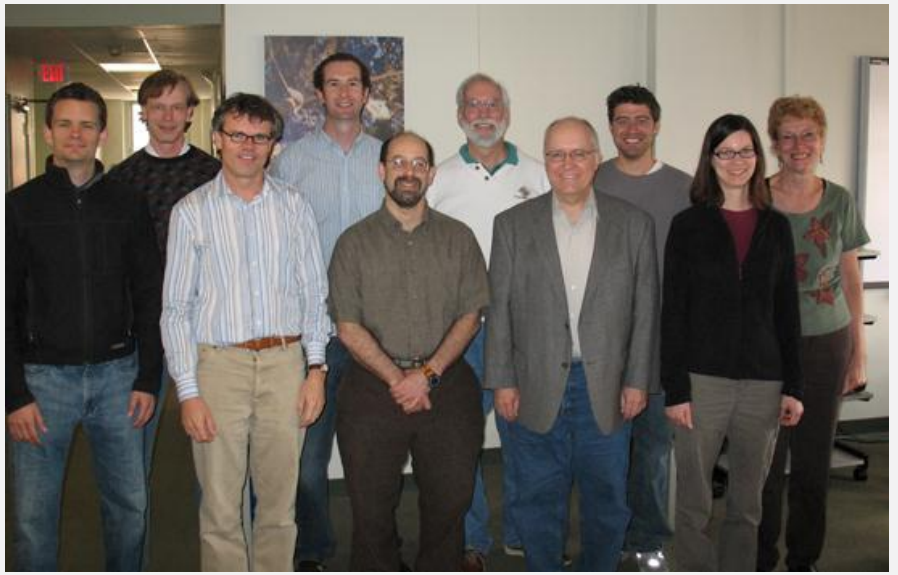
What are the net benefits of phytosanitary policy (ISPM15)?



Brian Leung
McGill University

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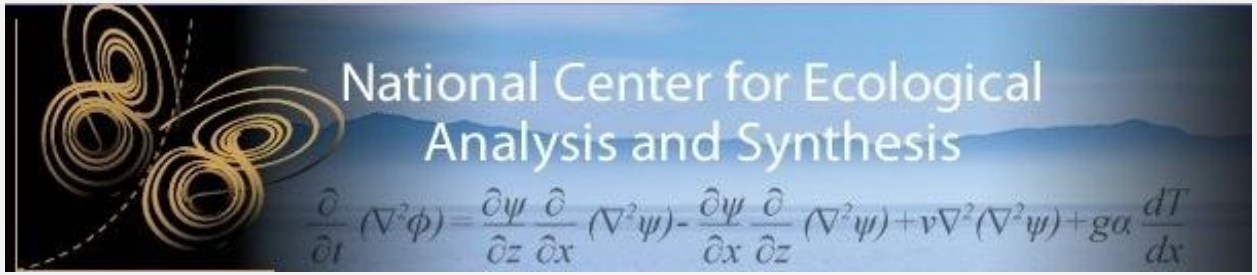
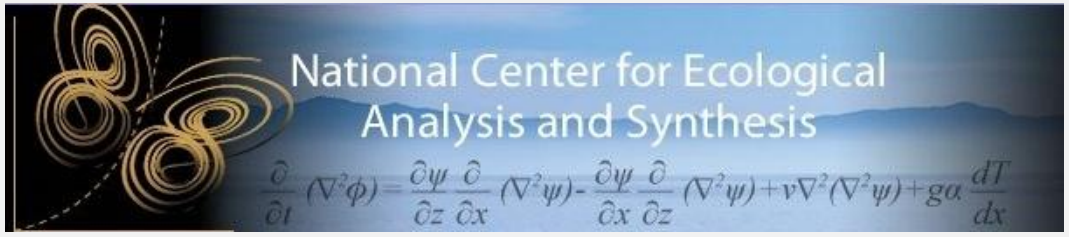


Economic Impacts of Invasive Forest Pests

Juliann Aukema
Brian Leung
Betsy Von Holle
Corey Chivers
Kent Kovacs
Robert Haight
Tom Holmes
Jeff Englin
Andrew Liebhold
Deborah McCullough
Kerry Britton
Susan Frankel



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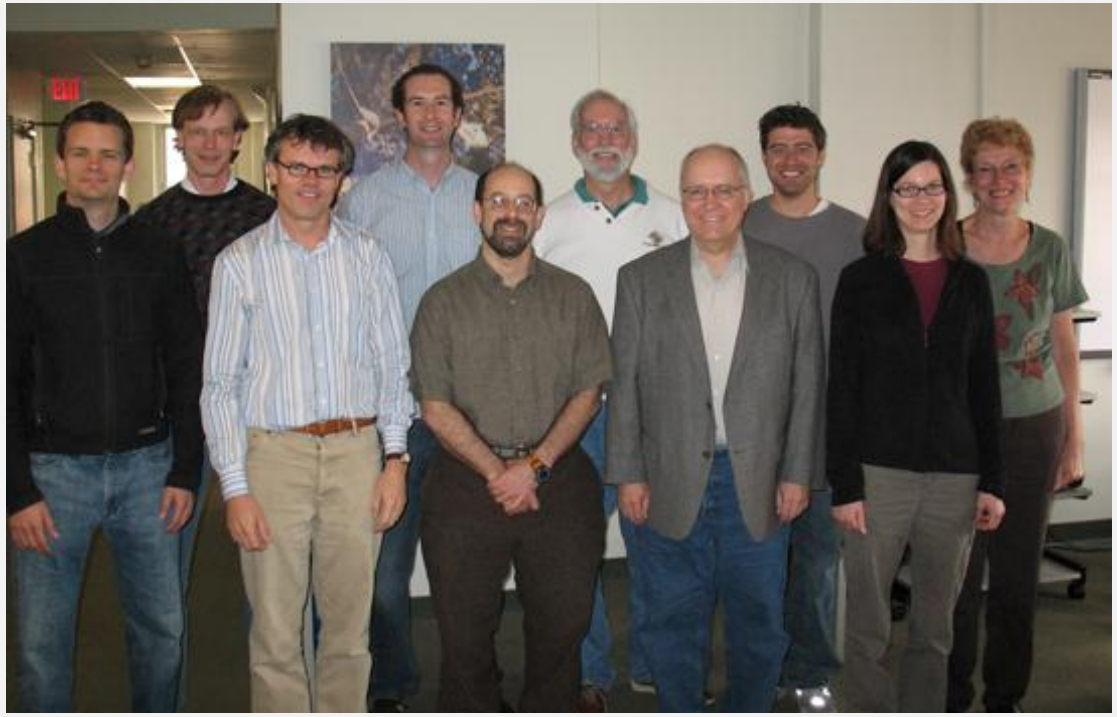
Effects of trade policy on management of non-native forest pests

Turner, James
Britton, Kerry
Brockerhoff, Eckehard
Cavey, Joseph
Garrett, Lynn
Haack, Robert
Lowenstein, Frank
Marassas, Carissa
Nuding, Amelia
Olson, Lars
Springborn, Mike



National Center for Ecological Analysis and Synthesis

$$\frac{\partial}{\partial t}(\nabla^2\phi) = \frac{\partial\psi}{\partial z}\frac{\partial}{\partial x}(\nabla^2\psi) - \frac{\partial\psi}{\partial x}\frac{\partial}{\partial z}(\nabla^2\psi) + \nu\nabla^2(\nabla^2\psi) + g\alpha\frac{dT}{dx}$$

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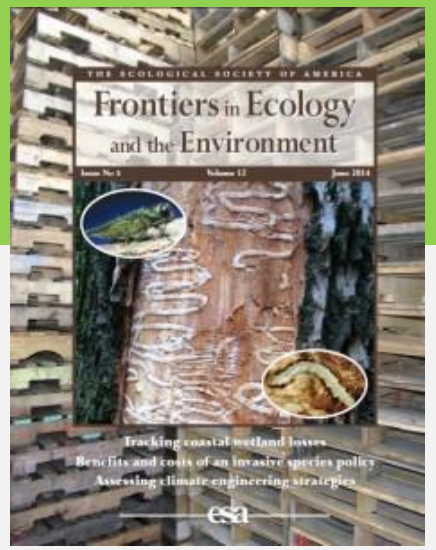
Pathway Level Economic Risk Analysis

Wood packing material and borers (ISPM15)



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- 437 Million treatment cost (Strutt et al. 2013)
- 52% efficacy of treatment (Haack et al. 2014)

Leung, Springborn, Turner, Brockerhoff . 2014. Frontiers in Ecology and the Environment

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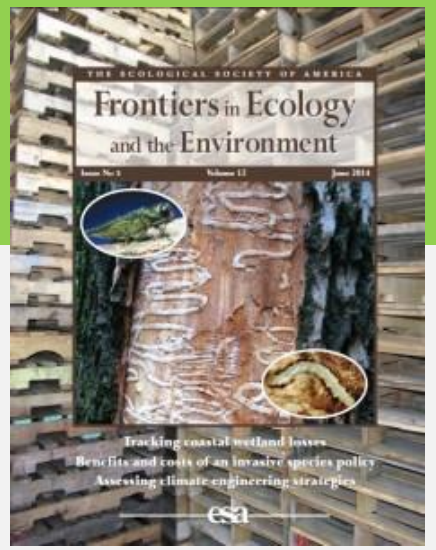

