Will Aeration Control Algae?

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Lake Stratification

- **Summer**: Wind drives water circulation in the epilimnion and metalimnion. The hypolimnion remains stable due to temperature inversion.
- **Autumn**: As temperatures drop, the epilimnion cools and water density increases, leading to overturn. The metalimnion remains stable, and the hypolimnion is well-mixed.
- **Spring**: Overturn continues, and the lower layers mix. The surface layers heat up, and the hypolimnion remains cool, promoting an inverse temperature gradient.
- **Winter**: Ice forms on the surface, and the hypolimnion remains cold. Water circulation is minimal due to ice cover.
Summer Stratification in Nutrient-Rich Lakes

- Blue-green algae bloom shuts out sunlight, excretes toxins.
- Floating scum of decaying algae
- Fish try to catch food on its way to bottom
- Dead algae, fish, insects and food settle to bottom
- Decaying septic sludge of decomposing fish, animals, plants, fertilizer, fish food
- Black anaerobic sludge
- Thin layer of water with oxygen suitable for fish life
- Dead water. No living fish or animal life
- Septic water. No oxygen. Loaded with toxic gases from decaying animal matter
Phosphorus in Sediment can cause Algae Blooms or Plant Growth
Does Aeration Control Algae?

...Sometimes

• Provides a healthier ecosystem for fish.

• Often recommended for lake problems.
  – May take years to see results.
  – Mixing of the water will depend on the type of aeration used.
  – May depend on phosphorus inputs.

• Systems can be costly – purchasing, maintenance, and electricity.
Types of Aeration

**Diffusers / Bubblers**

- Has an air line and an air stone at the bottom of the lake or pond.

- De-stratifies the water – so oxygen rich environment occurs at the bottom.

- More efficient with water 6’ or deeper.
Diffuser with filamentous algae
Diffuser with Wolffia
Diffuser with aquatic plants
Types of Aeration

Fountains

• Decorative
• Circulates water near the surface.
• Does not aerate the bottom of the lake.
• Can work in shallow areas.
Fountain with filamentous algae
Circulators

- Moves water away from an area.
- Circulates water around boat docks, beaches, or small coves.
- Reduces algae growth or bacteria in swimming areas.
Solarbee uses solar power to circulate water.
• Costly
• Used mostly to control blue-green algae in large lakes.
• Did not control curly leaf pondweed.
Problems with Aeration

• Not functioning
  – Clogging
  – Fishing line tangles.
  – Muskrats chewing on wires or air lines.

• Not controlling algae
  – Under aeration
  – Phosphorus level too high.
Case Study – Turnberry Lakes

Residential subdivision with 4 lakes & 2 golf courses.

- Lake 1 is a 48 acre shallow lake (4.2’ avg.) dominated by filamentous algae.
  - Had grass carp until a fish kill occurred in 2009.
  - Total P = 0.111 mg/l in 2009

- Lake 2 is a 20 acre deep lake (10.6’ avg.) dominated by blue-green algae.
  - Total P = 0.126 mg/l in 2009.
Turnberry Lake Options

ILM developed a lake management plan with an estimated 5-year cost projection:

- Chemical control of algae (no assurance of success) - for 78 acres (4 lakes) - $450,000
- Dredging - $4,000,000
- Application of aluminum w/aeration - $600,000
- Algae harvesting & chemical control - $800,000
- Multi-source aeration w/enzymes & bacteria (w/chemical algae control) - $478,000

All options exceeded their budget
An Alternative Solution

For Lake 1 – the most challenging lake

• ILM proposed a multiple source diffuser system for Lake 1 requiring 160 diffusers.
  – Cost (2009) for all 4 lakes to purchase the system $327,777
  – Plus enzymes & bacteria ~ $150,000

• Leased system (Lake Savers, LLC) only used 24 diffusers. Multiple horse-power single air source aeration system.
  – Investment for 1st year was only $45,075
    • Included installation, 1 year leasing, and bacteria & enzymes.
Seven years later

- Turnberry Lakes purchased the aeration system and was very happy with the outcome.
- Due to nutrient-rich inflows, they still need to use algaecides.
  - Annual algaecide budget is $30,000.
  - Some algae and weeds occur, but only during hot dry periods.
Conclusions

Aeration creates a more balanced ecology by allowing aerobic bacteria to decompose organic material, which should reduce algae growth.

• Did aeration & bacteria and enzymes reduce algae or absence of grass carp?
• How are total costs for aeration, B&E, electrical compared to harvesting and disposal followed by re-introduction of native plants?
• Can these results be duplicated in different lakes?
Conclusions

• Use an experienced vendor who you can work with and trust.

• At Turnberry, leasing the system was an important option that allowed the community to see the results.

• Sometimes unexpected results happen.

Questions?
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