



Wisconsin River Power Company  
(owners of the Petenwell & Castle Rock Hydroelectric Plants)  
P.O. Box 19001  
Green Bay, WI 54307-9001

December 10, 2013

Dear Member of Adaptive Management Plan Stakeholder Panel:

You have volunteered to participate as a member of the stakeholder panel for Wisconsin River Power Company's (WRPCO's) Adaptive Management Plan. Under the Adaptive Management Plan, a five-year pilot project is being conducted to determine whether delaying the winter drawdown on the Petenwell Flowage would stimulate aquatic plant growth, and thereby increase fish and wildlife habitat and help to improve water quality.

### **2013 Adaptive Management Plan Annual Report**

The Wisconsin River Power Company is providing a report of activities taking place regarding the Adaptive Management Plan for 2013.

#### **March 12, 2013 Steering Committee Meeting**

WRPCO met with the steering committee on March 12, 2013 during the 2013 annual resource agency meeting. A discussion of the 2012 annual report was conducted. No comments were received from the stakeholder panel. Membership of the Steering Committee was updated. WRPCO is represented by Darrin Johnson, Shawn Puzen, Jeff Klaas and William Bosacki. The U.S. Fish and Wildlife Service (FWS) is represented by Nick Utrup. The Wisconsin Department of Natural Resources (WDNR) is represented by Scott Provost, Cheryl Laatsch, and Jennifer Bergman (replacing Justine Hasz). Johnson serves as chair of the committee.

2013 marked the fourth year of the five-year study. The winter drawdown on the Petenwell Flowage began on February 10, 2013. Water levels went below 923.0 on February 13, 2013. The flowage was drawn down to its lowest level of 919.48 on March 24, 2013. License conditions allow for a drawdown to the level of 919.0. During the five-year project, WRPCO has agreed to draw down the flowage only as far as necessary to accommodate spring runoff. In 2013, a 3.52 foot drawdown was implemented. Water levels returned above 923.0 on April 28, 2013.

Minutes of the Steering Committee meeting are attached as Appendix A. A hydrograph detailing the 2013 drawdown and a spreadsheet listing daily water elevations during the drawdown is attached as Appendix B.

#### **2013 Vegetation Survey**

In 2013, the WDNR conducted vegetation sampling. The same grids sampled in 2012 were sampled in 2013. Each grid contained 25 individual sampling points where standard WDNR plant protocols were followed. A copy of the vegetation sampling report and map are attached in Appendix C.

Positive vegetation response has been noted in areas with a mucky substrate and water depths of 2 feet or less. Areas with deeper water and/or sandy substrates are not seeing vegetative response.

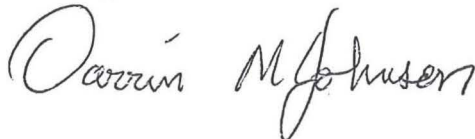
**2014 Operational Modifications Continue**

WRPCO will continue operational modifications required under the Adaptive Management Plan with the 2014 winter drawdown at the Petenwell Flowage. Safety will be the primary factor to be considered when implementing this modification. The modification will not be implemented if a thorough evaluation of snowpack information and other available spring runoff indicators demonstrate it would not be safe. As long as safety is not a factor, WRPCO will begin the winter drawdown on or after February 10, 2014. This will allow will allow the final year data to be collected on the aquatic vegetation response to the measure. After the 2014 vegetation survey has been completed, WRPCO will re-convene the stakeholder panel. Results from the 5-year study will be presented to the panel. The panel will review the sampling data to determine whether the later drawdown is effective at stimulating aquatic plant growth. After reviewing the data, the panel will make a recommendation on whether to make the operational modifications permanent.

