herbicide treatment to control CLP will not be needed in 2014. The fall data, however, will be evaluated to determine CLP extent when CLP begins its new growth cycle. Figure 5 shows the CLP growth cycle, which begins in fall and ends in late June.

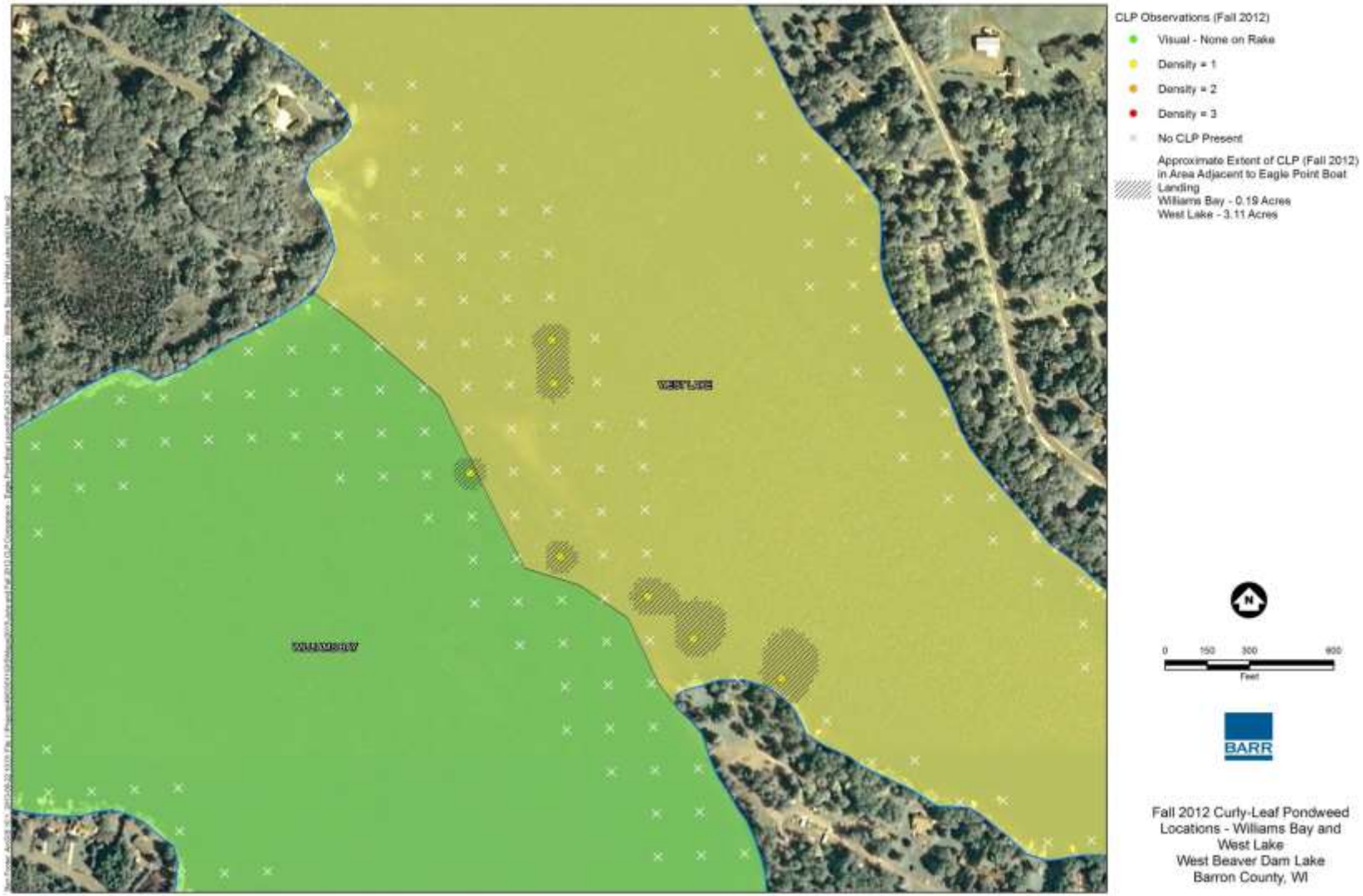

