Aquatic Plant Management
in Midwest Aquaculture Ponds

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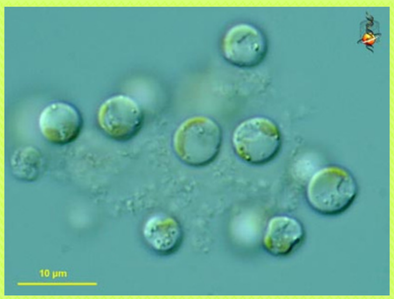
Aquatic Plants …….

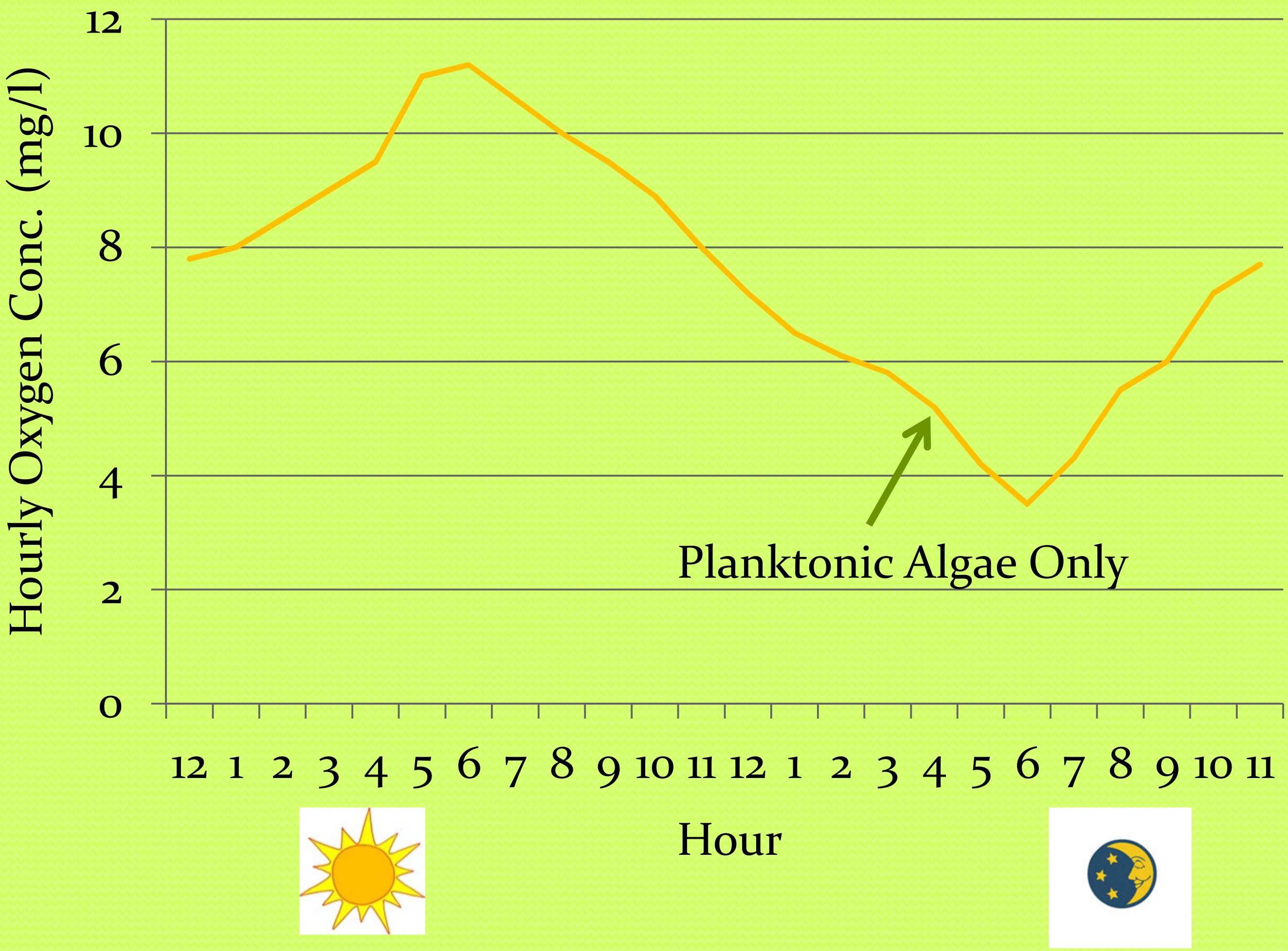


- An absolutely critical component to pond aquaculture but too much, too little, or a monoculture can be problematic!

