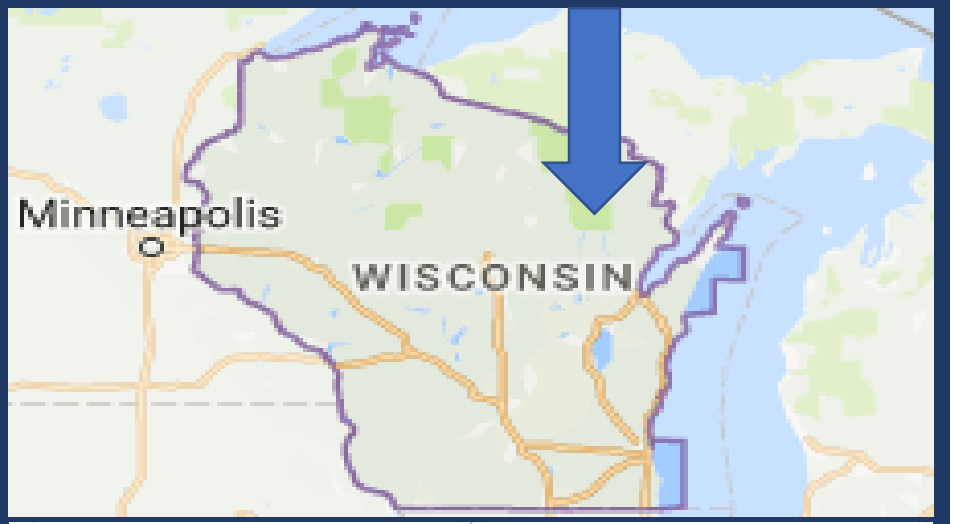
Flowering Rush Control on Archibald Lake 2011 – 2016

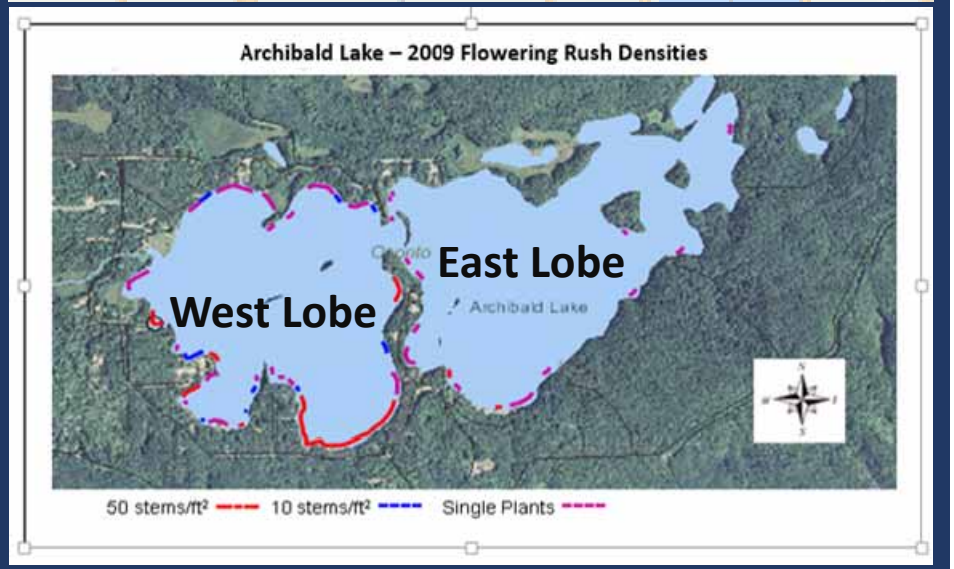
By Steve Fleming and Brenda Nordin

Photo by Paul Skawinski

Archibald Lake

- 430 acre mesotropic seepage lake
- Northeast Wisconsin.
- Maximum depth 50 ft
- 19 ft average depth
- 2 distinct East / West Lobes
- Flowering rush first identified in early 1980's.





History of Flowering Rush in Archibald

Numerous control methods tried

- Hand digging
- Repeated cutting
- Cutting flowering buds before seed release

- 2010 - Lake Association received WDNR Control grant to evaluate various chemical treatment approaches.

Chronology of Events

- **2010** – Received WDNR Research and Control Grant
- **2011** – Two trial areas– Aquathol Super K (Endothall) and Renovate Max G (Triclopyr / 2,4D)
- **2012** – No treatment - collect 2011 regrowth data
- **2013** – Expanded areas. Two trial areas - Renovate Max G (Triclopyr / 2,4D) and two applications of Tribune (Diquat)
- **2014** –Continued Tribune (Diquat) / trials on larger application areas
- **2015** – Re-treated the same areas as 2014 using one Reward (Diquat) application
- **2016** – Re-treated the same areas as 2014 (Without the original Renovate Max G area) using two Reward (Diquat) applications

2011 Chemical Treatment

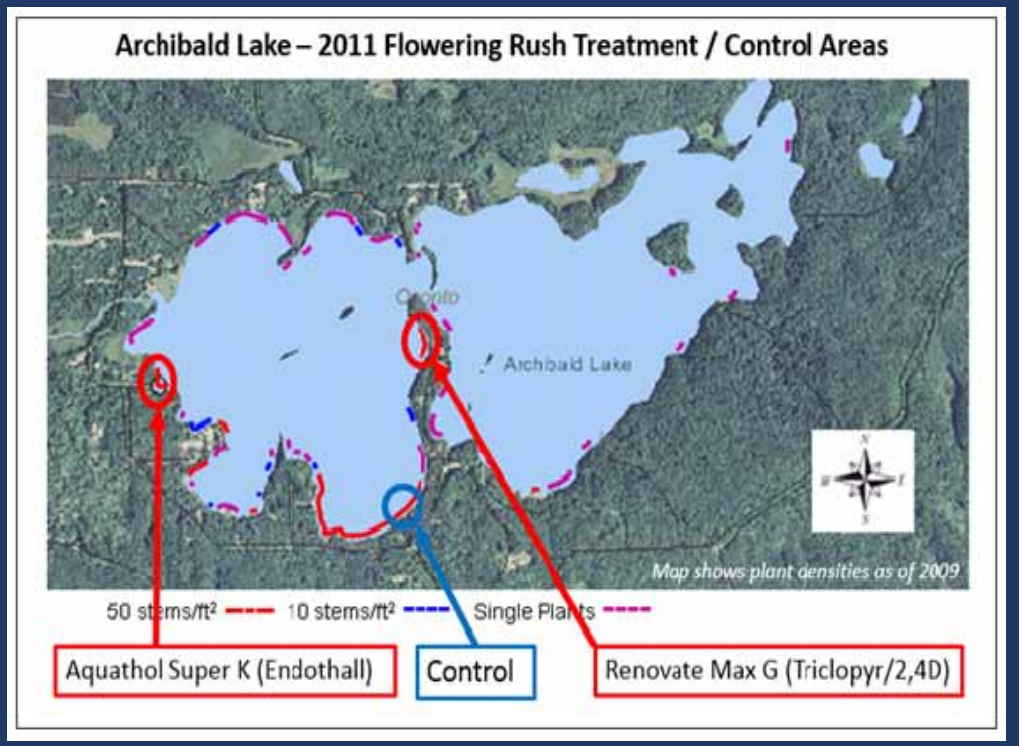
2 treatment areas – July, 2011

- ½ acre treated with Aquathol Super K (Endothall) - concentration of 2.19 ppm

***Endothall not used at max label concentration of 5ppm

- ½ acre treated with Renovate Max G (Triclopyr/2,4D) at 3.01 ppm.

