

# Lake DeNevue's Algae Growth Contributors

January 13, 2021

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We have all learned how unsightly algae can be, how fast algae can spread, and how this algae can interfere with recreation opportunities. This algae can and may also affect our future lake property values. We have also learned that under the right conditions algae can become toxic to zebra mussels, crayfish, and even smaller fish. So why is the algae growing and what can we do to reduce or prevent it?

Facts: Nutrients, including nitrogen and phosphorous grow algae. Sunlight and warm water temperatures increase algae blooms. There are over 3 million algae species and when conditions are right, algae can grow, even in cold water.

*We have identified many nutrient loading contributors including:*

1. Increased development in the watershed; more people with larger homes, more homes, lawns, rooftops, driveways, etc. = Increased runoff and less water filtration
2. Unstable shorelines
3. Construction near shore and on highly erodible steep sloped land
4. Increased surface water runoff from drainage ditches and roadways, etc.
5. More inflowing nutrients - phosphorus and nitrogen
6. More contaminated spring and ground water activity
7. More or less spring and ground water flow
8. Less shoreline buffer zones, less forested areas
9. Fewer aquatic plants to filter and compete for the nutrients that grow algae
10. Changes in aquatic plant species over time
11. Increased number of larger boats spending more time and activity on the water
12. Boat wakes causing shoreline erosion
13. More lake-bottom disturbance from boating activity in shallow water - this increases and re-suspends accumulated nutrients in the bottom sediment
14. Less woody structure along the shoreline to reduce waves
15. Fewer natural areas
16. Fertilizer runoff and infiltration from larger farming practices nearby
17. Larger farming practices nearby
18. Increasing muck accumulation on the lake bottom
19. Waterfowl waste (goose poop)
20. More rocky shorelines
21. Lawn fertilizers
22. Ash (fertilizer) from fire pits
23. Leaf litter accumulation and decomposition

And the list goes on.

Smile  
So what can we do about it?

# What can we do to help improve the health and water quality of Lake DeNeveu?

January 13, 2021

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- Continue to educate all lake property owners including their children and new homeowners.
- Hold shoreline and lake stewardship classes to create awareness.
- Share "Lake DeNeveu's Algae Growth Contributors".
- Share the article "Stirring Up Trouble".
- Discuss the effects of boat activity and talk about ways to reduce the issues. See "Stirring up Trouble" letter from February 25, 2020. Mark "slow – no wake areas".
- Continue to measure phosphorus and nitrogen levels in the lake when it is stirred up and during major rain events.
- Continue to monitor inflowing water flow rates and nutrient levels especially during storm events.
- Continue to monitor the new northeast intermittent stream to learn if phosphorus loading has been reduced since the riprap has been added.
- Inflowing stream canopies could be opened for more sunlight which will promote instream aquatics and aquatic plant life, aquatic plants could be added in the streams and along the stream shoreline.
- Add aquatic plantings to the inflow areas.
- Add BioFil filters along our major inflow areas to filter sediment and nutrients.
- Add phosphorus polymer blocks to inflow areas.
- Add phosphorus polymer blocks where there is extensive water movement near aerators and agitators.
- Add stream flow bioreactors to inflow areas - (coconut logs, bagged wood chips, bagged shavings, and bagged sawdust). This would help filter and slow down sedimentation.
- Add upstream storm water holding and filtering pond(s) on the Shaw/Flood property, especially after the recent passage of the "Wisconsin Resource Recovery Act of 2020".
- Analyze the lake bottom sediment for phosphorus, nitrogen and % organics.
- Encourage aquatic and shoreline plant buffers.
- Encourage tree plantings along shorelines, the roots will help stabilize the shoreline.
- Continue to add woody structure for fish and wildlife habitat and to break up wave activity.
- Continue to monitor our lakes fishery. Fish tie up nutrients.
- Continue to stock fat head minnows because they work for us 24/7 eating algae, etc.
- Continue to stock walleye every 4 to 6 years depending on harvest numbers.
- Identify specific algae species and note changes and algae densities over time.
- Monitor shoreline soil erosion over time. We have lost 6 feet or more in some areas. Stabilize these areas.
- Continue to work with the town, county, DNR and government representatives discussing our concerns and work together to find affordable solutions.
- Lake DeNeveu is considered a dumping ground for phosphorus. Can we receive any financial credit or assistance for this?
- Multiple board members or lake property owners could join the Winnebago Waterways group, Wisconsin Lakes Partnership, Wisconsin Association of Lakes and even North American Lake Management Society.
- Send more emails or newsletters to all lake association members more often.