If you have any questions or comments on this report, please send them to:

Darrin Johnson  
WRPCO  
2001 Plover Road  
Plover, WI 54467  
Phone: 715-345-7509  
Email: dmjohnson@integrysgroup.com

Sincerely,



Darrin Johnson  
Environmental Consultant

Enclosures

**APPENDIX A**  
**Minutes of Adaptive Management Plan Steering Committee Meeting**

## 3/12/2013 Adaptive Management Plan Steering Committee Meeting Minutes

**Members:** Darrin Johnson –Chair, Shawn Puzen, Jeff Klaas, Bill Bosacki, Scott Provost, Cheryl Laatsch, Nick Utrup and Jennifer Begrman (to replace Justin Hasz).

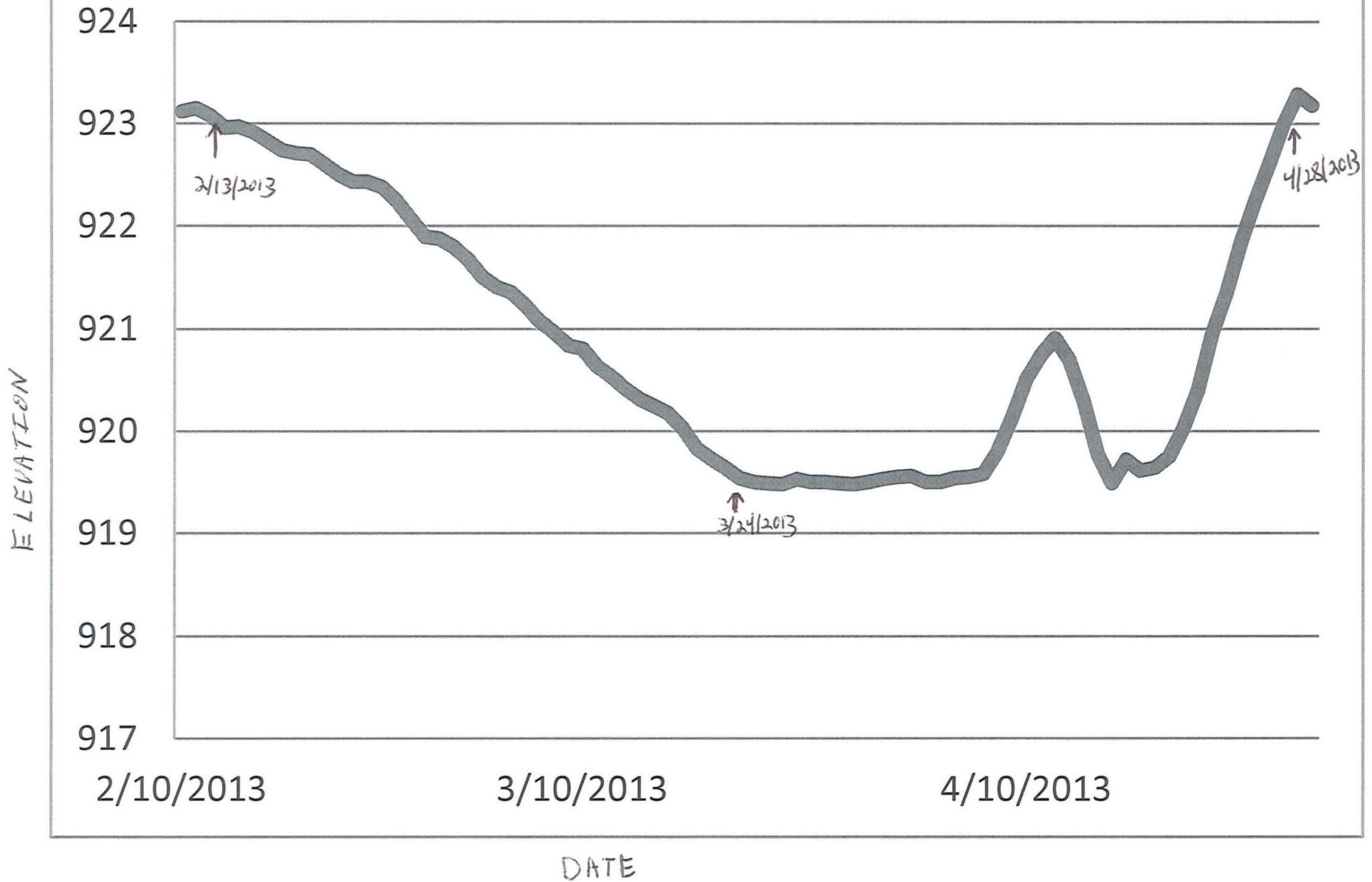
- Darrin J. provided background on AMP, how it was developed during licensing to address items not worked out in the licensing process. The current project to delay the annual winter drawdown to reduce the amount of time that vegetation is dewatered and potentially frozen to attempt to stimulate aquatic vegetation growth. Darrin had provided information on Year 4 of the 5 year study. Aquatic vegetation has increased.
- WRPCO is looking at a 3.5 foot drawdown this year for anticipated spring runoff. WRPCO only draws down the reservoir as much as needed for anticipated spring runoff. The reservoir should be at its lowest level by March 22<sup>nd</sup>.
- Scott indicated that there is a direct correlation between an increase in aquatic vegetation and how long the vegetation can remain dewatered.
- After the end of the 5 year study stakeholders will meet and determine if the current activities are working or should be discontinued with FERC making the final decision.

