

Golden Brown Benthic Algae (GBA): Responses to FAQs

By Becky Norris, Rick Doornbos,
Trish Narwold and Dean Branson

What is Golden Brown Benthic Algae?

Golden Brown Benthic Algae (GBA for short) is algae, mostly of the diatoms family of organisms that grow on near-shore sand and rocks. Our 2015 investigation discovered about 140 different species of diatoms in these assemblages of GBA. Eight of the species had not previously been reported in the scientific literature. Each diatom consists of cellular material encased in glass-like silica shells or valves. Diatoms contain photosynthetic pigments (chlorophyll a or c) as well as a brown pigment (fucoxanthin) and yellow beta-carotene, which give them their characteristic color. Diatoms are at the bottom of the food chain. Diatoms derive energy from the sun through photosynthesis, which converts carbon dioxide into sugars, liberates oxygen, and serves as a food source for zooplankton and aquatic animal larvae.

Where is GBA found?

GBA is native to the local environment; it is not an invasive species. Some diatom species can be found in sand, on sand and rocks, and in water as well as in damp soil and may even grow in non-aquatic locations that remain damp (such as



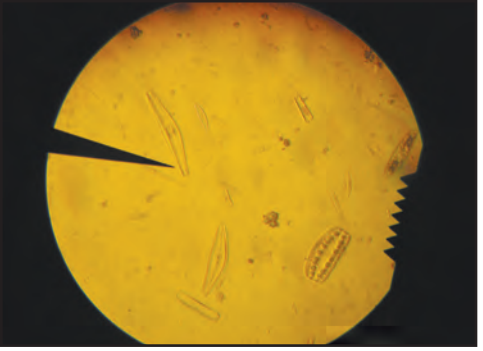
bark on certain trees). Diatoms in soil can be carried into the air by wind and serve as the condensation points for water vapor, resulting in spread through rainfall.

Is GBA toxic or otherwise harmful?

The forms of diatom species in Torch Lake are not toxic. Other microbial species, including cyanobacteria, can produce toxins, which is an issue of concern with the algae blooms in Lake Erie. Some species of diatoms develop a symbiotic relationship with some species of cyanobacteria.

Symbiosis means that each type of organism helps the other type of organism. To date, we have not found

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The mission of the Association is to provide leadership to preserve, protect, and improve the environmental quality of the Elk River Chain of Lakes Watershed for all generations with emphasis on Lake Bellaire, Clam Lake, Torch Lake and their tributaries.





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President's Message

Greetings to all,

The summer of 2016 promises to be very full and very exciting!

At TLA's March Board meeting, it was announced that we already had three excellent interns lined up for the summer. We had only one more slot to fill. To put that into perspective, we normally don't start publicizing the program and actively recruiting interns until April. This much of a head start to the program is very encouraging. Adult volunteers are always needed. If you can offer some time, or the use of a boat, or skill at mentoring, or knowledge of report-writing, or anything to support our interns in their learning, you are welcome. Please do contact us and offer your help (contact info given below).

The 2016 phase of the Golden Brown Algae study will include an expansion of the area under investigation, to include Clam Lake and Lake Bellaire; there will also be some repeating of last year's sampling in order to confirm reproducibility of our results.

Keep in mind that 2016 marks fifty years of the Three Lakes Association's environmental stewardship of our region's fine lakes and streams. Be sure to mark your calendar for the gala celebration of this significant milestone, to be held August 11 at Shanty Creek. A main focus of the event will be to look twenty-five years into the future. Of course, we will celebrate where we've been and what we've accomplished in the last fifty years, but we also want to think about where we will be and what we need to accomplish in the

next twenty-five years. If you are a person who would enjoy helping with this celebration, be sure to contact us by phone (231-544-7221), or by email (info@3lakes.com); or visit our website (www.3lakes.com) and fill out the volunteer form. Sandy Gourley is chairing this event; she will know what jobs still need willing hands to help.

Some things are ongoing and may not get the attention they deserve, such as the now decades-long water sampling program that provides data for the long-term monitoring of the health of our waters. The volunteers who keep this program going cannot do so forever. If this is a passion and concern of yours, please do offer a few hours of your time (contact info above).

This will be the fifth and final year for the collaborative Fish Shelters program. There remain a half-dozen or so fish shelter sites to be completed. Here is another opportunity for you to volunteer, if this is a project that has caught your attention (contact info above).

For the past fifty years, TLA has striven to bring science-based information to the people of our communities, and to provide sound environmental education to both young and old, with the mission "to provide leadership to preserve, protect, and improve the environmental quality of the Elk River Chain of Lakes Watershed for all generations with emphasis on Lake Bellaire, Clam Lake, Torch Lake and their tributaries." If this speaks to your passions, please join us!

