Aquatic Plant Control Methods

The Three Lakes Council

May 16, 2008

Allied Biological

Benefits of Aquatic Plants

- Aquatic Biota Habitat
  - Fish
  - Aquatic Invertebrates
  - Zooplankton
- Wildlife Habitat and Food
  - Waterfowl, muskrats, otters, beavers, deer
- Nutrient Sink
- Shoreline and Benthic Stabilization
- Aesthetics

But at Nuisance Densities…

- Restrict Recreational Uses
  - Boat movement
  - Fishing
  - Aesthetics
- Ecological Imbalances
  - Fish Community
- Invasive Species

There is no Silver Bullet!

- Aquatic Plant Control is about compromise
- Many Factors when choosing:
  - Budget
  - Type of Plant/Plant Abundance
  - Local vs. Lake-wide control
  - Permits Required for Aquatic Plant Control
  - Physical Lake Characteristics
    - Basin morphology
    - Water flow
    - Downstream activities
  - Environmental Concerns
    - Freshwater wetlands
    - RTE species
    - Desirable native species

Types of Aquatic Plant Control

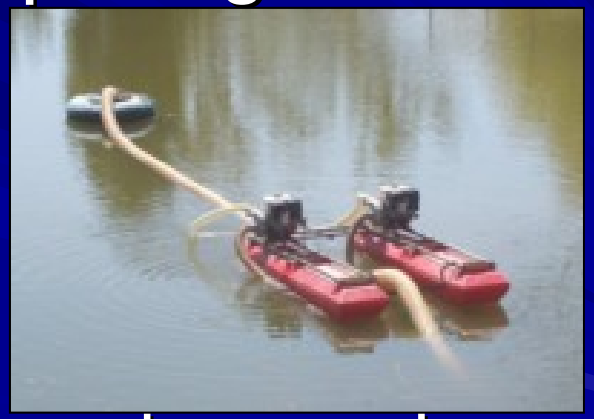
- Local vs. Lake-wide
- Mechanical
  - Hand pulling/suction harvesting, sediment agitation, harvesting (and removal), mechanical raking
- Physical
  - Benthic barriers, lake lowering, dredging
- Biological
  - Grass carp, herbivorous insects
- Chemical
  - Contact herbicides, systemic herbicides, alum (nutrient inactivation), algaecides

Mechanical: Hand Pulling/Cutting

- Type: Local
- Oldest form of aquatic plant control
- Advantages
  - Low technology
  - Can be inexpensive (volunteers)
  - Can be selective
- Disadvantages
  - Labor intensive
  - Costs is labor-based
  - Poor productivity
  - Fragmentation

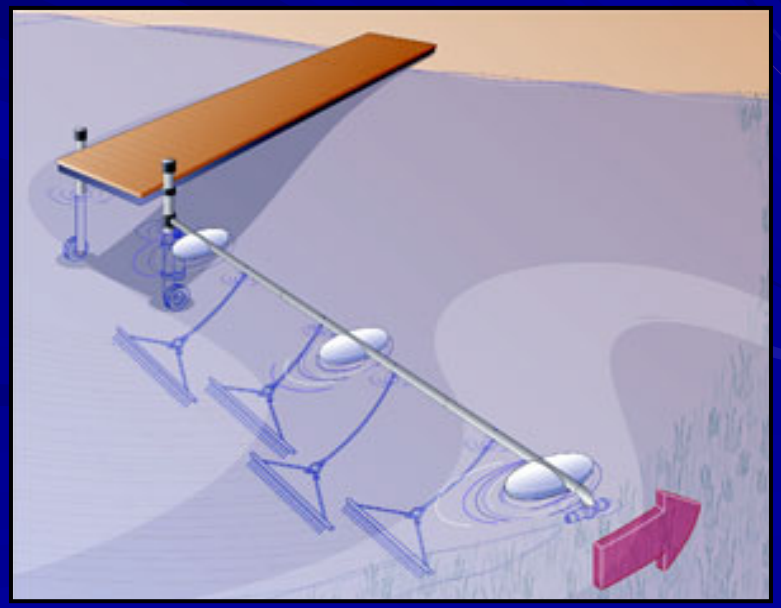
Mechanical: Suction Harvesting

- Type: Local
- Essentially a high tech form of hand pulling
- Advantages: Same as hand pulling
- Disadvantages
  - Expensive ($5000-$10,000/acre)
  - Turbidity (curtains can contain)
  - Destroys benthic habitat
  - If not selective, encourages invasive species re-colonization



