Eurasian Watermilfoil Management Strategies

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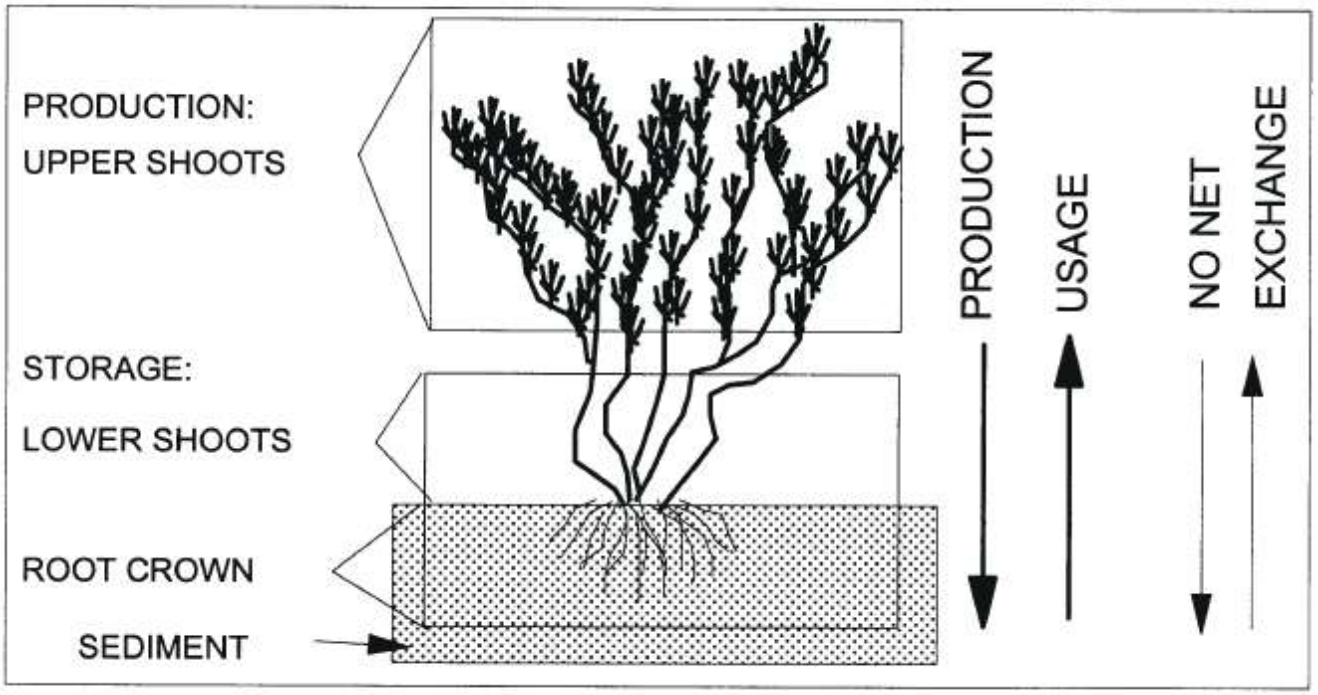
Vegetative Spread

VT DEC

Carbohydrate Allocation



Owens and Madsen 1998

Eurasian watermilfoil Management Application

- Timing of management to coincide with susceptible points in life history, reduce regrowth or overwintering
- Timing of management to prevent autofragment formation

Eurasian watermilfoil strategies

- Goal: Long-term management of Eurasian watermilfoil to cause population decline
- Management point: 1) carbohydrate storage or 2) root crowns / growing points of Eurasian watermilfoil
- Manage in a way that is:
  - Cost-effective
  - Minimizes environmental damage
  - Complies with laws and regulations
  - Acceptable to stakeholders
  - Technically feasible and defensible

