Cladophora, Aquatic Macrophytes, and Beach Management

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Beach Management

- What constitutes beach management?
  - Physical Maintenance
    - Beach grooming
    - Trash removal
    - Building maintenance
  - Aesthetics
  - Ecosystem Protections
  - Public Health and Safety
    - Water quality
    - Public education

Harmful Algal Blooms

- Direct Health Effects
  - Due to toxins
  - Human
  - Animal
- Economic Impacts
  - Direct economic impact, i.e. lost revenue
  - Loss of utility
    - Indirect economic impact, i.e. lack of satisfaction

Increase in Freshwater HAB

- Naturally occurring
- Altered nutrient regimes
- Modified hydrology
- Non-native species
  - Modified food web
- Increased pollutant inputs

NOAA GLERL

Cyanobacteria

- Formerly Blue-green algae
- High biomass and/or toxins
- Taste/odor compounds
  - Drinking water reservoirs
- Animal Fatalities
- Human illness
- Off flavor compounds
  - Aquaculture

Managing Cyanobacteria

- Report blooms to DNR or Local Public Health Department
- Do not use algaecides
  - Algaecides release toxins upon cell death
- Don’t irrigate lawns and golf courses with water that looks or smells bad
- Post signs or close beach
  - Toxins may persist after visible signs of bloom are gone

Cladophora

- Filamentous green algae
- Grows in response to nutrients/light
  - Resurgence may be linked to invasive mussel species
- Appears throughout summer
- Benthic
  - Float to surface on death
  - Final resting place depends on wind/waves
- Not known to produce toxins
- Bacterial pathogens?

Other Aquatic Macrophytes

- Various aquatic plants can also become stranded on Great Lakes beaches
- Can serve as attachment point of *E. coli*
- Can attract waterfowl

NOAA GLERL, Ladd Johnson

Caseville County Park Beach, MI

Additive Impacts

- Many biological, chemical, and physical factors interact to create a favorable growth environment
  - Invasive Species
    - Zebra mussels promote by selectively filtering other algae, leaving toxic cyanos and rapidly recycling nutrients that stimulate growth
    - Zebra mussels promote blooms by providing substrate for growth and providing localized nutrient source
  - Nutrients – phosphorous fertilizers
  - Wildfowl – natural nutrient source, bacteria

Utility vs. Ecosystem Health

Maximize Utility

- Low lake levels have increased exposed lake bed (beach size)
- Better view
- No smell
- Nicer experience
- Less frequent WQA
- Poor economy – recreate closer to home
  - Maximize public access

Protect the Environment

- Emergent and submergent vegetation provides habitat
- Vegetation can prevent shoreline erosion
- Vegetation can act to filter nutrients
- Stranded and submerged algal mats provide habitat and a source of food

Regulations

- Public Trust Doctrine (WI)
- Changes
  - 2001, land only accessible for portage if unavoidable
- Any land below ordinary high water mark in held in trust for the public
  - Protected areas
  - May require approvals or permits to remove plant material

WI DNR

- Can be allowed to decompose along the shoreline
- Can not be actively pushed back into the water
- May be removed by hand without approval
  - Shovel, rake, wheelbarrow, etc.
  - Must be disposed of in an upland location
  - Mechanized removal of nuisance levels requires a permit
    - A single permit may be used for multiple properties
- Vegetation, other than protected species, may be cleared in a single 30-ft wide path
  - By hand w/o a permit (includes push lawn mower)
  - Unlimited amounts of invasive species may be removed (purple loosestrife, Phragmites, etc.)

MDEQ

- Manual removal of algae, without the assistance of mechanical equipment, does not require a permit from the DEQ
- Algae removal activities below the water's edge (i.e., in the water) or in areas that contain vegetation require a permit
- All mechanical activities between the ordinary high watermark of the Great Lakes and the water's edge require a permit
- A permit is required by the U.S. Army Corp of Engineers for all mechanical removal of algae
- Beach grooming permits must specify algae/debris removal

Wenona Beach, Saginaw Bay, MI

- Beach servicing mobile home park
- Covered in vegetation and muck
- No MDEQ permit to remove
- Balance between access and preservation of exposed coastal wetlands