### **2012 Activities:**

- Scott P. - 25 plots were surveyed; recorded depth, plant species and density. Compared changes in density from previous surveys. Since 2010, there has been an overall increase in plant growth and habitat and less blue/green algae.
- Some plots showed no change, but that was due to bad substrate or high flow areas. This is a good Public Relations project.
- In addition to the AMP project, WRPCO worked with the PACRS citizen's organization to conduct a voluntary aquatic vegetation planting project in 2012.

**APPENDIX B**  
**2013 Drawdown Hydrograph**

# 2013 Drawdown Hydrograph



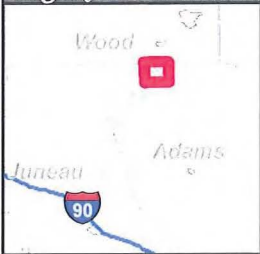
Date	Headwater Elevation
2/10/2013	923.12
2/11/2013	923.15
2/12/2013	923.08
2/13/2013	922.96
2/14/2013	922.97
2/15/2013	922.92
2/16/2013	922.83
2/17/2013	922.74
2/18/2013	922.71
2/19/2013	922.7
2/20/2013	922.6
2/21/2013	922.5
2/22/2013	922.43
2/23/2013	922.43
2/24/2013	922.38
2/25/2013	922.25
2/26/2013	922.07
2/27/2013	921.9
2/28/2013	921.88
3/1/2013	921.8
3/2/2013	921.68
3/3/2013	921.51
3/4/2013	921.41
3/5/2013	921.36
3/6/2013	921.23
3/7/2013	921.08
3/8/2013	920.97
3/9/2013	920.84
3/10/2013	920.81
3/11/2013	920.64
3/12/2013	920.54
3/13/2013	920.42
3/14/2013	920.32
3/15/2013	920.25
3/16/2013	920.18
3/17/2013	920.03
3/18/2013	919.83
3/19/2013	919.73
3/20/2013	919.64
3/21/2013	919.54
3/22/2013	919.5
3/23/2013	919.49
3/24/2013	919.48
3/25/2013	919.53
3/26/2013	919.5
3/27/2013	919.5
3/28/2013	919.49
3/29/2013	919.48
3/30/2013	919.5
3/31/2013	919.53
4/1/2013	919.55
4/2/2013	919.56
4/3/2013	919.5
4/4/2013	919.5
4/5/2013	919.54
4/6/2013	919.55
4/7/2013	919.58
4/8/2013	919.8
4/9/2013	920.13
4/10/2013	920.51
4/11/2013	920.74
4/12/2013	920.91
4/13/2013	920.7
4/14/2013	920.3
4/15/2013	919.77
4/16/2013	919.49
4/17/2013	919.72
4/18/2013	919.61
4/19/2013	919.64
4/20/2013	919.75
4/21/2013	920.03
4/22/2013	920.4
4/23/2013	920.95
4/24/2013	921.35
4/25/2013	921.84
4/26/2013	922.24
4/27/2013	922.61
4/28/2013	923
4/29/2013	923.29
4/30/2013	923.18