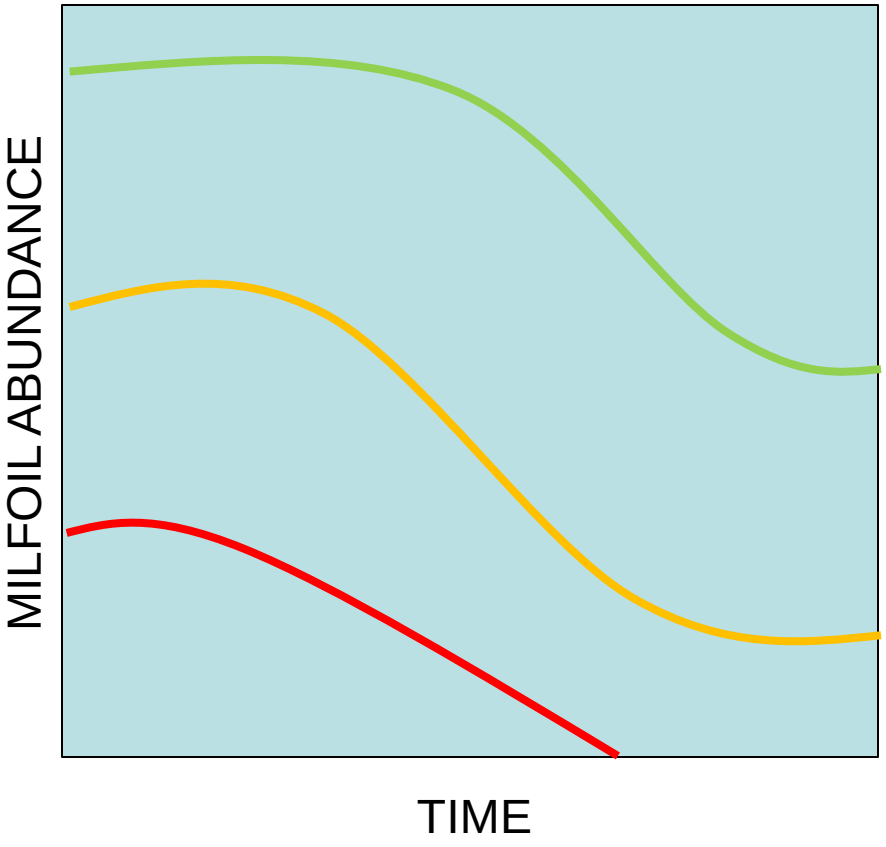
ONE MORE CAVEAT

- The plan for a given lake is YOURS, not mine.
- I'm telling you my experiences and opinions, but it's your lake, your province, your country.
- I am not aware of the specific regulations regarding plant management in BC and Canada, so consult the appropriate agency

To manage or not to manage?

- Are the environmental impacts of invasive plants a threat to our resource?
- What is the real impact of management techniques relative to no management, or to each other?

What are Reasonable Expectations?



- Eradication
- Control
- Management

Aquatic Plant Management Plan

- Develop management goals
- Prevention
- Assessment
- Site-specific management
- Evaluation
- Monitoring
- Education

Management Goals

- Develop specific and achievable management goals
- Develop specific assessment measures for success