February 25, 2020

## Effects of Motorized Watercraft on Lake Beds in Aquatic Ecosystems

### “Stirring up Trouble”

How does your boating activity affect the aquatic ecosystem?

Depth of impact and disturbance depends on many factors, including boat size, engine size, hull displacement, speed, and lake bottom substrate. Disturbance is greatest at intermittent speeds during starts, stops and turns.

**Multiple Effects:** (from 12 Scientific research papers)

1. Sediment suspension:
  - When sediment is suspended it is more likely to get re-suspended by additional activity and even by wind activity.
  - Softer silty sediment is more prone to stirring (marl is less than .06 mm in size)
2. Water pollution from stirred up sediment:
  - Increases internal nutrient loading.
  - More phosphorus increases algae growth and causes algae and cyanobacteria blooms.
  - Raises ammonia.
  - Raises toxicity and re-distributes toxins,
  - Elevates levels of turbidity and heavy metals.
  - Changes pH.
3. Disturbs fish and wildlife:
  - Affects fish habitat and spawning, silt covers eggs.
  - Impacts the ability of fish to uptake oxygen and can kill small fish.
  - Affects the ability of fish to find food.
  - Reduces water clarity which can affect the ability of birds and wildlife to find food.
4. Impacts aquatic plants:
  - Boat propulsion, wakes and waves can uproot vegetation.
  - Plants may not grow taller because they are cut off from boat motors.
  - Sediment coats plants which limits their ability to grow, filter, and compete for nutrients.
  - Cloudy water limits sunlight which affects plant growth.

5. Shoreline erosion:
  - Wave activity disturbs the bottom in shallow water.
  - Wave activity erodes the shoreline.
  - Erosion adds more nutrients and sediment into the water column.
6. Affects water clarity:
  - Shallow areas less than 10 ft. are most affected.
  - Boats are becoming larger and faster, which increases their potential to affect water quality and water clarity.
7. Boating activity in lakes may limit other recreational uses, fishing, swimming, etc.
8. Affects property values:
  - A one foot increase in water clarity can increase property values by \$30,000.
  - A one foot decrease in water clarity can decrease property values by \$30,000.

“When people understand that their activity may be hurting the ecosystem they may be willing to change or continue their activities to more appropriate places.

The most important area of a waterbody to protect is the littoral zone (shallow water). “There is a direct correlation to sediment grain size, boat activity and algae blooms.”

Proper management of waterways is vital, for were a waterbody allowed to degrade significantly, the very quality that made it initially an attractive resource would vanish.

Of particular importance is that frequent re-suspension of benthic sediment may maintain poor water quality long after internal nutrient loading has drastically reduced.

The failure to account for sediment re-suspension and internal nutrient loading in shallow lake systems could lead to erroneous nutrient budgeting, poorly targeted restoration plans, and unrealistic goals towards restoration.

Smaller lakes may not be appropriate for large boats and large engines.”

In Wisconsin, all lakes less than 50 acres are slow-no wake lakes.

#### **Possible solutions:**

1. Continue to educate all boaters, promote awareness:
  - Boat startup has the greatest impact on re-suspending bottom sediment.
  - Shoreline erosion can also occur when boat wakes of more than 12 - 15 in. reach the shoreline.
2. Reduce boat activity:
  - In all shallow water 10 ft. and less.
  - Where the tops of plants come within 5 ft. of the surface.
  - Where the sediment is particularly fine.
3. Restrict boat activity to specific deep water areas.
4. Manage or restrict boats and motorized vessels.
5. Limit high speed boats and horsepower.

6. Establish slow-no wake zones:
  - Present state laws are slow-no-wake within 100 ft. from shore, any dock, raft, pier, or restricted area, swimmers, fisherman or other boats and 200 ft. from shore for personal watercraft.
  - Extend no-wake restrictions to 200, 300, 500 ft. from shore where necessary and all shallow waters areas less than 10 ft. deep.
7. Confine boating activities to more appropriate areas or different bodies of water.
8. Create slow-no-wake weekends.
9. Re-establish more aquatic plants in 10 ft. of water depth or less (to help filter water and nutrients).
10. Boating activity should be evaluated in the context of the characteristics of each waterbody:
  - Lake DeNeveu has seven off shore shallow water reefs; some areas extend 500 ft. from shore.
  - The lake bottom in Lake DeNeveu is extremely fine (marl) and can go into suspension easily, stay in suspension a long time, and settle almost anywhere.
11. Enforcement:
  - Rules are often misunderstood by boaters.
  - Add buoy's to mark shallow areas.
  - Shallow areas would benefit from additional protection through local ordinances.
  - Must allow access for enforcement personnel.

