

What is Alum?

A Case Study on Lake Barrington for Improving Water Quality

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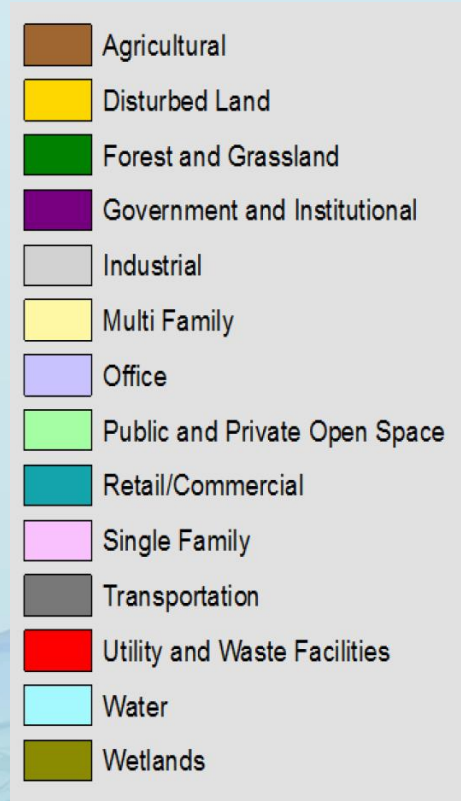
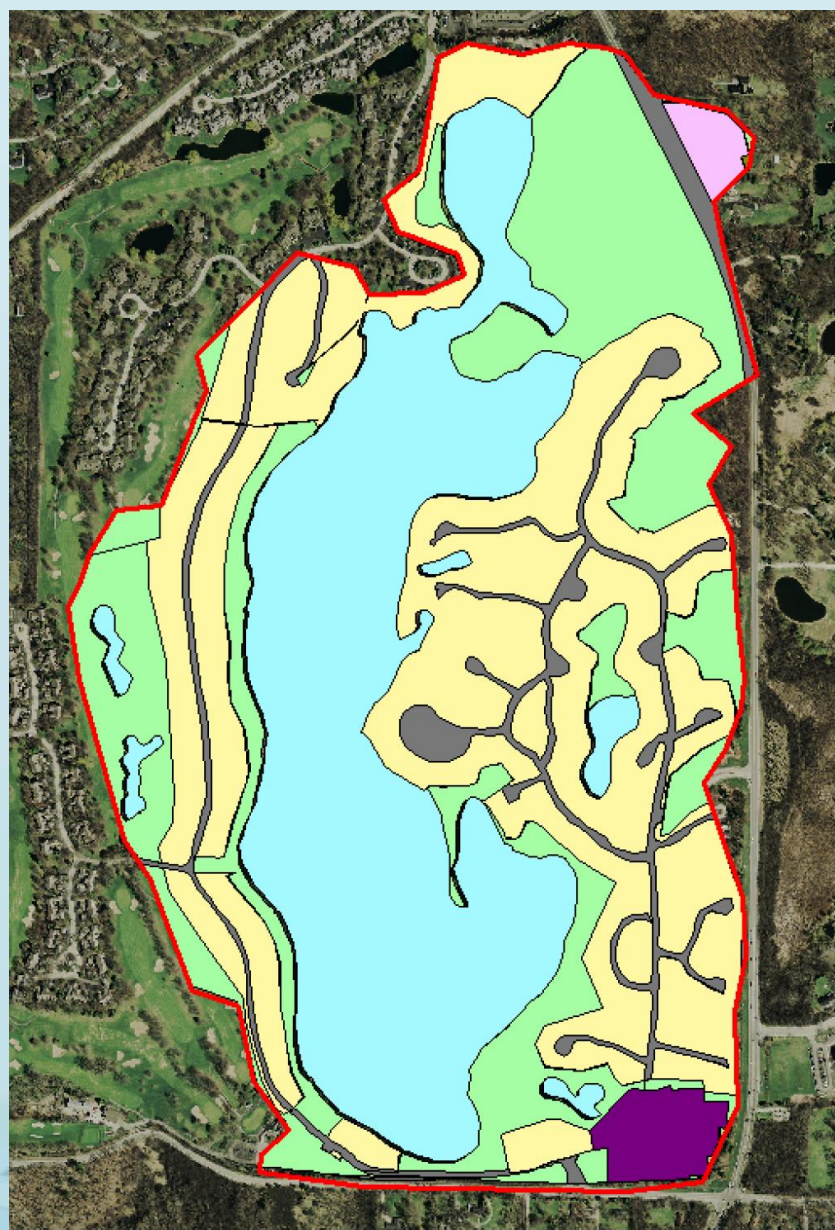


Lake Barrington, IL



- 91-ac in the Village of Barrington
- Mean depth = 5 ft; Max. depth = 20 ft
- Watershed = 291-ac; WS:L area = 3.2:1
- Retention time = 3.5 yrs

Lake Barrington, IL



● 64% of watershed is developed

● 36% undeveloped (open space)