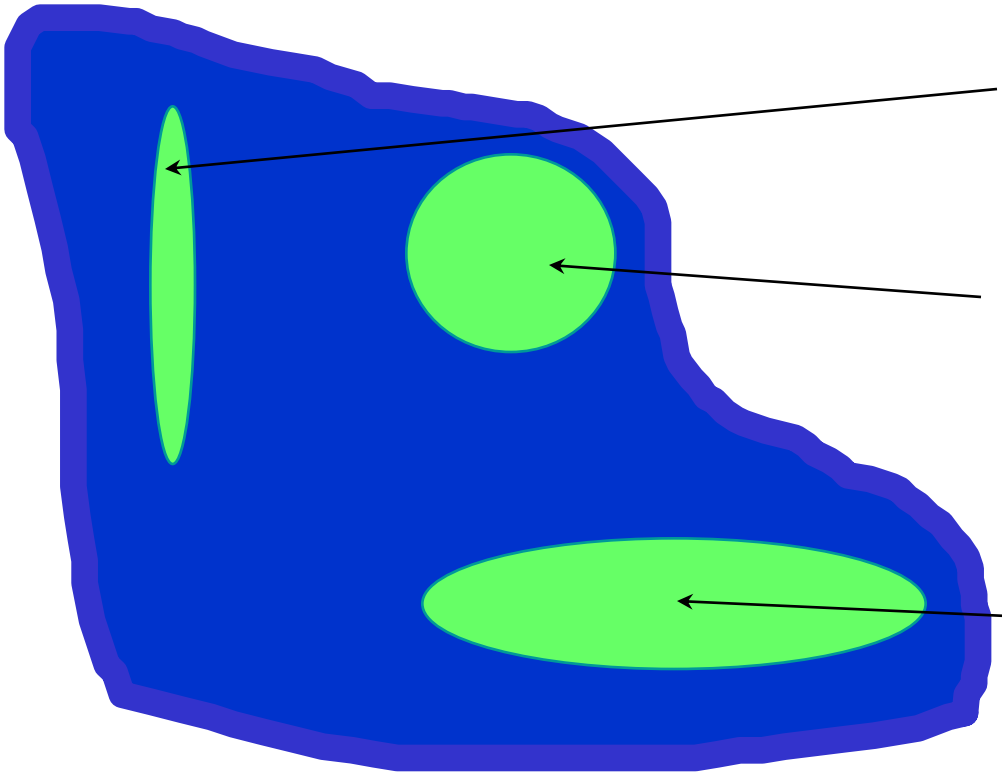
Site Specific Management

- Select management practices tailored to site-specific needs and site priority
- Evaluate site-specific economic and environmental constraints

Site-Specific Management

- Consider the use of all techniques evaluated on their merits
- Use various techniques both spatially and temporally