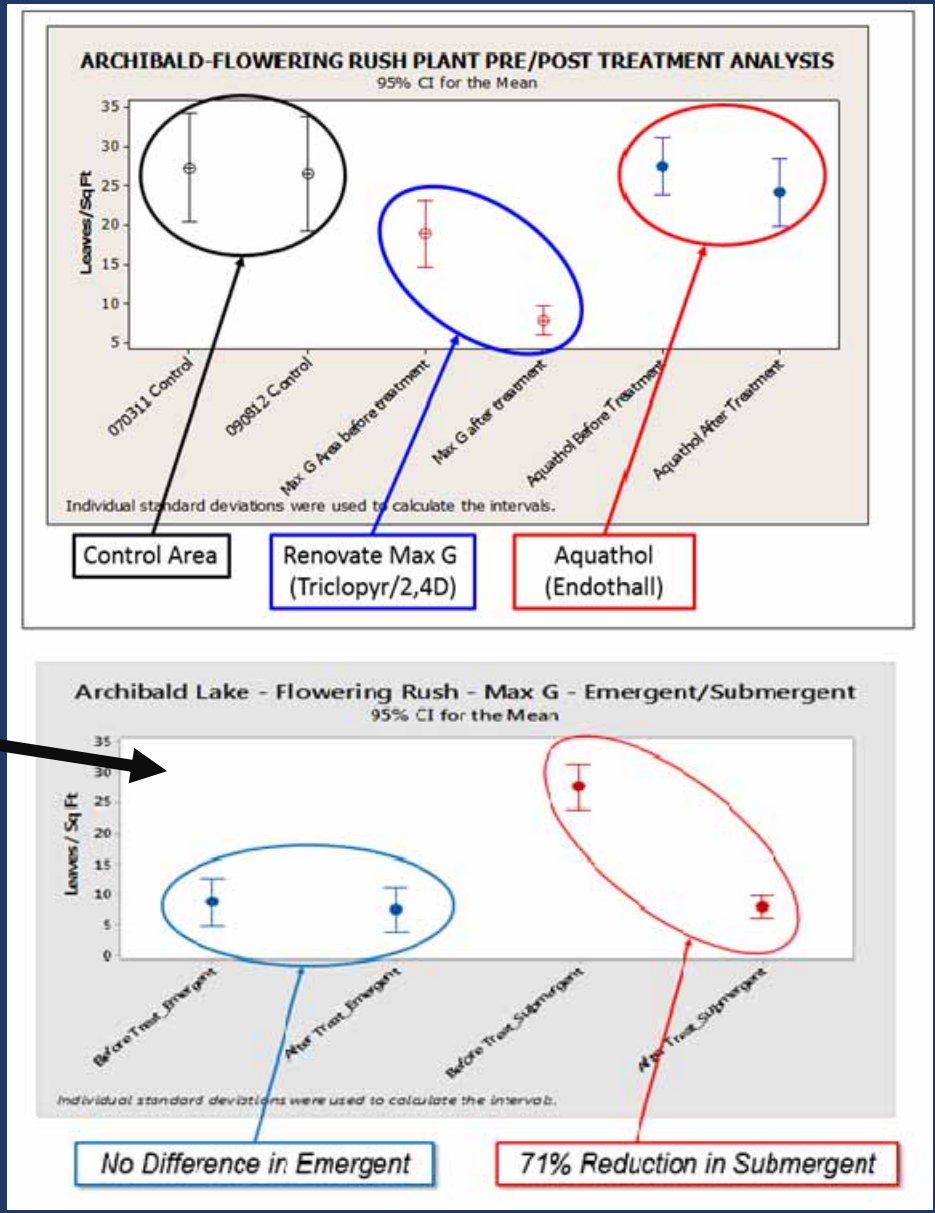
- Control area – no treatment



2011 - Pre/Post Treatment Results

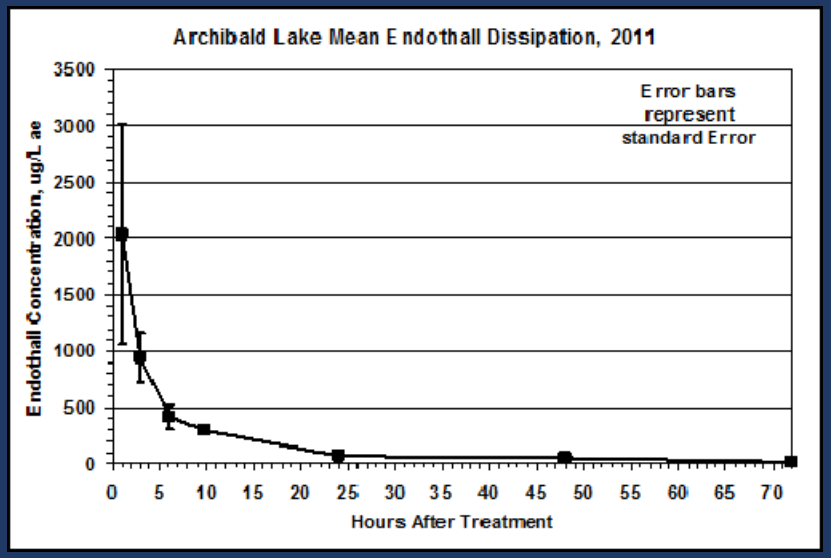
- "Control" area showed no significant change
- Renovate Max G (Triclopyr / 2,4D) - statistically significant 59% reduction
- Aquathol Super K (Endothall) - slight reduction but not statistically significant
- Renovate Max G (Triclopyr / 2,4D) - 71% reduction on submergent, No reduction on emerged Flowering Rush

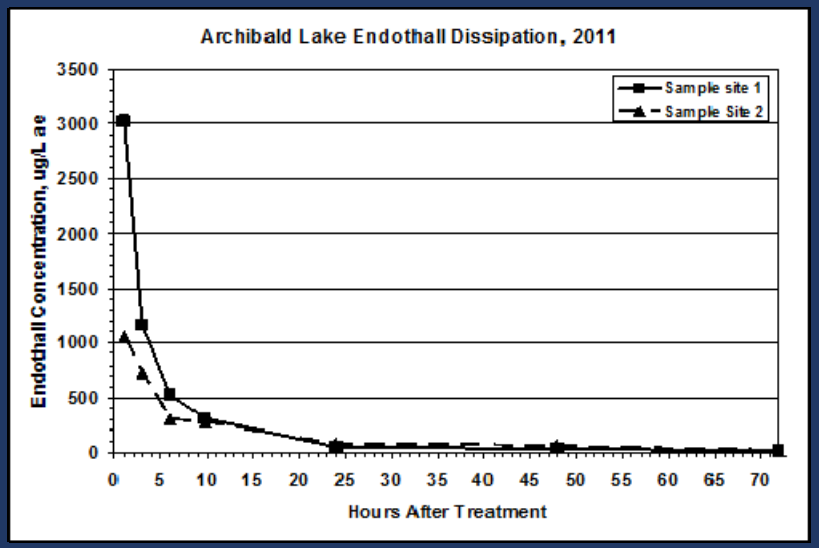
Note: All Before / After treatment densities taken via dropping one foot square PVC pipe into the water and counting number of leaves inside the square.

