Tipping the Balance: Is Aggressive Control of Invasive Plants Warranted?

Sandy M. Smith, Faculty of Forestry, University of Toronto
Should we use aggressive control?

How do we assess/justify intervention?
   a) What do we mean by ‘invasive’?
   b) What do we mean by ‘control’?
   c) What do we mean by ‘aggressive’?

Can we ‘tip the balance’?

**BENEFIT > RISK BALANCE**
Native species also ‘invade’

(cause ecological disturbance)
Areas within which spruce budworm caused moderate to severe defoliation 1980

Disturbed Natural Ecosystems?
Cyclical ‘Invasions’ in Our Native Forests
Naturally Introduced Invasive Species?

Native earthworms expanding into native forests
Deliberate Introductions

Accidental Introductions

Buckthorn

Zebra Mussels
Is Control Warranted? At What Level?

(Dog-Strangling Vine) (Garlic Mustard)
Control  \((kn-trl)\)  trans. verb

1. To exercise dominating influence over.
2. To regulate: *control the flow of water.*
3. To hold in restraint; check: *to control my temper.*
4. To reduce or prevent the spread of: *‘control insects’.*

**Continuum of Control** (strategy = approach)

- **Prevention** (legislation)
- **Regulation** (sustainable)
- **Suppression** (protection - temporary)
- **Eradication** (elimination)
Control Curve Continuum

INVASION CURVE

Eradication (Most Intense)

Prevention (Less Intense)

Regulation (Less Intense)
**Ag·gres·sive** (-*grsv*) **adj.**

1. Assertive, bold, and energetic.

2. Of or **relating to an investment** that seeks above-average returns by taking above-average risks.

3. Characterized by intensive treatment: *aggressive treatment of infection (or invasive?).*

**Continuum of Aggression** *(tactics = tools)*
- Legislative/Regulatory
- Cultural/Sanitation/Mechanical
- Biological
- Chemical
Obligate Parasites & Pathogens
Facultative Parasites & Pathogens
Plant Competition
Pathogens
Behaviour-Modifying Chemicals

The Ultimate Tool
Integrated Pest Management (IPM)
“Strategy without tactics is the slowest route to victory. Tactics without strategy is the noise before defeat.”

Sun Tzu, The Art of War, China, 500 BC.

MANAGEMENT  IPM-Biological

PREVENTION
Early Detection
Pathways Risk Rating

ELIMINATION
Aggressive Control
Chemical Eradication

‘The Strategy Of Aggressive Control’
Who’s jurisdiction?

CFIA:
• Quarantine
• Surveys

Legislative Regulation of Invasive Insects

Canadian Food Inspection Agency
Federal Canadian Food Inspection Agency
(CFIA Ag Canada = APHIS USDA)

Legally responsible to implement IPPC measures
(International Plant Protection Convention 106 countries)

1) Prevent Arrival; Assessing risk & pathways (Blacklists)

2) Prevent Establishment; Permits for movement/import, destruction of infested material, quarantine (Eradication)

Ministerial Orders for Quarantine & Eradication

3) Prevent Spread; Monitoring & ‘Slow-the-Spread’

Initiate Research: Surveys, impact, biology, dispersal rates, spatial patterns, susceptibility, control options
Fig. 3.1 The process of Risk Analysis, illustrating the three main steps of risk assessment, risk response, and risk communication (adapted from Information Forestry, April 2008, Canadian Forest Service, Pacific Forestry Centre, Victoria, British Columbia, Canada)
Detection of exotic longhorned beetles and infestations of the Asian longhorned beetle in the U.S.

- Exotic longhorned beetle detections (not necessarily ALB)
- ALB Infestations
Monitoring & Certification
Brown Spruce Beetle in Halifax Harbour 1999

Photo: Taylor Scarr
Quarantine (*prevent establishment*)

Inspection on-site & at harbours or customs
**ATTENTION**

This insect kills hardwood trees! Cet insecte tue les arbres feuillus!

**Asian Longhorned Beetle**

**Longicorne asiatique**

**Description**
- Shiny body (2 to 3.5 cm long), black with white spots. Legs black, with pale blue sections.
- Antennae longer than body and with black and white bands.

**Signs of Attack on Trees**
- Holes in bark, 1 cm across.
- Oval wounds on bark (egg-laying sites).
- Sap leaking from egg-laying wounds.
- Sawdust on branches or tree base (from larvae feeding inside tree).

**Preferred Trees**
- Maple
- Poplar
- Willow
- Birch
- Elm
- Ash
- Horse Chestnut

**Arbres préférés**
- Érables
- Poiriers
- Ailés
- Bouleaux
- Ormes
- Frênes
- Marronniers

**Traces d’infestation sur les arbres**
- Trou dans l’écorce, 1 cm de diamètre.
- Blessures ovales sur l’écorce (sites de ponte).
- Sève s’accumulant des sites de ponte.
- Scierie grossière sur les branches et à la base de l’arbre (révélant la présence de larves dans l’arbre).