Spatial Variation in Technique Selection



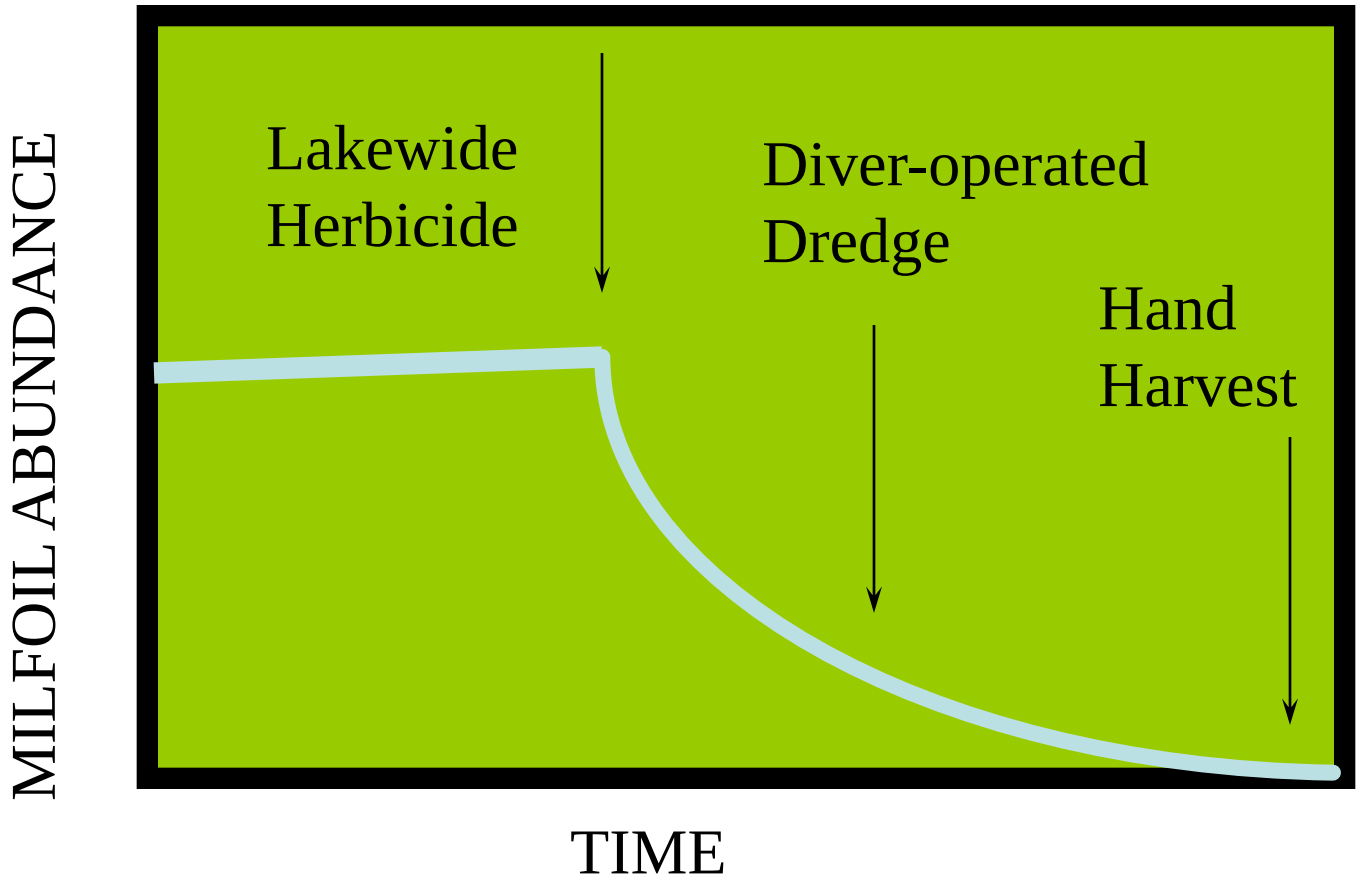
Lake O' Mine

Hand harvesting of scattered plants

Benthic barrier and suction harvesting near water intake

Herbicide treatment over 1 mile away from potable water intake

Temporal Variation in Technique Selection



Written Background

Madsen, J.D. (2000). "Advantages and disadvantages of aquatic plant management techniques," ERDC/EL MP-00-1, U.S. Army Engineer Research and Development Center, Vicksburg, MS.

Available in PDF format at the following web page link:
http://www.wes.army.mil/el/elpubs/pdf/mpel00-1.pdf
Or e-mail me at jmadsen@gri.msstate.edu

More Written Background

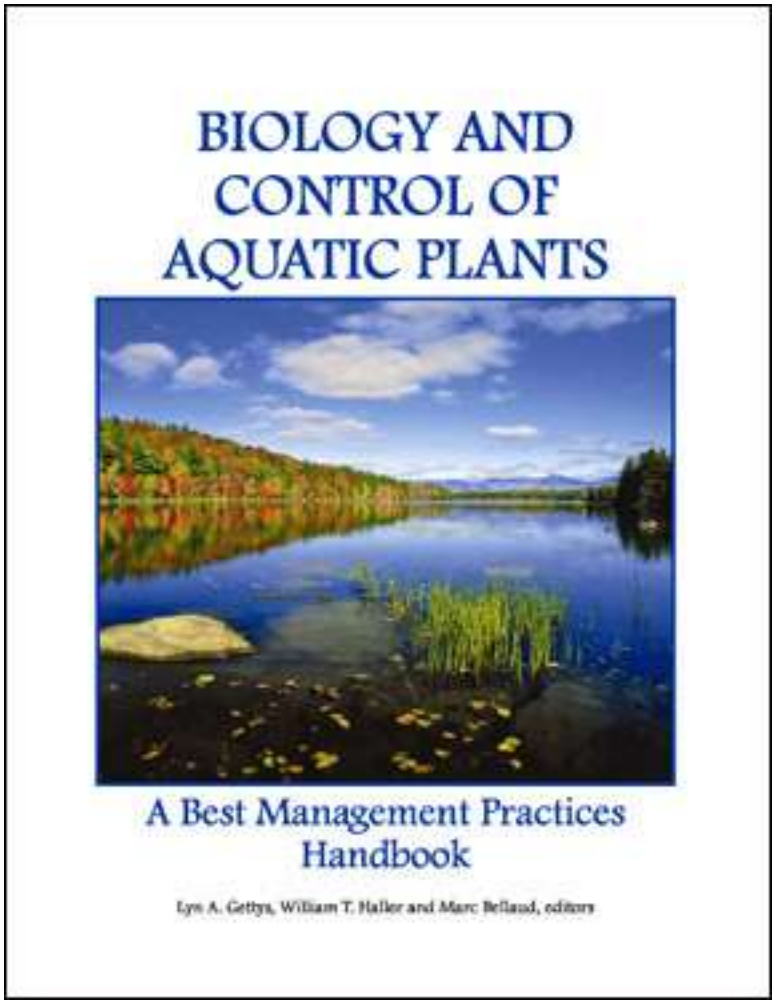
BIOLOGY AND CONTROL OF AQUATIC PLANTS
A Best Management Practices Handbook

Lyn A. Gettys, William T. Haller and Marc Bellaud, editors

Prepared by

Aquatic Ecosystem Restoration Foundation
3272 Sherman Ridge Rd
Marietta, GA 30064

http://www.aquatics.org/bmp.html



Aquatic Plant Management Approaches

- Biological Control
- Chemical Control
- Mechanical Control
- Physical Control
- Institutional Control

Classical Insect Control

- Advantages
  - Public perception
  - Low cost after R&D
  - Long-term
  - Works well for some species in some areas