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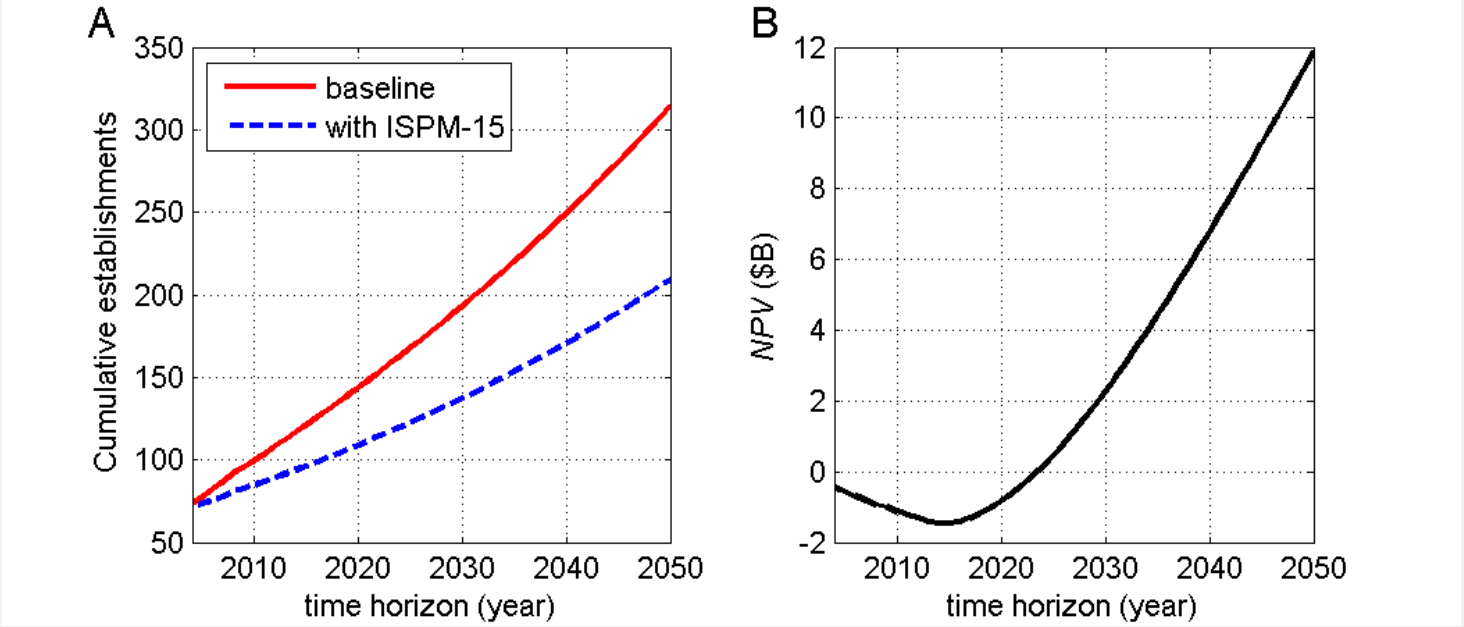
- 11.8B expected net benefit



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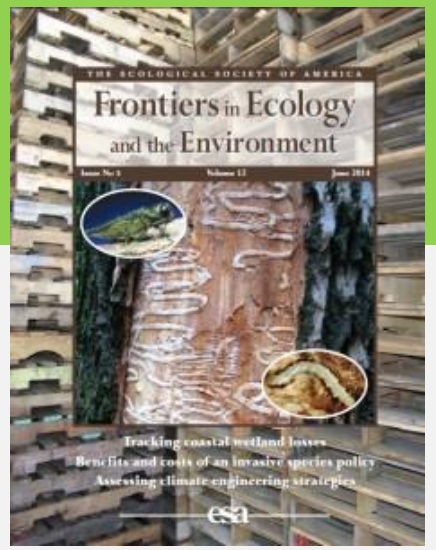

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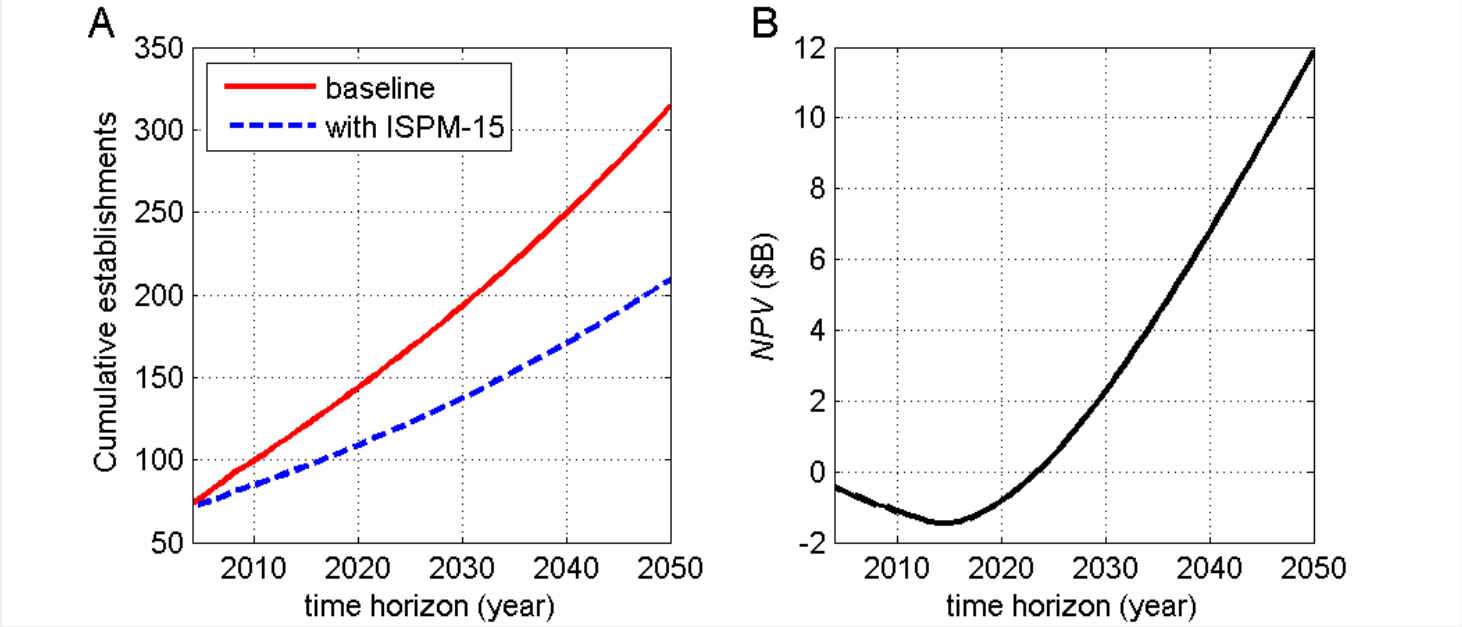

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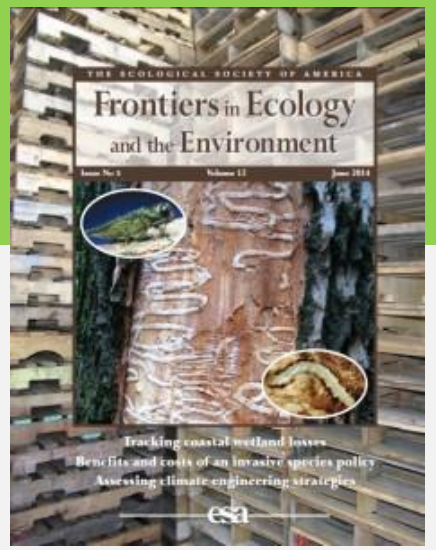

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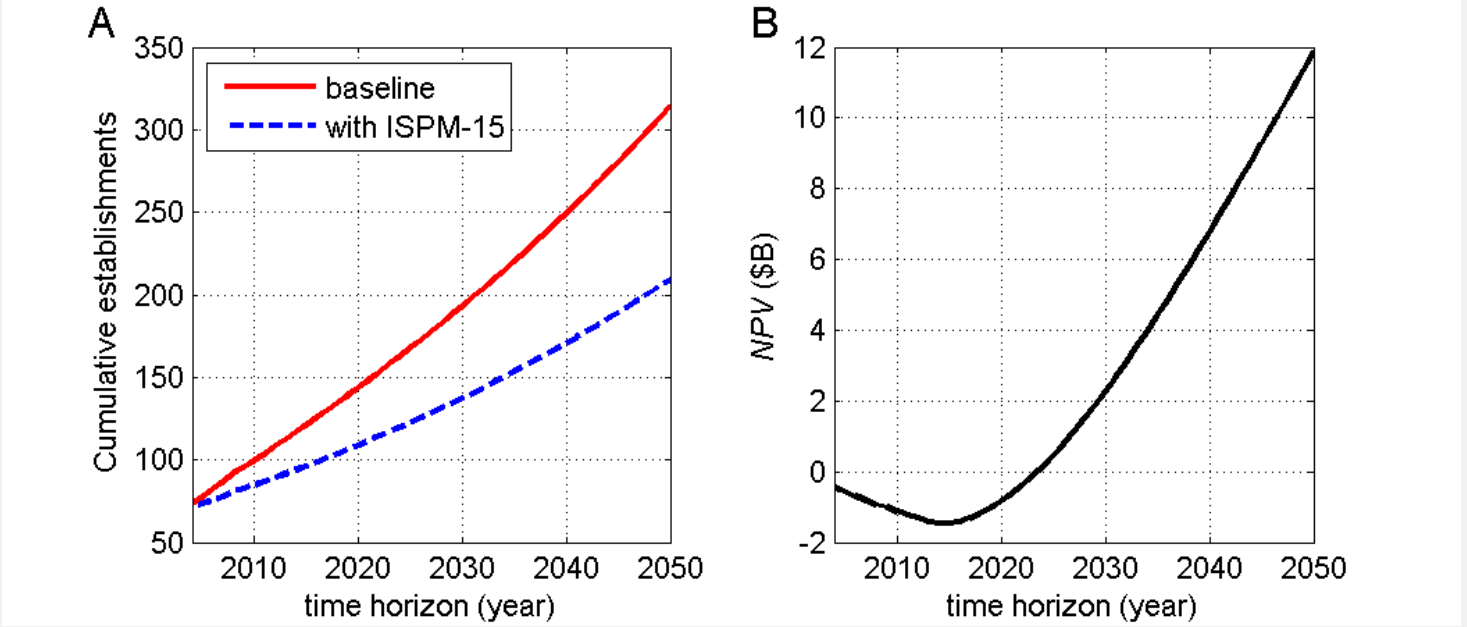

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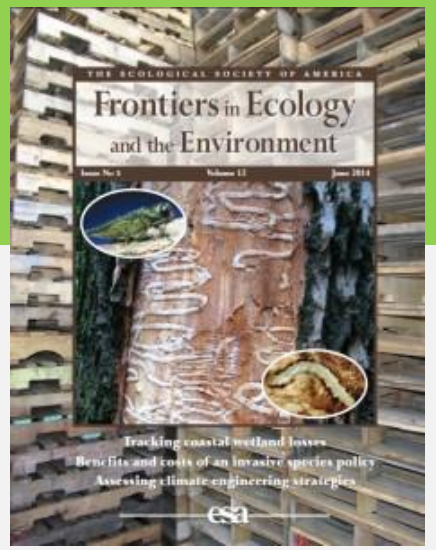