Figure 3 Fall 2012 CLP Locations in Area Adjacent to Eagle Point Boat Landing

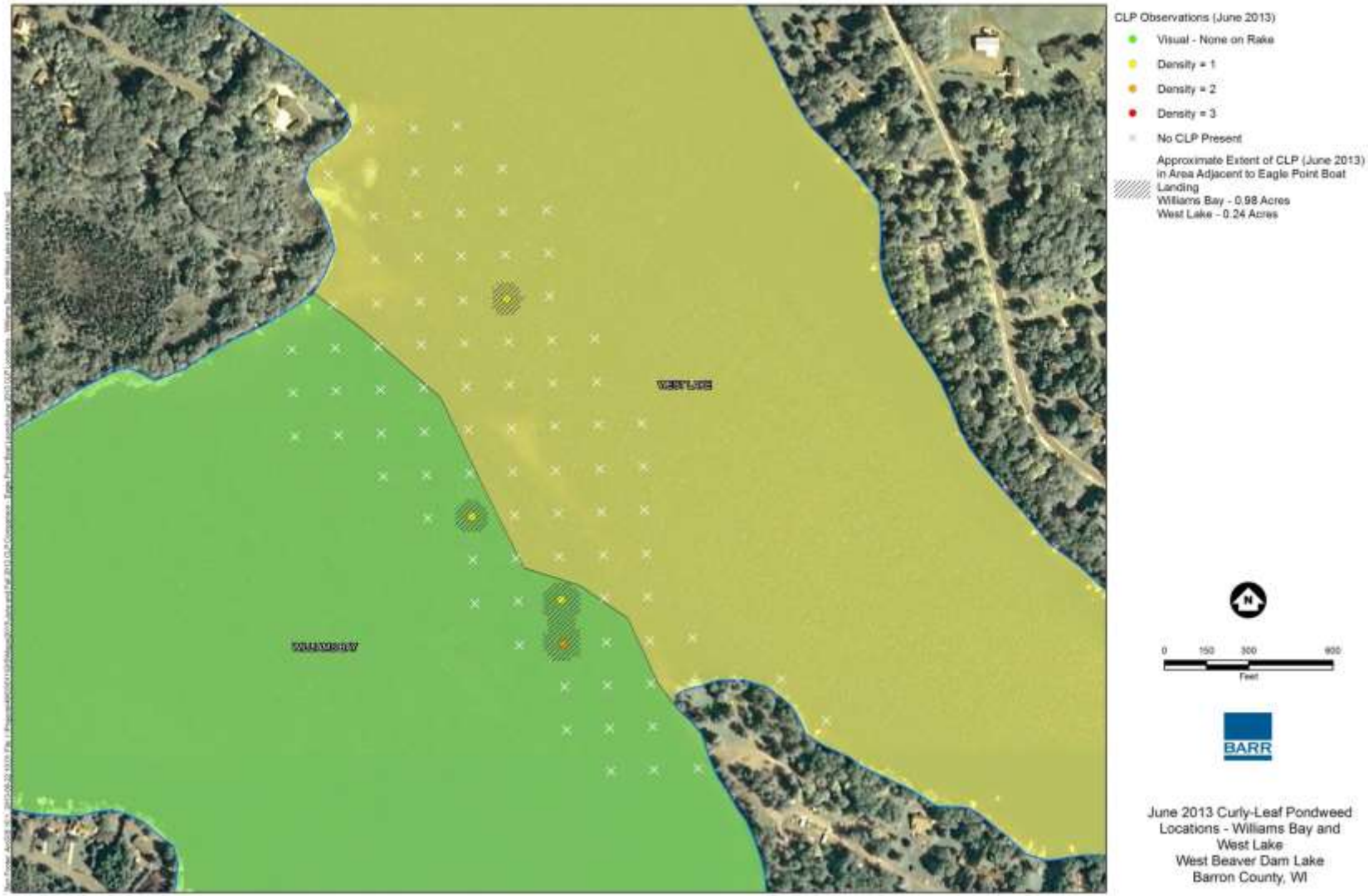

Figure 4 June 2013 CLP Locations in Area Adjacent to Eagle Point Boat Landing

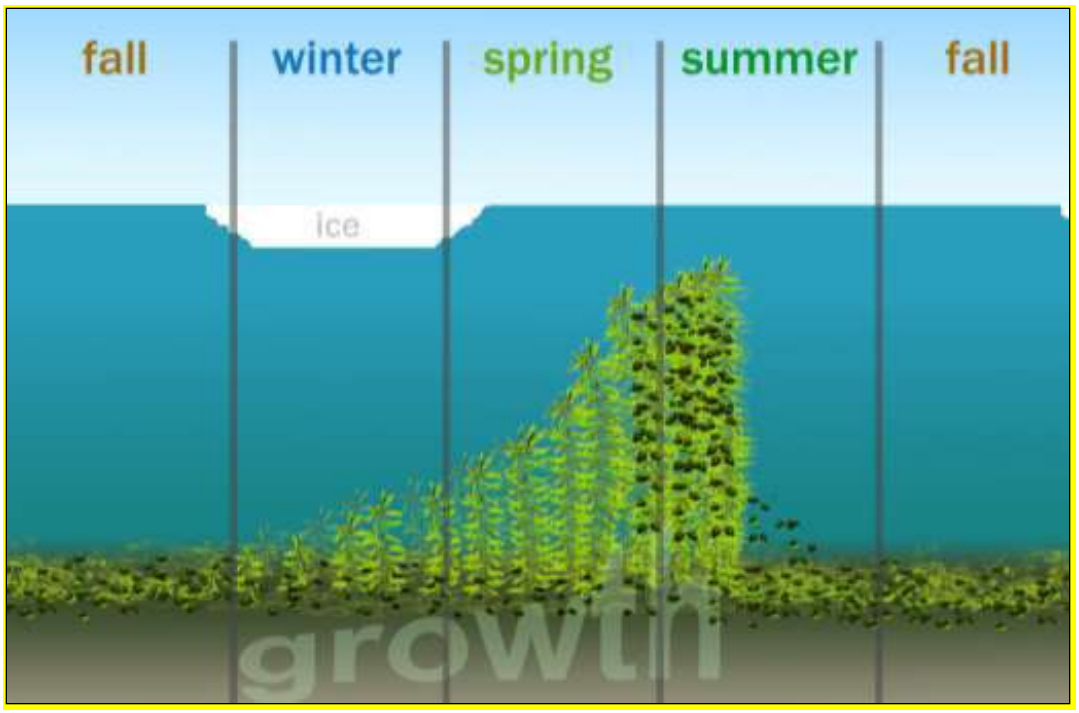

Figure5 Curly-leaf Pondweed Growth Cycle