- Disadvantages
  - No agents for several target invasive plants
  - Long time for R&D
  - Unpredictability of results
  - Limited distribution of effectiveness
  - THERE IS NO CLASSICAL BIOCONTROL FOR EURASIAN WATERMILFOIL

Native Insect Biocontrol

- Advantages
  - Public perception
  - Avoid quarantine period and problems
  - Several apparent successes through natural populations

- Disadvantages
  - No peer-reviewed successful operational protocol
  - Unpredictability of results
  - No current strategy for use
  - Very expensive
  - No theoretical basis for long-term success

Fungal Pathogens

- Advantages
  - Typical plant diseases that can be effective
  - Can be combined with other techniques
- Disadvantages
  - No operational formulations
  - To date, only a “contact mycoherbicide” is under R&D

Chemical Control

Active ingredients labeled for aquatic use in the US by US EPA

Contact
- Carfentrazone ethyl
- Complexed copper
- Diquat
- Endothall
- Flumioxazin

Systemic
- 2,4-D
- Bispyribac-sodium
- Fluridone
- Glyphosate*
- Imazamox
- Imazapyr*
- Penoxsulam
- Triclopyr

Some would also include sodium carbonate peroxyhydrate (an algaecide) and water dyes (alters water transparency)

Chemical Control

Active ingredients labeled for aquatic use in Canada

Contact
- Diquat

Systemic
- None

Some would also include sodium carbonate peroxyhydrate (an algaecide) and water dyes (alters water transparency)

Hand Harvesting

- Advantages
  - Low technology
  - Widely used in many parts of the world
  - Effective in small areas
  - Can be selective
  - Affordable (volunteers)
- Disadvantages
  - Very labor intensive
  - Not practical for large areas (<<1 acre)

Cutting / Harvesting

- Advantages
  - Direct relief
  - Immediate efficacy
  - Moderately expensive (~$400/acre)
  - Public perception
- Disadvantages
  - Not selective
  - Short-term control (2-3 harvests per season)
  - May aid spread some species
  - Slow
  - Disposal (?)

Harvesting Impact on Fish

Summary of direct effects of 1982 mechanical harvesting on juvenile Largemouth Bass (Micropterus salmoides). Revised from Mikol, G.F. 1985. Journal of Aquatic Plant Management 23:59-63.			
	Site #1	Site #2	Combined
Total Number of Fish Removed	11	7	18
Number of Fish Removed per Hectare	220	56	103
Fish Standing Crop (Number / ha)	1894	1894	1894
% Standing Crop Removed	11.6	3.0	5.4

Diver-operated Suction Harvester

- Advantages
  - Selective (dependent on operator and environment)
  - Longer-term control
- Disadvantages
  - Very limited areas
  - Very slow
  - Expensive (~$1,000/acre?)
  - Disposal (?)

Rotovating

- Advantages
  - Longer term than other mechanical (on Eurasian watermilfoil)
  - Moderately inexpensive
- Disadvantages
  - Turbidity
  - Spreads fragments
  - Limited environmental range by depth, sediment
  - Free-floating plant material

Drawdown

- Advantages
  - Effective
  - Very inexpensive (~$0/acre?)
  - Moderate-term
- Disadvantages
  - Not selective
  - Impacts on other organisms (?)
  - Impacts on human uses
  - Need water control structure

