Underwater View in East Rush Lake June 9, 2010 (photo by Steve McComas)

Impact of Sediment Iron Treatment on Curlyleaf Pondweed in Rush Lake, Chisago County, Minnesota in 2010

Iron Treatment Date: March 7, 2009
Curlyleaf Evaluation Dates: June 4, 2009
June 9, 2010

Prepared for:
Rush Lake Improvement Association
Chisago County, Minnesota

Prepared by:
Steve McComas
Blue Water Science
St. Paul, MN 55116

December 2010

Impact of Sediment Iron Treatment on Curlyleaf Pondweed in Rush Lake, Chisago County, Minnesota

Acknowledgments

Rush Lake Iron Treatment Team, March 7, 2009. This group plus others drilled holes through the ice and added the iron to three acres in Rush Lake on March 7, 2009. (photo by David Cartwright)

Impact of Sediment Iron Treatment on Curlyleaf Pondweed in Rush Lake, Chisago County, Minnesota in 2010

Summary

Curlyleaf pondweed is a non-native plant that can grow to nuisance conditions in lakes. When curlyleaf dies back in early summer, phosphorus is released from the decaying plant matter and can contribute to algae blooms.

By evaluating the relationship between curlyleaf growth and lake sediment characteristics, it was found that lakes with naturally high sediment iron concentrations had low curlyleaf densities. As a long term curlyleaf control method iron filings are being added to lake sediments to mimic naturally occurring conditions found in lakes where the growth of curlyleaf pondweed is light.

On March 7, 2009, a test was conducted on a one-acre plot in West Rush and on two one-acre plots in East Rush (Figure 1). Two objectives were being considered: to evaluate the potential for iron filings to sequester phosphorus and to determine if adding iron filings to lake sediments could reduce the nuisance curlyleaf growth conditions in areas where heavy growth had been previously documented. This report only discusses the impact of iron filings on curlyleaf pondweed. Pre-application testing had occurred in the reference and treatment areas in 2008 and post-treatment monitoring was conducted on June 4, 2009 and on June 9, 2010.

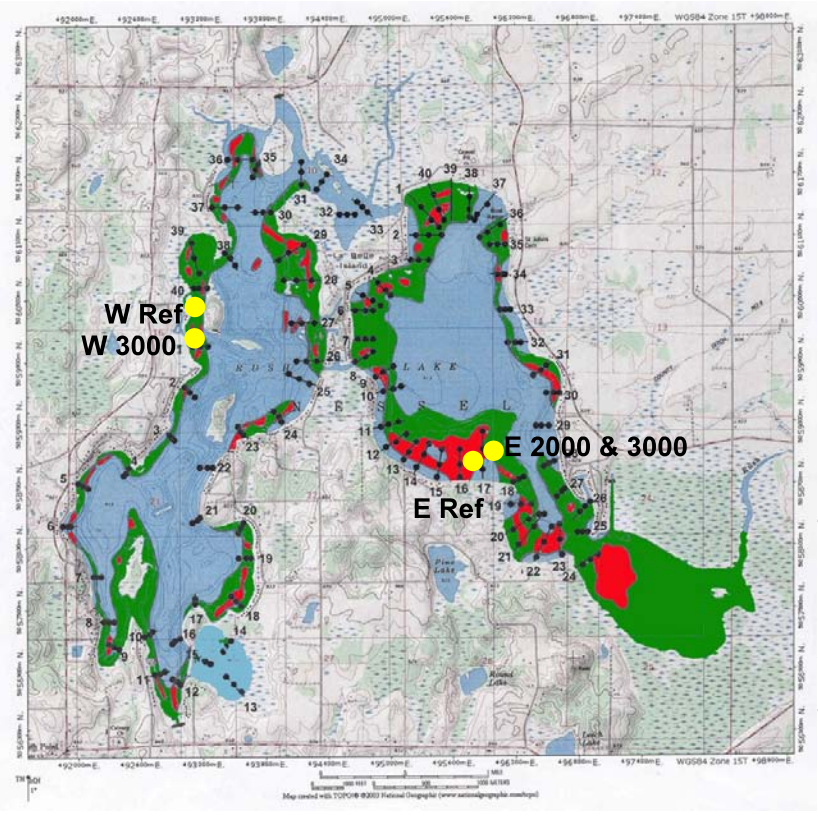

Figure 1. Iron filing treatment areas and untreated reference areas are shown with yellow dots. Key: W Ref = untreated reference area, W 3000 = one acre iron filing treatment area with 3,000 lbs-iron/acre, E Ref = untreated reference area, E 2000 & 3000 = one acre treatment area with 2,000 lbs-iron/ac adjacent to another one acre treatment area with 3,000 lbs-iron/ac.

In the first post-iron addition sampling year (conducted on June 4, 2009), approximately 89 days after the iron filing application to the Rush Lake sediments, curlyleaf stem densities were less in the East Rush treatment area that received 3,000 pounds of iron per acre (Table 1). There did not appear to be a reduction in curlyleaf stem densities in the West Rush treatment area dosed with 3,000 lbs of iron/acre or in the East Rush treatment area dosed with 2,000 lbs of iron/acre (Table 1). However, in other iron augmentation demonstrations, it was found curlyleaf control did not occur until the second growing season after an iron application (McComas, unpublished). In 2010 (June 9), the second growing season after the iron filing treatment, stem densities in all three treat areas were less than the reference areas (Table 1 and Figure 2). It was also noted that stem densities in the reference areas were less than densities found in 2008 and 2009.

