

DOCK SIDE

East Balsam Lake Water Quality

The water in East Balsam isn't clear, we know that. The basin is listed as an impaired water by the Wisconsin Department of Natural Resources for excess algae growth. Studies of East Balsam have demonstrated that it is phosphorus in the water that leads to this growth. Our most recent estimate tells us that 70 percent of this phosphorus is released from sediments at the bottom of the lake. If this sediment (internal load) of phosphorus isn't controlled, we will not be successful in significantly reducing algae growth.

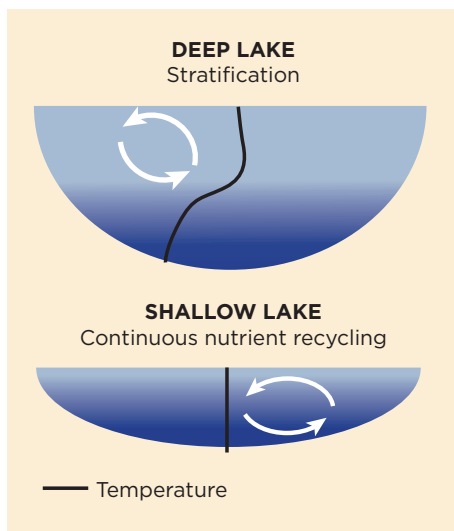
There are few who would argue against trying to lessen the growth of algae in East Balsam. The green swirling, smelly slime of July and August makes it undesirable for swimming, boating, and relaxing by the lake. The toxins that blue-green algae (cyanobacteria) produce can threaten human and animal health.

The Balsam Lake Protection and Rehabilitation District has examined several alternatives for addressing East Balsam water quality concerns. Our 2012 Lake Management Plan set this examination of alternatives for East Balsam in motion. Because lakes are complicated systems and potential fixes are expensive, the BLPRD sought professional advice. The BLPRD commissioners have been guided by studies conducted by Barr Engineering and UW-Stout. Ayers and Associates provided engineering analyses of alternatives in 2014.

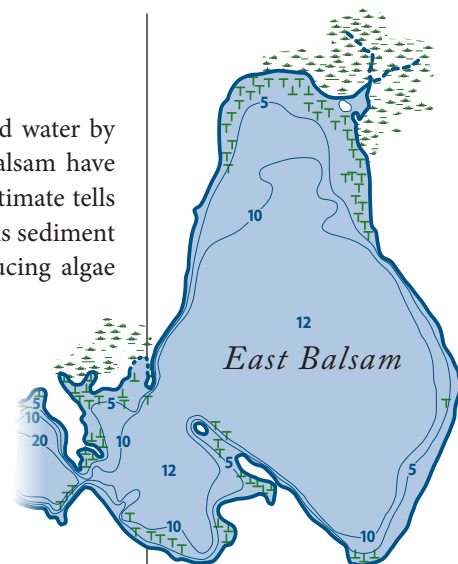
In consideration of alternatives, we need to keep the science and conditions in East Balsam in mind. Of course, we also need to think about the cost of each.

A brief science lesson will help to understand the alternatives considered.

Internal sediment load in East Balsam occurs when the bottom of the lake becomes devoid of oxygen (is anoxic). This happens at depths 10 feet and greater when layers of temperature form, with high-density, cold water at the bottom of the lake. When there is no oxygen at the bottom of the lake, phosphorus is released into the water from its bond with iron and other compounds in the sediment. As long as the lake *stays stratified* in layers, there is not a big impact on the water at the lake surface. However, in shallow lakes like East Balsam, the lake water can mix and break stratification when storms bring heavy rain and strong winds. When this happens, high phosphorus waters are brought to the surface to fuel algae blooms.



Deep lakes stratify into layers. Go to page 3 for a description of lake stratification layers.



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If you attended the annual meeting this year, you know the commissioners have focused on an alum treatment as the most viable alternative to control the release of phosphorus from sediments. You may not be aware of other alternatives considered or the rationale for focusing on alum as the selected alternative.

What are some other alternatives?
Dredging lake sediments. Short answer: dredging is costly. There are also concerns regarding suspension of sediments

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CHAIRMAN'S LETTER



*Tom and Mary Kelly
and family*

While the warm weather season at the lake was a bit abbreviated this year I trust it was enjoyable for all. We were hoping the delayed ice off and hard snow pack from the winter of 2017-18 would benefit the lake in regard to weed growth. In fact it did as we had a significant reduction and delay in growth of our primary aquatic invasive species, curly leaf pondweed.

