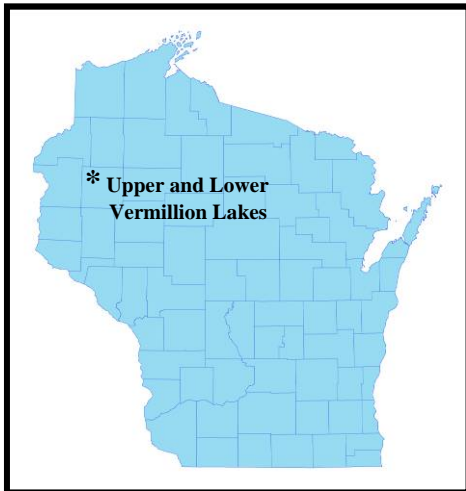


**Curly-leaf Pondweed and Bed Mapping Surveys
Upper and Lower Vermillion Lakes
Barron County, Wisconsin
WBIC: 2098800 and 2098200**



Project Initiated by:
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INTRODUCTION:

Upper Vermillion Lake (WBIC 2098800) and Lower Vermillion Lake (WBIC 2098200) combine to form a 297-acre (Upper Vermillion 89 acres and Lower Vermillion 208 acres) stratified drainage system in northwestern Barron County, Wisconsin in the Town of Cumberland (T35N R13W S15 SE NE and T35N R13W S22 SW NE). Upper Vermillion Lake achieves a maximum depth of 9ft in the east-central basin with an average depth of approximately 6ft. Lower Vermillion Lake reaches its maximum depth of 55 feet in the central basin and has an average depth of approximately 25ft (Busch et al, 1967). Upper Vermillion is borderline eutrophic/mesotrophic in nature and water clarity is poor to very poor with historical top summer Secchi readings from 3-6ft. Lower Vermillion is mesotrophic, and water clarity is fair to good with historic top summer Secchi readings from 7-12ft (WDNR 2009). The early season littoral zone reached approximately 7ft in Upper Vermillion and 10ft in Lower Vermillion. Upper Vermillion's bottom substrate is predominately muck with scattered gravel areas, while Lower Vermillion's has many rocky and sandy shoreline areas with muck and sandy muck in deeper water.



Figure 1: Aerial Photo of Vermillion Lakes

Following the discovery of Eurasian water milfoil (*Myriophyllum spicatum*) in Lower Vermillion Lake in the summer of 2008, the newly formed Vermillion Lakes Association and the Town of Cumberland decided to authorize a series of full lake plant surveys as part of developing an Aquatic Plant Management Plan (APMP) in 2009. In addition to intensively resurveying the landing area on May 16th where EWM was discovered, Curly-leaf pondweed (*Potamogeton crispus*) density and bed mapping surveys were carried out on both Upper and Lower Vermillion Lakes on May 30-31. This sub-report is a summary of those surveys.

METHODS:

We completed a density survey where we recorded the level of CLP at each point in the lake's littoral zone (Appendix I). We located each survey point using a handheld mapping GPS unit (Garmin 76CSx), and used a rake to sample an approximately 2.5ft section of the bottom. CLP was assigned a rake fullness value of 1-3 as an estimation of abundance (Figure 2). We also recorded visual sightings of CLP within six feet of the sample point.




<u>Rating</u>	<u>Coverage</u>	<u>Description</u>
1		A few plants on rake head
2		Rake head is about ½ full Can easily see top of rake head
3		Overflowing Cannot see top of rake head

Figure 2: Rake Fullness Ratings (UWEX, 2009)

Following the density survey, we used the resulting density map coupled with a meandering shoreline survey to locate and map all beds of CLP on Upper and Lower Vermillion Lakes. We defined a bed based on the following two criteria: CLP plants made up greater than 50% of all aquatic plants in the bed, and the CLP had canopied at the surface or was close enough to the surface that it would likely interfere with normal boat traffic.

Using a GPS unit, we recorded a string of waypoints that circled around the edges of the beds. We then uploaded these points into ArcView, created bed shapefiles, and determined the total acreage and perimeter of the bed to the nearest tenth of an acre and meter respectively.