Historic Water Quality



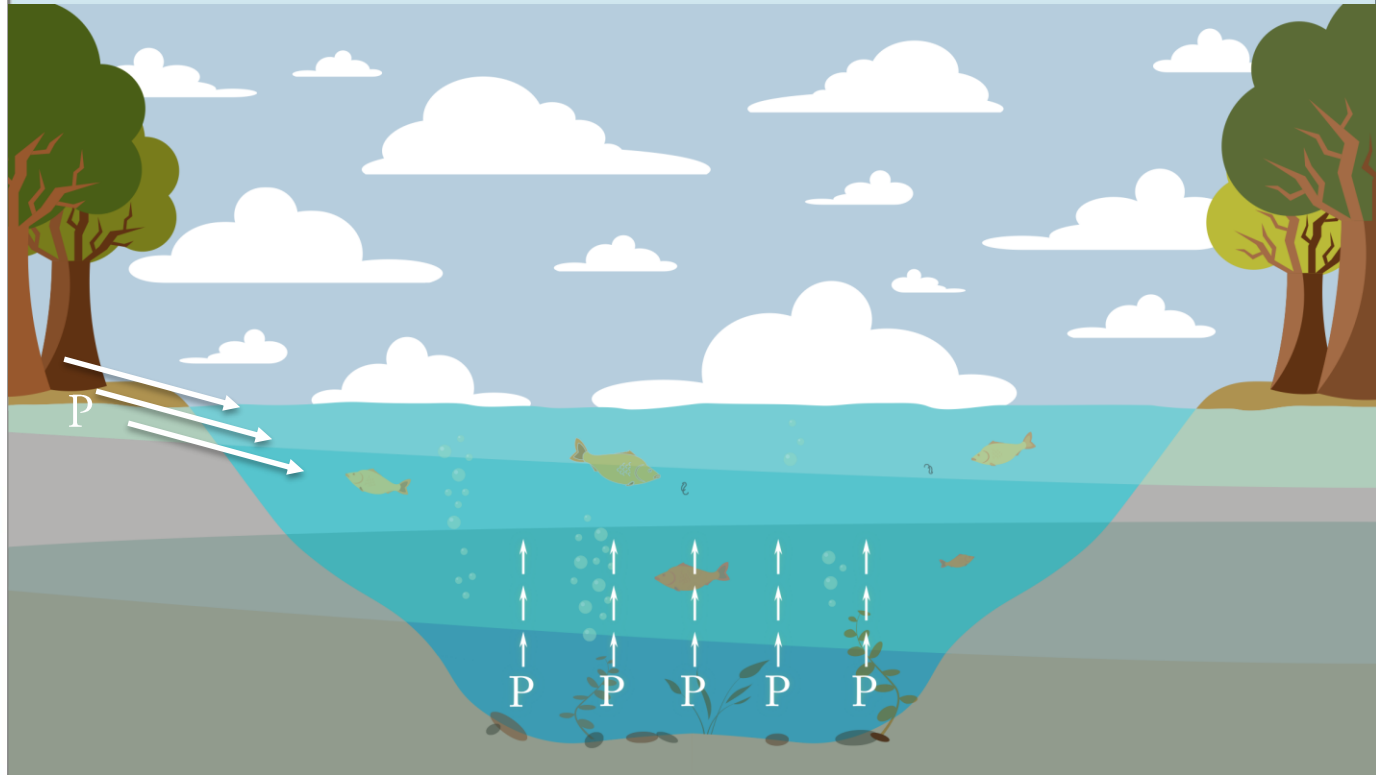
- Poor water quality & Phosphorus impairments
- Algae problems; lake closed in 2013 for toxins (microcystin 635 ug/L)
- Total-P = 60 ug/L (2013), 105 ug/L (2007)
- Secchi disk depth = 5.8 ft (2013)
- Anoxic below 8 ft in late summer

Phosphorus Management Plan (2014)



- Phosphorus identified as the driver of poor water quality & algae blooms
- Internal loading of P from lake sediments identified as a primary source of P
- Aron & Associates recommend an alum dose of 345 gal/ac to reduce internal loading

