Overview of Aquatic Plant Management Techniques & Representative MA Case Studies

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SŌLITUDE
LAKE MANAGEMENT

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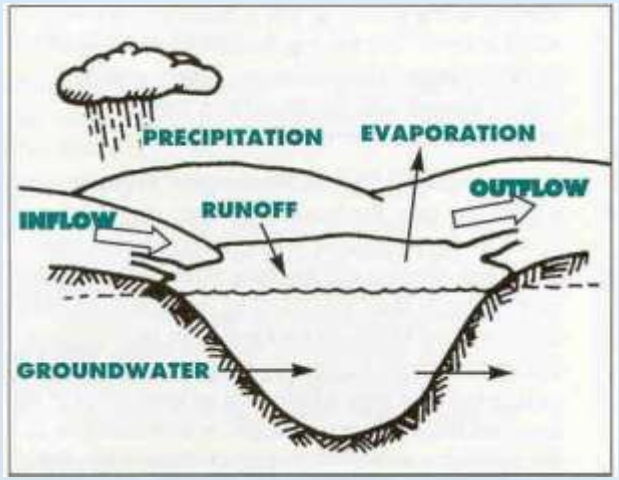
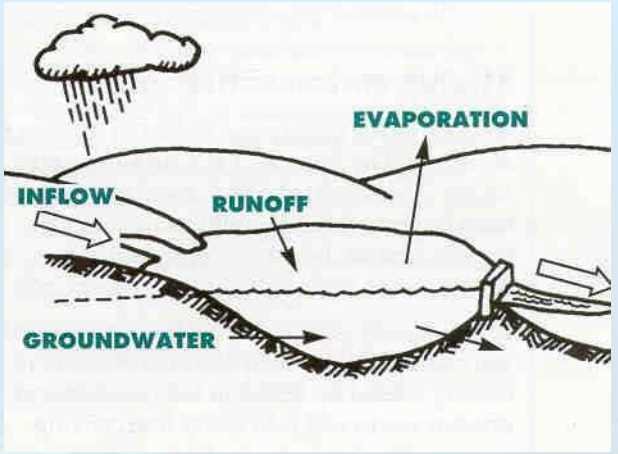
Presentation Overview

- Overview of Lakes/Ponds & Their Watersheds
- Development of a Management Program
  - Assessment, Implementation, Monitoring
- Management Techniques
  - Watershed
  - In-Lake
- Case Study Review