Most of us have seen and learned how the fine and easily suspended lake bottom sediment becomes disturbed and re-suspended after almost every busy summer boating weekend.

**Phosphorus is the primary nutrient that grows algae.** The phosphorus levels in Lake DeNeveu were and remain relatively low. Until a few years ago, Lake DeNeveu was considered an oligotrophic lake (low nutrients and high oxygen levels). From a trophic (nutrient) state index, this would suggest that Lake DeNeveu was considered a clean and healthy lake.

It is easy to identify over twenty external nutrient sources within the Lake DeNeveu watershed. Over 227 acres of runoff water alone is discharged through the new northeast culvert. This runoff water flowing into Lake DeNeveu during storm events has elevated phosphorus levels 40-46 times the level needed to grow algae. This elevated phosphorous level is 106 times the "normal" amount of phosphorus in our lake water. And this is only one sampling site along Highway 45.

We hope we are beginning to gain your attention. Phosphorus grows algae and our algae issues started occurring nearly 10 years ago.

We are fortunate that the marl and calcium in the bottom sediment ties up much of this phosphorus as  $\text{CaPO}_4$  as the lake has done for thousands of years. When the lake bottom is not disturbed, most of this phosphorus becomes tied up in the bottom sediment.

On February 12, 2020, Aquatic Biologists collected bottom sediment and water samples from two of the seven shallow water reefs. They were shipped to a certified lab and the results were shocking. The north sample phosphorus measured **6.0 mg/l which is 200 times the amount needed to grow algae**. The south sample measured **18.7 mg/l which is 623 times the amount needed to grow algae**. The lake water measurements over the last 9 years averaged .022 mg/l.

Stirring up the lake bottom sediment on busy summer weekends is raising the phosphorus level 272 - 850 times higher than the normal level, at the same time algae is seeking phosphorus to grow.

It is no coincidence that the last several years have shown a decline in aquatic plants, crayfish and zebra mussels.

The question remains - how do we continue to keep Lake DeNeveu a clean and healthy lake?

Let's make 2020 the year to focus our vision on the primary causes of algae blooms and turbid water.

The board welcomes your comments.



# Why Lake DeNeveu needs Slow No-wake Buoys

January 14, 2021

- Have you noticed how much Lake DeNeveu has changed in the last 10-15 years? The first algae treatment occurred in 2009.
- We have promoted coconut logs, shoreline plant buffers, rain gardens, filtering plants at inflows and along shore, floating plant islands, introducing and maintaining diverse native plant communities, etc. We continue to point out the benefits of plants and fish and filtering runoff water.
- Science has shown us time and again that boating activity from prop wash in shallow water stirs up trouble by re-suspending bottom nutrients.
- As waves reach shallow water, rolling waves continue to disturb the lake bottom. Waves also erode the shoreline.
- Many of us have observed the eroding shorelines from boat activity. In some areas, property owners have lost six feet or more.
- This erosion adds more nutrients and soils, which increases the water turbidity.
- Some property owners have added riprap (rocks) to protect their shoreline. Adding rocks also reduces shoreline habitat for fish, frogs, plants, etc. We need to add plants in these areas also.
- Phosphorus has been settling out in the lake bottom sediment for thousands of years due to the oxygenated environment and because of the high mineral and calcium content. (CaP04)
- We have learned that inflowing water can contain 52.78 times the amount of phosphorus as to what is leaving Lake DeNeveu. Where is it going? It is settling on the lake bottom and being utilized to grow algae and aquatic plants.
- Bottom sediment samples were collected last winter and sent to a certified lab. The bottom samples contained 623 times the amount of phosphorus necessary to grow nuisance algae. The bottom sediment is considered extremely fine and goes into suspension very easily.
- We have all seen what Lake DeNeveu can look like after a busy summer boating weekend. Water clarity can easily go from 15 feet of visibility to less than 6 inches only to get re-suspended and re-disturbed the following weekend.
- Every time bottom sediment goes into suspension the same bottom sediment can more easily be re-suspended even by wind activity later. Each disturbance releases more phosphorous into the water to grow algae.
- Wisconsin boating laws specifically state that boats creating wakes must stay 100 feet away from piers, rafts, swimmers, etc. And 200 feet for jet skis. The narrows at the north end of Lake DeNeveu are 403 ft. wide without considering piers and floating rafts. Any boats creating wakes should stay out of this area and slow down considerably.

*"THE QUALITY OF THE WATER REFLECTS THE QUALITY OF MANAGEMENT"*