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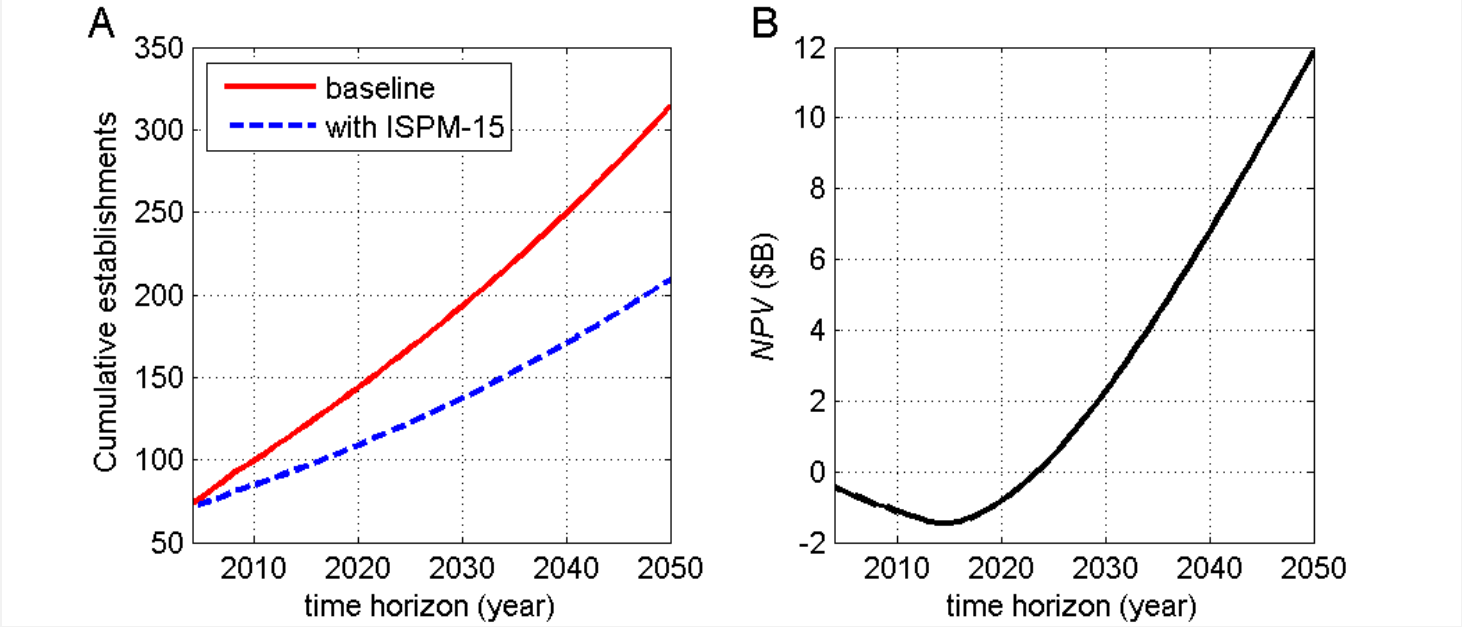

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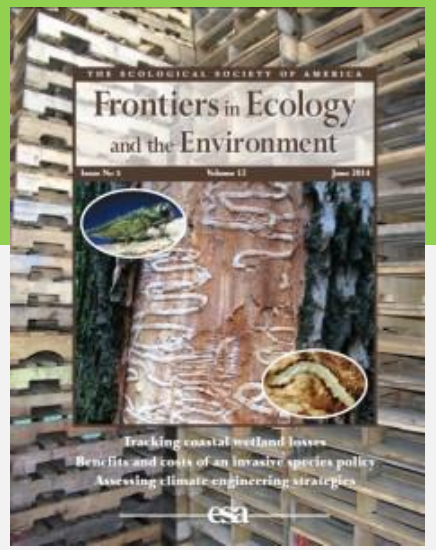

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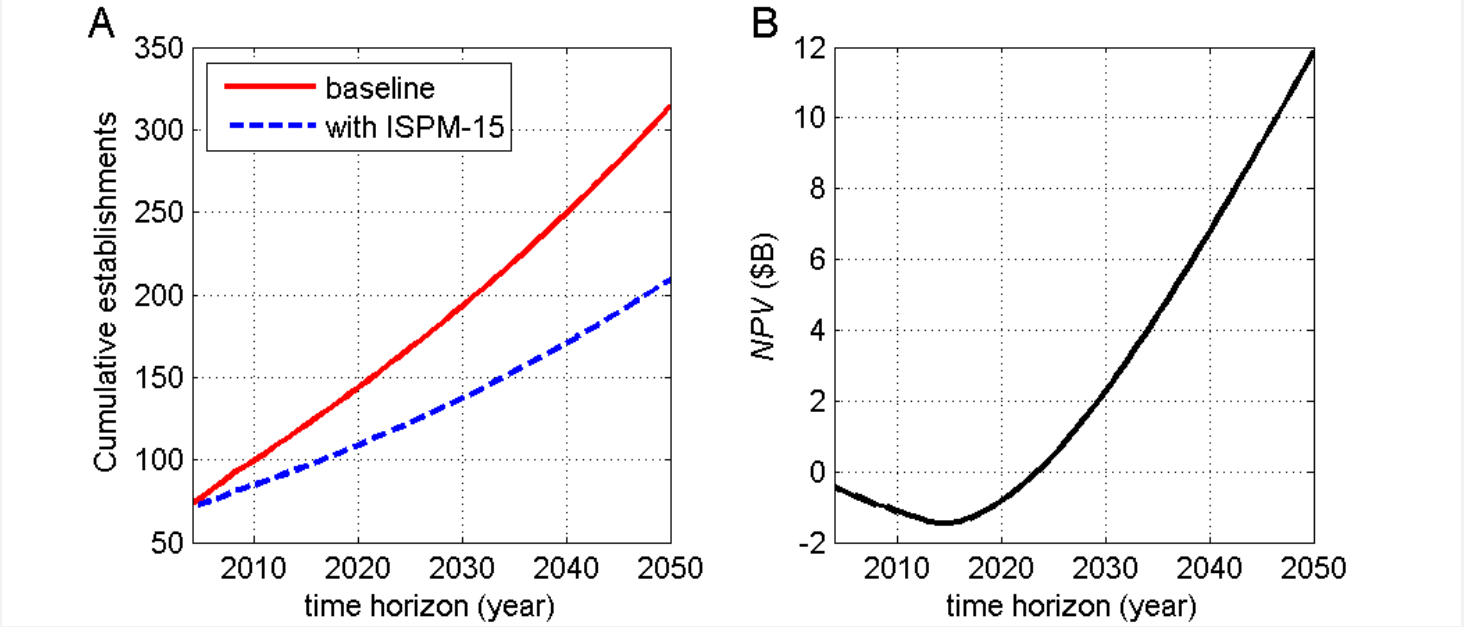

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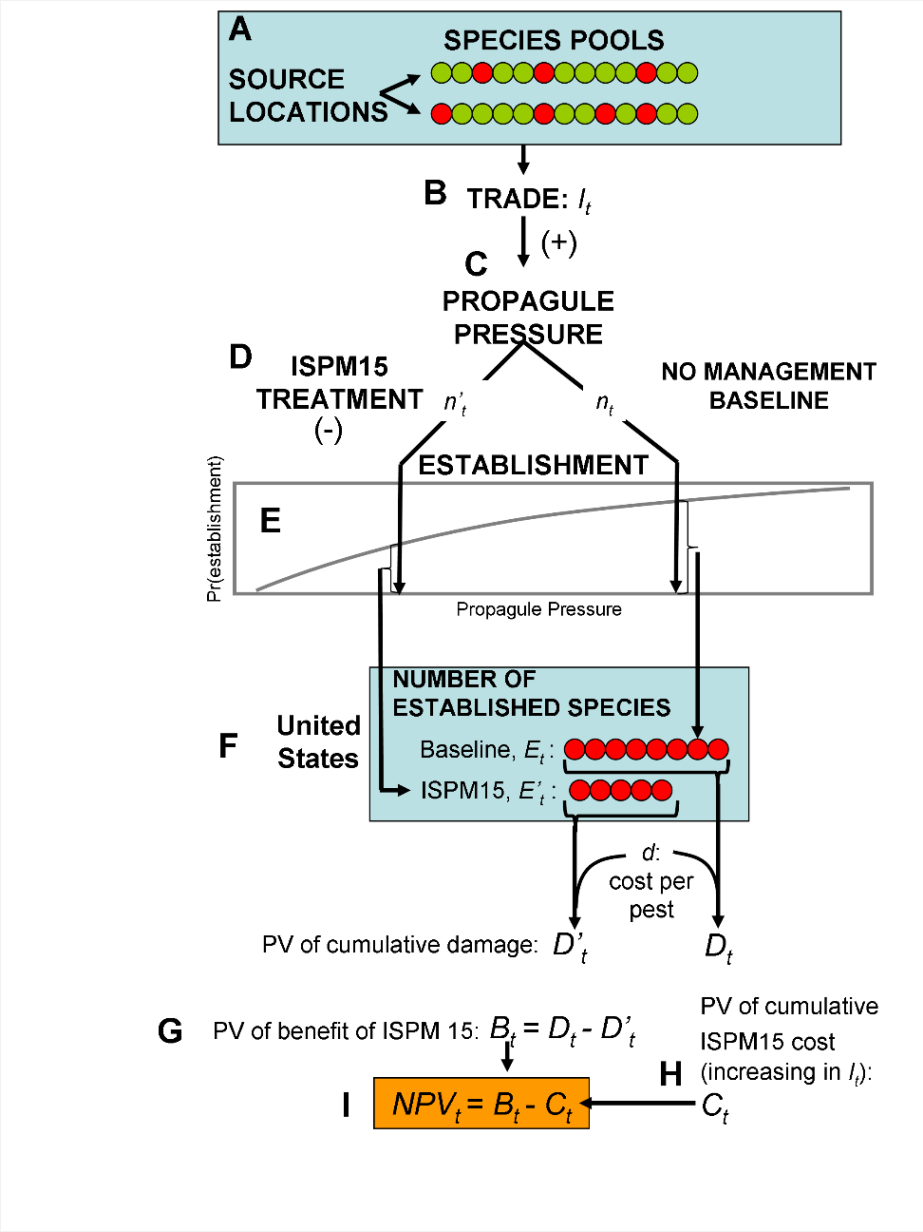
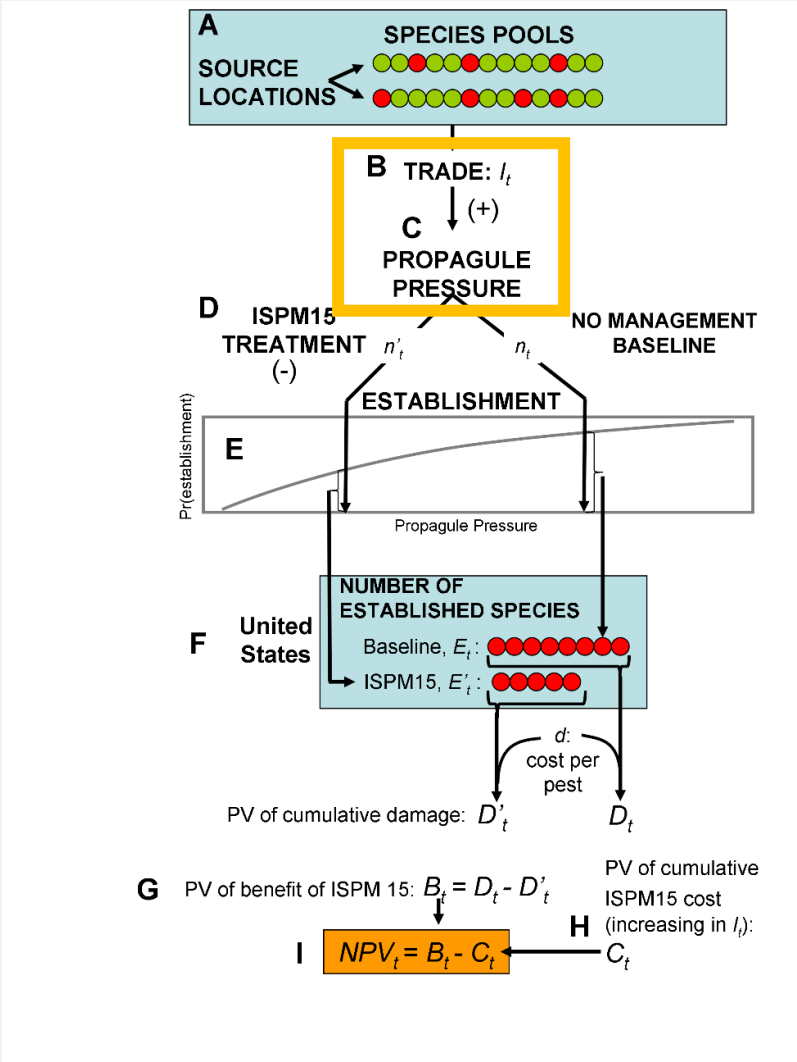
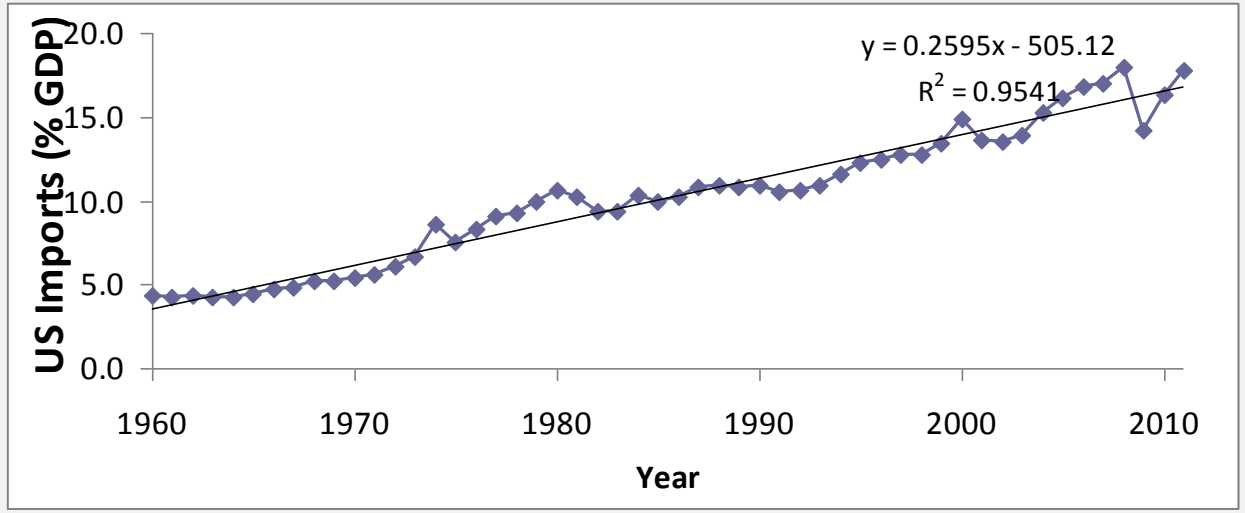