Overview of Lakes & Their Watersheds

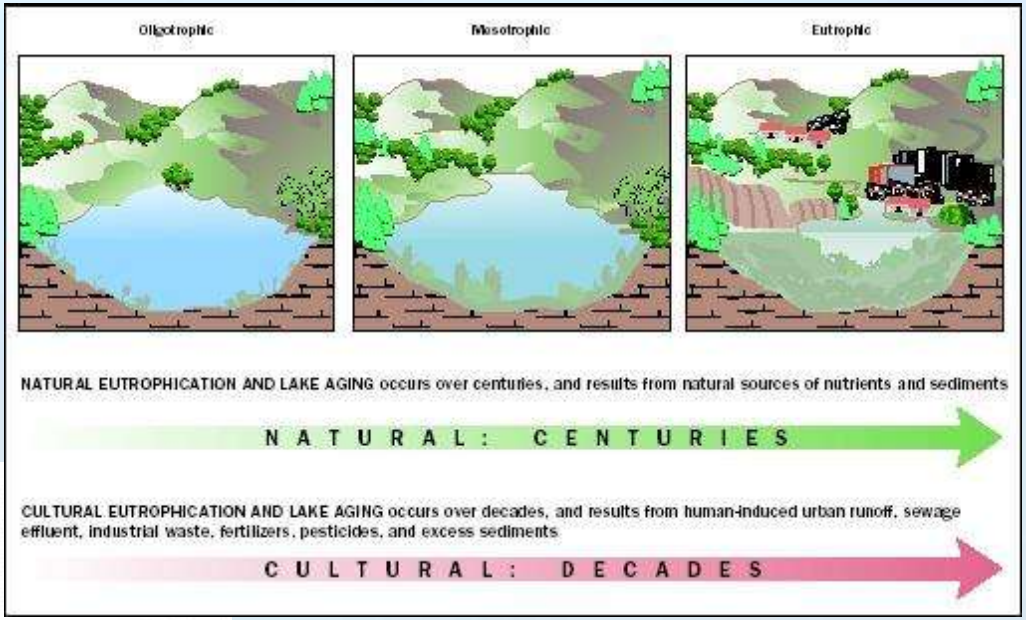
- Natural vs. Man-Made

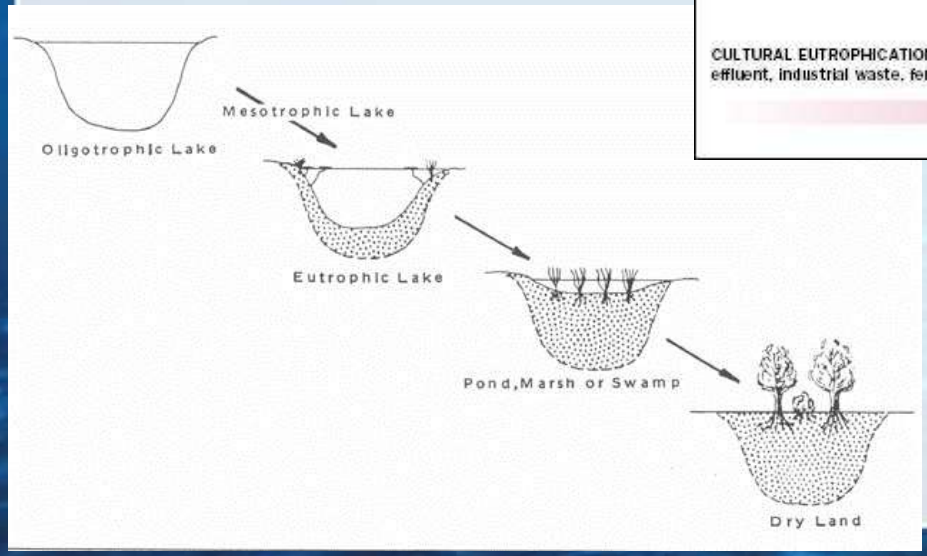




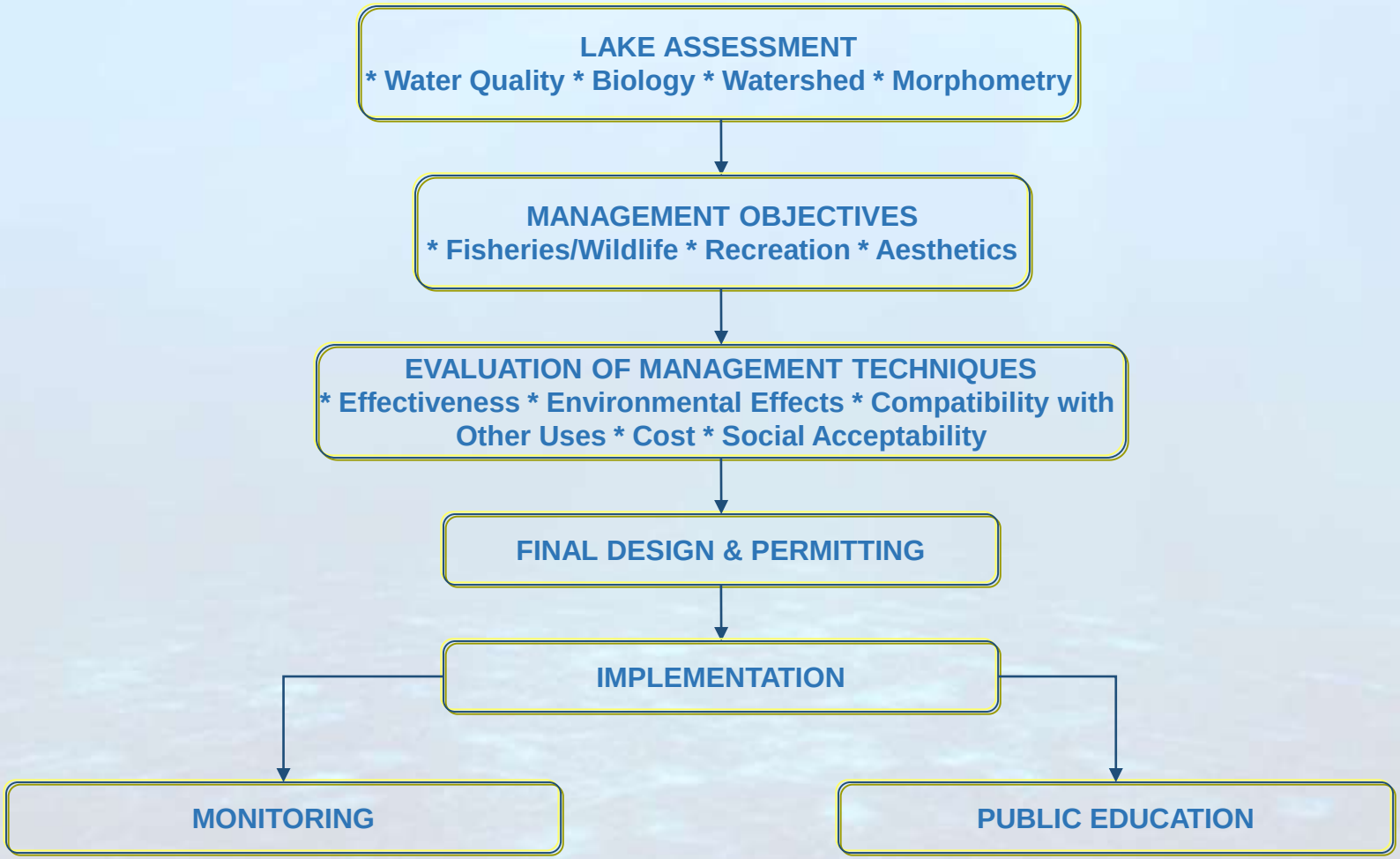
Overview of Lakes & Their Watersheds