**APPENDIX C**  
**Vegetation Sampling Results and Map**





Aerial Source: National Agriculture Imagery Program; USDA Farm Service Agency; 2010



## Wisconsin River Power Company 2013 Vegetation Survey



0 1,000 2,000 3,000 4,000 Feet

- 2012-2013 Survey Points
- 2009-2013 Survey Points
- 2010-2013 Survey Points



Project Boundary

12/9/2013

## Petenwell Plant Survey Summary 2010-2013

Wisconsin Department of Natural Resources  
West District  
Scott Provost – Aquatic Plant Manager  
Wisconsin Rapids, WI

**Introduction:** Lake Petenwell, Wisconsin's second largest lake (23,040 acres) is an impoundment of the Wisconsin River in Central Wisconsin. The lake's primary purpose is to provide hydro-electric power, which is operated by Wisconsin River Power Company (WRPCO). The lake is subject to extreme variations in water levels during the winter as WRPCO lowers water levels in anticipation of spring runoff. The annual winter drawdown would begin after January 1<sup>st</sup> of every year. The prolonged freezing of the lake bed prevents a robust aquatic plant community from becoming established in the littoral zone of the lake due to the exposure of the lake bed to freezing on an annual basis.

In the winter of 2009, WRPCO, WDNR and members of the Petenwell and Castle Rock Stewards (PACRS), worked collaboratively to delay the winter drawdown on Lake Petenwell in attempt to have aquatic plants re-establish themselves. Restoring the aquatic plant community in the littoral zone would improve fish and wildlife habitat as well as attenuate nutrients that otherwise would create serious algal blooms on the reservoir every year. A mutual agreement to postpone the drawdown to after February 10 was reached. The winter of 2010 was the first year of the delayed drawdown and then again in 2011, 2012.

Local DNR staff wrote a project to evaluate the aquatic plant community prior to the drawdown. The data gathered would serve as a baseline to compare against identical surveys following the delayed drawdown. This would help determine the efficacy of aquatic plant restoration by a delayed drawdown. Unfortunately the project did not receive departmental funding and could not be completed as designed. Despite this setback, DNR staff conducted an abbreviated version (1/4 of the original design) of the project. We were able to gain some very crude pre-drawdown data. The following year after the delayed drawdown, DNR received funding to conduct the project, which was completed near the end of the growing season of 2010. Subsequent surveys were conducted at similar times of the growing season for 201, 2012 and 2013.

**Methods:** Due to the vast size of the area, a complete survey of the entire area would not be practical under current staff resources. Thus, 16 sub-plots were randomly located near the mouth of the Wisconsin River. This area is shallow enough to grow plants and would be the best indicator to evaluate the efficacy of a winter drawdown. Figure 1. shows the locations of each sub-plot. The summer of 2009 only had four of these plots sampled due to the funding denial of the proposed project, which are color coded red. Each sub-plot has 25 sampling points where standard DNR aquatic plant protocols were followed.