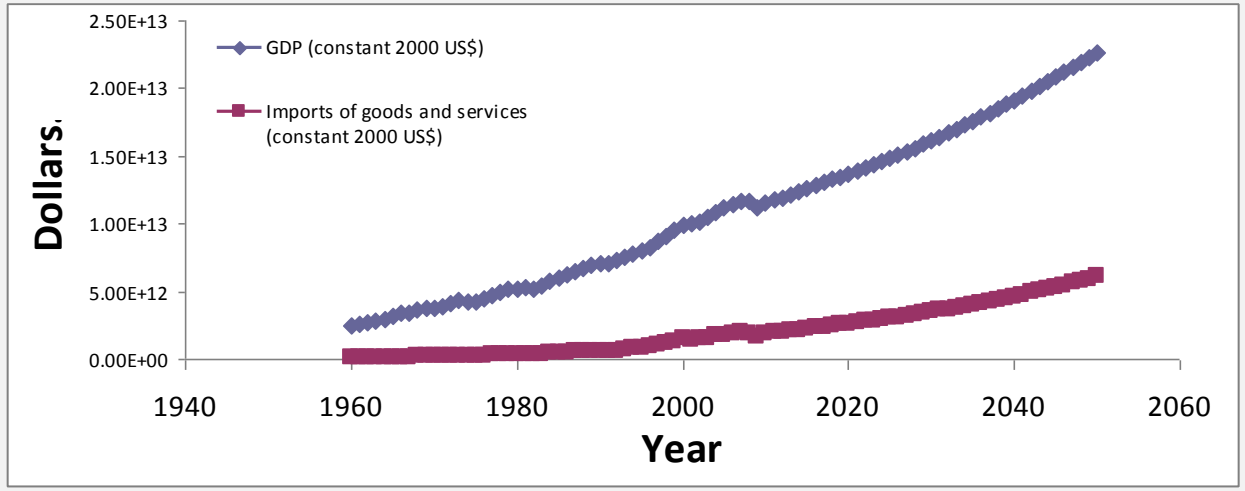
Conceptual model

Economic forecast to 2050

Scalar of relative total propagule pressure by year



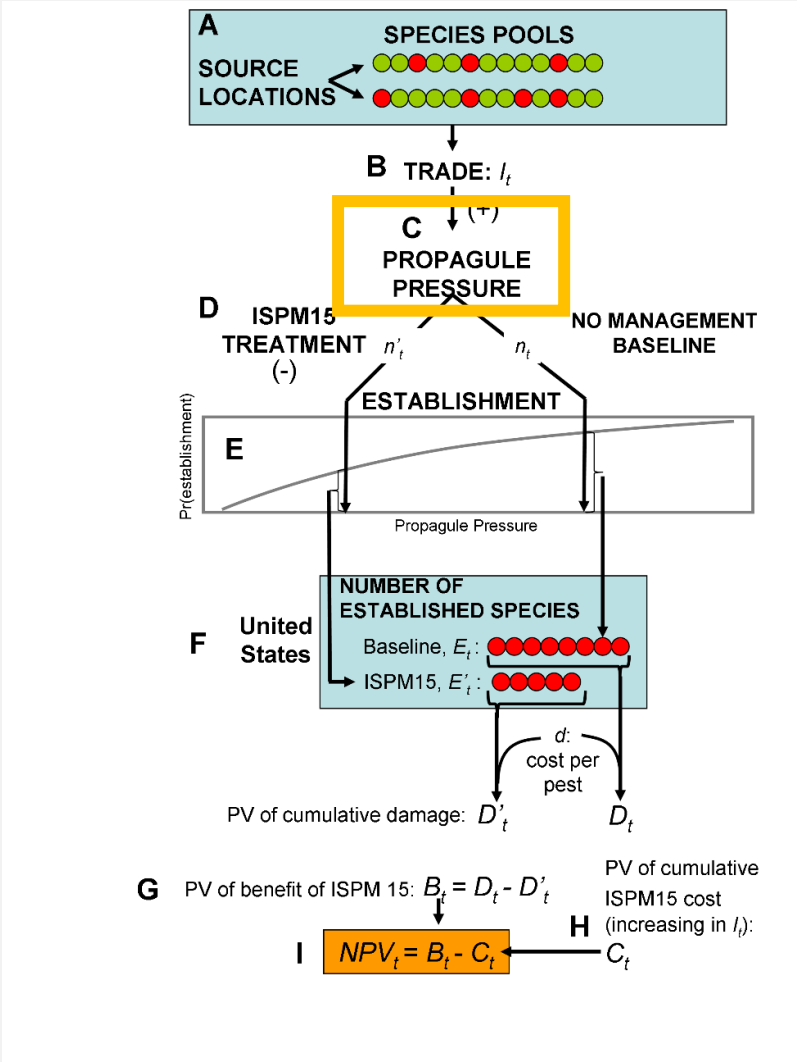


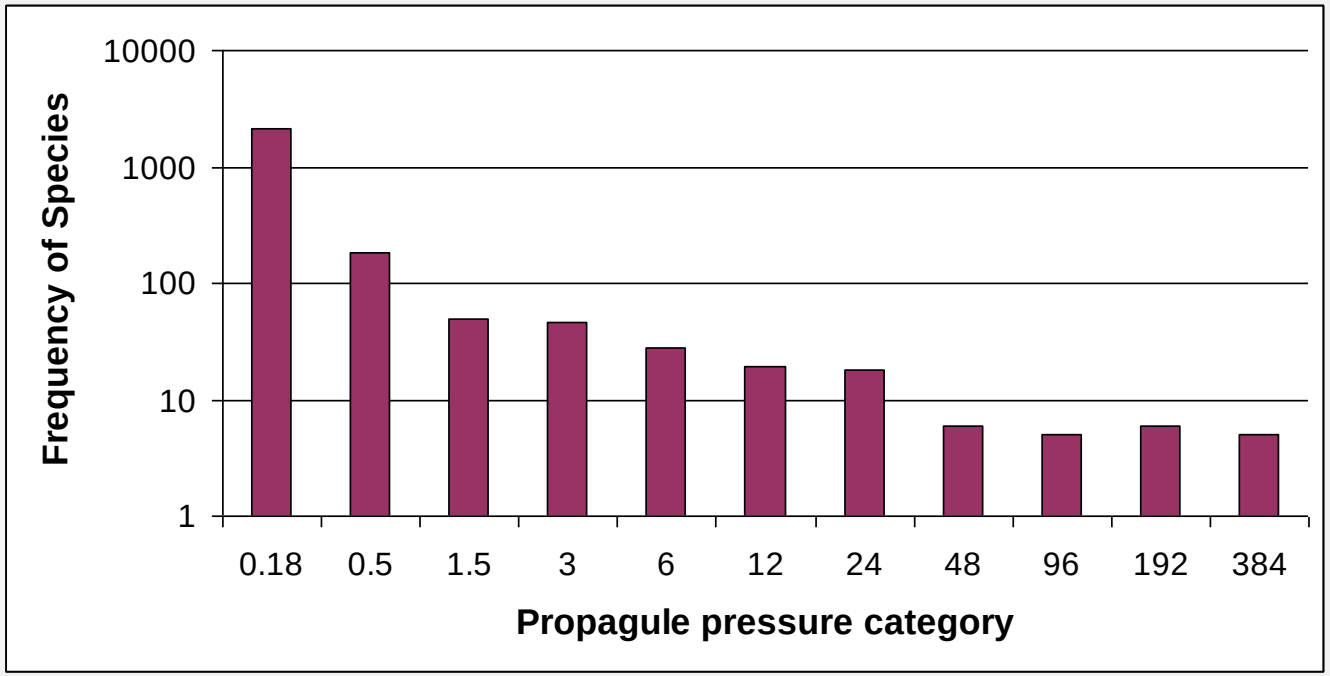


Foure et al. 2012.