- Eutrophication





DEVELOPMENT OF A COMPREHENSIVE AQUATIC VEGETATION MANAGEMENT PLAN



EXOTIC OR INVASIVE AQUATIC PLANTS

- **Eurasian Watermilfoil**
- **Variable Watermilfoil**
- **Fanwort**
- **Water Chestnut**
- **Curly-leaf Pondweed**
- **Hydrilla**
- **HABs/cyanobacteria**
- **Common Reed / Phragmites**

Eurasian Watermilfoil (*Myriophyllum spicatum*)

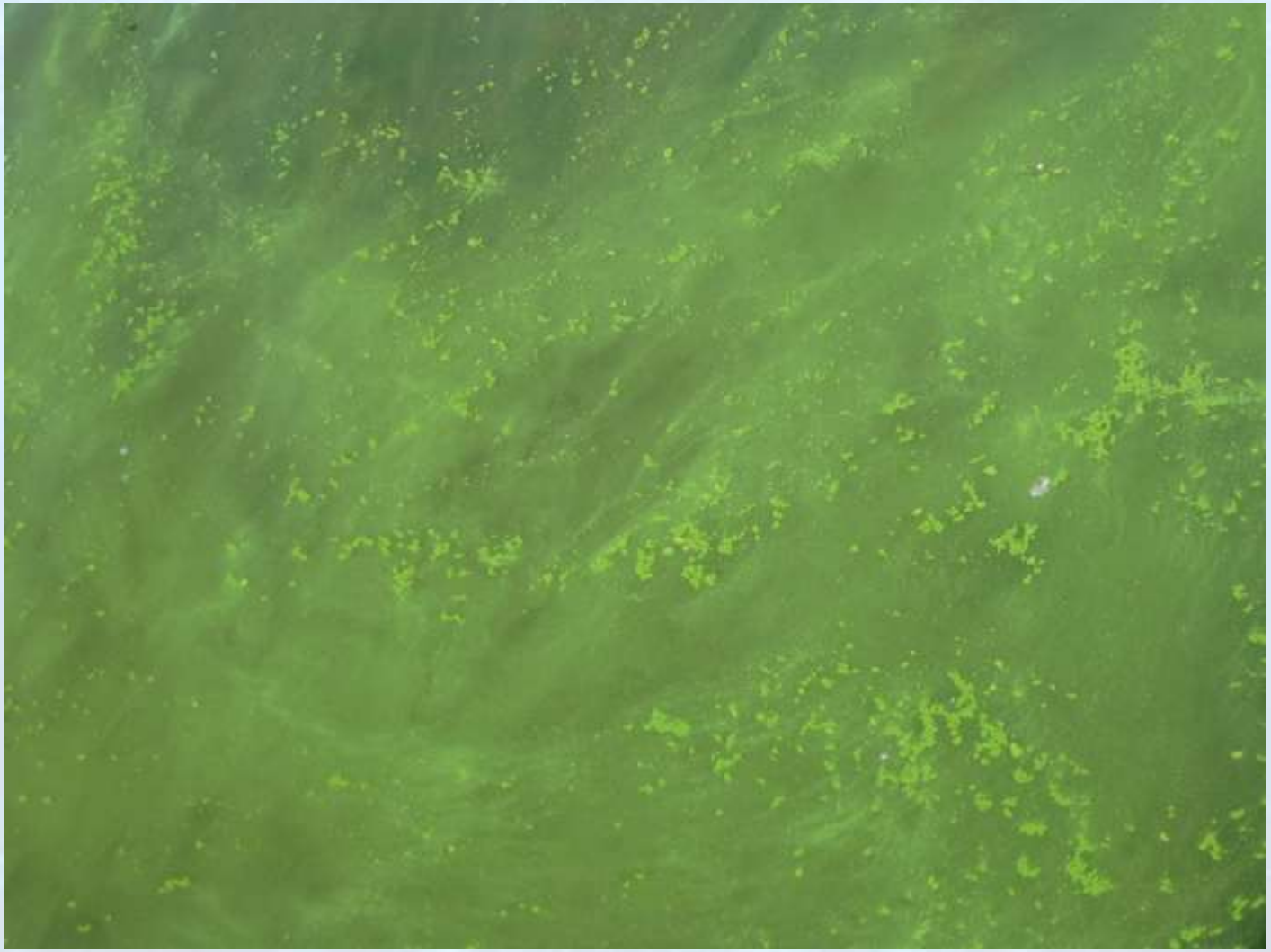
Variable Watermilfoil (*Myriophyllum heterophyllum*)