While conducting the density survey and mapping CLP beds, we also investigated any Milfoil found (*Myriophyllum* sp.) to make sure EWM had not spread beyond the initial boat landing area. We were especially diligent in searching the north shoreline of Lower Vermillion where prevailing winds would likely deposit any floating fragments. As a follow up to the intensive survey at the landing on May 16th, we also did a dive swimover of the area to look for any surviving EWM.

RESULTS AND DISCUSSION:

We found CLP to be present throughout the littoral zone of both lakes in various densities. While CLP in Upper Vermillion was generally monotypic and highly invasive, Lower Vermillion's plants tended to be found in lower densities, were more likely to be "just another member of the macrophyte community" and were not nearly so widespread.

Upper Vermillion Lake Results:

We checked all 286 points on Upper Vermillion as they potentially all could have fallen in the littoral zone. We found CLP present or visible at 200 locations or 70% of the points surveyed. Of these, 111 had a rakefull rating of 3 and another 26 a 2 indicating approximately 48% of the lake had a significant infestation. In general, all areas of the lake that had organic muck bottom and were between 1 and 6ft deep had dense CLP present. These densities declined rapidly in water deeper than 7 feet (Figure 3).

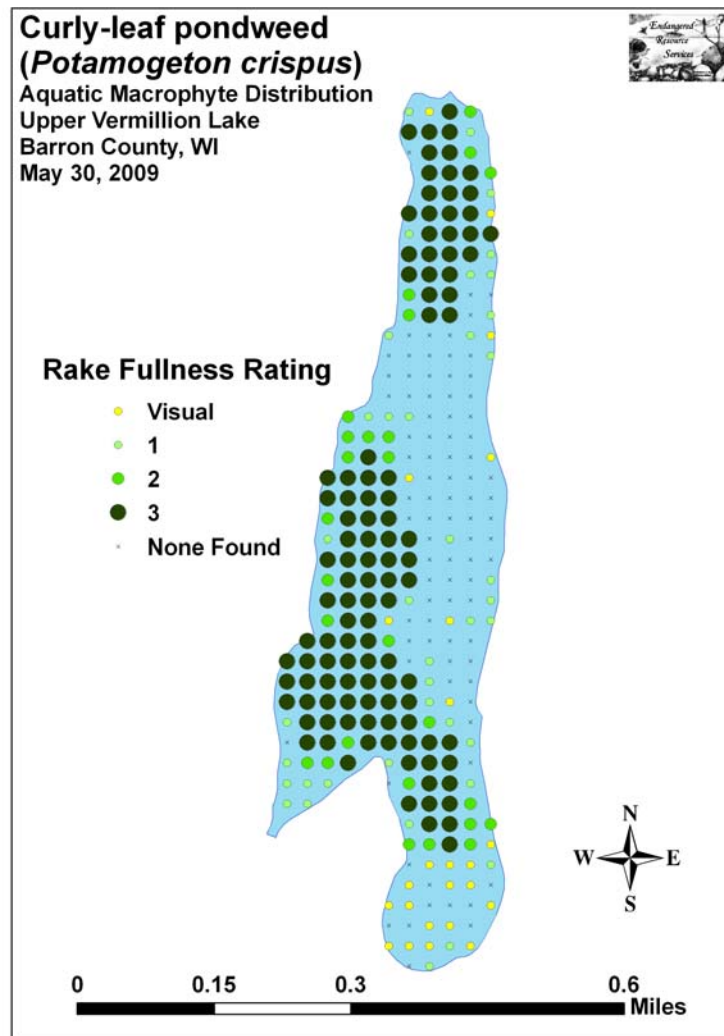


Figure 3: Upper Vermillion Lake CLP Density

We located and mapped two expansive beds in the north and west-central bays (Figure 4). They covered a total of 45.0 acres or 50.6% of the lake's 89 acres (Table 1).