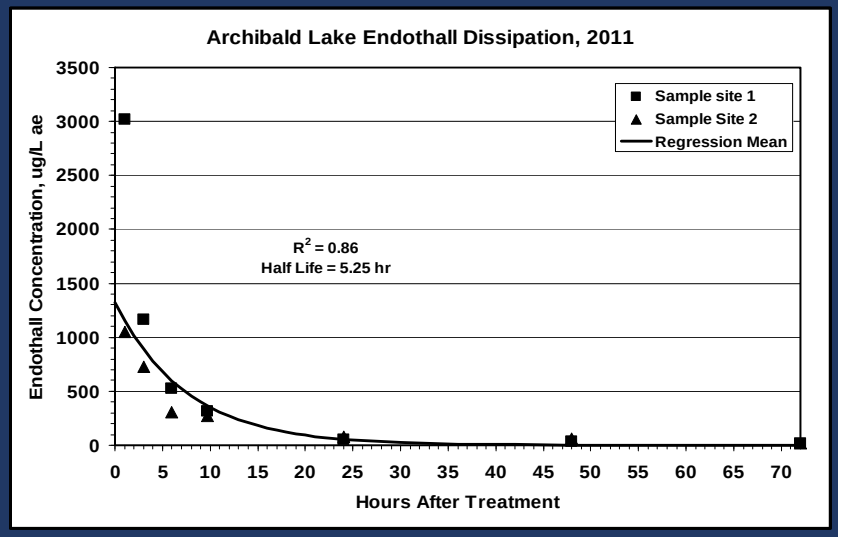


Endothall Residual Monitoring

- Water Samples collected from lake 2 sites, 11-14 July 2011, by lake volunteers. Analyzed at ERCL laboratory (Center for Aquatic and Invasive Plants, Gainesville, FL).
- Results - rapid dissipation (Figure 1). Mean / standard error were calculated for each interval(Figure 2). Concentration data were log transformed and linear regression conducted to determine the mean, R^2, and half life







(cooperation between Army Corps of engineers, Archibald Lake Association, and DNR)

2013 Treatment Approach

06/10/2013

- Treated 2.5 acres (submergent)- using Renovate Max G(Triclopyr/2,4D) at 2.65 ppm
- Treated 3 acres (submergent)- using Tribune (Diquat) at a rate of .553 ppm.

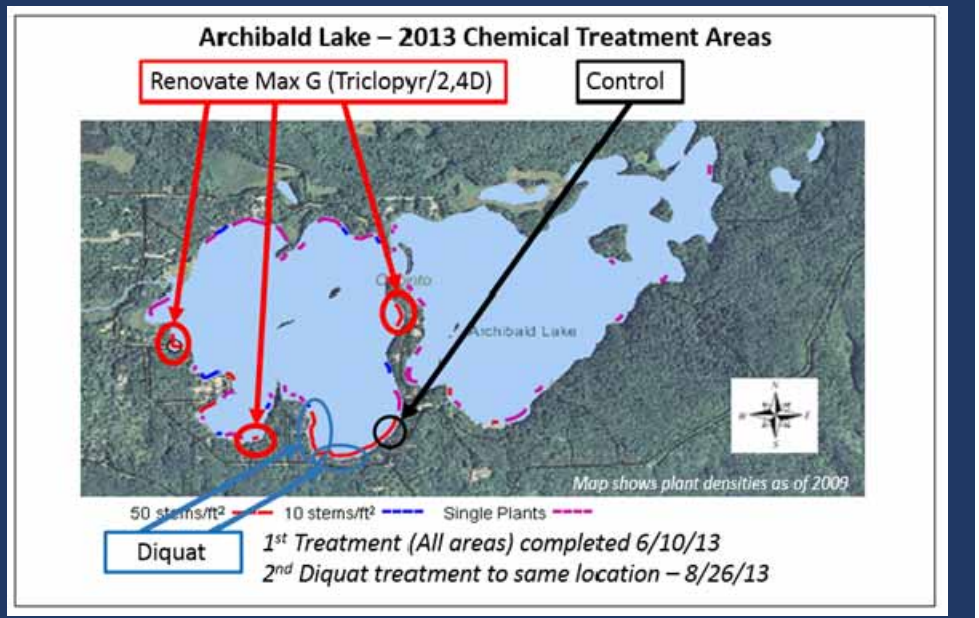
08/26/2013

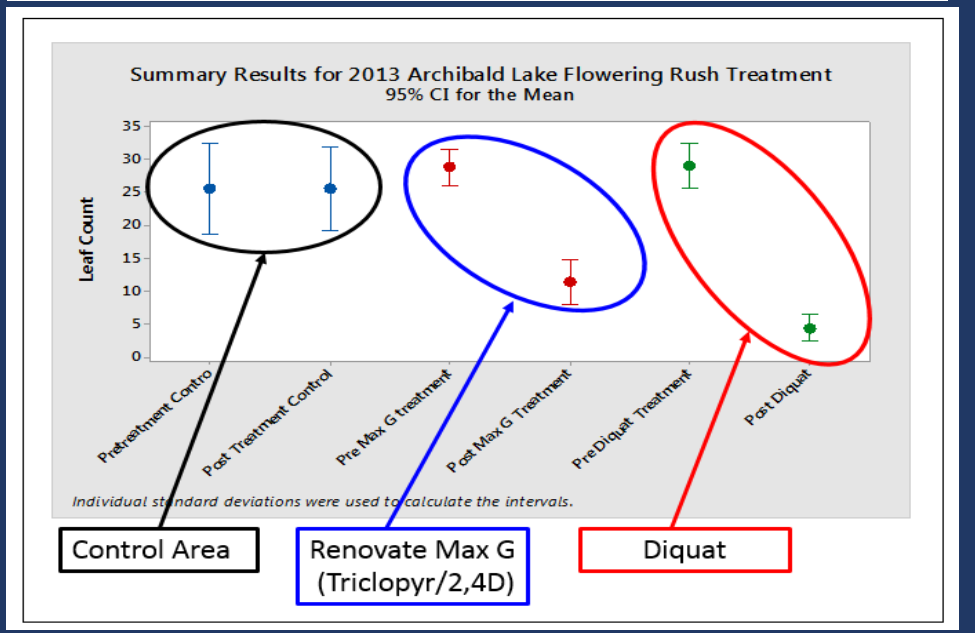
- Treated 3 acres (submergent)- using Tribune (Diquat) at .553 ppm.
  **** over max label rate of .37 ppm.*

Results

- Renovate Max G (Triclopyr / 2,4D) - significant (67%) impact
- Tribune (Diquat) – significant (86%) impact.

Note: The "pre" data was taken in June 2013 and the "post" data was taken in July 2014



