Control Methods for Eurasian Watermilfoil

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BIOL-3890Y: Community Based Research Project

Agenda

01 Introduction

Objectives: determine best practices for EWM control, find which methods have the best chance of success and are the most cost-effective, and determining differences between coconut fibre and burlap bottom barriers.

Nine control methods were discovered through a literature analysis; rototilling, hand harvesting, bottom barriers, the milfoil weevil, lake drawdown, grass carp, suction harvesting, herbicides, and integrated approaches were all methods noted to have been used against EWM in the past.

02 Control Options

Rototilling

- Advantages:
  - Leaves nothing behind so there are no public access limitations to treated areas
  - Lower chance of fragments rooting
  - Proven effective
  - Suitable for large treatment areas
  - Only on treatment per season required
  - Low effort

Rototilling

Disadvantages:

- Possibly ineffective over long periods
- EWM can re-establish itself within 1 year after treatment
- Can harm aquatic species
- Puts stress on ecosystems in the lake
- Could expose water to sediment contaminants
- Time consuming
- Expensive

Cost:

- Approximately $0.30 per m2 for the Okanagan Basin Water Board

Hand Harvesting

Advantages:

- Could be cheaper than other methods, depending on the size of the treatment area.
- Cost can be further reduced as EWM declines.
- Proven effective with over an 80% EWM reduction in one study.
- Has minimal impact on native and non-target species.
- Has little impact on aquatic fauna.
- Recommended maintenance only required every 2-3 years.

Hand Harvesting

Disadvantages:

- Fragmentation is a key concern.
- Takes a lot of time and effort.
- Requires a high degree of attention to detail.
- Divers needed in deeper waters.

Cost:

- Approximately $600-$700 per kilogram of EWM dry weight.

Bottom Barriers

Advantages:

- Can be used alone or in combination with other methods.
- Proven it can be successful in EWM control by up to 100% in 8 weeks.
- Biodegradable options.
- Fragments are contained under mats.
- Biodegradable types can degrade in 2-3 years without intervention.
- No residue or chemical changes left in water with the use of biodegradable options.
- Durable and permeable.
- Some types allow native species to grow on top.
- No long-term damages.
- Increase native species competition, which can naturally help control EWM.

Bottom Barriers

Disadvantages:

- Harm native species.
- Not good for areas with high public use.
- Cannot be tampered with once laid down.
- May require sediment removal in some situations.
- Possible that they do not control EWM for long periods, with evidence of a 71% regrowth in 1 year.
- Issues such as billowing can occur naturally, ruining placement.
- Susceptible to damage or dislocation, making mats ineffective.

Cost:

- Approximately $13 per m2
- 2 metre by 8 metre coconut fibre mats were $325 each in 2018 for the Chandos Lake project.
- Containment curtains would be an extra cost, at approximately $5,000 per year for the Farlain Lake project (2019-2021).

Milfoil Weevil

Advantages:

- Mostly self-sustaining.
- Highly selective, preserving native species.
- Require fewer treatments over time than some other methods.
- Do not require high levels of attention to detail as they will find EWM on their own.
- Adaptable to different sediment conditions.
- Have been successfully used in Kawartha Lakes.

Milfoil Weevil

Disadvantages:

- Do not yield immediate results.
- Hard to predict how they will respond.
- Sensitive to temperature conditions over 34C.
- Not naturally occurring in large enough numbers for EWM control without intervention.
- At risk of predation.
- Could bring pathogens/parasites to the area.
- Larvae need optimal conditions to thrive.

Costs:

- Approximately $1.26 per weevil with a minimum of 10,000 to 50,000 weevils required per project.

Lake Drawdown

Advantages:

- Simple.
- Cost-effective.
- Occurs quickly, killing EWM within 48 hours if the temperature is below -5C.
- Does not require controlled freezing.
- Reduces risk of fragmentation.
- Do not cause long-term damage to native species.

Lake Drawdown

Disadvantages:

- Could cause erosion.
- Can kill species overwintering.
- Could lead to a loss of non-target species.
- Surveying must be done regularly to ensure a deep enough drawdown to kill EWM roots.

Cost:

- Low to no cost to the DSLPOA as Parks Canada manages annual drawdown of the lake as part of the Trent-Severn Waterway servicing projects.

Grass Carp

Advantages:

- Can be stocked to the required numbers based on the introduction site size.
- Have shown some success with EWM control, such as a 24.4% decline in EWM in 8 years.
- Selective, may not eat many native species.
- Easy to contain.