Table 1. Summary of stem density and biomass results for pre-treatment conditions in 2008, the first season after iron augmentation in 2009, and the second season after iron augmentation in 2010. Iron filings were added to Rush Lake on March 7, 2009.

	Stem Density (#/m^2)			Biomass (g-dry wt/m^2)		
WEST RUSH						
	Reference	**Treatment (3,000 lb/ac)**		**Reference**	**Treatment (3,000 lbs/ac)**	
Pre-Iron (June 16, 2008)	429 (n=20)	546 (n=20)		154 (n=3)	164 (n=3)	
Post Iron - yr 1 (June 4, 2009)	680 (n=10)	561 (n=10)		82 (treated) (n=250)	166 (n=183)	
Post Iron - yr 2 (June 9, 2010)	171 (n=20)	73 (n=20)		91 (n=38)	21 (n=20)	
EAST RUSH						
	Reference	**Treatment (2,000 lbs/ac)**	**Treatment (3,000 lbs/ac)**	**Reference**	**Treatment (2,000 lbs/ac)**	**Treatment (3,000 lbs/ac)**
Pre-Iron (June 16, 2008)	468 (n=20)	426 (n=20)	426 (n=20)	267 (n=3)	298 (n=3)	298 (n=3)
Post Iron - yr 1 (June 4, 2009)	566 (n=10)	561 (n=10)	66 (n=10)	319 (n=225)	386 (n=195)	22 (n=19)
Post Iron - yr 2 (June 9, 2010)	281 (n=20)	80 (n=20)	99 (n=20)	129 (n=34)	42 (n=20)	48 (n=10)

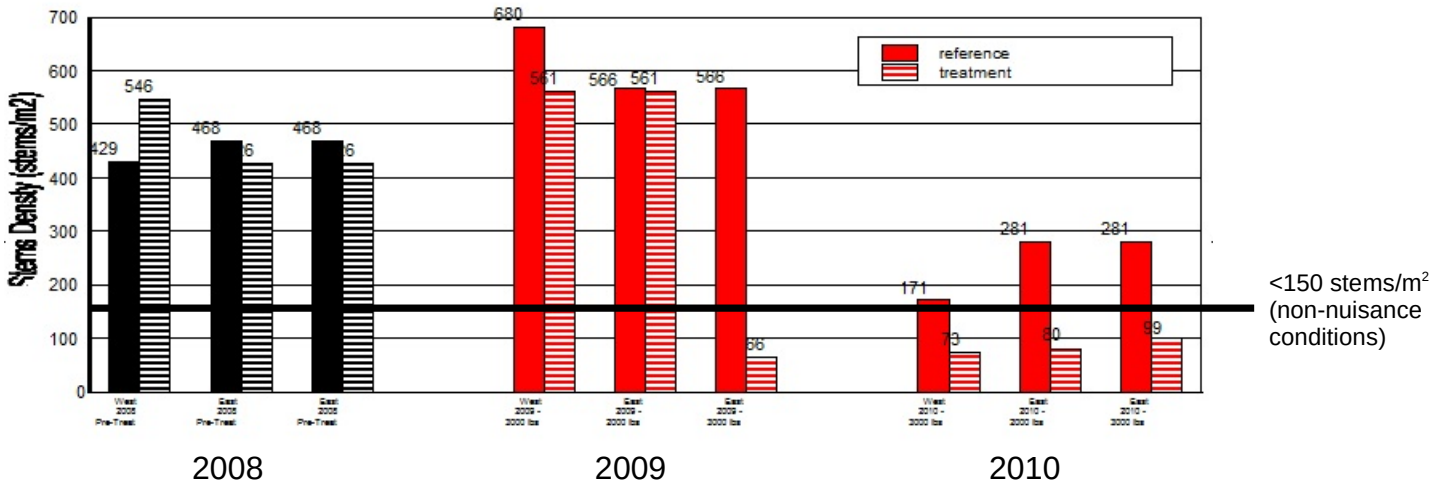

Figure 2. Average of Rush Lake curlyleaf pondweed stem densities for reference and treatment sites for pre-treatment conditions in 2008 (black bars) and for post treatment conditions in 2009 and 2010 with reference data shown with red bars and treatment data shown with pink bars.

Conclusions and Recommendations: Lake sediment analyses from over 60 lakes has found correlations with naturally occurring high sediment iron and low sediment pH (less than 7.7) with light curlyleaf growth (McComas, unpublished). Adding iron filings to three demonstration areas in Rush Lake is suppose to mimic what is found naturally in lakes with non-nuisance curlyleaf growth. In Rush Lake, in 2009, mixed results were observed in the first growing season. Light curlyleaf growth was observed in one plot in East Rush but not in the other two demonstration plots. However in 2010, curlyleaf stem densities were reduced to light growth densities in all three treatment sites (where light densities are defined as less than 150 stems/m^2). Stem densities were also less in the reference areas, but not below non-nuisance densities.

In the future, more acres in Rush Lake could be tested to extend the demonstration to wider areas and to other types of lake conditions in order to collect more information on the effectiveness of iron augmentation for phosphorus control as well as curlyleaf pondweed control in lakes.