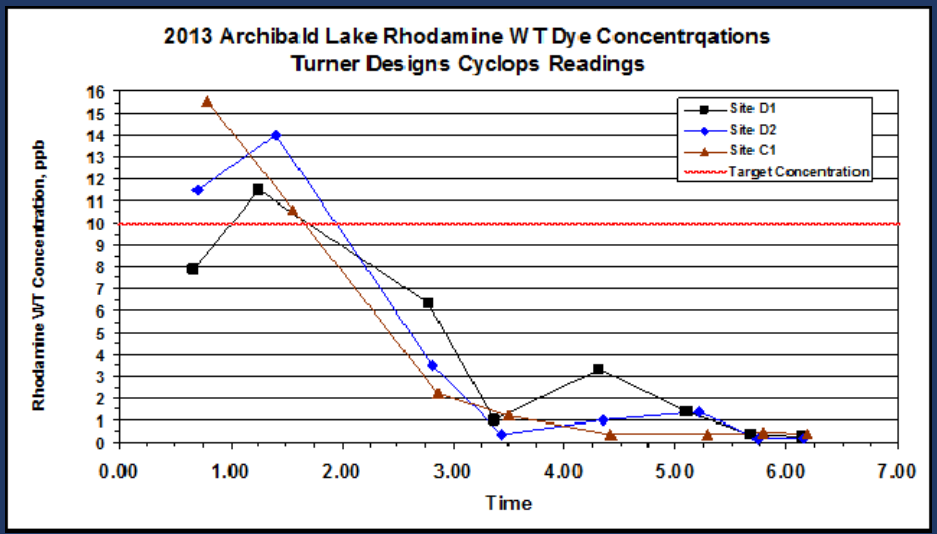


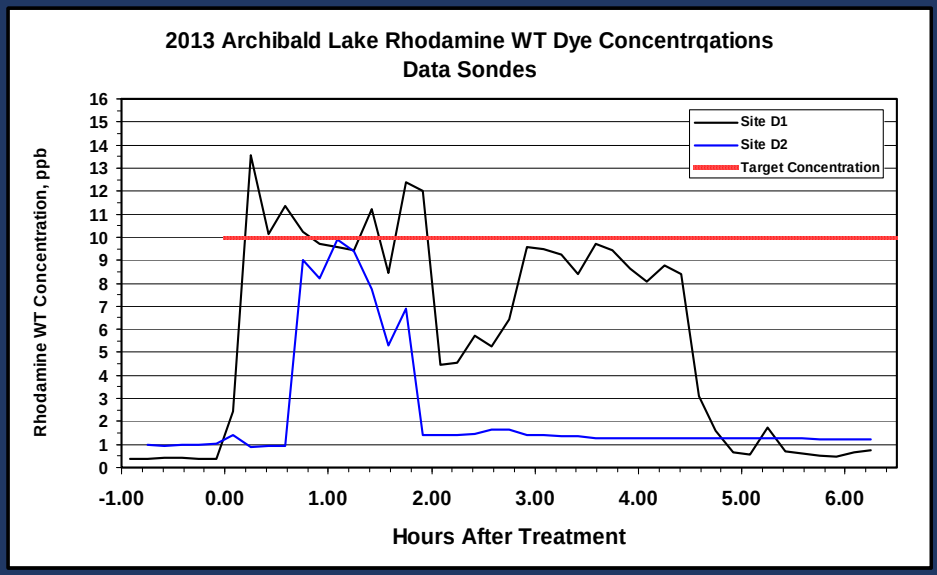
Residual Monitoring 2013

(collected by US Army Engineer Research and Development Center and WI DNR)

Conclusions:

- Exposure times were approximately 2 to 3.5 HAT.
- Exposure times are typical for similar size / configuration treatment areas
- Some site re-treatment may occur when herbicide from other areas move through.



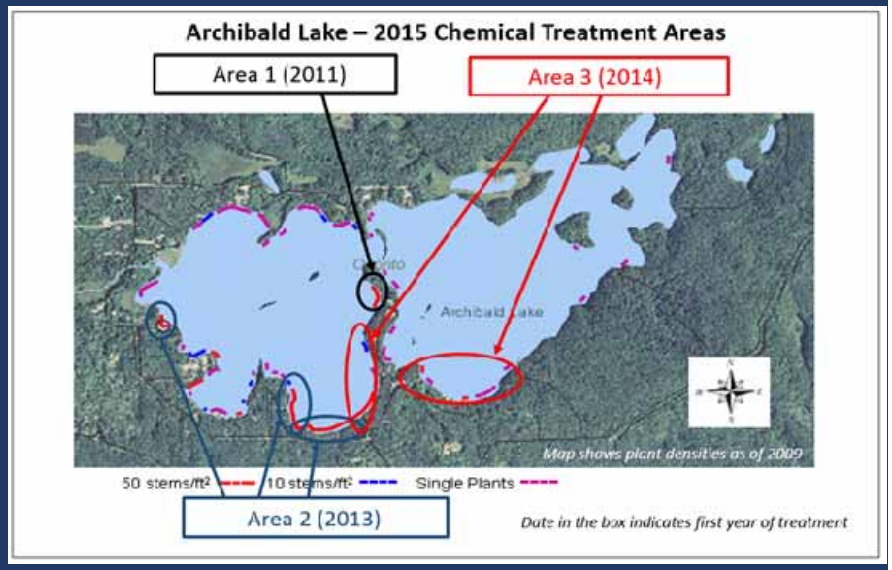


2014 - 2016 Treatment Approach

2014

- Decision made to treat larger areas using only Diquat.
- 7.59 acres treated with Tribune (Diquat) treated at a rate of .553 ppm.

**** over max label rate of .37 ppm. "For water depths of 2 feet or less including shorelines, do not exceed 1 gallon per surface acre."*



On 07-27-2015

- 6.6 acres were treated *concentrations of - A16 .409 ppm, E16 .318ppm, F16 .319 ppm, G16 .226 ppm, I16 .226 ppm, J16 .223 ppm, K16 .315 ppm*

On 06/27/2016

- 6.6 acres were treated at concentrations of - A16 .409 ppm, E16 .318ppm, F16 .319 ppm, G16 .22 ppm, I16 .226 ppm, J16 .223 ppm, K16 .315 ppm

On 09/13/2016

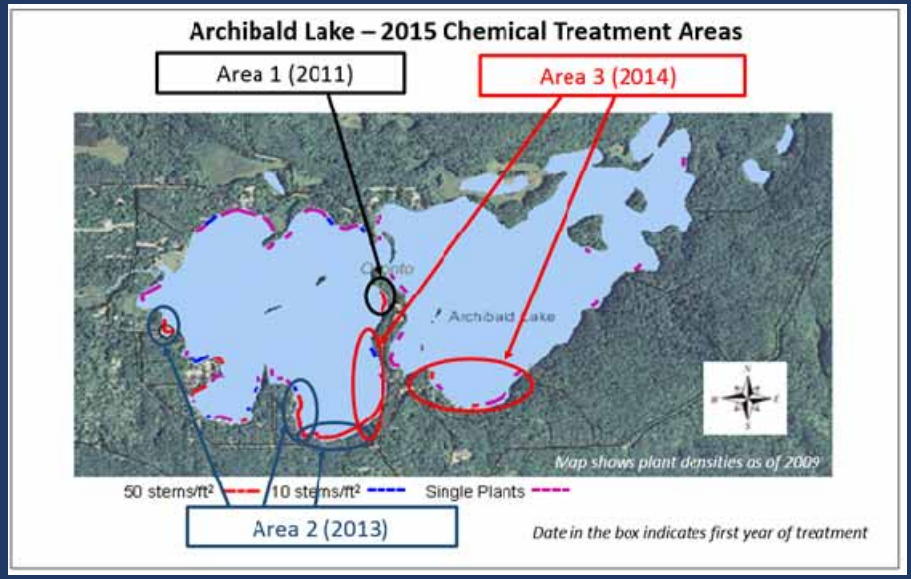
- 6 acres were treated at a concentration of - A16 .409 ppm, E16 .318 ppm, F16 .319 ppm, G16 .226 ppm, I16 .226 ppm, J16 .223 ppm, K16 .315 ppm