Benthic Barrier

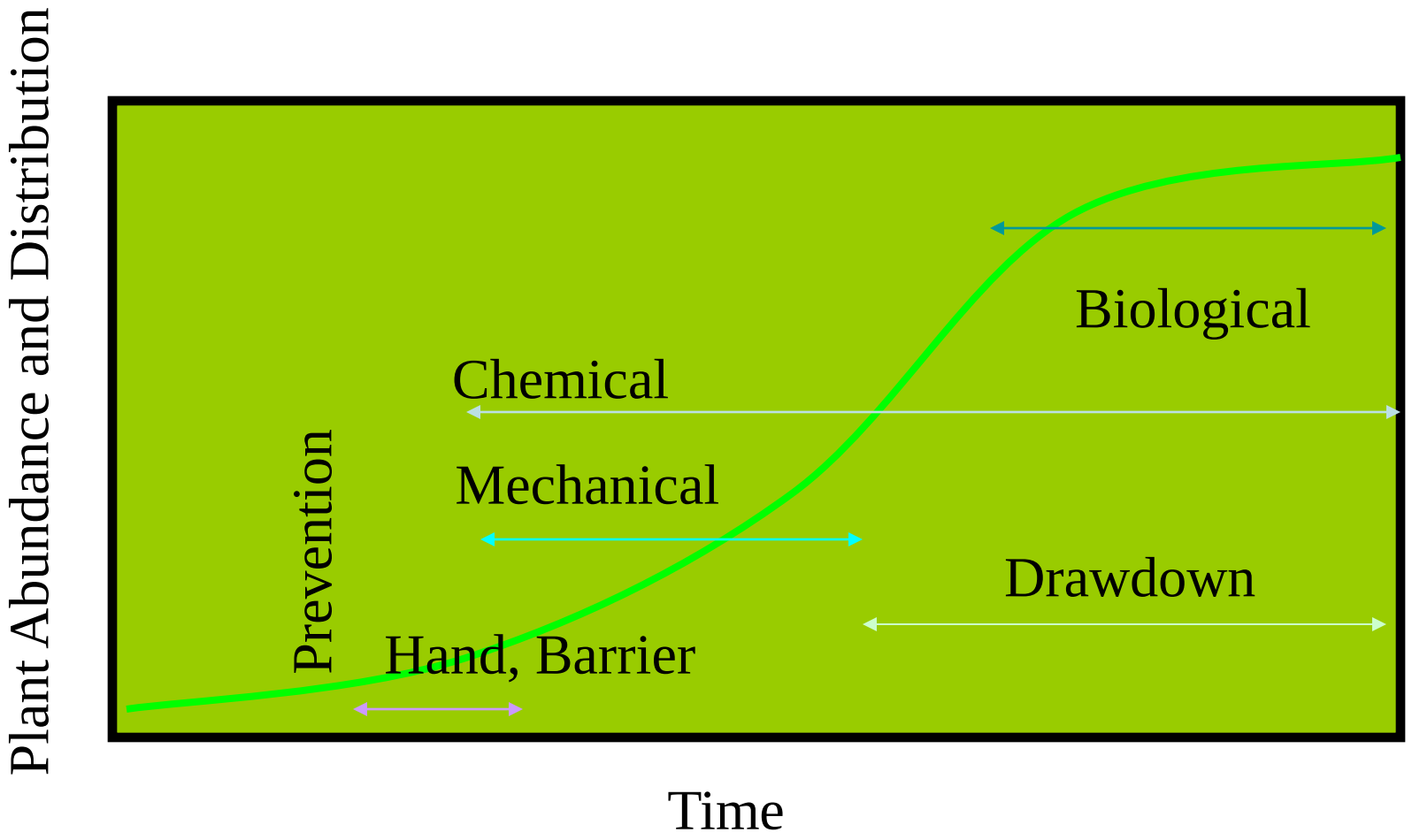
- Advantages
  - Effective
  - Broad spectrum
  - Immediate effect
  - Moderate term (several years)
- Disadvantages
  - Small scale
  - Expensive (~$3,000/acre)
  - Impacts on other organisms, fish spawning
  - Not selective

Institutional Control

- Advantages
  - May prevent problems from happening
  - May improve water quality over the long term
  - Relatively inexpensive (depending on solution)
- Disadvantages
  - May not redress current problems
  - Does little to alleviate short-term problems
  - May require cooperation and involvement of many diverse groups

Method	Utility for EWM Management
Classical Insect Biocontrol	None available
Native Insect Biocontrol	Some collapses, but no operational program
Pathogens	One “bioherbicide” under development
Chemical control / herbicides	Only one submersed herbicide labeled for use in Canada
Hand harvesting	Small areas of scattered plants, or very small beds
Harvester	Maintenance management, or very aggressive cutting
Diver suction harvesting	Small beds
Rotovating	Large areas, but extensive damage
Drawdown	Effective for whole-lake in cold winters, a hard freeze
Benthic barrier	Small beds
In-lake Nutrient management	Misdirected; no method for applying to sediment
Watershed control	May encourage rooted plant growth

Management Technique Distribution



Widespread Infestation

- Large areas can be aggressively treated with
  - Herbicides
  - Drawdown
- Maintenance management possible with
  - Harvesting
  - Herbicides

Conclusion

- Management goal is maintenance of low invasive plant population with diverse native plant community at most economical cost

Before management of invasive plant

After management of invasive plant

Contact Information

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