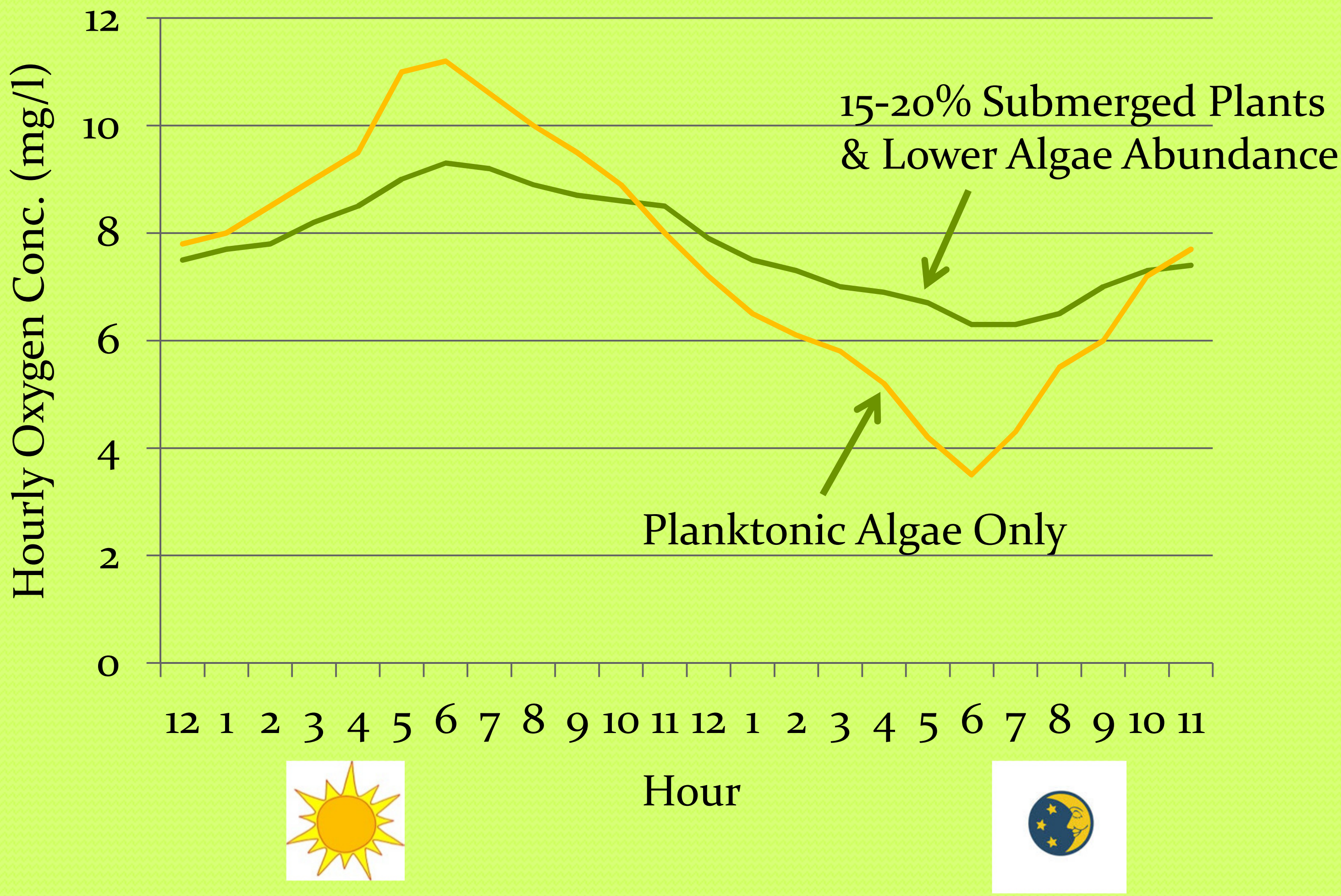
Pros of Aquatic Plants

- Produce the bulk of a pond's oxygen. Critical!
- Algae excellent at taking up ammonia directly, submerged plants fair.
- Submerged plants provide large amounts of attachment substrate for aerobic bacteria, enhancing conversion of ammonia into nitrates which are used by the plants.
- Submerged plants mitigate the water quality problems associated with crashes of algae populations.
- Aquatic plants produce aquatic invertebrates = free food.

Oxygen: Daily Variation in Relation to Algae & Submerged Plant Dominance



Oxygen: Daily Variation in Relation to Algae & Submerged Plant Dominance



Cons of Aquatic Plants

- Dense planktonic algae populations can crash, causing low oxygen levels and spikes in ammonia and nitrites.
- "Choked" aquatic plant & algae communities can lower AM oxygen levels to lethal levels due to high respiration. Expensive surface aeration needed.
- "Choked" aquatic plant & algae communities can raise afternoon pH levels above 9.0, causing un-ionized ammonia to potentially be a problem.
- Harvesting fish with seines can be problematic in the presence of aquatic plants.