COMMISSIONERS Heartfelt thank you to past commissioners Ed McGlynn and Ray Sloss for their years of service to the lake and the District. Welcome to our recently elected Commissioners Dick Miller and Andy Wilhoit.

EAST BALSAM The BLPRD Board, having enlisted the help of consultants to qualify the science of East Balsam water quality while monitoring other phosphorous mitigation projects, is developing a plan to reduce the high level of phosphorous in this basin. More information is available in this *Dock Side* regarding this plan.

HEALTHY LAKES 2019 Healthy Lakes native plantings, rain gardens and runoff diversion projects will continue to be partially funded through the District and DNR grant funding in 2019. We have approximately ten slots available in 2019 on a first come first serve basis. Please contact me at 612-508-0879 should you have interest in participating in this program.

HARVESTING A relatively quiet year for harvesting as it pertains to CLP. Navigational harvesting was active as usual and Commissioner Preble and his team were busy with late season CLP as well.

CLEAN BOATS CLEAN WATERS Bumper year in regard to boat and trailer inspections at the four landings we monitor. We continue to allocate more resources to this critical activity. Hats off to Commissioner Mork and his team for a successful season.

LAKE BOTTOM RESTORATION/DREDGING We continue to pursue permitting for dredging Forest Circle, Pine Island and Raskin Bays. Ayres Engineering has been engaged to assist the district in obtaining the permits and completing the project plan. The objective for lake bottom restoration/dredging these bays is to reduce high levels of phosphorous-laden sediment while increasing the water volume to improve navigation and water quality.

Thank you to my fellow Commissioners, their team members and our lake shore owners for their commitment and contributions to the lake and the Board. Without the contributions by all the programs we facilitate for the lake's wellbeing would not be possible. **—Tom Kelly**

**Balsam Lake Protection & Rehabilitation
District Commissioners**

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www.blprd.com

Contact us

Please contact the commissioners with any questions, comments or concerns you have. Commissioners meet on the third Saturday of the month, starting at 8:30 a.m. at Polk County Business Center, lower level conference room. You are welcome to attend the meetings.

Meeting Schedule

2018	2019		
November 17	January 19	May 18	September 21
December 15	February 16	June 15	October 19
	March 16	July 20	November 16
	April 20	Annual meeting Unity High School	December 21

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and nutrients into the water column, removal of aquatic plants which provide habitat, and finding a nearby disposal site. Dredged lake sediment from 300 acres of East Balsam would cover a land area of 160 acres to a depth of 6 to 12 feet!

Aeration. This is where it is important to understand lake science. An aeration system is intended to prevent the lake bottom from becoming devoid of oxygen and releasing phosphorus. Recall that iron releases its bond with phosphorus when there is no oxygen. The reverse is also true. Iron is needed to bind with phosphorus when there is oxygen present.

In order to prevent algae growth, an aeration system must be fully effective, allowing no areas to become devoid of oxygen. If only partially effective, an aerator can make the situation worse by weakening stratification and allowing phosphorus-rich waters to mix to the surface. Furthermore, there also must be iron in the water column to bind phosphorus when oxygen is present.

An aeration system installed in nearby Cedar Lake was found to make lake quality worse in a recent study. There were two reasons, as described in the Cedar Lake Management Plan:

1. The lake mixed frequently, bringing phosphorus to the surface in 2011. Therefore, when combined with the limited ability of iron to bind with phosphorus in the water column, the aerator actually increased phosphorus loading from lake sediments.
2. Like Cedar Lake, East Balsam has low iron levels in the water column. If not designed appropriately, aeration could also lead to periods of low oxygen followed by regular mixing—a recipe for even higher amounts of phosphorus and algae growth.

New East Balsam Outflow

Water in East Balsam takes about two years before it flows out of the lake. There are no practical, cost-effective options to increase the flow into and out of East Balsam. (You need to have more water come into the basin in order for more water to flow out.) Ayers and Associates examined alternatives to increase flow to East Balsam from Stump Bay, Harder Creek, Otter Creek, and/or Lower Rice Creek via systems of weirs, pumps, and pipes. Each option was deemed infeasible and extremely costly with not enough water available to effectively improve water quality, a minimum cost reported at \$50 million, and potential negative impacts on the rest of Balsam Lake.

Reducing Runoff from Homes and Farms

It is important to address the runoff of phosphorus from the watershed or land area that drains to East Balsam. The BLPRD has worked with the Polk County Land and Water Resources Department to examine agricultural lands in the watershed in an attempt to identify mitigation projects. Homeowners are encouraged to plant buffers of native vegetation along the shoreline and add projects such as rain gardens to capture runoff before it goes to the lake. Financial and technical assistance is available for these projects. Reducing the phosphorus load from the watershed, or external load, will help to increase the longevity of the selected alternative to reduce the internal load. However, lake studies tell us that watershed reduction alone will not lead to significant water quality improvement.