Tina

Welcome!

New Members

Randal and Jodi Balconi
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Collin & Amy Callaghan
Mitchell & Lori Clauw
Rick & Sandra Doornbos
Gunn Family Torch Lake Cottage
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evidence that the cyanobacteria associated with the GBA in our area are toxin-producing.

One “harm” being produced by the GBA is that the yellow-brown color of the diatoms coating the lake floor is causing the “Caribbean-blue” appearance of Torch Lake to change into an off-green, a most unwelcome aesthetic change for those who love this area.

What is causing the increase in recent years?

People have speculated as to the reasons for the increased amount of GBA seen in this region in the past several years. Among the most likely possibilities are (1) an increase in groundwater nutrients, which could be associated with more people living around the lake, (2) a slight increase in water temperature, (3) an increase in sunlight reaching the near-shore areas due to greater water clarity, and (4) a decrease in the zooplankton species that eat diatoms. Because the GBA are growing on the lake floor rather than in the lake water, it seems more likely that the excess supply of nutrients is coming through groundwater.

Atmospheric deposition of debris (such as pollen, dirt, or insect residues) is another potential source of nutrients that may be stimulating the GBA growth.

The real puzzle is what has changed in recent years. Among the things to consider in addition to more dense human population around the lakes are increased light penetration into the water due to the clearing effect of the invasive Zebra mussels that filter phytoplankton and diatoms from the lake water. Other contributing factors may also exist.

What have we learned so far?

In the summer of 2015, many samples of lake water, groundwater, and algae were collected and analyzed to more fully characterize the visible GBA and determine the sources and amounts of nutrients available to it for growth. As expected, the concentrations of both phosphorus and nitrogen in lake water

were very low and the concentrations in groundwater were substantially higher than in lake water. These findings are consistent with earlier study results and are consistent with the possibility that groundwater supply of phosphorus is encouraging the growth of the GBA.

In the summer of 2015 we also carried out a Nutrient Diffusing Substrate experiment to see what types of diatoms were encouraged to grow on artificial medium placed in the lake floor and enriched with either nitrogen, or phosphorus, or both, or unenriched. The results of this experiment were consistent with the possibility that the nutrient concentrations in the lake were so low that both phosphorus and nitrogen were limiting for the growth of the GBA. Under these conditions only a small increase in nutrient supply could trigger a growth spurt.

University of Michigan Professors Rex Lowe and Patrick Kocielek, and grad student, Kristel Sanchez retrieving one of the Nutrient Diffusing Substrate experiments from Torch Lake (“science in a basket”) to determine which nutrients are limiting GBA growth.

What are the next steps?

In 2016 we hope to expand the number and distribution of sites studied to include more of Torch Lake and a few sites in Clam and Bellaire lakes to see if the same GBA is proliferating in these other lakes. We will again collect groundwater and lake water and algae samples. We plan also to include assay of drinking well water from the same sites. In addition to the nutrients we expect to assay for human source-related chemicals (caffeine, chloride, and boron) as this will help to determine if septic drain field leachate is making its way into the lake through groundwater. We anticipate deploying temperature sensors that will provide a record of temperature changes over the summer on the lake floor where the GBA grows.

In the early spring, weather permitting, we will attempt to document through infrared photography some of the patterns of

groundwater entering Torch Lake and compare those patterns with the GBA growth patterns. If this is successful, it will provide guidance as to promising locations to collect samples of groundwater for measuring nutrient concentrations.

During the summer, we will also repeat the Nutrient Diffusing Substrate experiments to improve our over-all knowledge of the nutrient requirements of the GBA.

What can I do as a lakefront property owner to help?

If your neighbors are not members of TLA, please invite them to join. Your membership, and that of your neighbors helps pay for these GBA investigations. The experiments we are undertaking are expensive. If you are able, you could help by contributing financially to support these studies. If you would like to sponsor a specific part of this investigation, the following are some examples of the cost of specific parts:

- Analyzing six groundwater samples for chloride, boron, & caffeine: \$150
- Characterizing a sample of benthic algae for diatom species: \$200
- Analyzing 100 samples of water for nutrient concentrations: \$600
- Conducting a Nutrient Diffusion Substrate experiment, one site: \$2,000
- Comparing Infrared & visible light images, GBA sites, drone flight: \$3,000

Your property might happen to be an ideal location for one of the study sites. If so, you could help by permitting us access to the lake bottom land in front of your home and well water at your property. The care and maintenance of your septic system is critical to the health of the environment. You could check on the age of your septic system and email that information to TLA. You could also ensure that your septic tank is pumped out about every three years for optimal performance. You could have soil samples analyzed to determine what, if any, nutrients are needed in your soil for lawn and garden growth so as to make a proper selection if any fertilizer is called for.