Sources of Phosphorus in Lakes

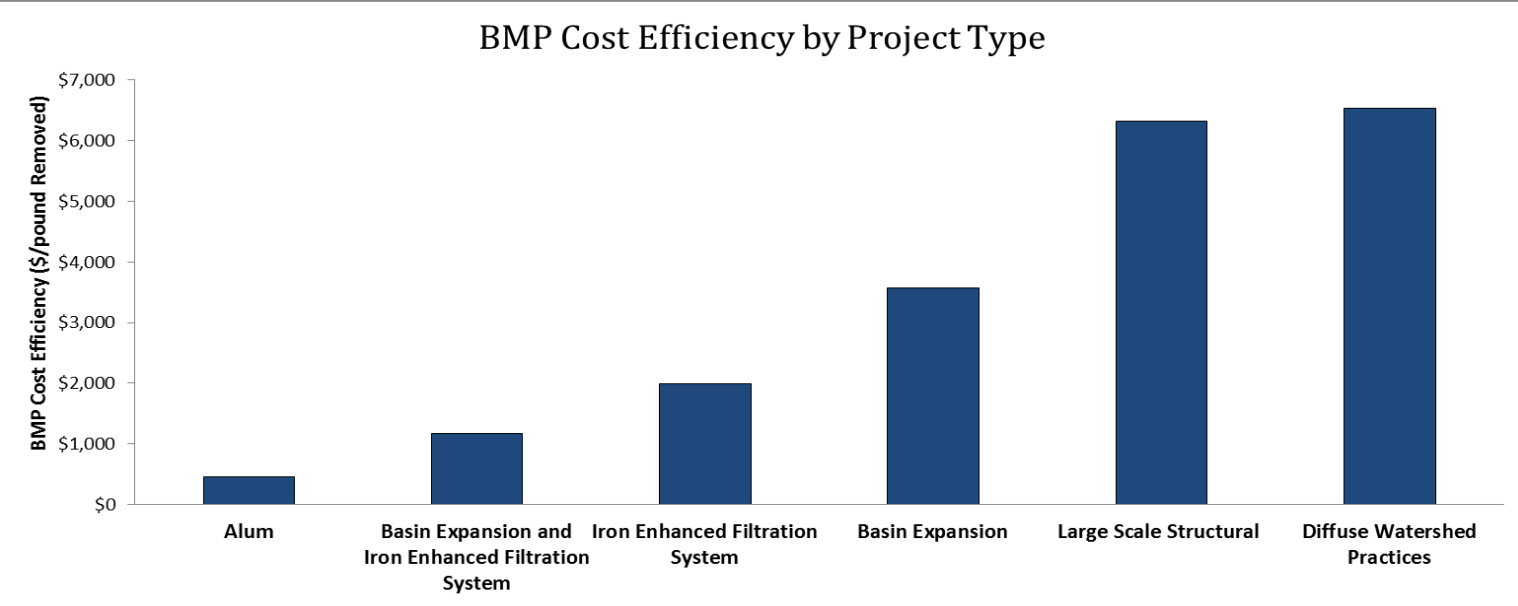


- Recognized the role of internal P loading and the cost effectiveness of alum applications

What is Alum?

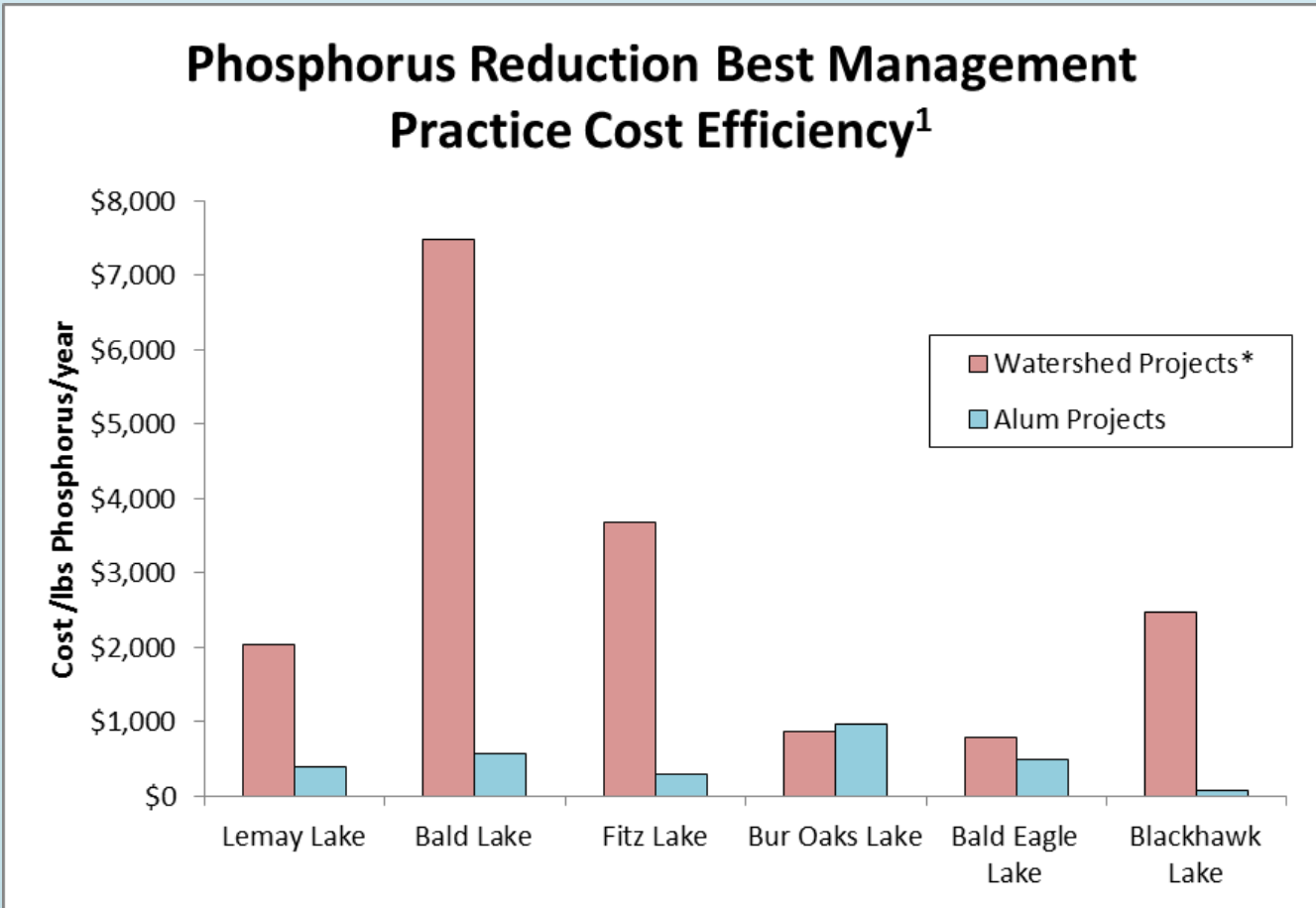
- Aluminum Sulfate (liquid)
 - Dissolves in water to form aluminum hydroxide
 - Aluminum hydroxide is a greenish-white precipitant (floc) that settles
- Permanently binds P in the sediments and intercepts future releases
- Aluminum phosphate complex ($\text{Al}(\text{OH})_3\text{PO}_4$)
 - Very stable in the environment
 - Not sensitive to anoxia (low oxygen)
- Not toxic & safe. Reduces algae by reducing P and limiting growth