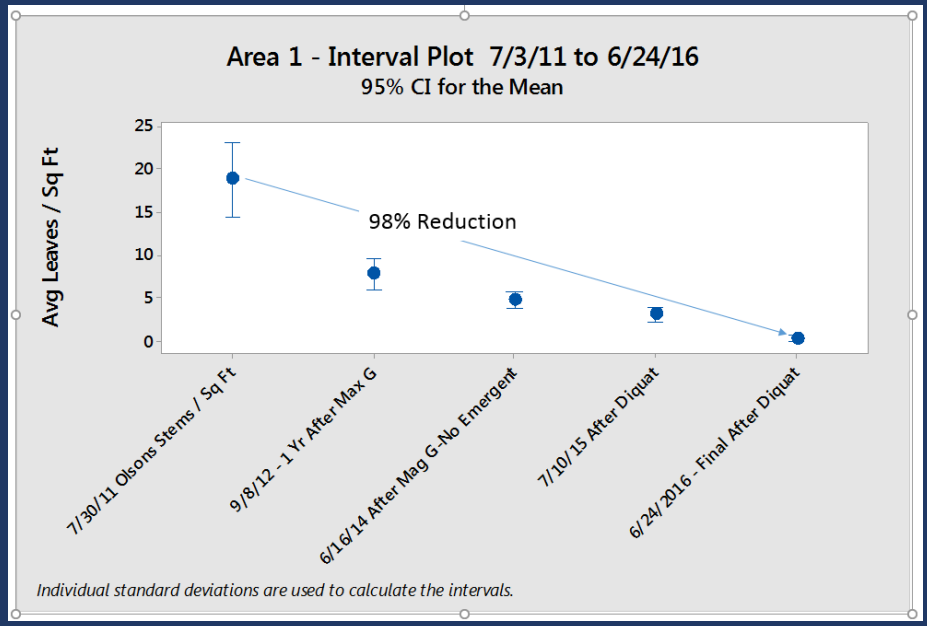
Cumulative Impact of Multiple Year Treatments (Area 1)

Area 1 Treatment / Results

- First treated in 2011. (Renovate Max G at 3.01 ppm)
- No treatment in 2012
- The second year of treatment for this area was in 2013. (Renovate Max G at 2.65 ppm)
- 2015 – 2015 treated with Tribune year of treatment for this area was 2015.
- Had 2 years (2014 and 2015)of Treatment with Tribune at .553 ppm.
- A 98% leaf reduction was observed as s result of the 4 years of chemical treatment.

****Current research (Madsen 2013) indicates expected yearly impact of Diquat on Flowering Rush is not as important as the long term impact. This report will not focus on each year but rather look at the cumulative impact of the multiple year treatments for each area shown.*



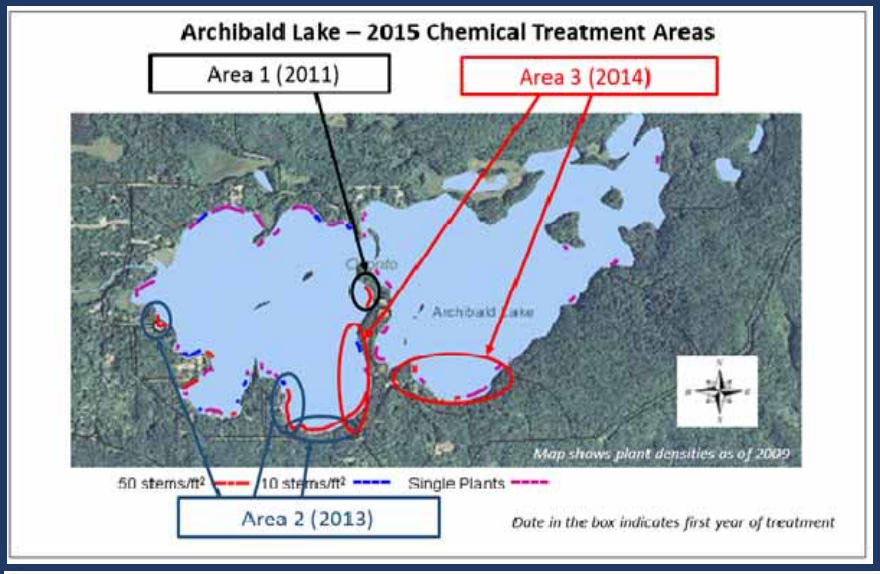


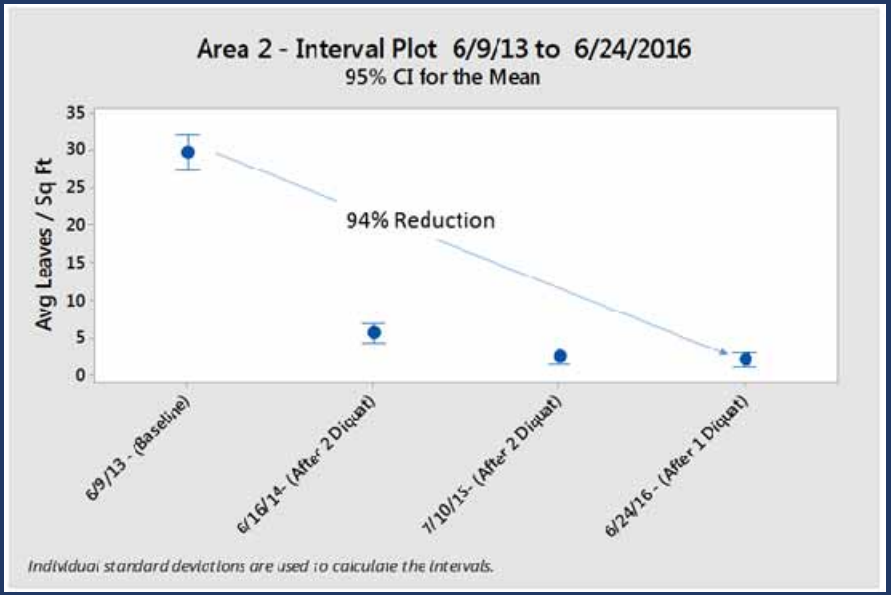
Cumulative Impact of Multiple Year Treatments (Area 2)

Area 2 Treatment / Results

- First treated in 2013 using Tribune (Diquat) at .553 ppm. This area includes the original Aquathol (Endothall) treated area
- A 94% Leaf count reduction was observed.

Noticed: boat landing area (original Aquathol treatment area) did not see same reduction in final year as the other areas.





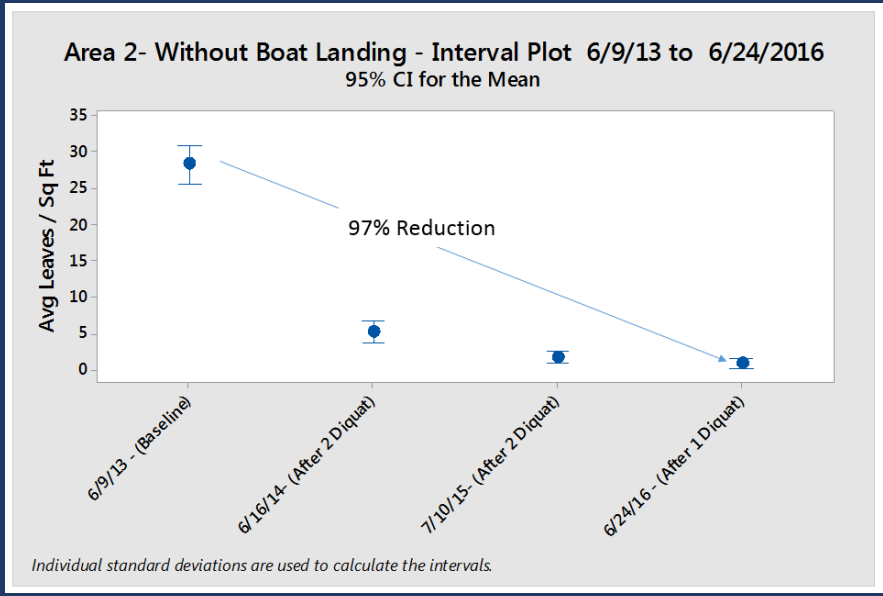
Cumulative Impact of Multiple Year Treatments (Area 2 without boat landing and boat landing only.)

