

UW-Oshkosh/UW Sea Grant

2009 *Cladophora* Conference Notes

Update on Phosphorus (P) and *Cladophora* (C.) in the Lake Michigan Nearshore Zone,

Harvey Bootsma, Great Lakes WATER Institute

Total dissolved P in the nearshore area is increasing; it is going down in open waters. P is increasing in Milwaukee area rivers; unclear if that is true in all tributaries basin-wide.

In the Milwaukee River, dissolved P is a larger fraction of total P.

P in Wisconsin agricultural soils is increasing. Although there has been great improvement in reducing P runoff, P additions to soil are still slightly greater than P removal. Ideally, the two should be balanced. Even if we reduce P additions today, it would take years for the lake to respond because there is so much P in the soil, and the lake phosphorus pool has a long turnover time. There could be as much as a 10 year (if not longer) lag between reducing P and the effect on the lake.

P in Spring is increasing due to more dramatic rain events. This could become a bigger issue in the future if more intense/frequent storms occur due to global warming as some predict/expect.

P from mussel excretion is about 5 times that contributed by rivers in the Milwaukee region (506 mg P per sq m vs. 120). Mussels are trapping more P in the nearshore zone. Although water clarity is the chief culprit for increasing C., P has more potential to be managed.

There was less C. on beaches in 2008 than 2007; P was also higher in 2008. Modeling suggests this is likely due to colder weather in 2008. If 2009 is warmer, we can expect more C.

The western coast of Lake Michigan is getting warmer; if that trend continues, C. could get worse. Mussels also excrete more P when it's warmer.

The eastern coast of Lake Michigan has experienced selective botulism problems. This may be due to the development of anoxic conditions in the nearshore benthos. This has particularly hit areas such as the Northeast corner and Sleeping Bear Dunes. Last year, this led to the death of 3,000 birds. The suspected transmission mechanism is from mussels to round gobies (fish) to birds.

If C. is not removed from the beach it adds to the P problem; however, that is minor in comparison to the P already in the lake.

C., Impact on Beach Water Quality, Colleen McDermott, UW-Oshkosh

C. has been increasing. She is in year 2 of a study to determine whether E. coli (or other pathogens) in C. mats is a contributor to water quality problems. Her presentation is of study results to date. The C. mats tested were primarily in Door County and also from Racine.

The water samples were collected from within and away from the mats, including an investigation of gradient, i.e. is there more E. coli in the middle of the mats?

2007: they found between 10,000 and 100,000 E. coli per hundred milliliters. The numbers increased the longer the mat sat on the beach. There was more E. coli in the center of the mat than the perimeter. There was a strong correlation between mat E. coli and water quality measurements.

2008: there was very little C. available for sampling in either Door County or Racine. There was a stationary mat in Newport State Park with very low E. coli numbers. The age of the mat may influence the ability of the E. coli to replicate/survive.

They also are attempting to determine whether E. coli replicates in the mats or whether more is being added/washed in using genetic fingerprinting techniques. The answer appears to be yes.

With respect to other pathogens (salmonella, shigella, and campylobacter), there were no detections in 2007 and only one incident in 2008. Very few pathogens have been detected in Door County waters; they will be trying to find more using more sensitive molecular techniques.

Removing C. from the beach should improve water quality.

C., aquatic macrophytes, and beach management, Julie Kinzelman, City of Racine Health Department

Waterfowl may be contributing to salmonella.

Racine's North Beach had 85,000 visitors last year; there was almost no C.

They have had other wash-ups of weed material as much as knee-high-this can also have E. coli issues.

Milwaukee's Bradford Beach was used as a case-study of beach management.

Grooming without compacting reduces E. coli.

Chicago is currently composting C. Toronto does not presently allow C. to be used as mulch that goes onto food.

Bay City, Michigan is experimenting with a pump system to draw algae from the water before it is deposited on the shore.

All Washed Up: Lake Michigan's Algae Challenge, John Karl, UW SeaGrant C. Video

SeaGrant is just releasing an excellent video that explains the Lake Michigan C. problem. It will be available free of charge and they are looking for venues where it can be shown. Common councils, county boards, the MMSD Commission, etc. would all be excellent venues for this. If interested in obtaining a copy to show to local units of government or to host Brown Bags, etc., contact Mr. Karl directly at: jkarl@seagrant.wisc.edu 608-263-8621 This presentation will also eventually be posted on YouTube. Information about that could easily be disseminated to the public.

Beaches/Changes, Stacy Hron, Miller Engineers and Scientists

Decreasing the swash zone can be a major aide to decreasing C. clean-up; for example, changing the grade or intentional selective trapping (engineering the beach sand to direct the C. to one locale). This should be evaluated as part of any Bradford Beach sand nourishment evaluation.

- Some improvements may be made to beaches in order to mitigate problems caused by Cladophora accumulation.
- Showed plans that give you a real example as to how some of these solutions can be implemented in different situations.
- The plans shown were created as a part of a storm water management and contaminant reduction project. While these plans were created for E.coli and storm water management and not specifically for Cladophora mitigation, it was a consideration in their design, they provide those benefits as well as.
- Before and after conditions of several beaches were explained in relation the redesign of the beaches. Several different solutions were used to improve water quality and to mitigate the Cladophora accumulation:

Improve Water Quality

- Remove Point Sources
- Infiltration
- Runoff Reduction
- Impervious Surface Reduction
- Bioretention
- BMP's

Beach Nourishment & Improvements

- Naturalizing Beach Profile
 - Removing Hard Surfaces and Obstructions
- Decreased Swash Zone

- Change Grade of Beach to Optimize Clean-up
- Selective Trapping
 - Confining Areas of Clean-up
- Access for Equipment

Reuse Options for C. Biomass, Mary Seaman, UW-Oshkosh

This is being investigated as part of a UW System Solid Waste Research Program.

No heavy metals were found in their samples; C. has good BTU values. C. used in other communities should be tested for metals prior to composting. Her project is to evaluate the compost for vegetable/flower gardens.

4 treatments were evaluated: 1) 100 % C.; 2) 50% C., 50% wood; 3) 75% C., 25% wood; 4) 25% C., 75% wood.

The average pH for compost is 6-8. Option 1 is in that range.

Compost should also have lots of Nitrate. The second key component is Ammonium because it can be converted into Nitrate. There was virtually no change in P or potassium.

Renewafuel (based in Cleveland)-can C. be dried, pelletized and burned?

100 lbs. of C. if moisture/ash free yields 7,792 BTUs. If some moisture/ash, it yields 4,239 BTUs.

If too high in ash, can't be use as a primary combustible but may be used as a secondary combustible.

C. can be used as compost; the preferred mix from this study was 75% C., 25% wood. Inorganic N had high enough concentration to make good compost.

Organic material management: anaerobic digestion via BIOFerm dry fermentation, Sara Williams, BIOFerm-Energy Systems

If C. were to be used, it would have to be dried first. The residual compost from their process is Level 4. Cost to construct a typical 8 fermenter chamber plant is \$5.5 million. It is touted as carbon neutral energy production.

There are presently no plants in the United States; Germany has 21 (including the Munich Zoo) and there are 6 other plants elsewhere in the world