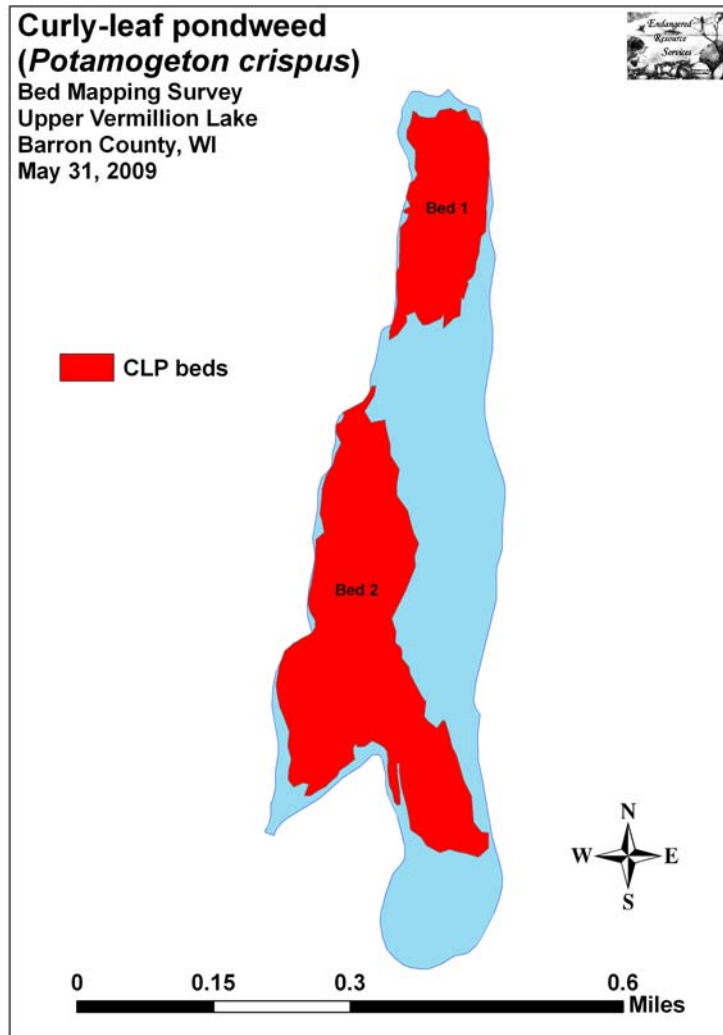


Figure 4: Upper Vermillion Lake CLP Bed Map

**Table 1: CLP Bed Summary
Upper Vermillion Lake, Barron Co. May 31, 2009**

Bed Number	Acreage	Perimeter (m)
1	32.8	2503
2	12.2	1168
Total Acres	45.0	

Description of the CLP Beds on Upper Vermillion Lake:

Bed 1 – Located in the north bay from the edge of the lily pads (*Nuphar variegata* and *Nymphaea odorata*) to the edge of the littoral zone, this bed was extremely dense, almost exclusively monotypic, and was canopied over the entire area. A narrow channel created by motor props ran from the landing to open water. Other than this, the bed essentially completely restricted boat travel on the north end of the lake.

Bed 2 – Dominating most of the west bay and spilling into the central basin, this bed was also extremely dense, almost exclusively monotypic, and was canopied over the entire area with the exception of the eastern boarder where the bay dropped off into deeper water. There was little evidence that people had using the area as there were no prop trails through the bed. Because the west bay is bordered by woods and pasture and has no cabins, the bed is likely not directly impacting lakeshore owners.

Lower Vermillion Lake Results:

We sampled 286 points on Lower Vermillion that could have fallen in the littoral zone (Figure 5). We found CLP present or visible at 58 locations or fewer than 7% of the area surveyed. Of these, 11 had a rakefull rating of 3 and another 18 a 2 indicating just over 4% of the lake had a significant infestation. During our meandering shoreline survey, we found CLP scattered throughout the lake, but it was seldom dense except over the muckiest areas in the lake's east side. Even here, it was seldom canopied or monotypic in nature. The densest areas were in approximately 7ft of water, but plants were only 3ft long making it unlikely they would ever canopy.