Fanwort (*Cabomba caroliniana*)

Water Chestnut (*Trapa natans*)

Curlyleaf Pondweed (*Potamogeton crispus*)

Hydrilla (*Hydrilla verticillata*)



Cyanobacteria

Common Reed (*Phragmites australis*)

POTENTIAL IMPACTS OF EXOTIC OR INVASIVE PLANTS

FISH, WILDLIFE & NATIVE PLANTS

- **Displacement of native plants**
- **Displacement of endangered, threatened or rare aquatic plants**
- **Habitat loss for fish & wildlife**
- **Change in spawning site availability**
- **Change in fish distribution**
- **Reduction in feeding success of predatory fish**
- **Reduction of open-water**

WATER QUALITY

- **Temperature & oxygen fluctuations**
- **Increased phosphorus (nutrient) loading**
- **Alteration in plant and algae communities**
- **Accelerated eutrophication rates**

Source: A report from the Milfoil Study Committee on the Use of Aquatic Herbicides to Control Eurasian Watermilfoil in Vermont. VTDEC, March 1993

Watershed Management

In-Lake Management

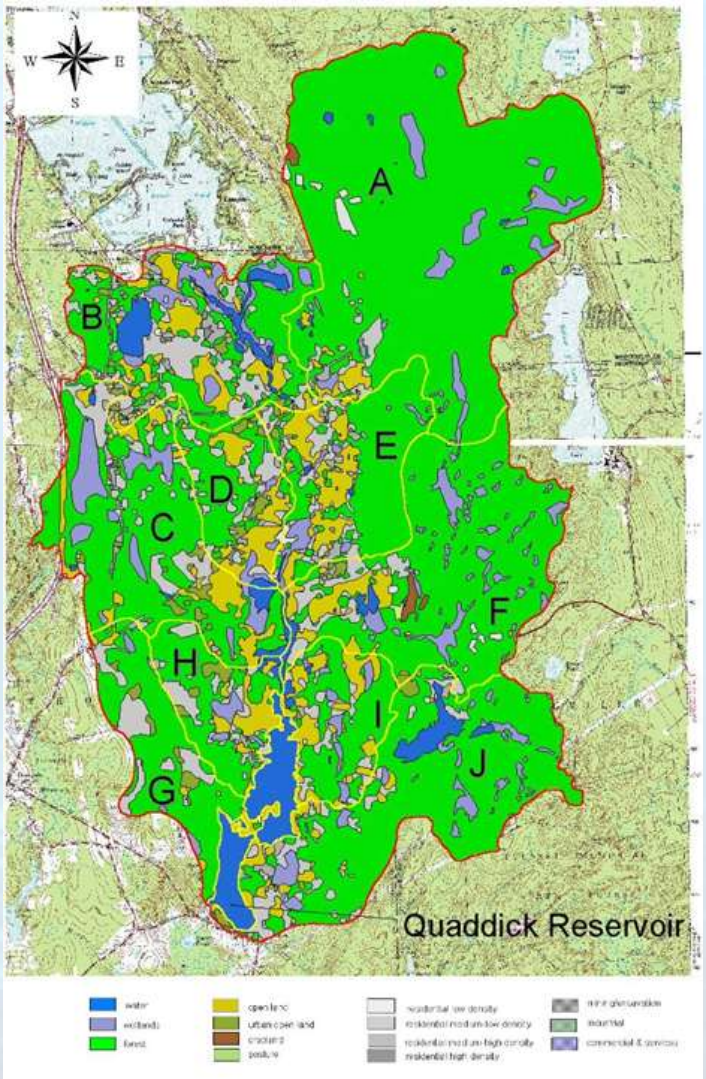
Watershed Management

Source Reduction

- Agricultural Best Management Practices
- Bank and Slope Stabilization
- Behavior Modifications
- Stormwater / Wastewater Management
- Zoning and Land Use Planning

Transport Mitigation

- Buffer Strips
- Catch Basins and Street Sweeping
- Created Wetlands for Infiltration
- Detention Ponds and Infiltration Systems



In-Lake Management

Different Approaches

- Physical/Manual
- Mechanical
- Chemical
- Biological

Which One to Use

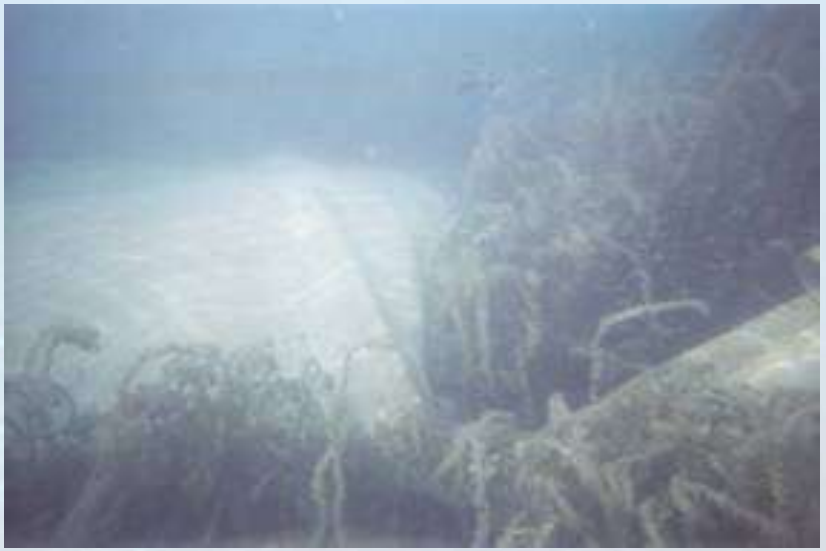
- Program goals and objectives
- Accurate plant identification
- Environmental constraints
- Social acceptability