What do we know about alum?

Alum (aluminum sulfate) is added to the water, forming a floc which settles to the lake bottom. It removes phosphorus from the water column, but more importantly, covers bottom sediments and prevents release of phosphorus under anaerobic conditions. Alum has been shown to be safe for fish and other living things as long as the acidity of the lake is closely monitored during application. Buffered alum is recommended for East Balsam if higher doses are applied to ensure that pH levels stay in the neutral range.



An algae bloom at East Balsam, summer, 2016.

Lake layers...

Lake stratification is the separation of a lake into three layers of temperature:

Epilimnion, top-most layer of the lake is exposed to wind, atmosphere and sunlight.

Metalimnion (or thermocline), is the middle layer.

Temperature can change with depth throughout the day.

Hypolimnion, the bottom layer of a stratified lake, is typically the colder layer in summer and the warmer layer in winter.

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Comprehensive study of East Balsam sediments and lake conditions tell us that areas ten feet and deeper would need to be treated at a rate of 100 grams per square meter. To maximize alum binding efficiency, the alum dose would be divided over a number of treatments. There are options for dividing the dose, and availability of funds can play a role in the dosing decision. The rate and timing of application would ultimately be influenced by monitoring results.

Effective binding of phosphorus in lake sediments is predicted to result in significant water quality improvements and the ability to remove the basin from the impaired waters list. Lake clarity is predicted to improve throughout the growing season by an average of about 3 feet following an alum application.

There is a cost for this improvement in lake water quality. The total application cost to reach the full recommended dose is estimated at approximately \$1.4 million for three treatments. Follow-up treatment will likely be needed in 15-20 years. There will also be additional investment in monitoring at a cost of about \$15,000 annually. Wisconsin Department of Natural Resources grants of up to \$200,000 are available on a competitive basis to fund a portion of the cost of alum application. It is possible to receive multiple grants over the life of the project. Grants can also support two-thirds the cost of monitoring. Updates to the Balsam Lake Long Range Plan will be needed to qualify for grant funding.

A committee of lake residents and board members will be meeting and examining options for the alum application and funding in more detail during spring and early summer, 2019. The committee will bring its recommendations to the 2019 Annual Meeting. The recommendations can be used to amend the Balsam Lake Long Range plan to qualify for WDNR grants. Approval is needed at the BLPRD Annual Meeting for the alum treatment to proceed. ●

If you are interested in participating in the alum committee, please contact one of these BLPRD commissioners:

**Andy Wilhoit, Andy@Wilhoit.org, 651-402-5003, or
Dick Miller, dmillerfinancial@msn.com, 651-587-4191**

Sources:

- Ayres Associates. *East Balsam Lake Water Quality Study. Feasibility of Engineered Solutions for Summer Algae Blooms*. March 2014.
- Barr Engineering. *Balsam Lake Water Quality Study*. 2011.
- *BalsamLakeReportWaterQualityStudy.pdf*. <http://www.blprd.com/docs/2011>.
- Harmony Environmental. *Balsam Lake Long Range Plan*. August 2012.
- James, William F. *East Balsam Lake, Wisconsin: Analysis of Phosphorus Sources, Loading Reduction Scenarios, and Alum Dosage and Application Strategies*. May 2018.
- James, William F. University of Wisconsin Stout Sustainability Sciences Institute – Discovery Center. *Internal Phosphorus Loading and Alum Dosage Considerations for East Balsam Lake, Wisconsin*. December 2015.
- Wojchik, Eric. Polk County Land and Water Resources Department. *East Balsam Lake Watershed Soil Fertility and Phosphorus Index Assessment*. July 2015.

Learn more
about algae, blue-green
algae and other lake topics
at the WI DNR website:
dnr.wi.gov/lakes/topics.

Adapting to meet the challenge

by Rod Preble

Harvesting in 2018 on Balsam Lake again focused on curly leaf pondweed. On May 21, 2018 Matt Berg, Endangered Resources Services, conducted the spring CLP bed survey and reported the CLP was 1-2 feet tall and spread sparsely throughout the four main beds in East Balsam. There wasn't much to be found, due in part to the late ice out and rapid lake water warm up, he determined. Considering this, along with the emergence of native plant growth, we decided not to spray CLP in East Balsam in order to prevent damage to native aquatic plants.