Beach Management on the Great Lakes

US and Canadian Examples

Motivation for Action

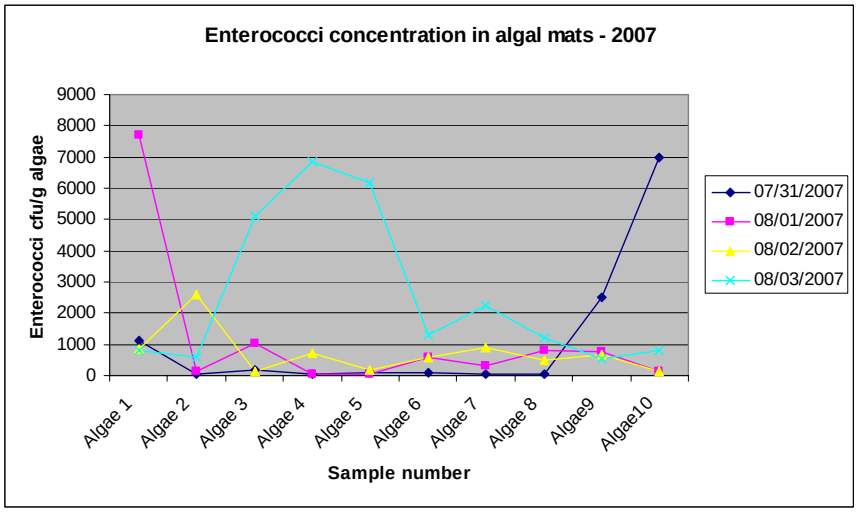
- **Public perception/expectations**
  - **Citizens value utility as condition of residence**
- **Economic issues**
- **Social issues**
  - **Equity with regards to access**
- **Environmental protection/preservation**
  - **Coastal habitat**
  - **Fisheries and wildlife**
- **Public health**

Milwaukee, WI

- Bradford Beach
  - Milwaukee County Parks System
- Workforce
  - Milwaukee Community Service Corps
  - City of Milwaukee summer interns
  - Milwaukee Area Workforce Investment Board
    - "Green Jobs" workers
- Rake daily (weekdays) and then landfill
  - Investigating possibility of composting
    - *Growing Power*
- Storm Water Management
- Daily beach grooming

Racine, WI

The “Yuck” Cycle



Mechanical Removal & Storm Water Management

- Reduce NPS, phosphorous
- Rake material on to shore
- Grooming removes plant and animal material that can attract scavengers
- Also removes materials that may be harmful to beach patrons like broken glass

Chicago, IL

- Clean the beaches daily during the swimming season
- 6 Barber SurfRakes
  - New = 12” tines, 4” depth
- Picking up trash
- Break up/Pick up most of the algae on Chicago beaches
- Extreme weather events may trigger manual removal
  - More frequent at beaches with structures
  - Chicago Parks District crews
- Composting program for weedy organic refuse

Bay City, MI

- *Beach Wellness Volleyball Tournament*
- Charity runs
- Fundraiser for beach cleanup efforts
- Money used to maintain the algae-stricken beach shoreline
- Raised over $15,000 per event
- Used funds to move sand and purchase beach groomer

Bay City, USACE, DNR, and MDEQ pilot study

Experimenting with a pump system to draw suspended algae from the water before it washes ashore and turns into smelly muck

Hamilton, ON

- Hamilton removes algae from the
- beach by hand with fan rakes.
  - Beaches too small for a groomer
- It is raked into piles, picked up with a pitchfork, and deposited into the dump box of a "gator" (a 6 wheeled motorized golf cart).
- The amount of algae has lessened considerably over the past couple of years.
- Staff estimate that in mid-July to mid August they may clear the beach from once per week to daily depending on weather.

Toronto, ON

- Algal blooms are only one of many issues
  - Rakes and beach groomer in sandy areas
  - Rakes only in rocky areas of shoreline
  - Weed harvester used for offshore blooms
- Weeds are an issue
  - Especially near islands
  - Impedes boat traffic
- No provincial permits required for algae removal or weed cutting

Weed Harvesters

Didn't work well for *Cladophora*

- $1 million CAD each
- Partner with Harbourfront Centre
  - Nonprofit group
  - Operates city equipment
- Weeds composted for use as mulch
- Herbicides not allowed

Sunnyside Beach, Toronto

Appearance is key! Visual impact.

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