Propagule pressure

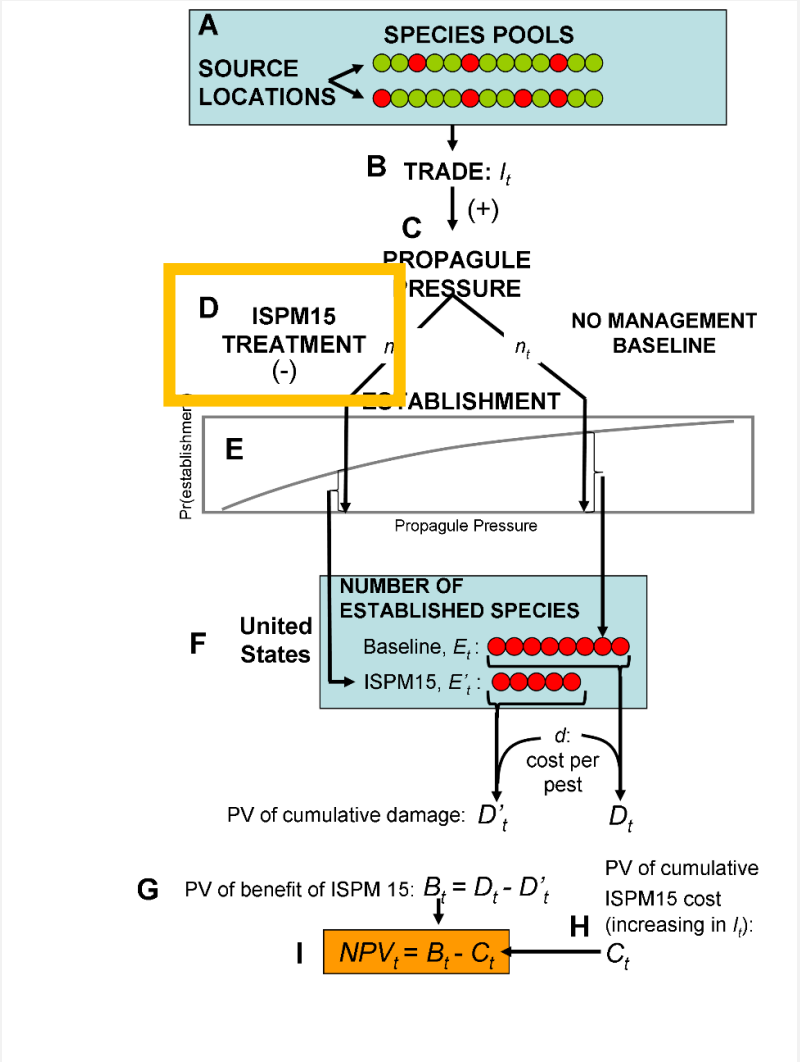
Relative propagule pressure by species

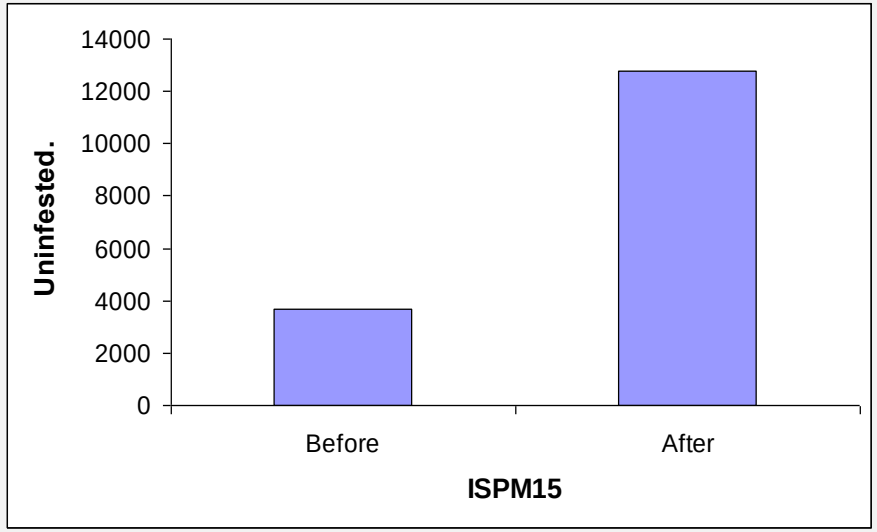


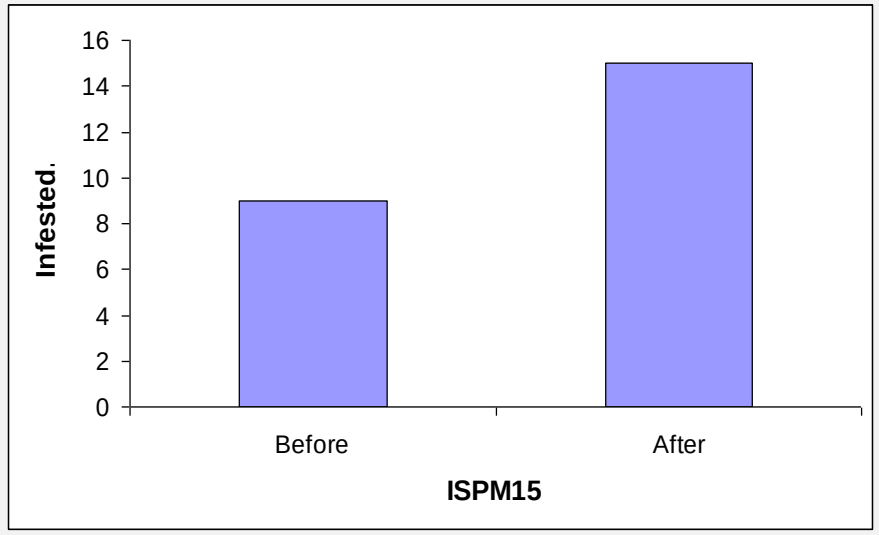


Brockerhoff et al. 2014. Ecology

Management Effectiveness



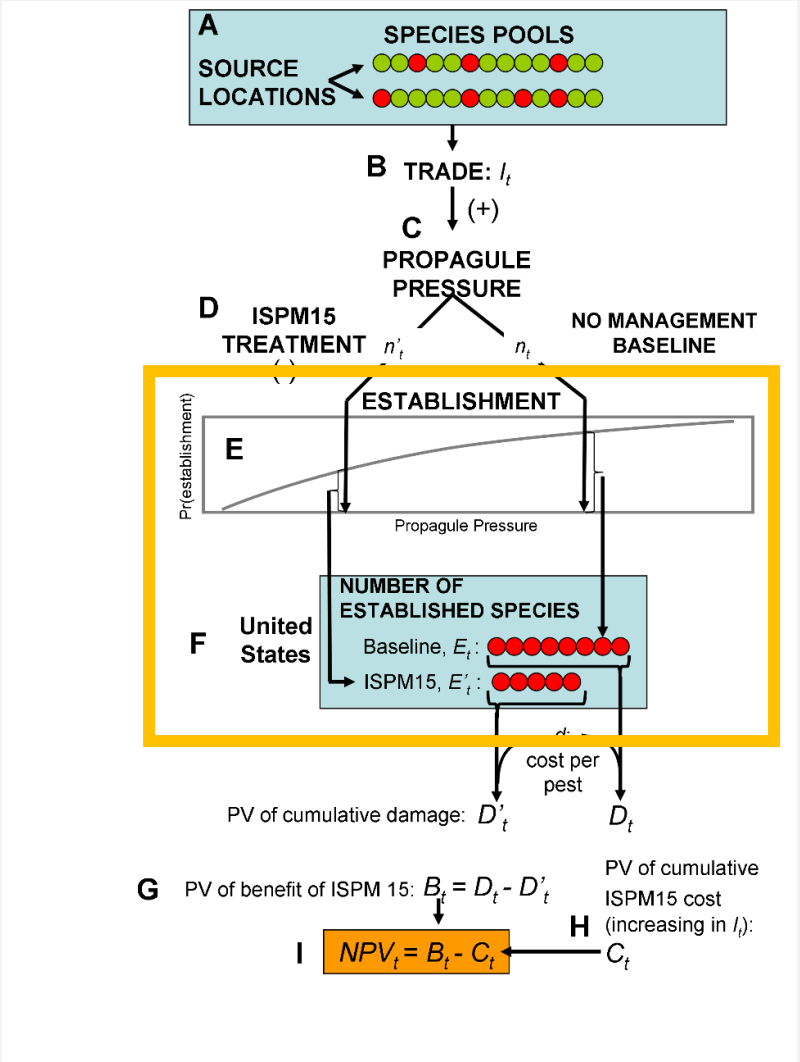


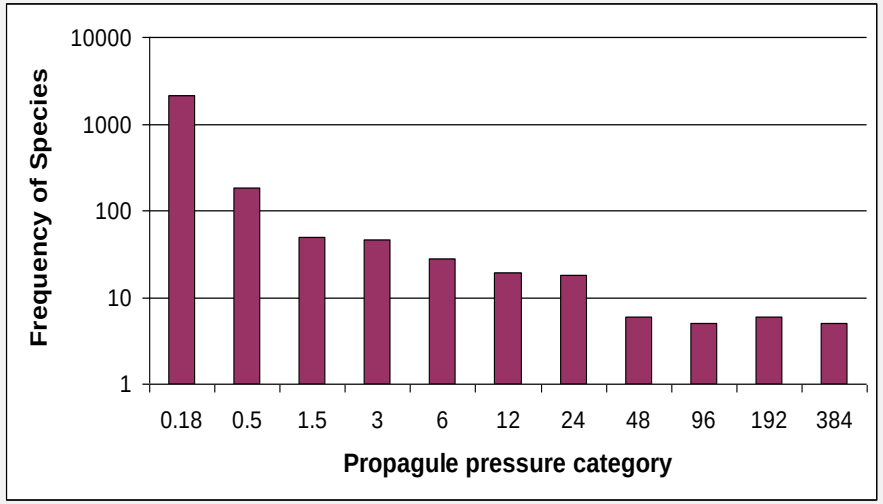


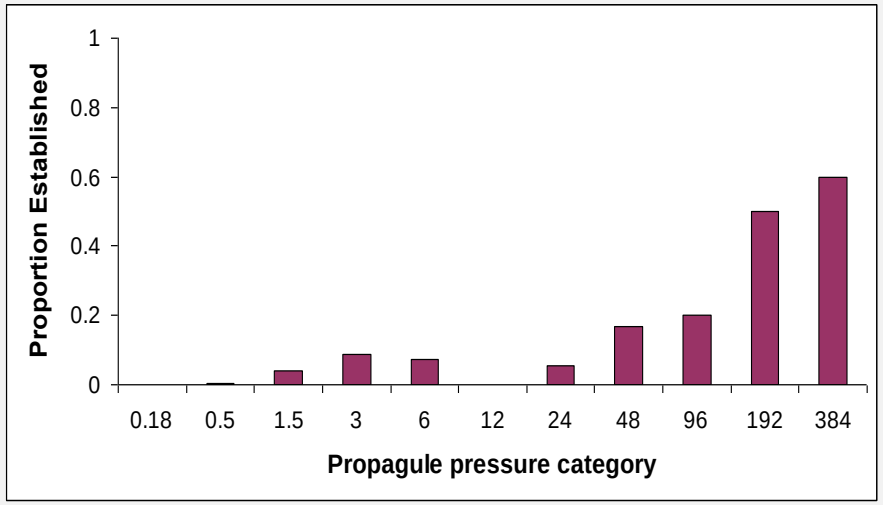
Haack et al. 2014. PLoS One.