Mechanical: Sediment Agitation

- Type: Local (around docks)
- Advantages
  - Homeowner friendly
  - Can be moved around
  - Inexpensive ($2000-$3000/unit)
- Disadvantages
  - Disrupts the benthic community
  - Disrupts fish spawning
  - Fragments plants



Mechanical: Mechanical Harvesting

- Local or Lake-wide
- Advantages
  - Any size area
  - May not require a permit
  - May remove some biomass/nutrients?
- Disadvantages
  - Non-selective
  - Provides seasonal control only (numerous cuttings needed)
  - Fragmentation of aquatic plants
  - Fish/invertebrate bycatch
  - Disposal of harvested vegetation

Mechanical: Mechanical Harvesting

Mechanical: Mechanical Raking

- Type: Local
- Also called Hydro-raking
- Advantages
  - Can increase water depth
  - Removes biomass and reproductive structures
  - Effective on water lilies, cattails and *Phragmites*
- Disadvantages
  - Non-selective
  - Slow Process
  - Disposal of harvested material
  - Inefficient for most submersed plants
  - Fragmentation of plants

Mechanical: Mechanical Raking

Mechanical: Mechanical Raking

To see movie of mechanical rake in action, visit:

www.alliedbiological.com

Physical: Benthic Barriers

- Type: Local
- Advantages
  - Effective at controlling plant growth in high-use areas
  - Multi-year control possible
- Disadvantages
  - Expensive ($5,000-$20,000/acre)
  - Non-selective
  - Small areas
  - Destroys benthic community
  - Labor intensive to install
  - Maintenance
    - Seams
    - Gas build-up under barrier (needs occasional “burping”)
    - Sediment accumulation on surface

Physical: Lake Lowering

- Type: Lake-wide
- Enhanced if sediments frozen for at least one month
- Advantages
  - Cost is negligible
  - Effective
  - Moderate term control possible
- Disadvantages
  - Water lowering structure needed
  - Aesthetics and reduced access
  - Has severe environmental impacts on other biota
  - Recent warm winters prevent sediment freezing

Physical: Dredging

- Type: Lake-wide
- Advantages:
  - Can be long term
  - Can improve trophic status
  - Creates other benefits
    - Deepens water
    - Removes seed bank, reproductive rhizomes
    - Dam repair
    - Fish habitat enhancement
- Disadvantages:
  - Permits required
  - Destroys current lake habitat (start over)
  - Disposal of dredged sediments
  - Extremely expensive for plant control alone
    - $10,000 to $50,000/acre

Physical: Dredging

Traditional Dredging

Physical: Dredging

Aqua-dredge

- More Expensive
- Less Efficient
- Need De-watering Site
- More Environmentally Friendly

Biological: Grass Carp

- Type: Lake-wide
- Advantages:
  - Relatively easy to implement
  - Relatively inexpensive ($175-$250/acre)
  - Multi-year control
- Disadvantages:
  - Short Envr. Assessment form required
  - Selective on preferred plants
  - No control on the feeding area
  - Slow results (often takes years)
  - Unpredictable results
  - Grass Carp are an exotic species (potential fishery impacts)
  - Construction of outlet fences
  - Increased turbidity from feeding activities