Grass Carp

Disadvantages:

- Although they have proven effective, some studies have shown grass carp do not initially like EWM.
- Having to contain or capture the carp would increase costs and effort.
- Could be ineffective, hard to know how the carp will react to the new environment.
- Could put non-target species at risk of eradication.
- Could take much longer to see damages to EWM if the carp prefer a different species in the lake first.
- Illegal to release Grass Carp in Ontario.

Cost:

- Between $6 to $20 per fish.

Suction Harvesting

Advantages:

- Can steer the vacuum around native plants, preventing some impact.
- Harvesting effort can be decreased over time.
- Proven efficacy.
- Up to 50 times faster than hand harvesting.
- Could possibly reduce fragmentation risks.

Suction Harvesting

Disadvantages:

- Some studies have shown this method does not completely eradicate EWM.
- Has a significant impact on native species.
- Can be less effective depending on conditions it is used in; sediment plays a big role.
- One of the most expensive methods.
- Disruptive to aquatic organisms and property owners due to the noise pollution it creates.

Cost:

- Approximately $45,000 for DASH equipment, SCUBA, and trained divers on contract for 4 days for the Farlain Lake project (2019-2021).

Herbicides

Advantages:

- Proven to be effective.
- Works quickly after application.
- Lower cost than some other methods.
- Can allow native species to grow if they are herbicide tolerant.
- Target species provide structural habitats and oxygen as they die.
- Public use restrictions are only in place for up to a week following treatment.
- Lower fragmentation risk.

Herbicides

Disadvantages:

- Damaging to all plant species.
- Puts negative pressure on all macroinvertebrates in the treatment area.
- Increases the risk of eutrophication.
- Could increase public concern regarding safety of the water.
- Has a limited timeframe for application, once per year and not before July 1st.
- Has restrictions against public use and consumption for 5 days after treatment.
- Many herbicides are only suitable for small areas.
- There is a need for multiple treatments over time.
- Some herbicides can quickly become inactive in unfavourable conditions.
- Only Diquat is approved in Ontario for aquatic treatments.

Cost:

- Limited price information available.
- Approximately $0.004 per m2
- $1,100 for 1 day if used as a spot treatment for the Farlain Lake project (2019-2021).

Integrated Approaches

Advantages:

- Are more targeted and effective than using one method.
- Highly adjustable to the area, budget constraints, and preferences of the organization.
- Can address more than one concern at a time.
- Produce better, quicker results.
- Merges methods of decreasing EWM while increasing native species, giving the native species a better chance of survival and the possibility of a positive long-lasting outcome.

Integrated Approaches

Disadvantages:

- Combining approaches takes away the ability to evaluate each method on its own.
- Could cause setbacks if one method is not suitable for the environment.
- Using volunteers of different levels of training and attention to detail causes inconsistency.
- More costly upfront as multiple methods are being used.

Cost:

- Cost depends on the options being used together.

03 Comparative Analysis

COCONUT FIBRE BOTTOM BARRIERS

Advantages:

- pH neutral
- Limits growth through the mat better than burlap
- Can come from a Canadian company selling organic fibre

Disadvantages:

- Non-selective; can kill all species underneath it.
- More expensive than burlap.
- Weights used to hold it down can sink into the sediment.
- Can billow or become displaced.
- Inhibit public use of the treated areas.

Outcome:

- Shown success in limiting regrowth
- Can work in 4 months

Method:

- Large areas - use mat dispenser from boat
- Small areas - use divers to place
- Placed in mid to late July

Cost:

- Approximately $20.31/m2

03 Comparative Analysis

BURLAP BOTTOM BARRIERS

Advantages:

- Do not create anoxic conditions.
- Durable.
- Can be certified organic to prevent any chemicals from entering the water.

Disadvantages:

- Non-selective; can kill all species underneath it.
- Weights used to hold it down can sink into the sediment.
- Not as effective as coconut fibre for reducing plant growth.
- Can billow or become displaced.
- Inhibit public use of the treated areas.

Outcome:

- Has varied success based on the thickness of the woven yarn used.
- Can be effective in less than four months with evidence of success in just eight weeks.

Method:

- Large areas - use mat dispenser from boat
- Small areas - use divers to place
- Placed in late June or July

Cost:

- Approximately $4.78/m2

04 Closing & Recommendations

This study found a number of viable options for controlling invasions of Eurasian watermilfoil, based on the scientific findings of over 30 peer-reviewed articles.

Using this data, the main conclusion can be that the most cost-effective and time-effective technique for such control is an integrated approach using both hand harvesting and bottom barriers.

Using this type of integrated approach can be specialized to the current and future needs of the DSLPOA and preserves the use of the lakes for summer recreation.