- Cost

PHYSICAL/MANUAL CONTROL OR HABITAT MANIPULATION

Drawdown

Benthic Barriers

Photo By: Nikki Leam



Aeration

Diver Handpulling/DASH

MECHANICAL CONTROL

Harvesting

Hydro-Raking

Dredging

Hydraulic Dredging

CHEMICAL CONTROL

Registered aquatic herbicides available in the 1990's

Compound		Year Registered	Mode of Action
2,4-D Ester	Navigate	1959	Systemic – auxin mimic
2,4-D Amine	(liquids & Sculpin G)	1976	
Copper	Komeen, Nautique, etc.	1950's	Contact – phs – membrane
Diquat	Reward	1962	Contact – PSII – membrane
Endothall	Aquathol K	1960	Contact – Resp. – membrane
Glyphosate	Rodeo, etc.	1982	Systemic – protein synthesis
Fluridone	Sonar	1986	Systemic – Enzyme inhibitor

Aquatic herbicides registered since 2002

Compound		Year Registered	Mode of Action
Triclopyr	Renovate	2002	Systemic – auxin mimic
Imazapyr	Habitat	2003	Systemic – ALS inhibitor
Peroxide	Green Clean, etc.	2003 (1980s)	Contact - algaecide
Carfentrazone	Stingray	2004	Contact – Enzyme-membrane
Penoxulam	Galleon SC	2007	Systemic – ALS inhibitor
Imazamox	Clearcast	2008	Systemic – ALS inhibitor
Flumioxazin	Clipper	2010	Contact – protox
Bis-pyrobac	Tradewind	2012	Systemic – ALS inhibitor
Topramezone	Oasis	2014	Systemic – HPPD inhibitor

FACTORS FOR HERBICIDE SELECTION…

- Target species
- Size & configuration of treatment area
- Selectivity desired or required
- Water uses
- Flow considerations
- Timing
- Cost

METHODS OF APPLICATION

CAUTION

MA Dept. of Public Health guidelines for cyanobacteria (blue-green algae) in recreational waters have been exceeded. A public health advisory has been issued for this waterbody.