This meant we needed to harvest approximately 50 acres of CLP in East Balsam along with our permitted 80 acres in the west basin. CLP growth was sparse throughout the entire lake but was present in all monitored areas.

In 2017, Matt Berg suggested we test a fall CLP harvest of Bed 12 in East Balsam. We did this fall CLP harvest in August of 2017 and picked up a fair amount of CLP along with some native plants.

In his *Fall, 2017 Turion Count Report* Mr. Berg stated: "Interestingly, when a late-season mechanical harvest was coupled with the herbicide treatment in Bed 12, there was a greater than expected drop in the number of turions. Continuing this strategy in all the beds during either July or August may help eliminate the 'second crop' of CLP we have observed in the shallower parts of these bays and hasten the overall decline in surviving turions."

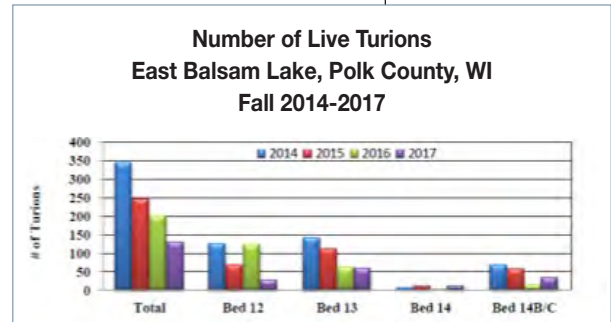
Spraying CLP in East Balsam along with fall mechanical harvesting is making a difference.

We can expect similar results throughout the entire lake using this Spring and Fall harvesting technique in all the CLP Beds.



Curly leaf pondweed

	2017	2018
Days of harvesting	22	21
Hours of harvesting	203	164
Harvester loads	89	48.5
Truck loads	42.5	24
Total volume	40,050 cu. ft.	21,825 cu. ft.
Total weight	653,705 lbs.	356,233 lbs



As expected, it took almost as much time to cover all required areas but with greatly reduced volumes. We look forward to the fall, 2018 turion count in anticipation of seeing a continuing decline in CLP.

For 2019 and going forward our spraying and harvesting plans will be a combined plan:

- Continue fall turion counts in East Balsam (October);
- Continue spring CLP bed monitoring in East Balsam (May);
- Spray CLP in East Balsam whenever possible (late May-June);
- Focus early Harvesting to target CLP beds in West Basin and East Balsam if needed (June);
- Harvest navigation lanes as allowed, approximately 7 acres (late June-September).
- Harvest all CLP beds *second crop* in both East Balsam and West Basin. (August-September)

We have two effective tools to combat CLP in our lake and we will continue to use them both as effectively and efficiently as possible going forward. ●

Get ready for Healthy Lakes 2019

by Tom Kelly

The BLPRD along with funding assistance from Wisconsin DNR will once again be affording lake shore owners the opportunity to reduce runoff from their properties in 2019. Water runoff is one of the primary sources that add phosphorous and other nutrients to the lake that negatively impact water quality.

We have funding for approximately ten projects available on a match basis where the lake shore owner pays 25 percent of project costs and the BLPRD/WDNR pays the remaining 75 percent not to exceed \$1,000 per project.

We have a professional consultant to assist you in identifying opportunities at your property to reduce runoff by using Healthy Lakes practices.

Eligible projects are native plantings, rain gardens and diversion practices. More information can be found at healthylakeswi.com.

Please call Tom Kelly at 612-508-0879 if you have an interest in participating in this effort to improve the water quality of our lake.



Learn more about
Healthy Lakes
practices at
healthylakeswi.com

Native plantings at the shore reduce runoff to the lake and also help improve wildlife habitat, natural beauty and privacy.

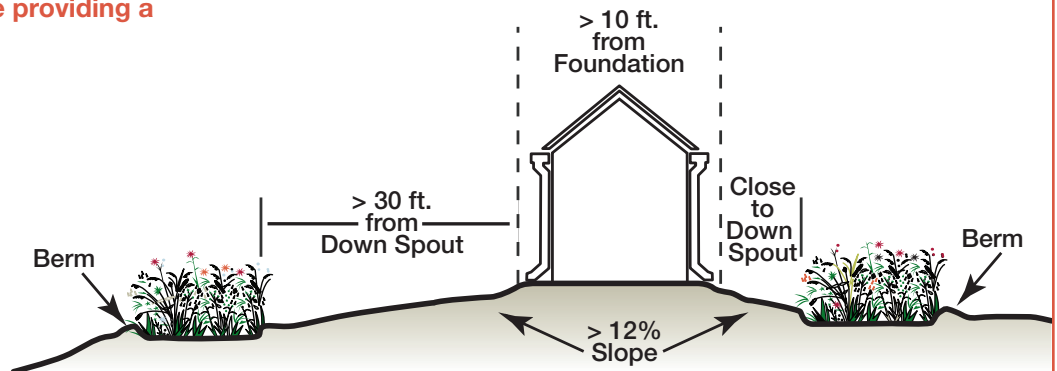
The deep roots of native plants help water soak into the soil, reducing runoff and erosion.