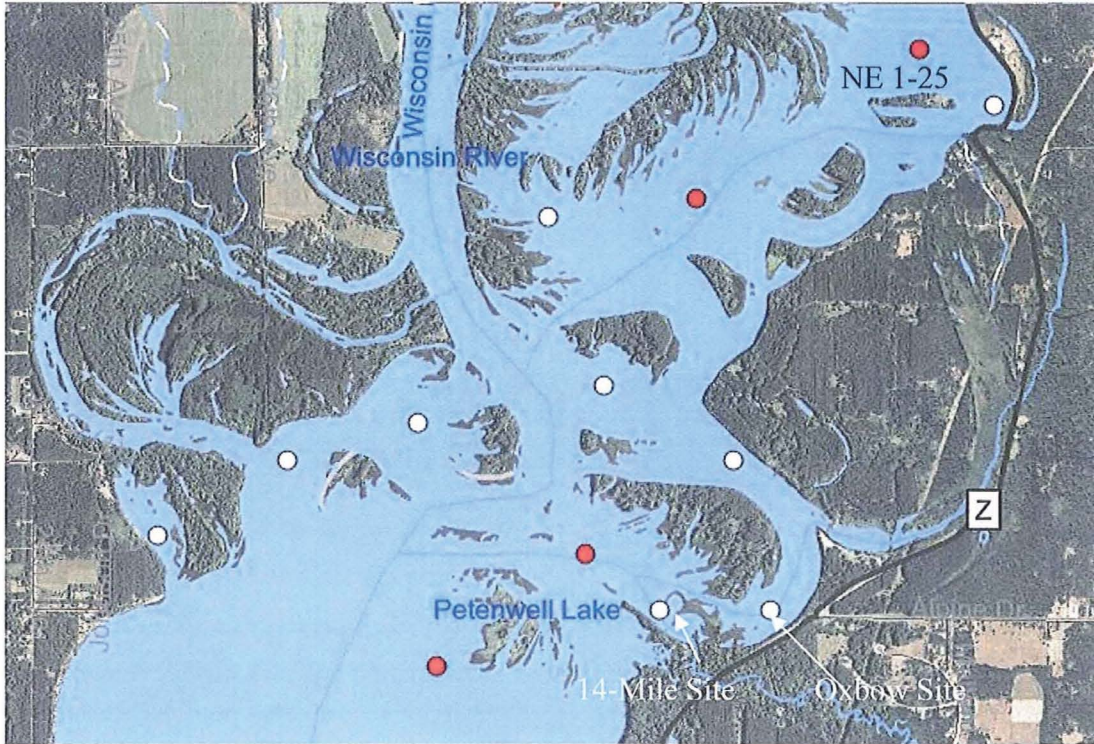





Figure 1., shows the geographical locations of each sub-plot sampling area. Each location had 25 points sampled.

Each sub-plot comprised of a 25-point grid approximately one-hectare in size, with points 20m apart. At every point the depth, sediment type, plant species and abundance was recorded using WDNR aquatic plant point-intercept sampling protocols. If the point was too deep to support plant growth (>6 feet), we did not sample it.

At each of these points we used a two-sided rake sampler to sample approximately 2.5 feet along the bottom. After pulling the plants to the surface, the rake was assigned a fullness rating of 1-3 to estimate density of plant growth (see Figure 2).

Figure 2 showing rake fullness descriptions

Fullness Rating	Coverage	Description
1		Only few plants on rake head.
2		Rake head is about half full; the rake is covered but the tines are still visible.
3		The rake is completely covered and tines are not visible.

Each individual plant species on the rake as well as any dislodged by the rake and floating were given similar fullness ratings to estimate abundance. We also recorded visual sightings of species within six feet of the sample point, and depth and substrate (lake bottom) type at each point. Any additional species seen in the lake during a general boat survey were recorded separately from the point-intercept data.

**Results:** Aquatic plant survey results showed a dynamic plant community with considerable variability, but also a trend of increasing frequency and the number of species (2010 n=9, 2013 n=15). There also appears to be clear limitations to plant growth, which are water depth and substrate material. Few rooted plants were found in depths greater than two feet and the vast majority of points with plants had a muck substrate.