Management Cost Efficiency



Blackhawk & Thomas Lake Management Plan (Wenck 2013)
Neighborhood Lakes Management Plan (Wenck 2014)
Bald Eagle Lake TMDL Implementation Plan (Wenck 2010)

Management Cost Efficiency

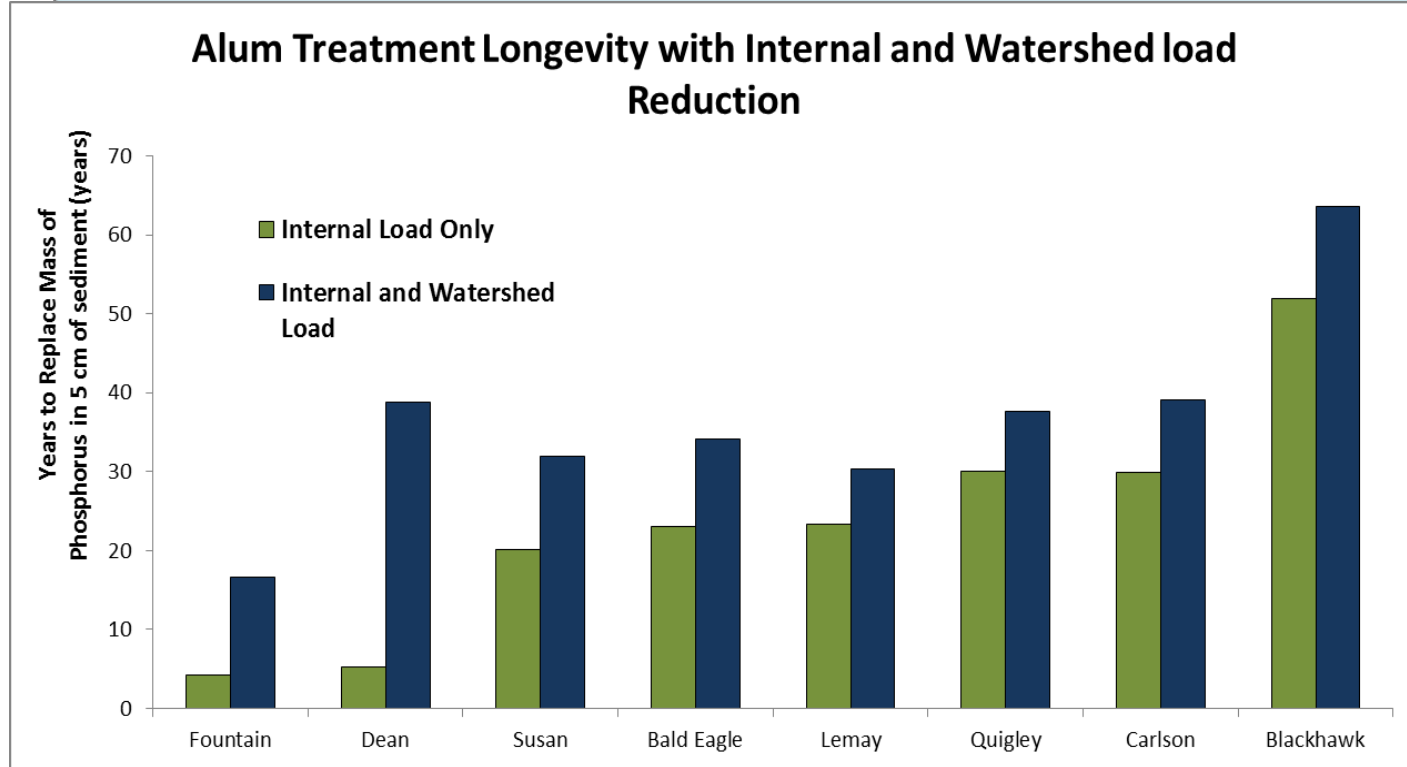


*Average cost of all potential watershed projects
¹Cost Efficiency = cost per pound/year



Blackhawk & Thomas Lake Management Plan (Wenck 2013)
 Neighborhood Lakes Management Plan (Wenck 2014)
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Alum Application Longevity



Lake Barrington Alum Application



- HAB Aquatic Solutions applied 31,424 gal of alum over two days in April of 2015