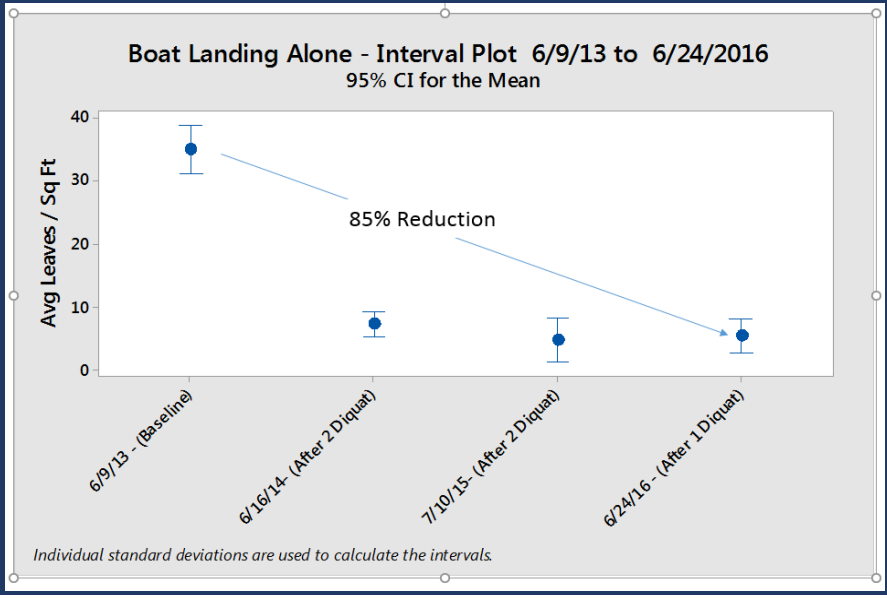
Top Chart - interval plot of Area 2 <u>without</u> Boat landing area.

- A 97% leaf count reduction shown in as compared to a 94% reduction when we included the boat landing area.

Bottom Chart - Interval plot of just boat landing area.

- 85% leaf count reduction
  - Different from other areas
  - Only area that did not show significant reduction between years 2 and 3
  - Did note that this area was only area with significant populations of emergent rush
  - Since it was the only area with emergent rush we have no basis to do further comparisons.

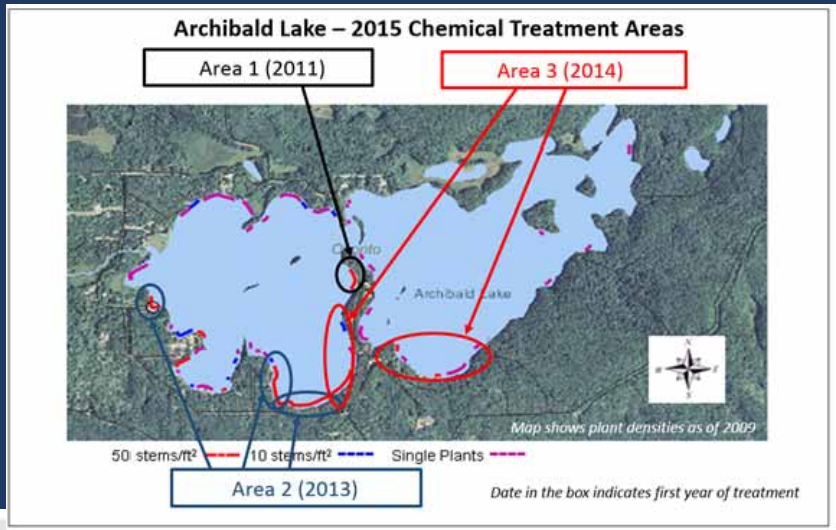


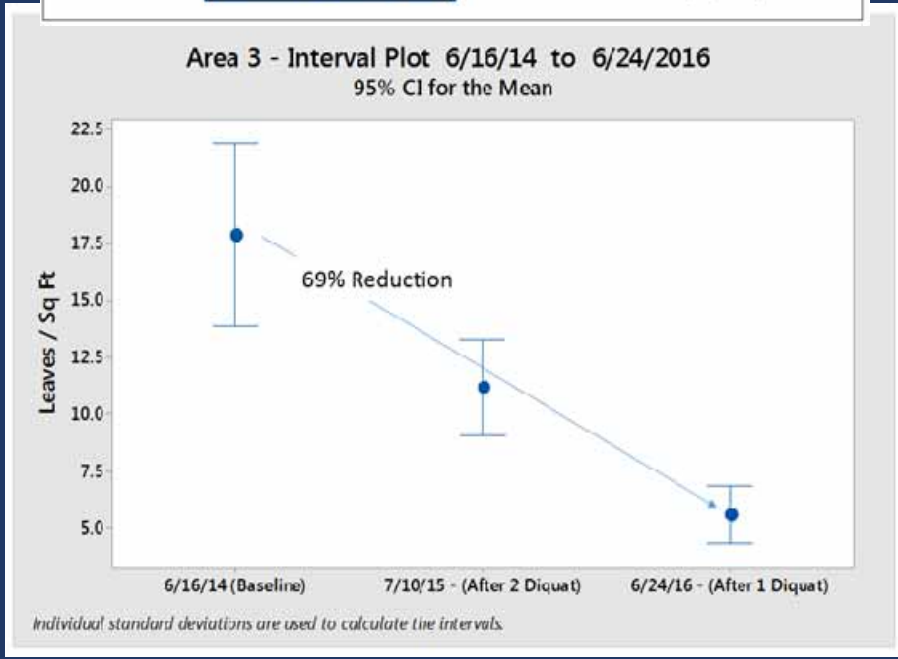


Cumulative Impact of Multiple Year Treatments (Area 3)

- Treatment in 2014 / 2015
- 68% leaf count reduction
- Less than any of the other areas. Most likely due to 2 years of treatment, one of which only had one treatment

(Current research (Madsen) indicates 3 – 5 years of 2 Diquat treatments per year needed to eliminate flowering rush)





