



# The Economics and Ecology of the Risk of Invasive Plant Establishment from the Horticultural Trade in North America

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# Project Summary

- **Description:**

Integrated economic and ecological analysis of the risk of invasion from the horticultural trade in North America

- **Objective:**

Produce new ecological-economic methods of assessing decisions by nurseries to sell exotic species given a risk of accidental spread

- **Activities:**

- Modeling profit-maximizing behavior of horticultural industry that imports exotic plant species
- Ecological and economic analysis of the risk and potential damages from accidental introduction and establishment of invasive plant species by horticultural industry
- Integrating these economic and ecological analyses to model the potential policy tradeoffs
- Evaluation of various policy interventions for reducing the risk of accidental introduction by the North American horticultural industry



# Background

- Cumulative losses to the U.S. economy from invasive plants estimated at \$600 million over 1906-1991
- Cumulative damages inflicted by non-native invaders in Canada are comparable to damages in the US
- North American (NA) horticultural industry accounts for 80-85% of woody plant and 60-65% of herbaceous invasions
- The NA horticultural industry is growing and profitable:
  - US floriculture and nursery crop sales increased more than 50% in past decade
  - Value of Canadian ornamental and plant sales also has risen significantly
- Despite risk of invasion, controlling sales of exotics imposes social costs (consumer benefits and nursery profits)
- These costs must be considered in a proper analysis of the economics of invasion if it is to serve as a practical guide to policies

# Policy Implications

- Both the United States and Canada face common ecological and economic impacts posed by plant invasions, because these species spread rapidly across similar eco-zones in North America.
- Control efforts are largely regulated by individual states and provinces, and are often inconsistent across jurisdictions.
- Growing mail-order and internet horticultural sales are resulting in the transport across jurisdictions, including the US-Canada border.
- The horticultural industry is becoming “horizontally integrated”; sales outlets are operating increasingly in both Canada and US.
- There is a need for a North American-wide study to consider:
  - The ecological and economic analysis of the risk of accidental introduction from the entire North American horticultural industry.
  - A coordinated policy approach by the US and Canada in considering options to reduce such risk.
  - Unilateral imposition of control policies by one country (e.g. Canada) could cause the relocation of industry outlets (nurseries) in North America (e.g. move from Canada to US).

# Progress to Date: Modeling the North American horticultural industry

- Developed a monopolistic competition model of the horticultural industry that imports an exotic plant species into a region by establishing nurseries at various locations.
- Following model results, estimating horticultural industry profits as a function of the number of established nurseries and other key parameters (e.g. number of employees, size of nursery).
- Estimation will be for the North American horticultural industry using USDA horticultural census data and the Annual Greenhouse, Sod and Nursery Survey of Canada (from Statistics Canada).
  - A preliminary estimation has been conducted utilizing USDA data, but the results are too premature to present.
- We plan to extend the single-economy model to a two-country version, in order to examine how policies implemented in one country (e.g. Canada) may affect the relocation of nurseries between both countries.

# Progress to Date: Analysis of the risk and potential damages of accidental introduction

- Investigating the use of duration models to estimate a hazard function for the risk of invasion by an exotic plant
- Continuing to assess the potential invasiveness of various plant exotics
- Completing an investigation of woody plant species, including finding information on:
  - dates of introduction
  - characteristics that influence potential invasiveness
- Herbaceous species need to be investigated further as just started work on this database
- Compiling plant invasion costs to model damage function associated with various invasive plants

# Progress to Date: Evaluating policies to reduce the risk of accidental introduction

- Designed and now testing a contingent ranking survey for Canadian & US stakeholders in 9 states (5)/provinces (4)
- Assessing preferences for various policy options to control invasive species
- Policy options are:
  1. Status quo (mandatory listing & banning of only known invasives)
  2. Mandatory screening & banning of potentially invasive exotic plant imports
  3. Voluntary codes of conduct (screen & ban potentially invasive exotic plant imports)
  4. Variable tax on potentially invasive exotic plant imports
  5. Fixed environmental fee on all exotic plant imports
- Conducted preliminary modelling of an optimal tax on the NA horticultural industry