Chain of Lakes Water Trail

By Deanna Jerdee
Executive Director Paddle Antrim

Paddle Antrim is leading the effort to create and market a new non-motorized water trail through the Chain of Lakes.

What is a Water Trail?

A water trail is a designated route along a river, lake, canal or bay specifically designed for people using small, non-motorized boats like kayaks, canoes, single sailboats or rowboats. These trails are the aquatic equivalent to a hiking trail. Water trails typically feature well-developed access and launch points, are near significant historical, environmental or cultural points of interest, and often include nearby amenities such as restaurants, hotels and campgrounds.

What Are the Benefits of Water Trails?

- Encourage healthy lifestyles and active living by providing access to different paddling activities.
- Foster a strong sense of community and place, providing an opportunity for social interaction and access to community amenities such as parks and downtown areas.
- Encourage preservation and protection of local waterways.
- Positively impact the local economy. Water trails can help attract and support tourism and new business opportunities.

Has Any Water Trail Planning Been Completed?

Many significant shore lands have already been protected as parks and natural areas within the Chain of Lakes which are great assets for a water trail. In 2014, the Grand Traverse Regional Land Conservancy developed an inventory of potential access points for the water trail, as well as information on potential paddling routes and points of interest. We appreciate being able to use this information as a foundation to continue moving the project forward.

Water Trail Next Steps

- Paddle Antrim's next steps include:
- Seek official endorsement of public access points for inclusion in the water trail from the units of government who own the launch sites. To date, eight units



of government have passed resolutions supporting water trail development on specific sites along the route.

- Seek out input from public safety officials.
- Develop a final map showing the access points and identifying a variety of trail routes, including their level of difficulty.
- Develop a marketing plan for the trail.
- Evaluate and develop a list of recommended future improvements which may include better parking areas, universally accessible kayak and canoe sites, enhanced restroom facilities, signage, and places to clean watercraft to discourage the spread of invasive species.
- Share plan and improvements with local units of government and other project partners for their consideration.

Partnerships Working Together

Paddle Antrim's role leading the development of the water trail follows the model of many other organizations around the state and nation. We will be working with a long list of public and private sector partners to develop the new water trail. Several local units of government from Ellsworth to Elk Rapids, along with Chambers of Commerce in Ellsworth, Bellaire, Central Lake, and Elk Rapids, Grand Traverse Regional Land Conservancy and Short's Brewing

Company are part of a growing list of supporters who will be involved in trail planning in their area.

Commitment to the Waterways

Paddle Antrim is deeply committed to the stewardship of the waterways. We are excited about the opportunity to integrate information about water quality protection and stewardship into the planning and marketing effort for the water trail. With the support of many partner organizations, we will prioritize information on invasive species and other concerns into our marketing materials. We hope to develop and install some modest signage at strategic access points along the route that provides information about ways that recreational users can support and sustain on-going efforts to preserve and manage lands and shorelines to maintain high water quality. This includes sharing information about the on-going efforts and leadership of local watershed groups, lake associations, and others and their important water quality monitoring and protection work.

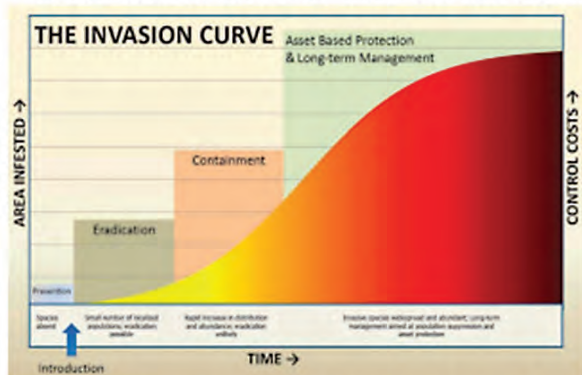
More Information

To learn more about Paddle Antrim or the water trail, please contact Deana Jerdee at deana@paddleantrim.com or 231-492-0171 or find us on the web at www.paddleantrim.com.