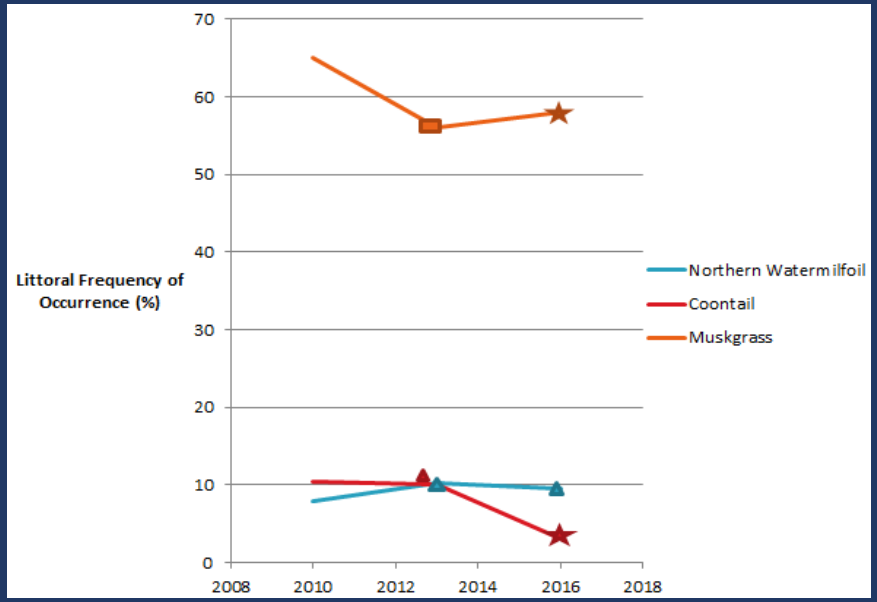
Native plant impacts

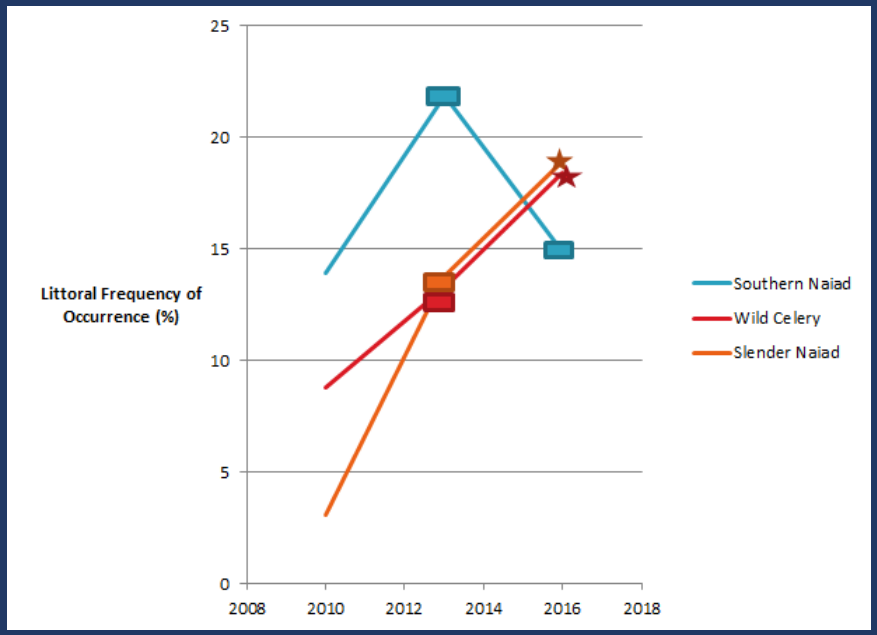
- Native plant impacts not clearly known - not enough subpolygon coordinates in treatment areas.

*** Scattering few points in each sub polygon then combining, won't provide enough useable statistical information on site specific native plant impacts.

- Whole lake plant data collected in 2010 (Springbob and Winn), 2013 (Nordin and Fleming, DNR) and 2016 (Onterra). Graphs provided by Onterra).

- **"Rectangle"** represents statistically valid change from previous survey (triangle means not statistically different from previous survey).
- **"Star"** in 2016 means statistically different from 2010.





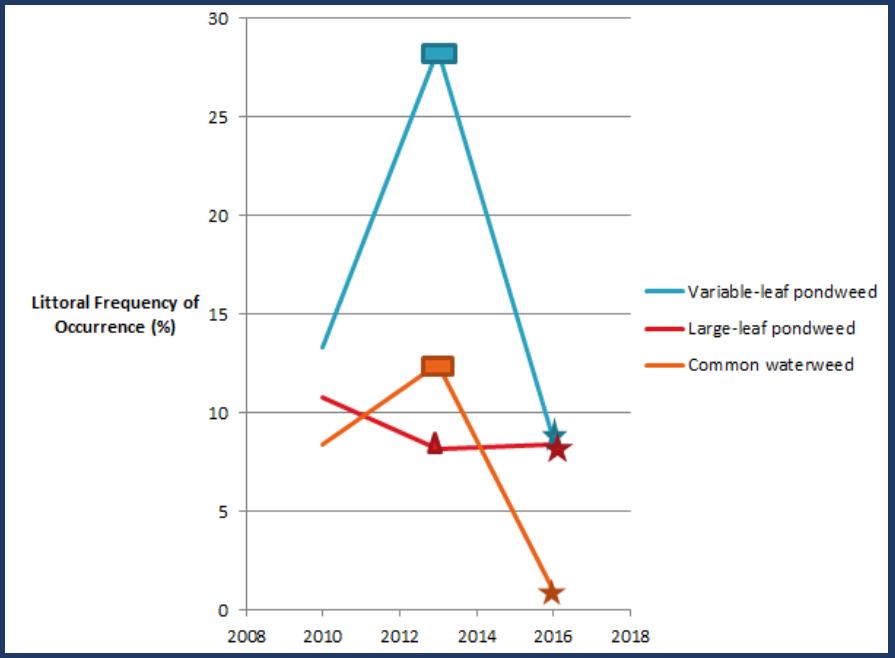
Native plant impacts

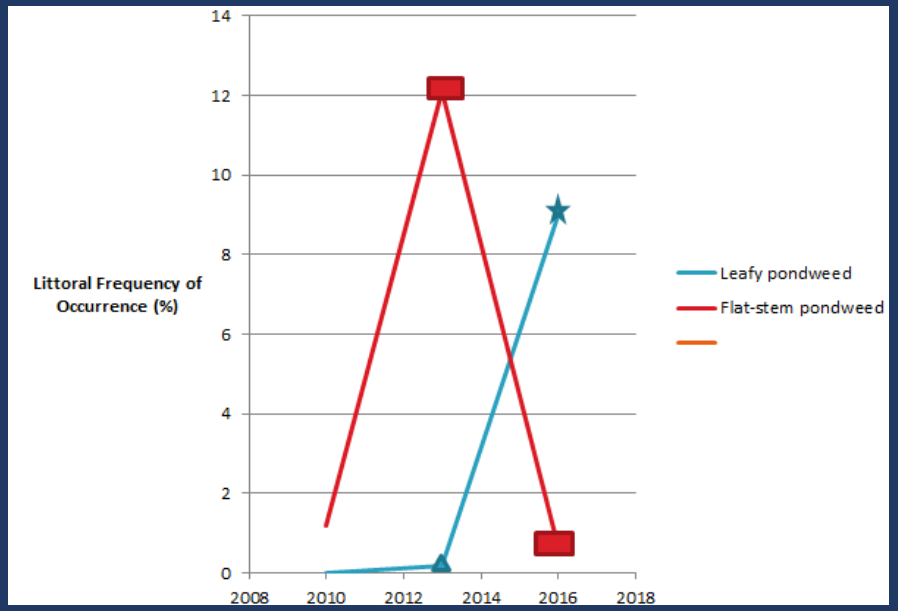
- Native plant impacts not clearly known - not enough subpolygon coordinates in treatment areas.

*** Scattering few points in each sub polygon then combining, won't provide enough useable statistical information on site specific native plant impacts.