Establishment

Relating propagule pressure







Brockerhoff et al. 2014. Ecology

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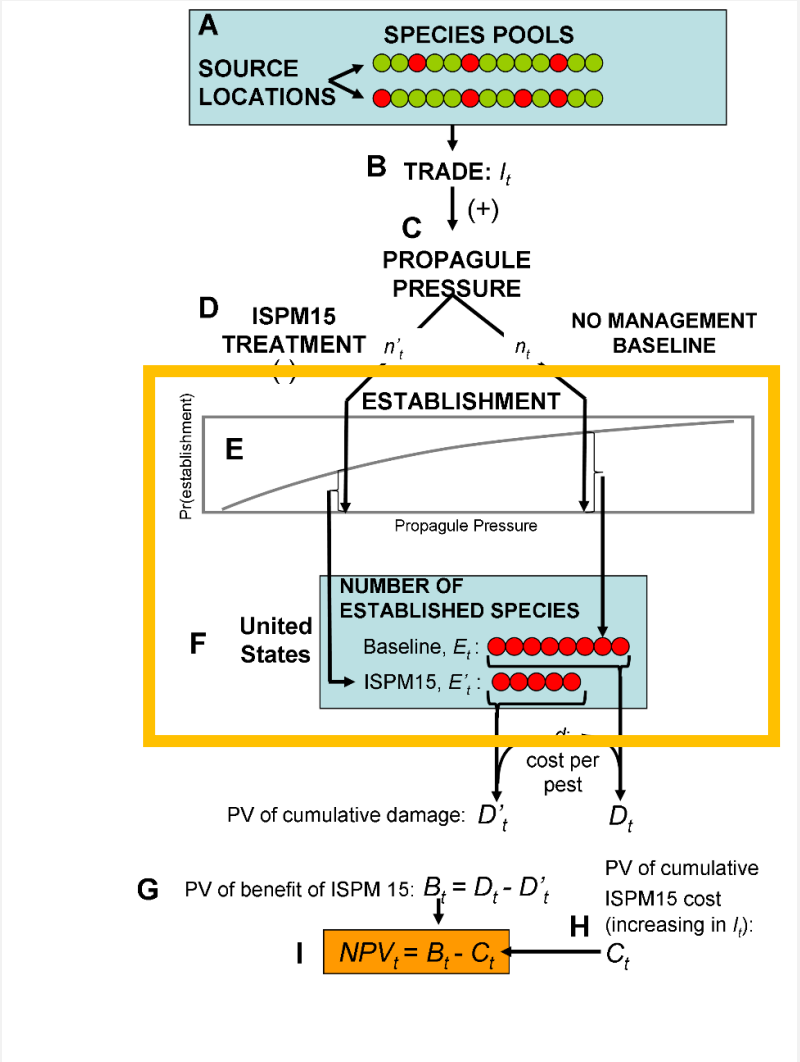
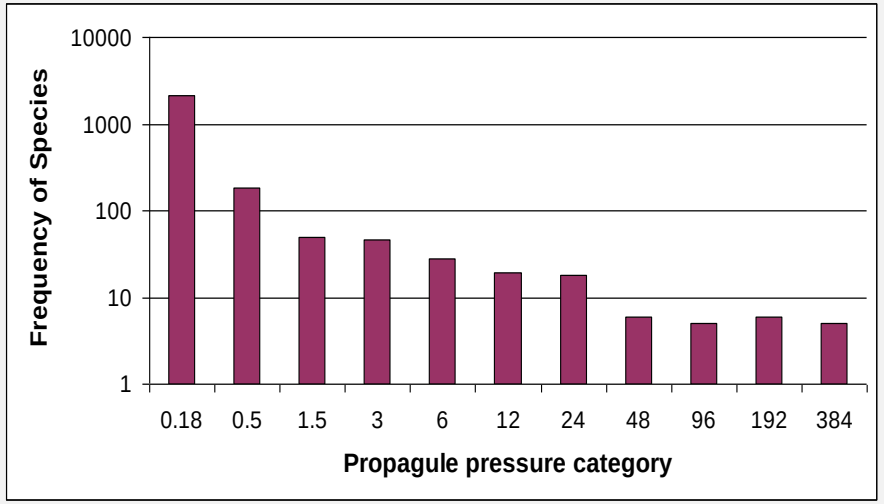
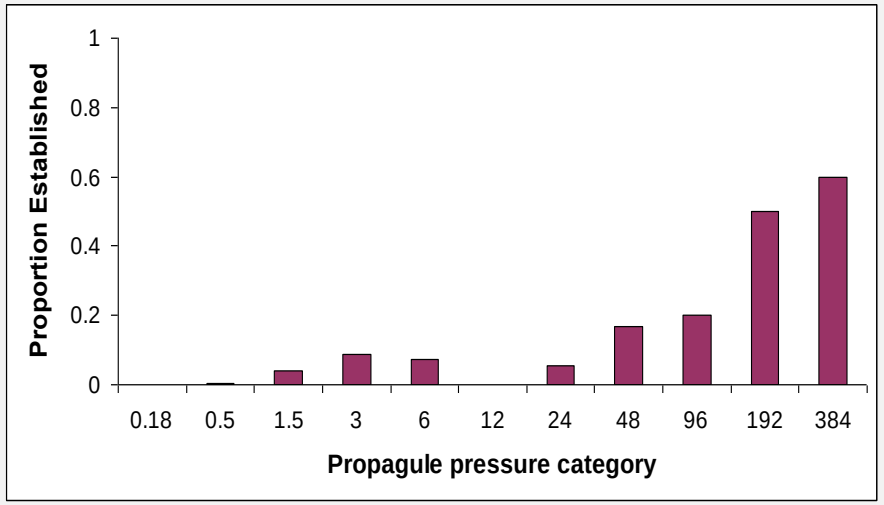
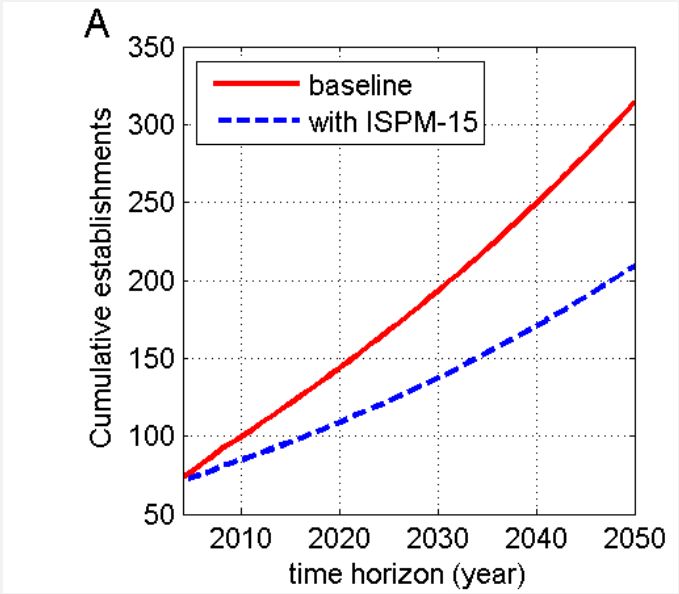


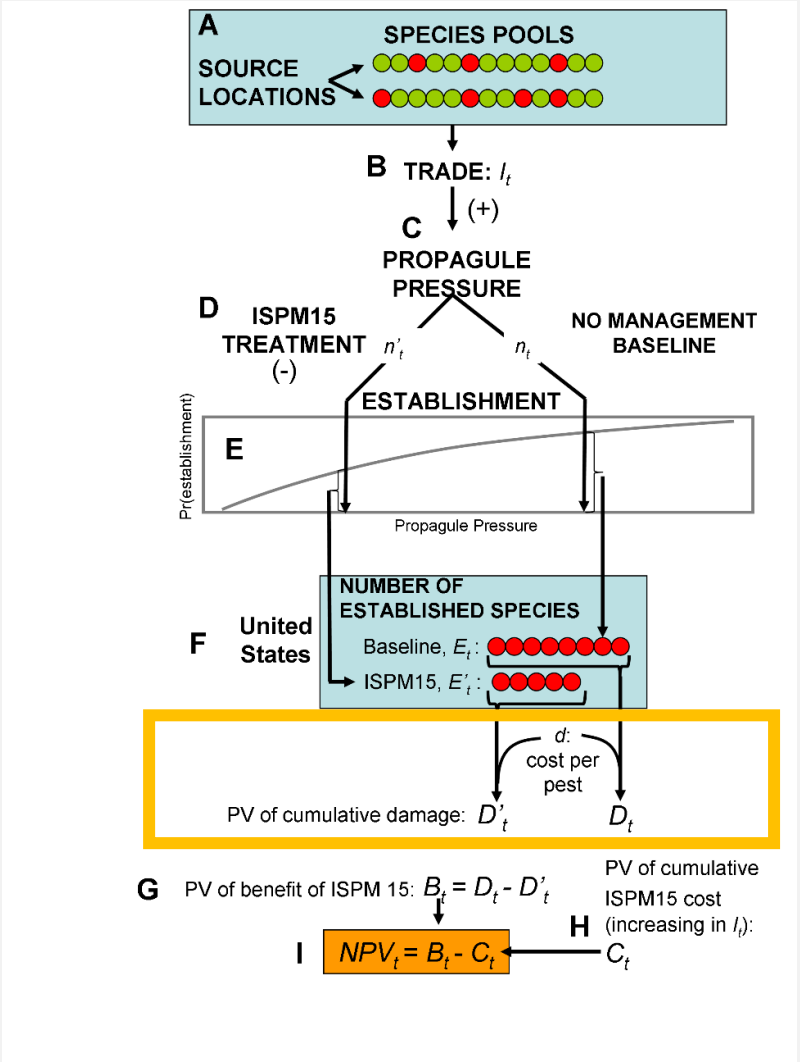






Brockerhoff et al. 2014. Ecology

Pathway Level Impact Model



Data

1. List of all pests
2. List of damaging pests
3. Full economic estimates – poster pests

Integrative model

1. Logic
2. Fitting data

Objectives

Estimate expected impact

Aukema et al. 2011. PLoS One.