Application Approach



Application Barge

Application Approach



Coverage Map

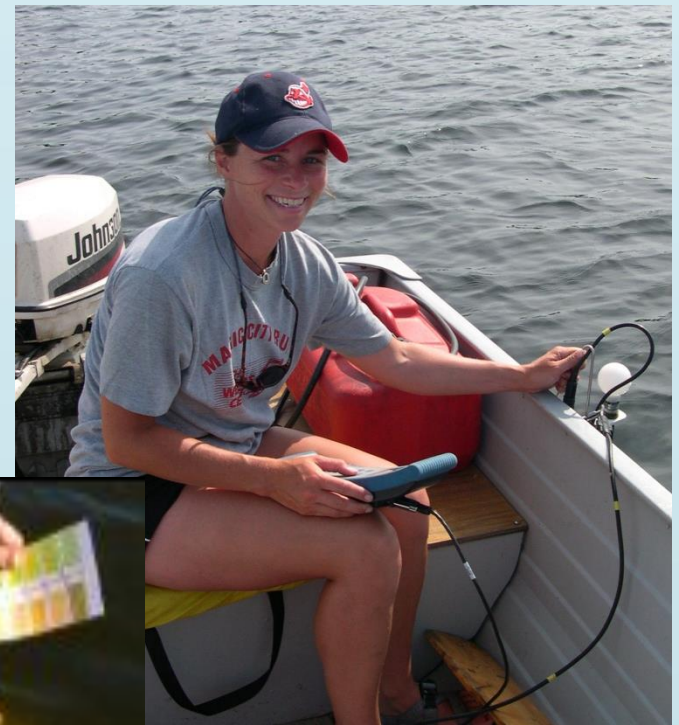
Application Approach



Water Quality Monitoring & Testing

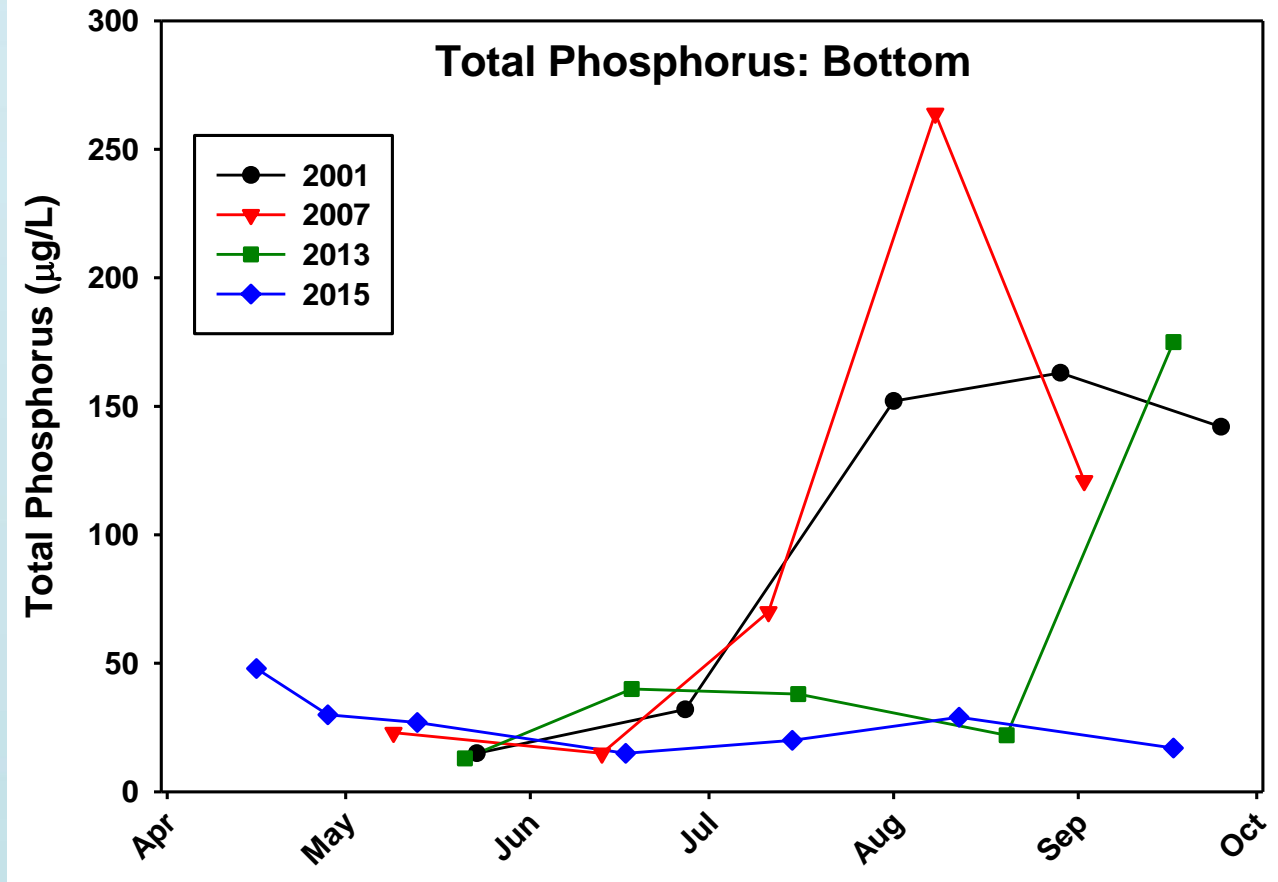


Water Quality Monitoring



- LCHD monitored 2013 pre-alum treatment, 2015 during/post alum treatment
- Lake Barrington volunteers monitored in 2018, through the Volunteer Lake Monitoring Program