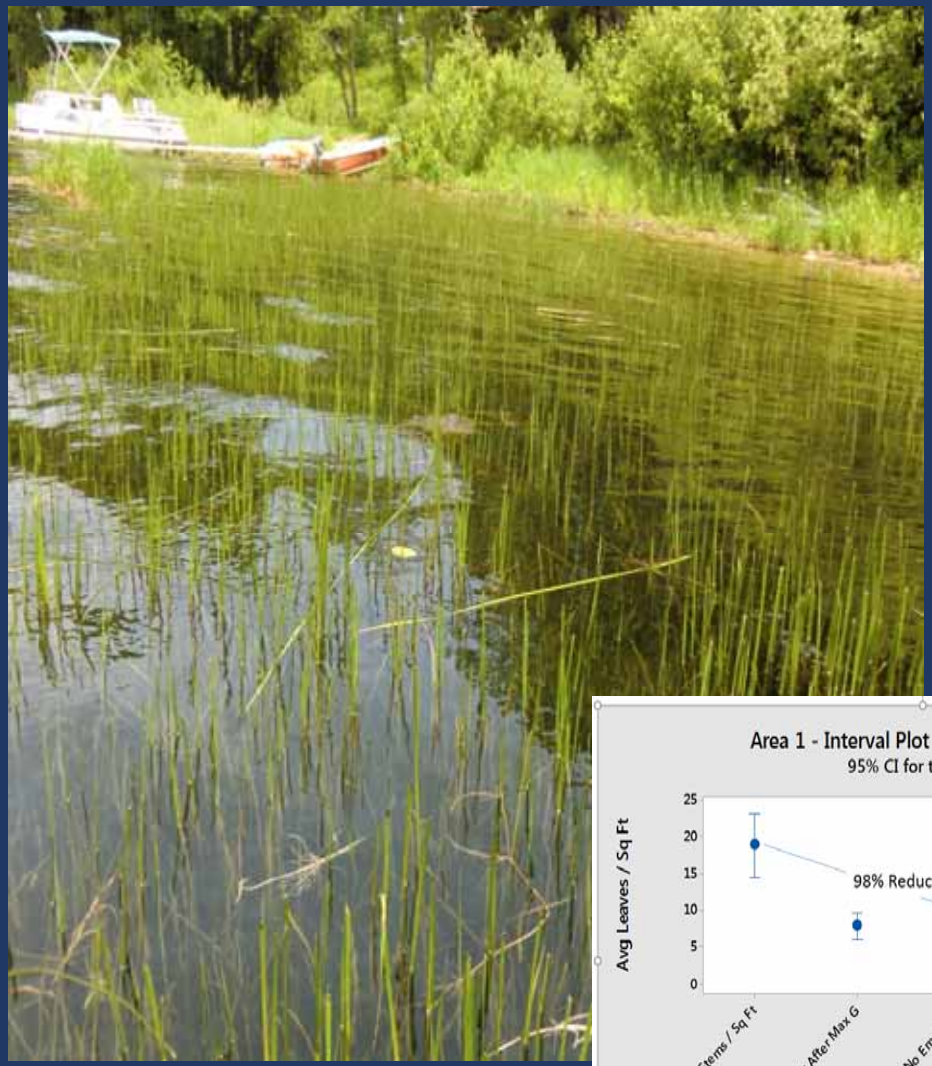
- Whole lake plant data collected in 2010 (Springbob and Winn), 2013 (Nordin and Fleming, DNR) and 2016 (Onterra). Graphs provided by Onterra).

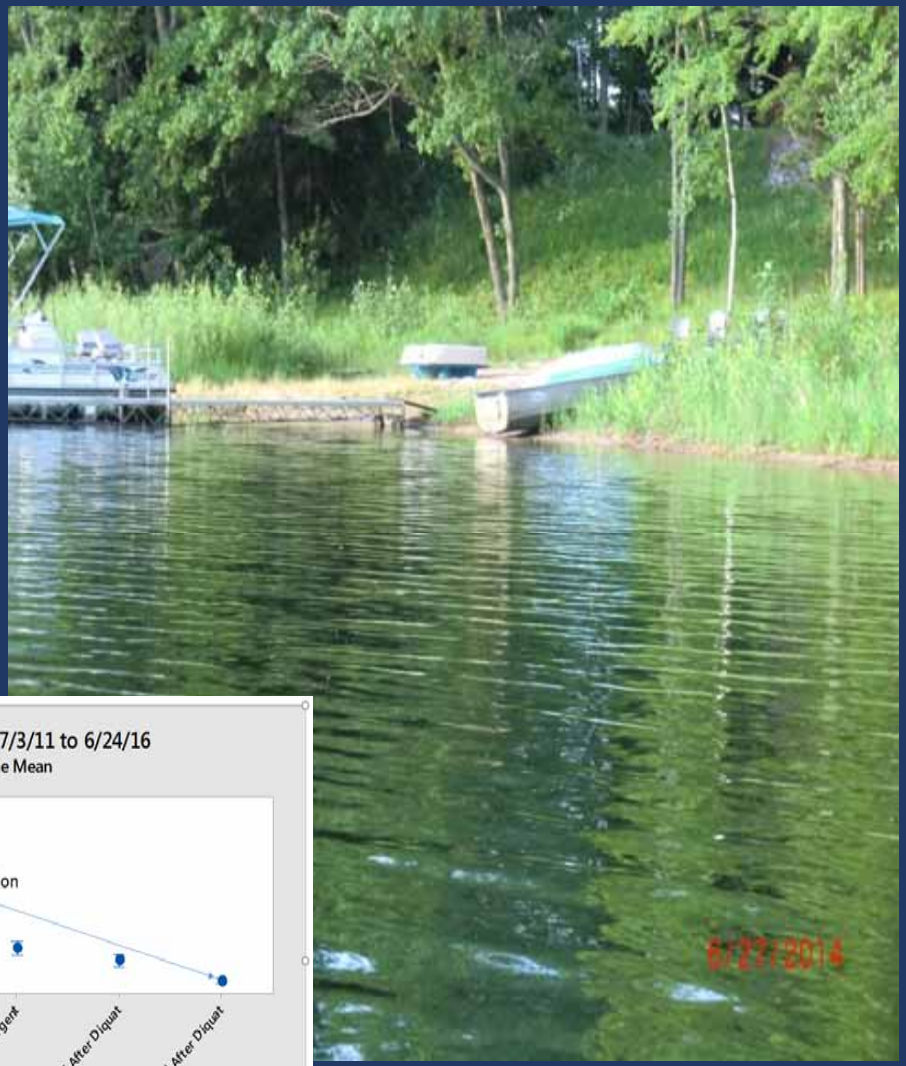
- **"Rectangle"** represents statistically valid change from previous survey (triangle means not statistically different from previous survey).
- **"Star"** in 2016 means statistically different from 2010.

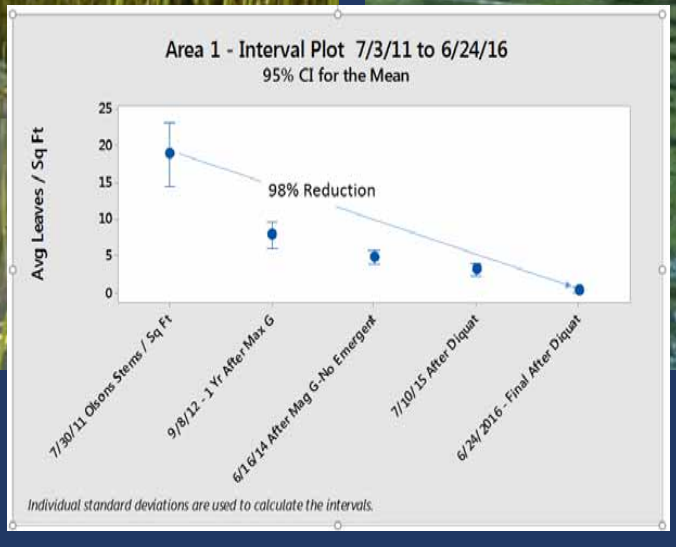




Pre / Post Visual Results (Area 1)







Conclusions

- Renovate Max G (Triclopyr / 2,4D) has potential for long term control of submergent flowering rush.
- Tribune (Diquat) has potential for long term control of both submergent and emergent flowering rush. *(Two yearly treatments (submergent and emergent) of Diquat over a 3-5 year period, similar to Madsen's research)*
- Statistically and visually - chemical treatments significantly reduced Flowering Rush in target areas
- Endothall treatments are inconclusive as maximum allowable concentration was not utilized

Lessons Learned

- Increase survey areas to detect native plant impact (using rake method with subpolygons)

Note: Rake method not used in the Flowering Rush areas as leaves slip through the rake tines.