Factors Affecting Daily & Seasonal Oxygen Levels

- Sunlight
  - Sunlight produces oxygen, BOD uses oxygen at night.
  - Cloudy days lower daylight oxygen production, affecting night levels.
  - After June 21, losing daylight.
- Water temperature
  - Warm water holds less oxygen than cool water.
- Amount of aquatic plants / algae / planktonic algae
  - “Choked” greenery elevates daytime oxygen to very high levels but night levels are very low (BOD).
  - Sudden die-off of planktonic algae major cause for concern.
  - Aquatic plants / filamentous algae do not die-off suddenly unless you do it!

More Factors Affecting Daily & Seasonal Oxygen Levels

- Feeding
  - Lower oxygen levels during periods of heavy feeding.
  - Begin to elevate a pond's BOD quickly once feeding exceeds 15 lbs per day per acre.
  - There is a feed / waste cumulative effect.
- Fish size
  - 2nd year growout equals higher feed amounts in June, July, & August as compared to 1st year fingerlings.
- Aeration
  - Nighttime oxygen levels can be raised with vigorous surface aeration.
- Volume of oxygen-less water
  - Increased volume of "hypolimnion" lacking oxygen lowers night levels.

Keep in Mind . . . . .

- Fish culture ponds are not comparable to private, recreational ponds in terms of biological function.
  - Fish biomasses are several orders of magnitude higher.
  - Fish feeding introduces considerable nutrients into the culture pond's ecosystem, resulting in potential water quality concerns. Monitoring highly recommended.
  - Nutrient enhancement results in high aquatic plant / algae growth. Like fertilizing your lawn!
- Managing a fish culture pond like it were a private pond is inviting disaster!

Why?

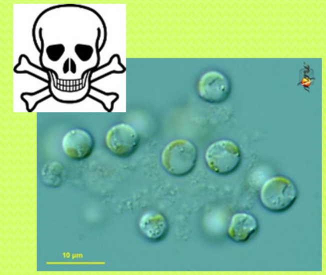
- Private, recreational pond owners often proactively treat even low amounts of algae & submerged plants.
- This strategy significantly reduces the pond's ability to degrade nitrogenous wastes, but . . .
- Not a problem in the private, recreational pond because fish biomasses are low (100-400 lbs. per acre) and the pond's bacteria community is not needing to handle large amounts of nitrogenous wastes in a short period of time.

The Fish Culturist on the Other Hand . . . .

- Needs to grow large biomasses of fish to make a profit, often up to 3000 lbs. per acre in the NCR, which
- requires large amounts of feed to grow them to target size, which
- means the pond needs a dense, efficient aerobic bacteria community to degrade the large amounts of nitrogenous wastes, which
- requires large amounts of oxygenated substrate for the necessary amounts of aerobic bacteria!
- Plants can provide a substantial amount of that substrate.

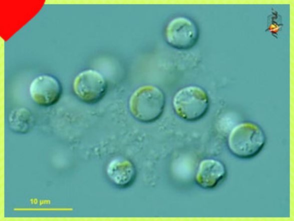
Private Pond Owner's Aquatic Plants Goal

- A planktonic algae community so sparse that a secchi disk can be seen down to about 48-60 inches. Owners like clear water – the clearer the better!
- A sparse submerged plant community that provides virtually no coverage in shallow areas. Interferes with swimming!
- No cattails whatsoever, a few owners may allow small clumps for wildlife.
- No filamentous algae . Private pond owners despise the presence of floating algae mats.



Millcreek's Aquatic Plants Goal

- A planktonic algae community that allows a secchi disk to be seen down to about 24 inches.



- A submerged plant community that provides about 15-20% coverage in shallow areas.

- No cattails whatsoever- virtually impossible to keep a seine down along the bottom.

- Keep filamentous algae abundance low – seine collects this as you pull, causing harvest to be stressful to both the fish and you.

Millcreek's (MC) Strategies & Other Options to Manage . . .

- Emergent Plants
- Floating-leaved Plants
- Duckweed & Watermeal
- Submerged Plants
- Filamentous Algae
- Planktonic Algae
- Cynanobacteria (blue-green algae)

Millcreek's Approach to Emergent Plants

- Cattails – currently none, manually pull as young plants appear.
- Shoreline plants – MC weed eats 2-3 times a year to keep low in height. Never chemically eliminate all shoreline plants as erosion becomes a problem.
- If cattails are abundant, best control is with aquatic labeled glyphosate products, such as Rodeo. Add a surfactant such as Cide-Kick.