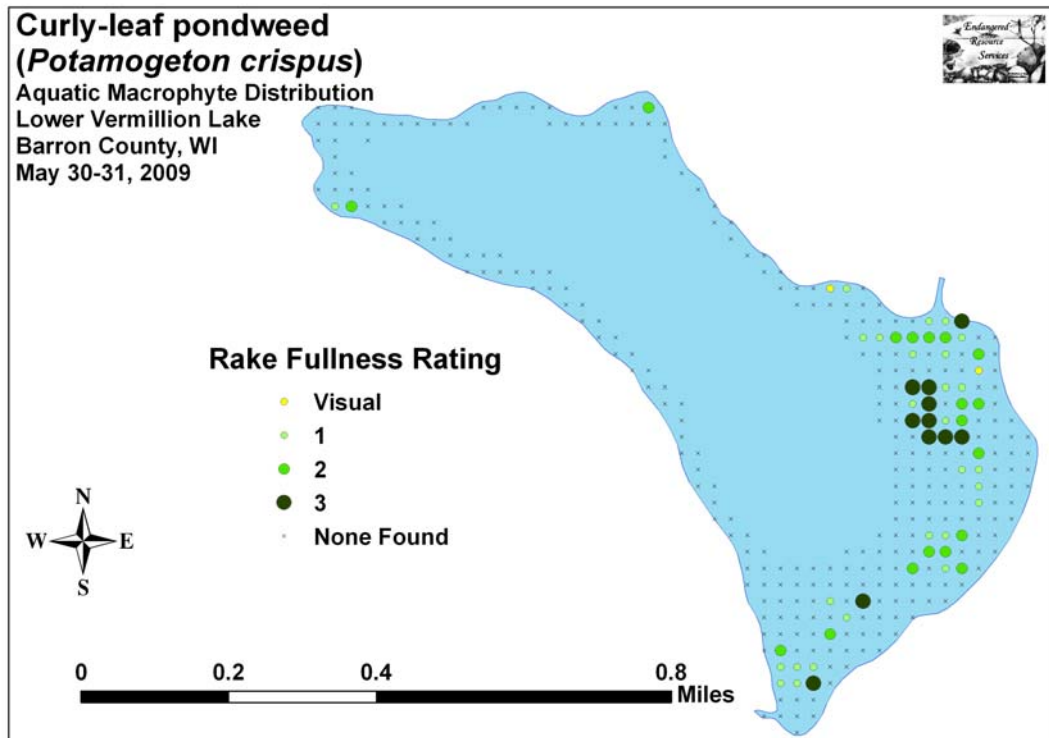


Figure 5: Lower Vermillion Lake CLP Density

We located and mapped a single bed of CLP on the northeast side of the lake (Figure 6). It covered a total of 1.1 acres or 0.5% of the lake’s 208 acres (Table 2).