- Water that looks like the pictures above may contain algae capable of producing toxins that can be dangerous to humans and pets.

- People and pets should avoid contact in areas of algae concentration- even on shore.

- Do not swallow water and be sure to rinse off after contact.

For further information call MDPH at 617-624-5757 or visit www.mass.gov/dph/environmental_health

Nutrient Management

- Phosphorus is the limiting nutrient in freshwater systems
- Percipitant treatment
  - Aluminum sulfate
  - Phoslock (Lanthanum)
- Precipitation vs. Inactivation

BIOLOGICAL CONTROL

Herbaceous Insects

Aquatic weevil (*Euhyrychiopsis lecontei*)

- **- Eurasian watermilfoil only**
- **- Stem borrowing/tunneling**
- **- Limited and very inconsistent milfoil impact**

Photo By Robert Johnson, Cornell University

European beetle (*Galerucella calmariensis & G. pusilla*)

- **- Purple loosestrife**
- **- Eat plant foliage**
- **- Positive results throughout NE**


Photo Taken By: Mark Wilson, Boston Globe

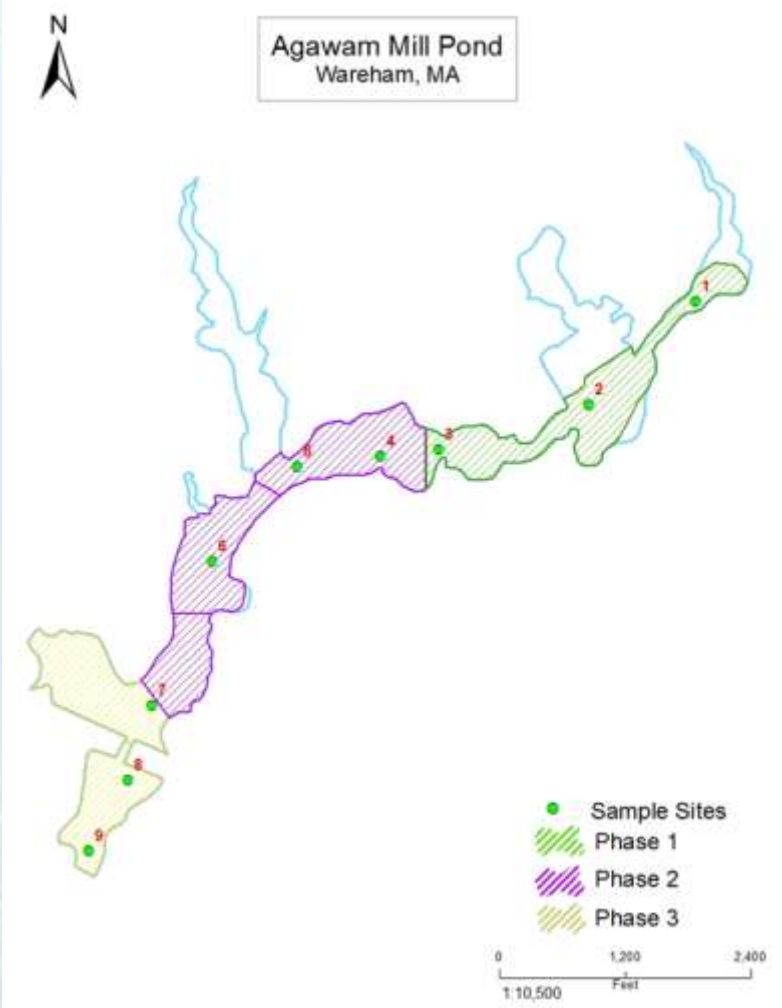
Triploid (sterile) Grass Carp

- **- Not approved in MA**
- **- 5-15 fish/vegetated acre**

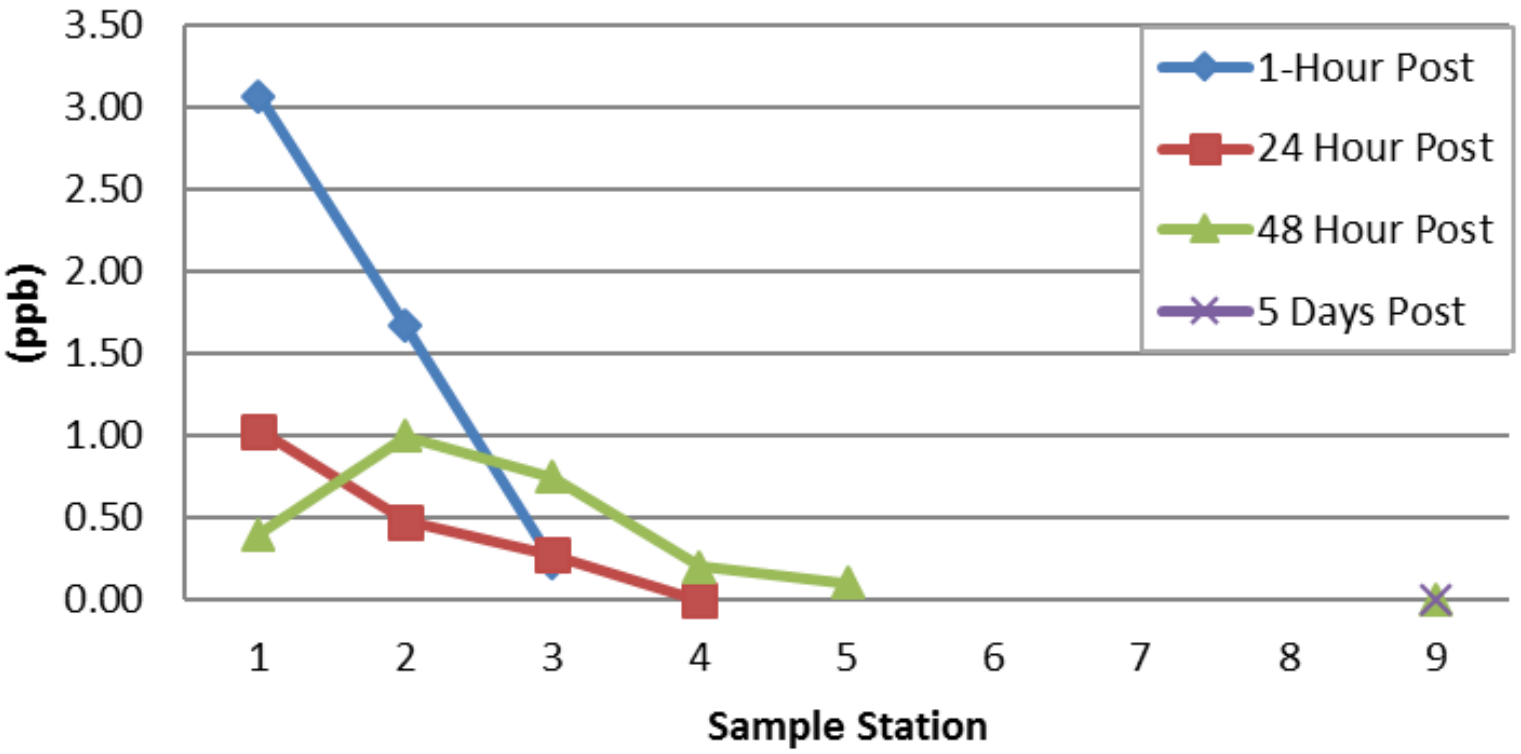
MA CASE STUDIES

Management Plan

- Three phase herbicide treatment approach using Clipper (flumioxazin)
- Divert water flow to mitigate flow through the system following treatment
- Pre & post treatment vegetation, water quality, and herbicide residue monitoring at nine designated stations throughout the system
- State listed species surveys following each treatment event
- DMF TOY waiver for treatment prior to July 1