Water Quality Results: Total-P

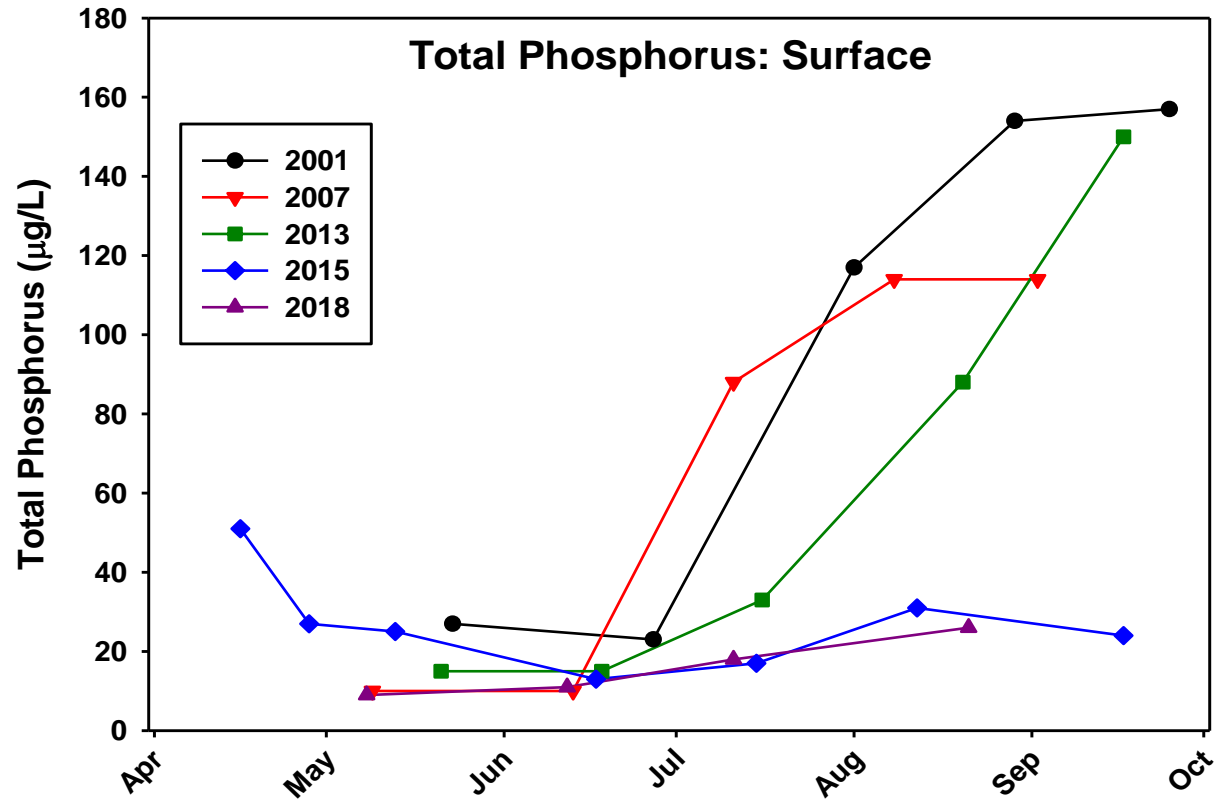


● There were large internal loading events prior to the alum application



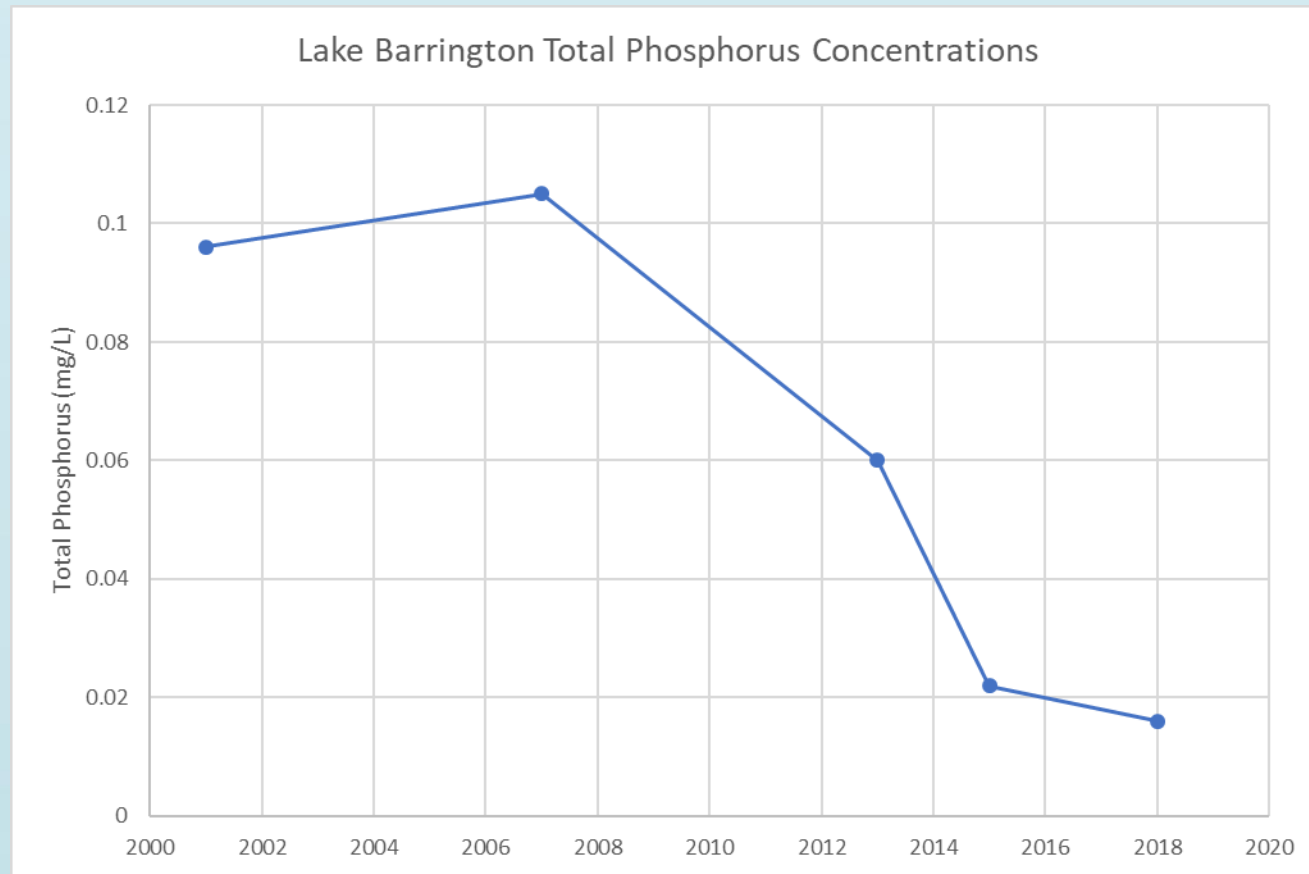
● Alum reduced mean TP near the bottom from 97 ug/L (2013) to 22 ug/L in 2015 (77% reduction)