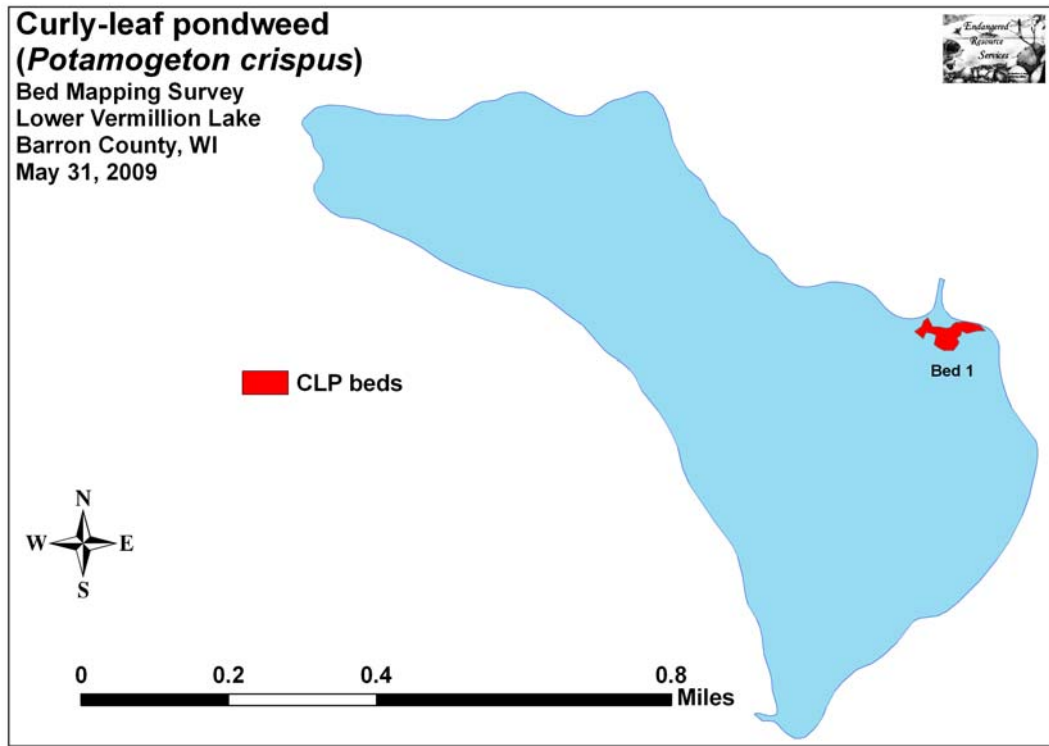


Figure 6: Lower Vermillion Lake CLP Bed Map

**Table 2: CLP Bed Summary
Lower Vermillion Lake, Barron Co. May 31, 2009**

Bed Number	Acreage	Perimeter (m)
1	1.1	428.4
Total Acres	1.1	

Description of the CLP Bed on Lower Vermillion Lake:

Bed 1 – This small bed was established just south and east of the Vermillion River’s entrance into the lake. We noted that plants were growing in 1-4ft of water, had canopied and were in bloom. Although the bed was fairly dense in the middle, the borders were poorly defined, and we found natives interspersed throughout. Because the bed was adjacent to a tamarack bog with no cabins, it is likely that boaters could easily avoid it.

EWM Boat Search and Swimover Dive:

Although we boated overlapping transects throughout the littoral zone of the four bays on the north side of Lower Vermillion and single transects along the entire rest of the littoral zone, we did not locate any trace of EWM either rooted or floating. Unfortunately, multiple dive transects through the treatment zone did locate a single EWM plant which we promptly bagged and eliminated. The treatment area continued to be a moonscape, and good water clarity made searching conditions excellent with the exception of the area adjacent to the south/southwest shore where a thick layer of filamentous algae covered the plants and made searching for EWM almost impossible. The borders of the large managed lawn on the adjacent shoreline neatly matched the area with algae. Anything that could be done to buffer or eliminate potential runoff from this area could increase the chances of finding any EWM that might be growing in this area during future searches.

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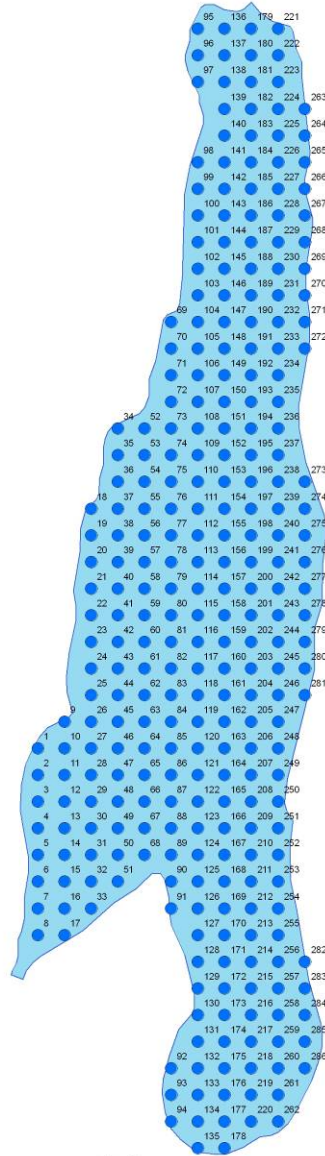
Appendix I: Upper and Lower Vermillion Lake Maps with Sample Points