Statistical evaluation is limited in the subplots due to the low population size (n=25), but a simple Chi-square analysis shows changes in the plant community from 2010 through 2014. It should be noted that some of these sites have exposed lake bed during the drawdowns, but they are inundated by water from groundwater seepage and/or flow from surface flow from the 14-Mile Creek. This would prevent freezing and assure annual production of plants. Table 1. shows the plants species and whether the plant had a statistically significant increase or decrease from 2010 to 2014.

Table 1., shows the plants species found at the 14-Mile Creek site.

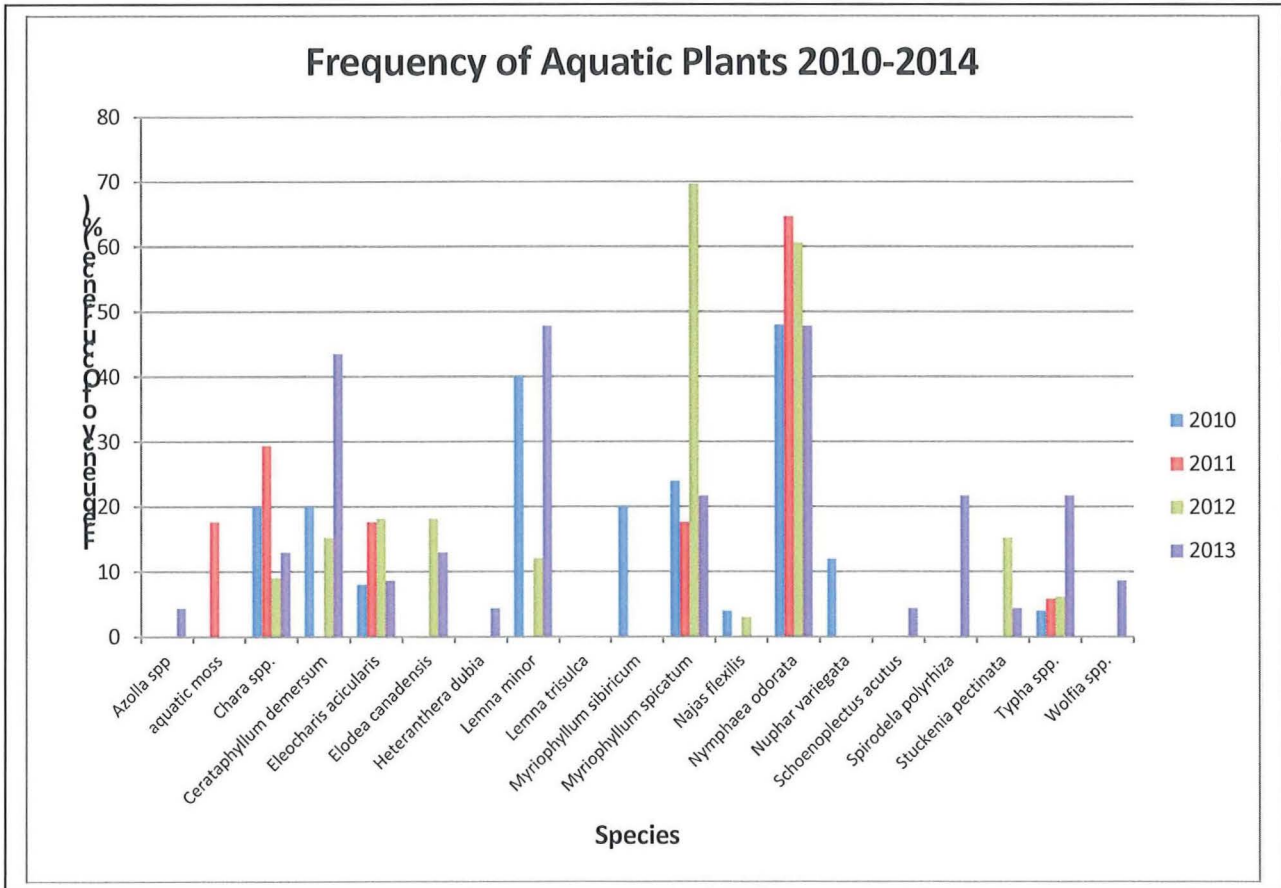
Petenwell	2010-2013		p	Significant change	Increase/Decrease
	pre-treatment survey total points	400			
	post-treatment survey total points	400			
	PRE present	POST present		(proportional to # sampling points)	
Myriophyllum spicatum	6	5	0.00000	***	-
Ceratophyllum demersum	5	10	0.00000	***	+
Eleocharis acicularis	2	2	0.55786	n.s.	no change
Elodea canadensis	0	3	0.13108	n.s.	+
Heteranthera dubia	0	1	0.31567	n.s.	+
Lemna minor	10	11	0.00000	***	+
Nymphaea odorata	12	11	0.00001	***	-
Chara	5	3	0.00011	***	-
Schoenoplectus acutis	0	1	0.00000	***	+
Stuckenia pectinata	0	1	0.00000	***	+
Spirodeta polyrhiza	0	5	0.56609	n.s.	+
Najas flexilis	1	0	0.00000	***	-
Tpha spp.	0	5	0.00000	***	+
Valisneria americana	0	1	0.00019	***	+
Wolffia spp	0	2	0.00009	***	+
Azolla spp.	0	1	0.31829	n.s.	+
Myriophyllum sibiricum	5	0	0.12652	n.s.	-
Nuphar variegata	3	0	0.99694	n.s.	-