Herbicide Residue Sample Results



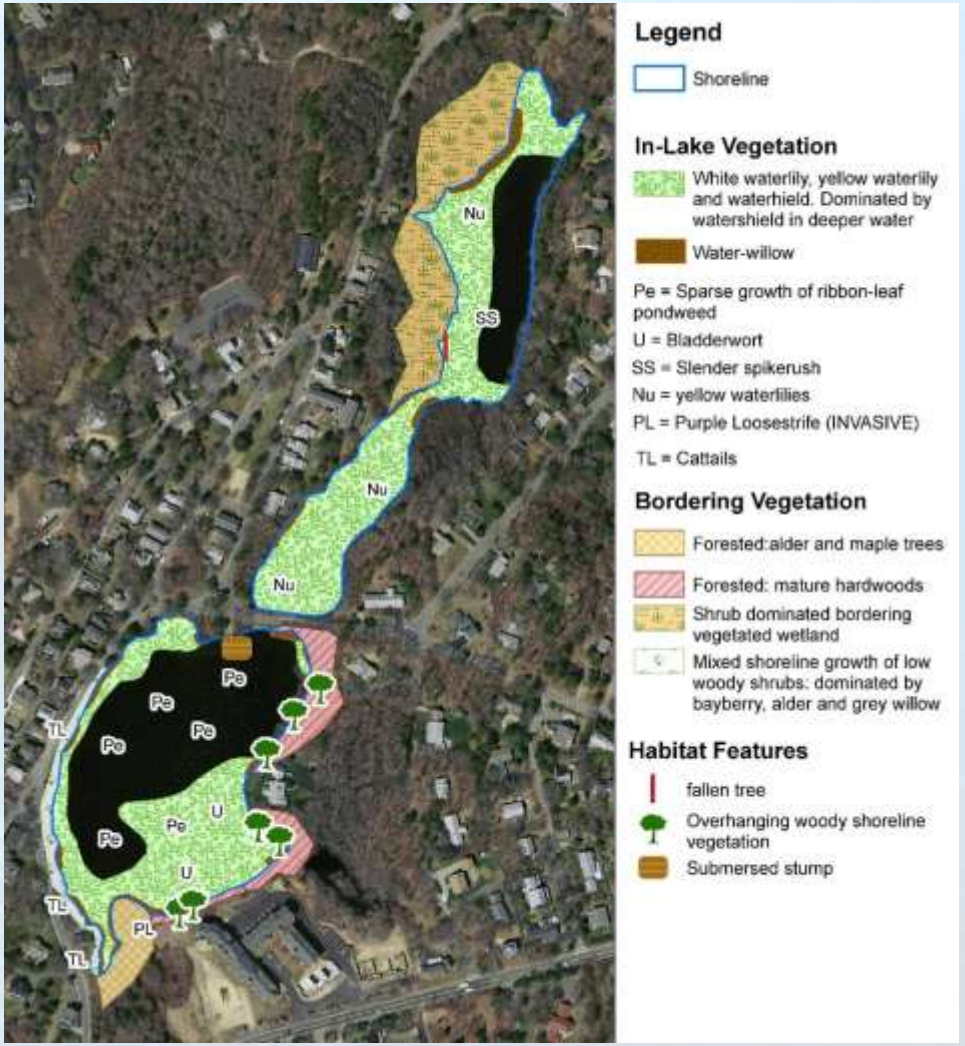
PHASE 1 – AFTER TREATMENT

Phase I & II Results

- Effective control of the target species
- Minimal impact on non-target species outside of designated treatment areas
- Movement of herbicide downstream observed, but at concentrations below lethal levels
- Drop in dissolved oxygen following treatment peaking at about 5 DAT
- Observed increase in turbidity and loss of clarity following treatment
- No fish stress or mortality observed or reported following treatment
- No observed impact to downstream state listed plant species following treatments
- Observed carry-over control of target plant species in Phase I throughout year two
- Maintenance level spot treatment of areas of target plant regrowth not to exceed a total of 20 acres annually

Red Lily Pond & Lake Elizabeth

- Barnstable, MA
- 5.5 acres of area selective mechanical hydro-raking to restore open water habitat and "edge-effect"
- Areas of state-listed habitat – water willow stem borer
- Herring run from Centerville Harbor



Red Lily Pond & Lake Elizabeth

- In 2011 approximately 25 days of raking was conducted to remove areas of dense water lily, watershield, and encroaching burreed
- Work conducted during the month of October and November
- Effective vegetation control and biomass reduction achieved
- Intensive raking effort continues to provide long-term plant control

Billington Sea – Plymouth, MA

- 80 acre Sonar (fluridone) treatment for the control of fanwort
- State listed mussel species present in treatment area – tidewater mucket & eastern pondmussel
- Town brook herring run

Billington Sea – Plymouth, MA

- DMF TOY April 1-July 1
- Installed 600 ft. of water impermeable limno-barrier to prevent herring access and loss of herbicide
- Conducted a series of low-dose Sonar herbicide treatments to achieve desired concentration exposure time for fanwort control
- No impacts to herring, mussels, or other no targets

Questions?

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