Survey Sample Points

Upper Vermillion Lake
Barron County, WI
Summer, 2009



● Sample Point

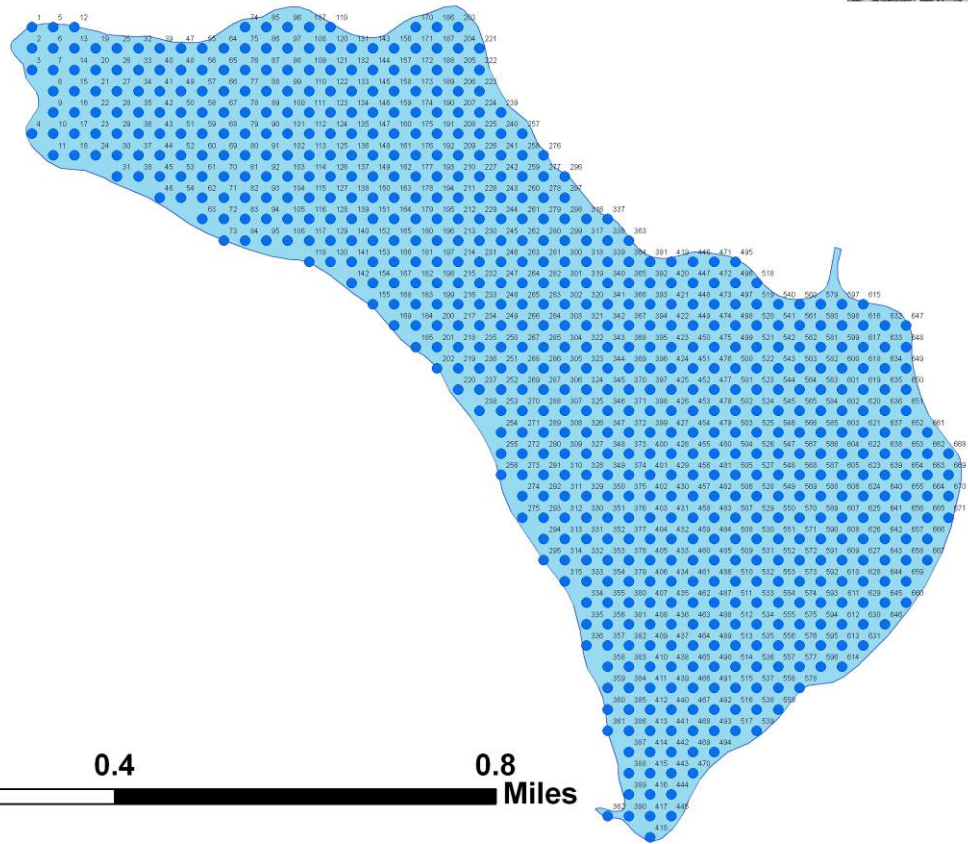


Suvey Sample Points

Lower Vermillion Lake
Barron County, WI
Summer, 2009



• Sample Point



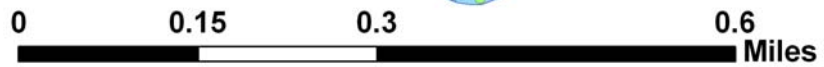
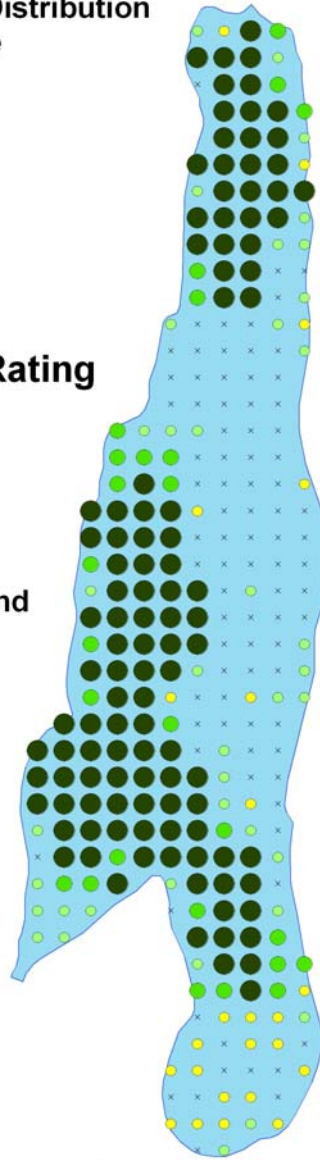
Appendix II: Upper and Lower Vermillion Lake CLP Maps

Curly-leaf pondweed
(*Potamogeton crispus*)
Aquatic Macrophyte Distribution
Upper Vermillion Lake
Barron County, WI
May 30, 2009



Rake Fullness Rating

- Visual
- 1
- 2
- 3
- × None Found



Curly-leaf pondweed (*Potamogeton crispus*)

Bed Mapping Survey
Upper Vermillion Lake
Barron County, WI
May 31, 2009



 CLP beds

