Every plant has an Achilles heel!

The importance of plant biology in an effective invasive species control program

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What is Plant Biology?

• What do plants need?

• How do plants grow?
What is EBIPM?

• Ecologically Based Integrated Pest Management
Species Performance
**factors contributing to plant community change**

Ecological Principles/
Plant Biology Characteristics

- Invasive plants limit resource availability for desirable plants
- A variety of adaptive traits favours survival
- Typically ‘r’ strategist benefit from disturbance regimes
- What ‘stresses’ your plant out?
- More overlap in plant biology means greater difficulty for control

Modified from: www.ebipm.org
Yellow flag iris

Photos: Judy Millar
Life history traits

• 25% of seeds still floating after a year
• Populations expand rapidly via rhizomes
• Can tolerate a wide variety of conditions from dry to completely saturated, and partial shade to full sun
• Ecosystem engineer
Current control options

From: http://www.irmforestry.com

http://www.quamichanlake.ca/node/63
The Achilles’ heel

- Rhizomes continue to use carbohydrate reserves under dark, anoxic conditions

Rhizome is an underground stem
Cell activity of yellow flag iris rhizome tissue incubated under anoxic conditions at 20°C in the dark. Cell activity was calculated as 
\[(\text{ATP} + 0.5\text{ADP})/(\text{ATP} + \text{ADP} + \text{AMP})\]. The results are means ± SE

Recreated from: Hanhijärvi and Fagerstedt, 1994
The benthic barrier
Foundation of Research
Taking the laboratory concept into the field

1. Does the benthic barrier create an anoxic condition?
2. Is there a difference in cellular health between using benthic barriers, removing the vegetation or leaving the plants (control)?
3. After what amount of time (days) does cellular death occur in the rhizomes underneath the benthic barriers?
1. Control (no treatment)
2. Vegetation removed to <5 cm
3. Vegetation removed to <5 cm and a benthic barrier on top
Measurements

1. Rhizome health from all treatments
2. Dissolved oxygen - control versus benthic barrier
3. Plant regrowth
4. Water depth
Results

34 days after treatment
Does the barrier create an anoxic condition?

Figure 3: Percent dissolved oxygen within the rhizome mat in the control and the benthic barrier treatments at Vaseux and Dutch Lake combined.
How long does it take to work?
Is there a difference between treatments?

**Dutch Lake**

- Benthic barrier is 7 times more likely to have no living cells at 150 DAT than the control.

**Vaseux Lake**

- Benthic barrier is 3.6 times more likely to have no living cells at 150 DAT than the control.
Water depth may be critical in choosing treatment options.
Recolonization
Conclusions

• Reduced oxygen
• Benthic barriers stress cells
• Mortality occurred 56 (Dutch Lake) and 70 (Vaseux Lake) days after treatment.
• Water depth may play a critical role in selecting treatment options
• Benthic barriers may be ‘selective’

Final Report Available on EcoCat:
Species Performance
**factors contributing to plant community change

Ecological Principles/
Plant Biology Characteristics

Vigorous plants limit resource availability for desirable plants – native plants are able to recolonize after removal

A variety of adaptive traits favours survival - spun carbohydrate use to our advantage

Typically ‘r’ strategist benefit from disturbance regimes

Created a stressful environment

More overlap in plant biology means greater difficulty for control – cattail may not be strongly affected by barrier

Modified from: www.ebipm.org
Future research

• Continue to monitor recolonization of treated areas

• Province-wide project

• Yellow flag iris effect on invertebrate community
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