Myriophyllum spicatum (Eurasian Water Milfoil) species is non-native and potentially invasive in WI  
 NS = change is not statistically significant

This analysis does not show inter-season variability of the plant community. This variability is caused by typical seasonal variations in water temperatures, water clarity, growing season length, nutrient levels and other weather conditions that affect plant growth.

This is best illustrated by showing change in frequency of occurrence for each species over the four-year period starting in 2010 (see Figure 3). The year 2011 had the lowest number of plants species found (n=6) to the best year of 2013 (n=15).

Figure 3. Change in frequency of occurrence for each species found from 2010-2013



**Conclusion:** The sampling of the post drawdown periods may not be of sufficient size to draw any solid conclusions at this time, but the data do show plants having a positive response to the delayed drawdown. Plant growth is expanding however it appears to be limited by depth and substrate type. For example, most plants were found in water depths of two feet or less and there was a clear preference to mucky substrate. Poor light penetration from the stained water color is most likely responsible for shallow depths of plant colonization. Also, mucky substrate may be insulating roots and other reproductive structures from freezing now that the window of exposure has decreased. This may have an impact on aquatic plant growth rates and natural restoration or where to choose restoration sites.

Inter-seasonal variability can explain some of the changes from one year to the other that seem to deviate from an upward trend of plant growth. For instance, the summer of 2010 and spring of 2011 witness very high water and potentially scouring of the lake bed that normally would not have happened. This could explain the low number of species and lowest density (average rake fullness 1.41) found in 2011. Conversely, the 2012 growing season was very long with periods of low water levels - the highest rake fullness values were the highest in 2012 (1.94). This inter-season variability requires us to continue monitoring to help define trends and eliminate statistical noise.

In 2012 and 2013, citizens of the Petenwell and Castle Rock Stewards (PACRS) augmented plant growth in two sites in the upper reaches of Petenwell. These sites are not located at the sub-plots or in an area that could skew the results of long-term monitoring. The planting of species may show that restoring the vegetation in upper Petenwell will require augmentation to get started. Bulrushes are known to thrive in ecosystems with mild water level fluctuation and provide very valuable habitat to fish and wildlife. This project was a volunteer effort with generous donations from PACRS and WRPCo. The project also enlisted the help of many unknown volunteers who showed up at the boat landings the day of plantings after reading about it in the local newspapers. The wide range of help from citizens and partners showed the intense interest of restoration and help build ownership in a system in the midst of a TMDL where citizen participation is crucial.