A native planting at Sheryl Holmgren's property on the Mill Pond.



Rain gardens multi-task—they improve habitat and filter runoff while providing a naturally beautiful view.

Rain gardens are landscaped shallow depressions with loose soil planted with deep-rooted native grasses and flowers. Runoff from roofs, pathways and driveways can be directed to a rain garden to soak into the ground rather than flow to the lake. Rain gardens are generally designed to drain within 24 to 48 hours.

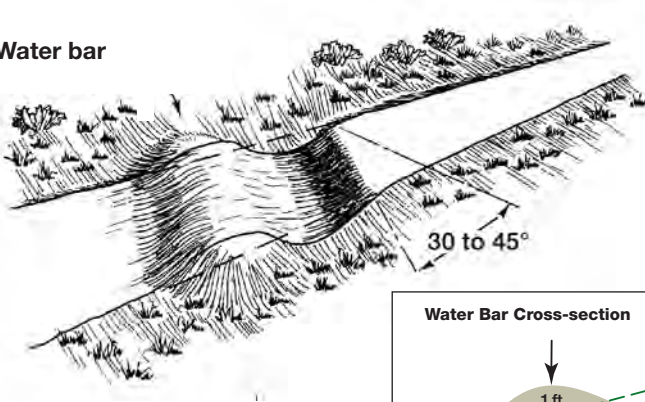


Diversion practices prevent runoff from getting to the lake by directing water to areas where it can soak into the ground instead.

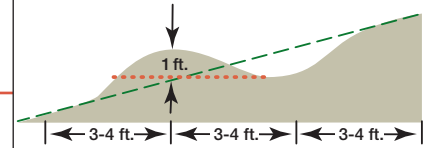
Diversions may be used in connection with rock infiltration or rain gardens. Diversions include pipes, berms, trenches, and water bars.

A water bar in combination with a diverter and broad-based dip can redirect water flowing downhill to a natural, well vegetated area or an infiltration practice like a rain garden or rock trench.

Water bar



Water Bar Cross-section



A native planting at JoAnn Hajek's property on the Mill Pond.



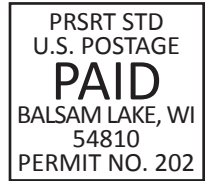
In rain gardens or native plantings, New England aster and big bluestem grass provide fall color when other plants have already finished blooming.

Cardinal flower is a popular choice for native plantings; the flowers attract hummingbirds.



DOCK SIDE

Balsam Lake Protection & Rehabilitation District
P.O. Box 202
Balsam Lake, WI 54810



Clean Boats Clean Waters



Once again this year's monitoring of the boat landings was spearheaded by Terry Morton. Our crew was seasoned and all had worked at least one year in the past, with some as many as four years. All went to training class a week ahead of starting to work at the landings.

Our objective is to monitor the boat landings to achieve our goal of preventing invasive species entering our lake, primarily Eurasian water milfoil and zebra mussels. Monitoring began on May 5th and ended on October 3rd, and covered approximately 40 fishing tournaments during that time.

We had people at all four landings:

- 46 Store landing from 6:00 AM to 6:00 PM, five days per week;
- Town Bay landing 6:00 AM to 6:00 PM, five days per week;
- Little Balsam landing, three days per week from 6:00 AM to 10:00 AM, Saturday and Sunday from 6:00 AM to 2:00 PM;
- East Balsam landing, three days per week from 6:00 AM to 10:00 AM, Saturday and Sunday from 6:00 AM to 2:00 PM.

Swans at sunset

In addition there was a total of:

- 1,088 monitoring hours at the Village Beach public landing in town;
- 1,928 hours at the access off Hwy 46 (next to the 46 Store);
- 543 hours at the East Balsam landing; and
- 429 hours at the landing in Little Balsam.

We also surveyed over 4,000 individuals in regards to the location of their watercraft in the past five days as well as their willingness to cooperate with having their boat inspected. There were a few we had to ask to leave and clean their boat before entering the lake, but all-in-all there were no issues. ● —Bill Mork