Pathway Level Impact Model

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↓

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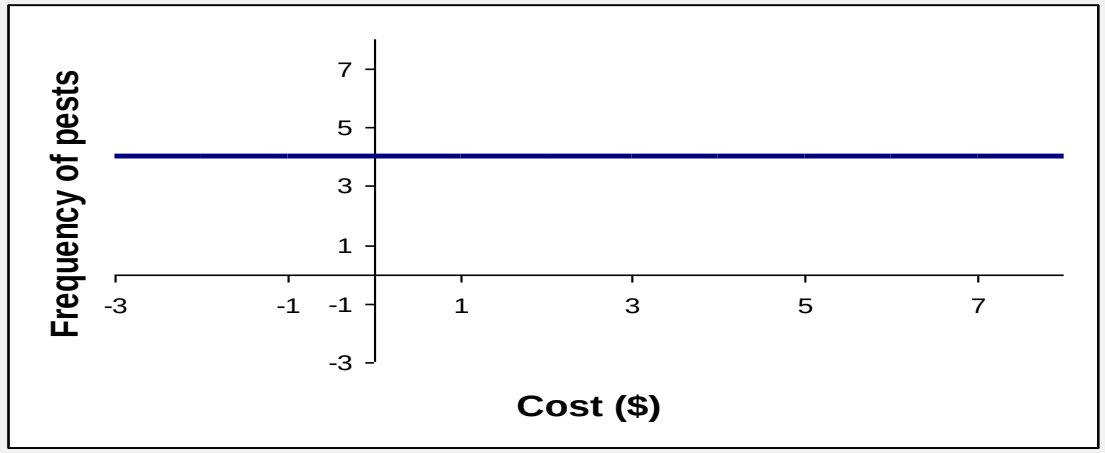

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- There is a frequency distribution of costs

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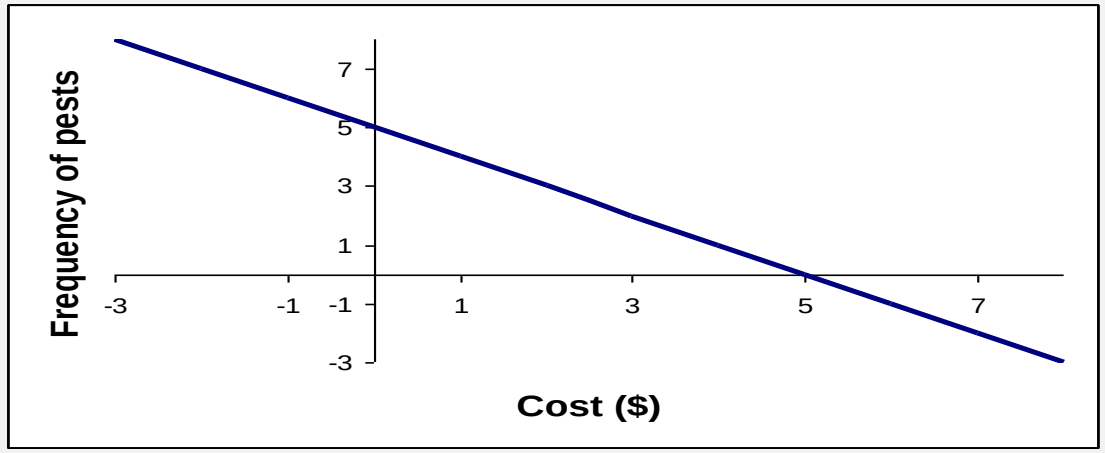

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- There is a frequency distribution of costs
- Low impact is more frequent than high

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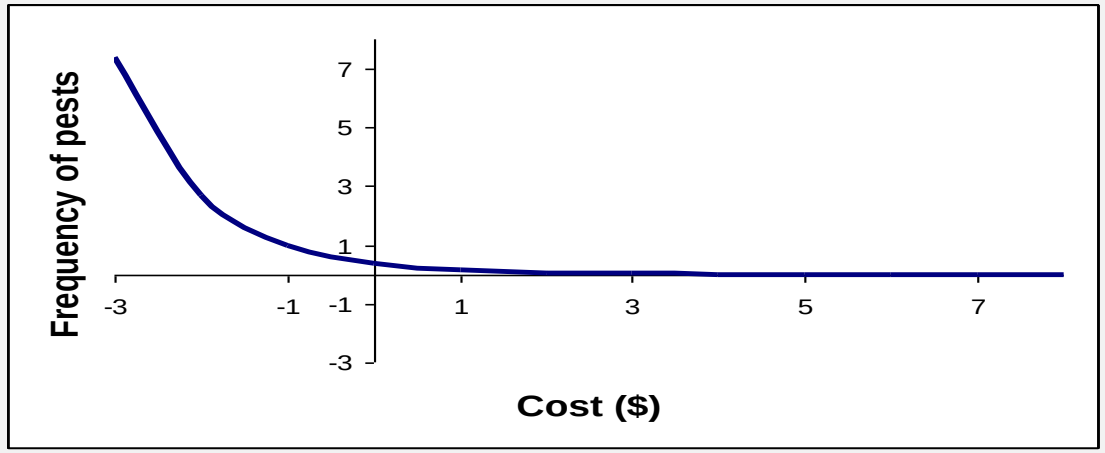

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- There is a frequency distribution of costs
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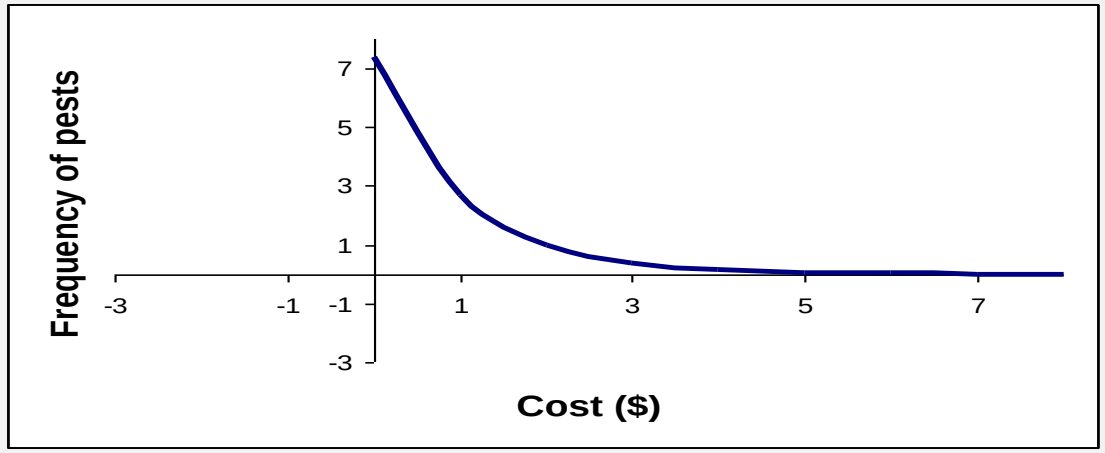
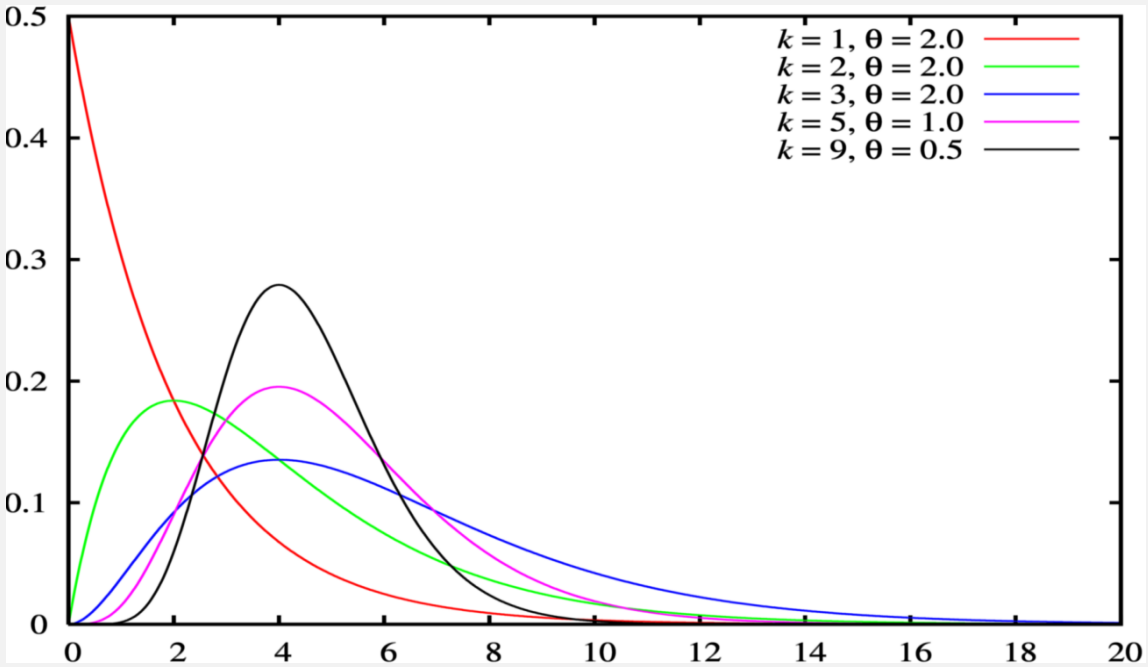


Logic

- There is a frequency distribution of costs
- Low impact is more frequent than high
- Negative frequencies not possible
- Phytophagous insects on balance are not beneficial