Millcreek's Approach to Floating-leaved Plants

- Lily pads – MC currently has none, will manually pull as young plants appear.
- Floating –leaved pondweeds – MC considers them an asset (bacteria films) and does not control them.
- If lily pads are abundant, best control is with aquatic labeled glyphosate products, such as Rodeo. Add a surfactant. Spray on a dead calm morning!

Millcreek's Approach to Duckweed & Watermeal Plants

- MC currently has none due to windswept levee ponds. These very small plants cannot tolerate moving water.

- If duckweeds and/or watermeal are abundant, best control is manual removal with a very small mesh, large net. Wait for a slight breeze to move it to one side, then remove.

- Preventing de-stratification via bubble aeration can reduce, if not eliminate.
- Fluridone products will provide control, but it will kill the submerged plants also. Can lead to oxygen depletion and high ammonia levels.

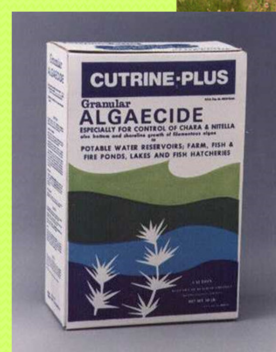
Millcreek's Approach to Submerged Plants

- Annual occurrence for MC, as long as 15-20% no concern or control.
- MC achieves desired goals with Aquashade at 1.5 gal per surface acre.
- MC seines have mud line, allowing seine to roll over rooted aquatic plants.
- If treatment must occur, do spot treatments with granular herbicides. No total pond treatment! Treat 20% of plants every 7-10 days. Avoid "shocking" the pond's waste degradation system.



Millcreek's Approach to Filamentous Algae

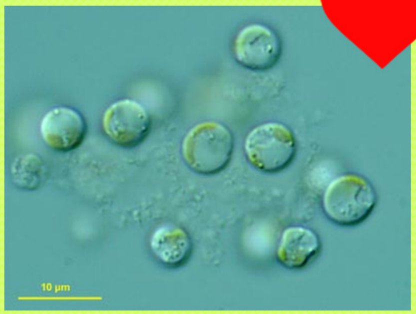
- Annual occurrence for MC, usually in corner where feeding is occurring.
- MC manually removes algal mats in that corner. Not elsewhere.
- Prior to seining, MC slowly lowers the pond 2-3 feet to "strand" the algae.
- If algae is overly abundant, control with chelated copper (Cutrine Plus) or sodium carbonate peroxhydtrate (GreenClean).
- No total pond treatment! Treat 20% of algal mats every 7-10 days.



You Know Filamentous Algae is a Problem When …….

Millcreek's Approach to Planktonic Algae

- Constantly present in MC ponds, fortunately in moderate amounts.
- Critically important to oxygen production as well as waste degradation via ammonia and nitrate uptake.
- The basis for fry fish food chain in fingerling production ponds.
- Excessive amounts (pea green water) can lead to severe nighttime oxygen depletion, must surface aerate at night.
- Do not control, even in excess. Sudden die-off will cause low oxygen and high ammonia.



Millcreek's Approach to Cyanobacteria

- Formerly known as blue-green algae, can release toxins making mammals sick. Off flavor taste in fish.
- Typically blooms in MC ponds in August-Sept., fortunately in small amounts.
- Excessive amounts (green water) can lead to severe nighttime oxygen depletion, must surface aerate at night.
- Do not control, even in excess. Sudden die-off will cause low oxygen and high ammonia.
- De-stratification via bottom bubble aeration can help prevent or minimize blooms.

Take Home Messages

- Optimal amounts (15-20%) of submerged aquatic plants can provide tangible benefits in enhanced waste degradation and reduced variability in water quality.
- Planktonic algae dominated culture ponds are prone to "algae crashes" and cyclic variability in water quality.
- Pond dyes, de-stratification via aeration, and manual removal all preferable to chemical control.
- Chemical control of too much vegetation to quickly can cause oxygen depletion and sudden spikes in ammonia & un-ionized ammonia depending on pH and water temperature.
- Regularly monitor water quality parameter, especially if using chemical control.

Education! Education!

- Be a life-long learner!
- Use all sources of information on water quality, fish health, fish husbandry & aquatic plant management.
  - State extension programs
  - Factsheets, bulletins, published articles, websites (SRAC)
  - Workshops
  - Other culturists!
- Create, review and re-work your own Water Quality & Fish Husbandry BMP – it is a living document.

Questions?