If you see this insect please call:

**1-888-682-2242**

www.cfia-acia.agr.ca

**Canadian**

**Asian Longhorned Beetle**

**WHAT TO LOOK FOR:**

**Prevent Establishment**
Eradication (= prevent establishment)
Asian Longhorned Beetle / Longicorne Asiaticque
Toronto - Vaughan, Ontario
2003-11-05

Core Zone
Action Zone
400m + 400m

Hwy400
Hwy407
Hwy401

Cutting/Injection?
Cutting

ERADICATION

Canadian Food Inspection Agency
Agence canadienne d'inspection des aliments
80,000+ trees cut from Ash Free Zone

Eradication, Quarantine…now… Slow-the-Spread!
Containment & Limit Movement

(= prevent establishment & spread)
The Road Pathway of Ontario

(McMaster Map Library)
Invasive Forest Insect Control Strategies

- **Prevention** (Less Intense)
- **Eradication** (Most Intense)
- **Regulation** (Less Intense)

**Areas Infested**
- ALHB
- EAB

**Invasion Curve**
- Introduction
- Detection
- Prevention or Eradication Simple
- Eradication Feasible
- Eradication Unlikely, Intense effort required
- Local control and management only

**Control Costs**

**Invasive Forest Insect Control Strategies**
Insects Regulated at the County Level

Invasive Plants, Earthworms?
Intentional Introduction 141
- as agricultural crop (food, fodder, fibre) [33]
- as ornamental or landscaping plant [73]
- for soil improvement, erosion control, reclamation [15]
- for herbal or medicinal use [15]
- for research [escape from research stations, botanical gardens, arboreta, etc.] [2]
- unknown purpose [3]

Unintentional Introduction 120
- with plant products [contaminants in seed, forage, produce, wood products, garden supplies] [86]
- with livestock or other animals [9]
- in soil, sand, gravel [including ballast soil] [9]
- with freight, packing materials, machinery, equipment, etc. [15]
- through recreation/tourism [baggage, camping equipment, boats, etc.] [1]

Suspected pathways of introduction for invasive alien plants in Canada.
Based on >100 years of IPM Research...

Estimated Spread of the Gypsy Moth Through the Year 2025

- **Area of Gypsy Moth Quarantine as of 1996**
- **Projected Spread by 2025 with STS**
- **Projected Spread by 2025 without STS**

Estimated 10-year spread with STS implemented is 84 Km (52 miles).

Estimated 10-year spread without STS implemented is 210 Km (130.4 miles).
Mechanical Management
Monitoring Ash & Injecting with TreeAzin Insecticide
A powerful weapon....

1) Conservation *(conserve native natural enemies)*

2) Augmentation *(collect, rear & release native spp.)*

3) Classical *(introduce species for biocontrol)*

*Photos: Frank Herard*
Commercial success with natural products
“... Until now, no consensus on how to judge the magnitude of effects and whether these effects can be tolerated or are unacceptable has emerged.”
Impacts on Ecosystem Services & Resilience (= Biodiversity) of Our Ecosystems

- Canopies
- Dead Wood
- Biodiversity: $32 Billion
- Pollination: $16.4 Billion
- Bio-Control: $4.5 Billion
Native

Urban Forest Study
- 8 tree species
- 3 years
- >200,000 insects
- 30, 2-h bird surveys

> 50% diversity

Non-Native

Biodiversity

Biocontrol

Pollination
Can we ‘Tip the Balance’?

Should we use aggressive control to do so?

BENEFITS > RISKS?
Can we always afford to ‘DO NOTHING’?
1. **Essential to quantify the real impacts!**
   Must be assessing the situation…Be aware of the impacts, costs, risks, & be prepared to be aggressive…

2. **NEED to be pushing the science envelope.**
   Must have as much real measured information in as many key areas as possible, and to be developing innovative tools & strategies…

3. **Must be willing to act on information (or not)!**
   Must put into practice and make management decisions without sufficient information but with a long-term plan, erring on the side of caution….
Answer is...of course.....It depends!

4. Use the precautionary principle
   Have ecosystem resilience and human well-being balanced as the underlying directive and motivation...

5. Recognize: No silver bullets...No quick fix!
   Solutions will not be simple nor fast; they will require commitment of resources/time, long-term research & acceptance of adaptive management (trial & error)

6. Need coordination & leadership
   Collective approach will develop best strategy & tactics for acceptable, integrated response
Invasive Forest Insect Control Strategies

Prevention (Less Intense)

Eradication (Most Intense)

Regulation (Less Intense)

Kudzu Ontario?

Kudzu Florida?
“Know thy self, know thy enemy…”

Sun Tzu, *The Art of War*, China, 500 BC.
Aggressive Control for Possible Eradication

Session Moderator: Dr. Sandy Smith, Faculty of Forestry, University of Toronto

08:30
Tipping the Balance: Is Aggressive Control of Invasive Plants Warranted?
Sandy Smith, Faculty of Forestry, University of Toronto

08:50
Classical Weed Biocontrol in Canada: How do New Agents Against Emerging Invasive Species Happen?
Rosemarie De Clerck-Floate and Robert Bouchier, Agriculture and Agri-Food Canada

09:10
Proposed Release of Hypena opulentia: A Potential Biocontrol Agent for Dog-Strangling Vine
Rob Bouchier¹, Aaron Weed², Alexander Hazelhurst³, Lisa Tewksbury³, André Gassmann³, Sandy Smith⁴ and Richard Casagrande⁴.
¹Agriculture and Agri-Food Canada, Lethbridge Research Centre,
²Biological Sciences, Dartmouth College, ³Department of Plant Sciences and Entomology, University of Rhode Island, ⁴CABI Europe-Switzerland, ⁵Faculty of Forestry, University of Toronto

09:30
Herbicide Use in Invasive Exotic Plant Management. A Review of Policy Regulations and Current Use, with a Focus on North America
Viktoria Wagner¹, Pedro M. Antunes², Michael Irvine³, Cara Nelson¹.
¹Department of Ecosystem and Conservation Sciences, University of Montana, ²Algoma University, ³Ontario Ministry of Natural Resources

09:50
Will Native Dogbane Beetles (Chrysochus auratus) Adapt to Dog-Strangling Vine (Vincetoxicum spp.)?
Rhoda deJonge², Sandy Smith⁴ and Rob Bouchier³.
²University of Toronto, ³Faculty of Forestry, University of Toronto, ⁴Agriculture and Agri-Food Canada, Lethbridge Research Centre

10:10 – 10:30
Algoma Foyer
Networking Break