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U, F



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(*PHRAGMITES AUSTRALIS*)
W, A



EUROPEAN SWAMP THISTLE
(*CIRSIUM PALUSTRE*)
W



CANADA THISTLE
(*CIRSIUM ARVENSE*)
U, M



JAPANESE KNOTWEED
(*FALLOPIA JAPONICA*)
U, F, M



JAPANESE BARBERRY
(*BERBERIS THUNBERGII*)
U, F, M



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(*CIRSIUM VULGARE*)
U, M



PURPLE LOOSESTRIFE
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W, A



AUTUMN OLIVE
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U, F, M



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D, M



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CONTACT INFORMATION:

EMAIL: CISMA.CAKE@GMAIL.COM

ANTRIM CONSERVATION DISTRICT
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WWW.ANTRIMCD.COM

*WATCH WWW.ANTRIMCD.COM FOR INVASIVE SPECIES EVENTS AND OPPORTUNITIES TO HELP PROTECT THIS INCREDIBLE AREA.



TLA INTERNS... WHERE ARE THEY NOW?



BETHANY SPRINGDORF INTERNED WITH TLA IN THE SUMMER OF 2006. BETHANY AND HER FELLOW CLASSMATES GAINED EXPERIENCE COLLECTING WATER SAMPLES FROM RIVERS, LAKES AND WELLS. THEY WORKED CLOSELY WITH RAY LUDWA AND TIM HANNERT IN THE FOURTH YEAR OF THE TLA INTERNSHIP PROGRAM.

THIS YEAR BETHANY IS BACK IN ANTRIM COUNTY, VOLUNTEERING AS AN AMERICORPS MEMBER AT THE ANTRIM CONSERVATION DISTRICT. IN THIS POSITION SHE HAS THE OPPORTUNITY TO ASSIST IN EDUCATIONAL OUTREACH RELATING TO STORM WATER MANAGEMENT AND INVASIVE SPECIES CONTROL. SHE PLANS TO HOST INVASIVE SPECIES WORKSHOPS AROUND THE COUNTY IN PARTNERSHIP WITH CAKE-CISMA AND OUR LAKE ASSOCIATIONS TO EDUCATION COMMUNITY MEMBERS ON THE EARLY DETECTION, RAPID RESPONSE IN RELATION TO THE SPREAD OF INVASIVE PLANT SPECIES. FEEL FREE TO CONTACT BETHANY WITH ANY QUESTIONS ABOUT UPCOMING WORKSHOPS OR THE AMERICORPS PROGRAM THROUGH HURON PINES BY EMAILING HER AT BETHANY.ACD@GMAIL.COM.





The Torch Lake Protection Alliance

(TLPA) filed a lawsuit against promoters of the Torch Lake Sandbar Bash on April 5, 2016 in the Kalkaska County District Court.

The TLPA is seeking a permanent injunction against future Sandbar Bashes stating they're a public and private nuisance and are held without legally required

permits. The complaint alleges that defendants Beatbox Beverages LLC, Lansing Party.com LLC and Brooks Ehlert (known as DJ Fade) created a nuisance by sponsoring, promoting and holding the Sandbar Bash on July 4, 2015, which attracted about 10,000 people to Torch Lake.

Natural Shoreline Presentations

Together with the Antrim Conservation District, TLA invites you to attend of 2 events this June. TLA created pilot greenbelts, one on Lake Bellaire and the other on a canal of the Clam River in 2013. June 6 we will meet at the Summit Village Beach Club on Lake Bellaire. June 13 we meet at Butch's Tackle & Marine.

After a short presentation on the importance of Natural Shorelines to our watershed, participants will spend time assisting with the maintenance of TLA's pilot projects, attendees will receive a native plant to take home and begin their own shoreline project! Lunch will be served at the Beach Club and evening Libations/Appetizers will be served at Butch's.

Please contact Leslie at info@3lakes.com or 231-544-7221 for more information or to register.



Dockside

The Dockside - Torch Lake has challenged our membership one more time! Gordie has offered up \$2500 for 2016's Science Education Outreach Program (SEOP) if our membership can match the amount. The SEOP provides grants to science teachers in our service area for environmental science equipment and field trips. To date, TLA has granted over \$60,000 - preparing our youth to be stewards of our watershed. We look forward to your assistance in claiming the finds. More information will follow in early June.



- Membership counts! -

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* * * * *

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Upcoming Events

- | | |
|--------------------|--|
| June 6 | Natural Shorelines - Summit Beach Club - Noon |
| June 13 | Natural Shorelines - Butch's Tackle & Marine - 3:00 PM |
| July 14 | An insight into Golden Brown Algae - Kearney Township Hall - 5:30 PM |
| August 11 | 50th Anniversary Celebration - Bellaire Room & Terrace - 5:00 PM |
| Sept 17 -18 | Paddle Antrim - See paddleantrim.com for more information |