Biological: Grass Carp

Grass Carp Feeding Preferences

Aquatic Plants Consumed Preferentially or Controlled	**Aquatic Plants Sometimes Preferred or Controlled**	**Aquatic Plants Not Preferred and Sometimes Not Controlled**
Fanwort (*Cabomba caroliniana*)	Water fern (*Azolla caroliniana*)	Slender naiad (*Najas flexilis*)
Muskgrass (*Chara* spp.)	Water hyssop (*Bacopa* spp.)	Coontail (*Ceratophyllum demersum*)
Brazilian Elodea (*Egeria densa*)	Spikerush (*Eleocharis* spp.)	Cattail (*Typha* spp.)
Common waterweed (*Elodea canadensis*)	Watercress (*Nasturtium officinale*)	Spatterdock (*Nuphar* spp.)
Hydrilla (*Hydrilla verticillata*)	Pondweeds (*Potamogeton* spp.)	White Lily (*Nymphaea* spp.)
Duckweeds (*Lemna* spp. and *Spirodela* spp.)	Filamentous algae (*Spirogyra* spp.)	Eurasian water milfoil (*Myriophyllum spicatum*)
Southern Naiad (*Najas guadalupensis*)		Tapegrass (*Vallisneria*)
Arrowhead (*Sagittaria graminea*)		Parrot-feather (*Myriophyllum aquaticum*)
Creeping Bladderwort (*Utricularia gibba*)		Water hyacinth (*Eichhornia crassipes*)
Watermeal (*Wolffia* spp.)		Frogbit (*Hydrocharis morsus-ranae*)
		Bulrush (*Scirpus* spp.)
		Water primrose (*Ludwigia repens*)
		Variable-leaf water milfoil (*Myriophyllum heterophyllum*)

(Source: Sanders, L., Hoover, J.J., Killgore, K.J., 1991)

Biological: Herbivorous Insects

- Type: Lake-wide
- Advantages:
  - Easy to implement
  - Multi-year control possible
  - Reasonably inexpensive ($500-$1000/acre)
- Disadvantages:
  - Very selective (species specific)
  - Slow results (years)
  - Unpredictable results in New York

Biological: Herbivorous Insects

Euhrychiopsis lecontei

Milfoil Weevil

Acentria ephemerella

Milfoil Moth

Eurasian Water Milfoil Control

Chemical: Herbicides

- Type: Local or Lake-wide
- Advantages:
  - Can be selective (dosage)
  - Can have quick, visible results
  - Can have consistent and reliable results
  - Seasonal or multi-year control
  - Can be Inexpensive (as low as $150-$200/acre)
- Disadvantages:
  - Must be applied by a certified applicator
  - Water use restrictions
  - Negative public perception

Chemical: Contact Herbicides

- Fast acting on plant tissue (~7days)
  - But can cause DO depletion if not careful
- Causes extensive cellular damage, but not roots
- Usually only provides seasonal control
- Site-specific
- Can be species selective
- Examples: diquat dibromide, endothall

Chemical: Systemic Herbicides

- Product is translocated throughout the plant structure
- Longer contact time needed, but…
  - Slower decomposition has less effect on the lake's oxygen regime.
  - Often multi-year control of certain species can be achieved
- Tend to be more species selective
- Granular formulations useful for site specific or high flow areas
- Examples: fluridone, 2, 4-D, triclopyr

Chemical: Aluminum Sulfate

- Lake-wide
- Nutrient Inactivation (treats the “cause”, not the symptoms)
- Creates a drop in pH and alkalinity
  - Addition of soda ash effectively offsets
- Alum binds with particles and TPO4 in water column, creates a Floc that settles on the bottom (unavailable for use)
  - Used since the late 1960’s
  - Extensively employed in the Midwest
  - Not permitted in Region 3, NY

Chemical: Aluminum Sulfate
Four Strategies of Application

- Phosphorus Water Column Stripping
  - Low dose for clarity and external nutrient loading
- Phosphorus Inactivation
  - High dose to inactivate internal nutrient loads
- Phosphorus Interception
  - Continuous (or variable) injection to intercept external nutrient sources
- Alum Maintenance Treatments
  - Several low doses over time to establish inactivation of internal nutrient loads

Chemical: Algaecides

- Copper-based products
  - Copper Sulfate (49% elemental copper)
  - Chelated Copper (8-9% elemental copper)
    - More expensive formulation
    - Greater contact time
    - Less frequent algae rebound
    - Less impact on zooplankton
  - Peroxygen-based
    - Alternative to copper products
    - Releases dissolved oxygen into the water
    - Typically requires more maintenance
    - Example: GreenClean

Keep in Mind…

- **Many of these methods require a permit in NY (NYDEC, and possible township permits)**
- **<u>Any</u>** form of Aquatic Plant Control will have an effect on the natural ecology of the lake!
  - Impacts on desirable native plants
  - Impacts on other biota
  - Impacts on physical characteristics
    - Water depth
    - Turbidity
    - Altering habitat

Thank You!

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Allied Biological