Water Quality Results: Total-P



- Reduced internal P loading reduced water column TP by 63% (2013 to 2015)
- Mean TP was 60 ug/L prior to alum (2013) and 22 ug/L post alum
- Average (2001-2013) 87 ug/L to 22 ug/L post alum
IEPA TP standard = 50 ug/L

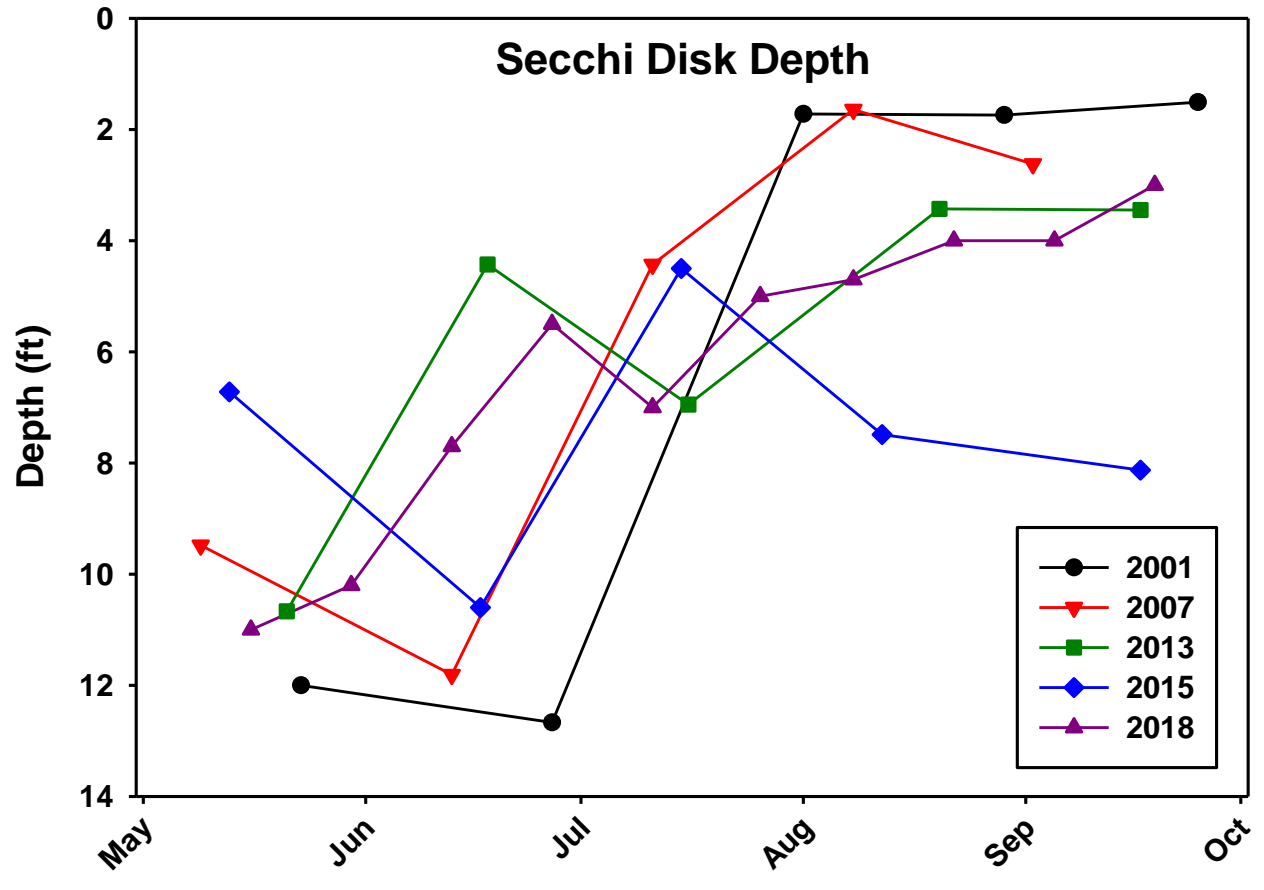
Water Quality Results: Total-P



● Surface total phosphorus remains low, 3 years post treatment



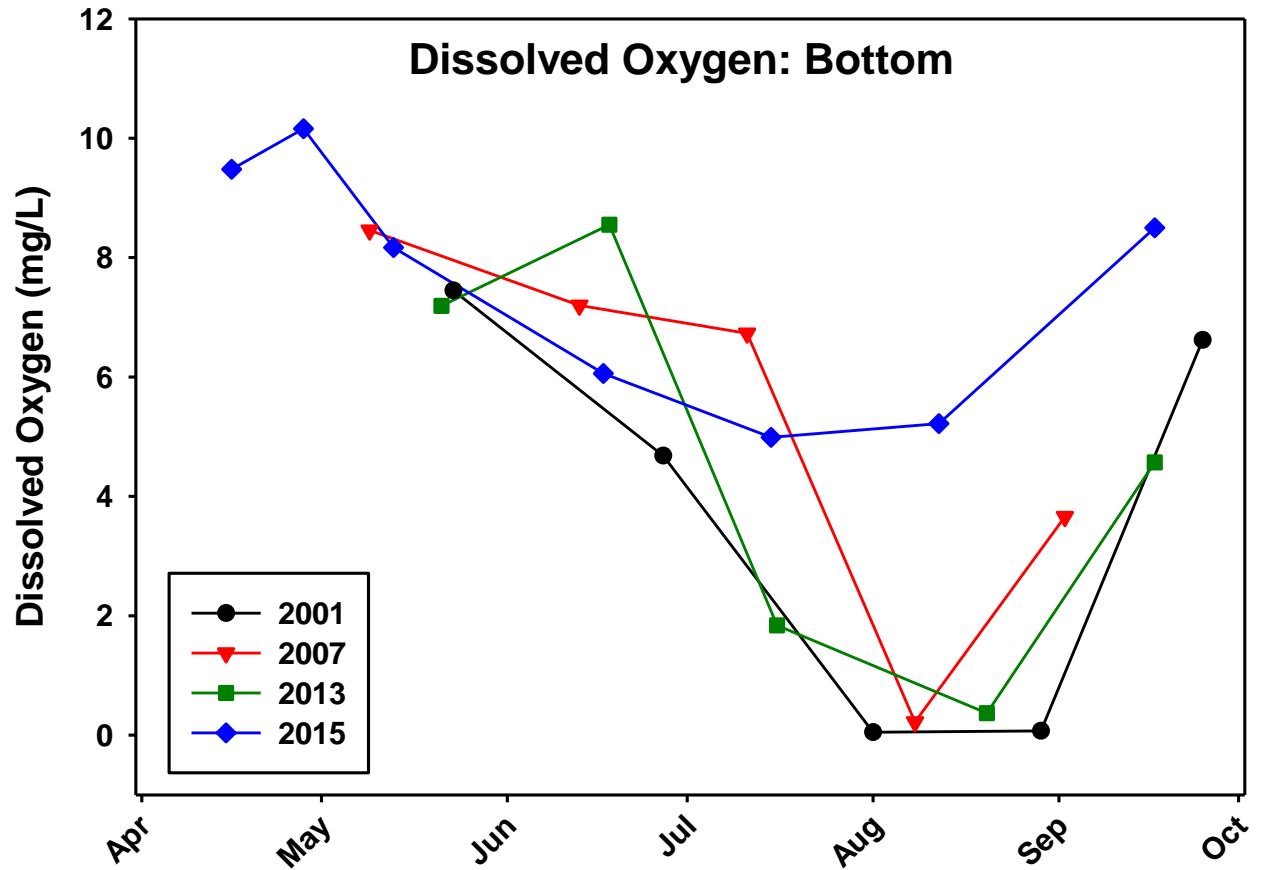
Water Quality Results: Clarity



Water clarity increased by over 1 ft (29%) from 5.8 ft to 7.5 ft after the alum application

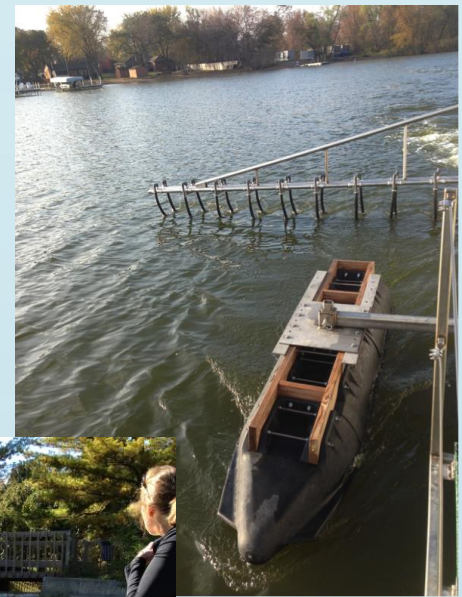
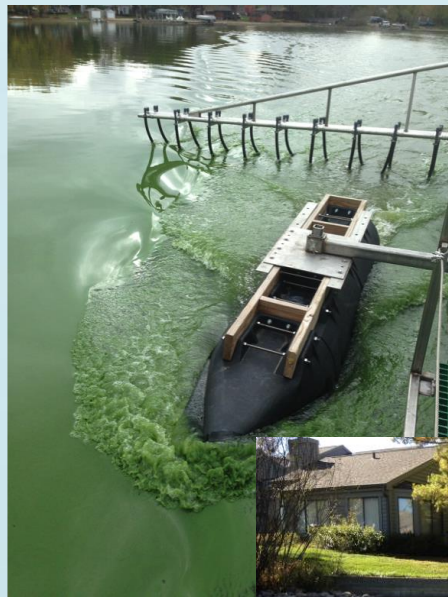


Water Quality Results: Dissolved Oxygen



- Mean dissolved oxygen near the bottom increased by 2.8 mg/L (60%) from 4.4 to 7.2 mg/L after the alum application

Water Quality Results: Algae



- The toxic cyanobacteria blooms that closed the lake in 2013 have not occurred after the alum application reduced TP

Water Quality Results: Aquatic Vegetation

- Curlyleaf Pondweed has increased in the lake post alum treatment. This was expected and the lake association knew they might have had to increase lake treatments for this
- 2018 native pondweeds found growing including 10-14 foot depths



Conclusions

- Alum use integration into Lake Barrington's management program has been successful and cost effective
- TP near the bottom reduced by 77%
- TP in the water column reduced by 63%
- Dissolved oxygen near the bottom increased by 60%
- Secchi Disk depth increased by 1 foot
- Toxic algal blooms have not occurred
- 3 years post treatment TP in surface waters still low.
- Detailed project bid specifications ensure contractor performance



Questions?

www.fishlakealum.com

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www.pintolakealum.com

www.habaquatics.com