Frequency distribution of costs

39 families of curves considered



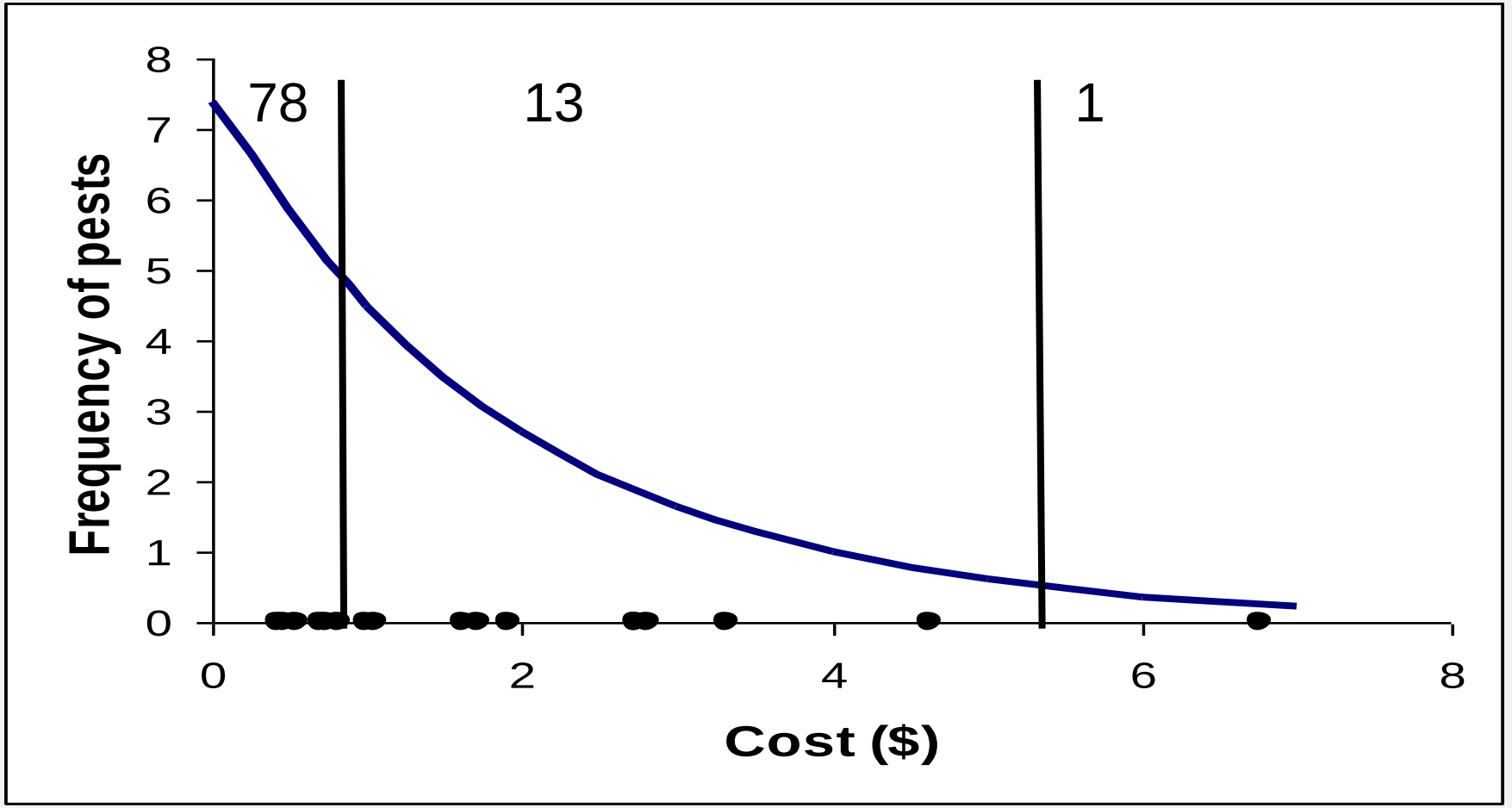
Gamma

Weibull

Log-normal

Power function

Fitting Data



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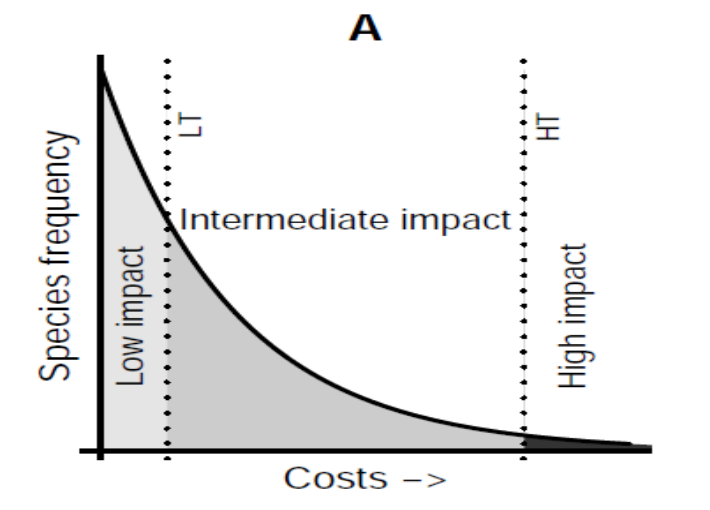

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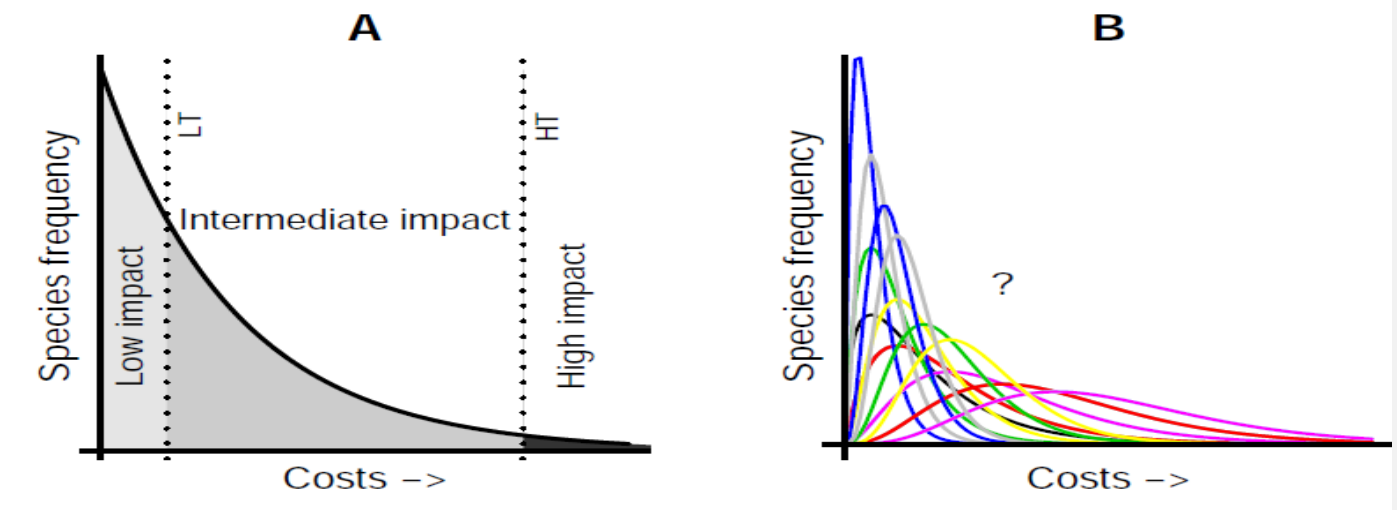

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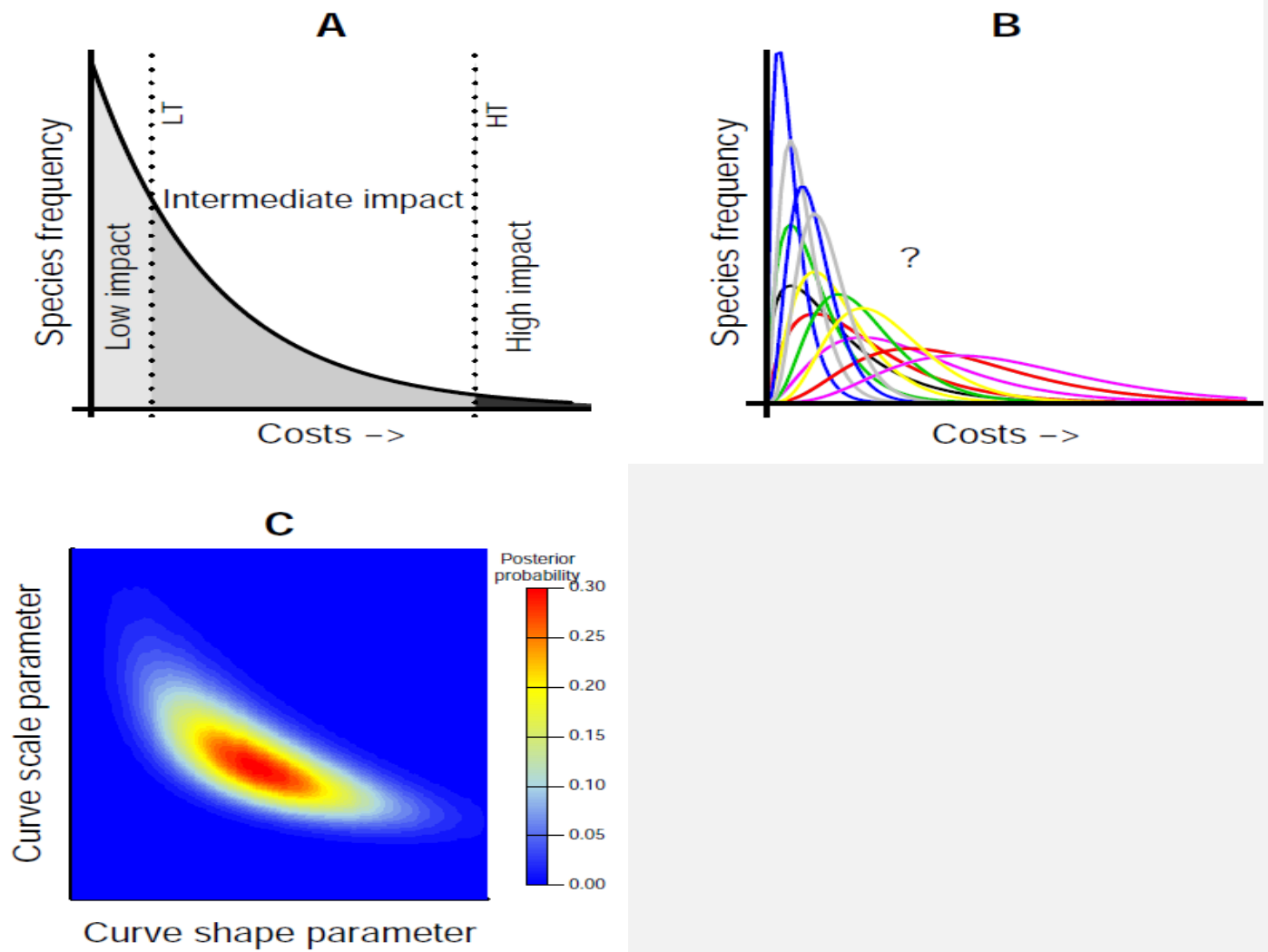

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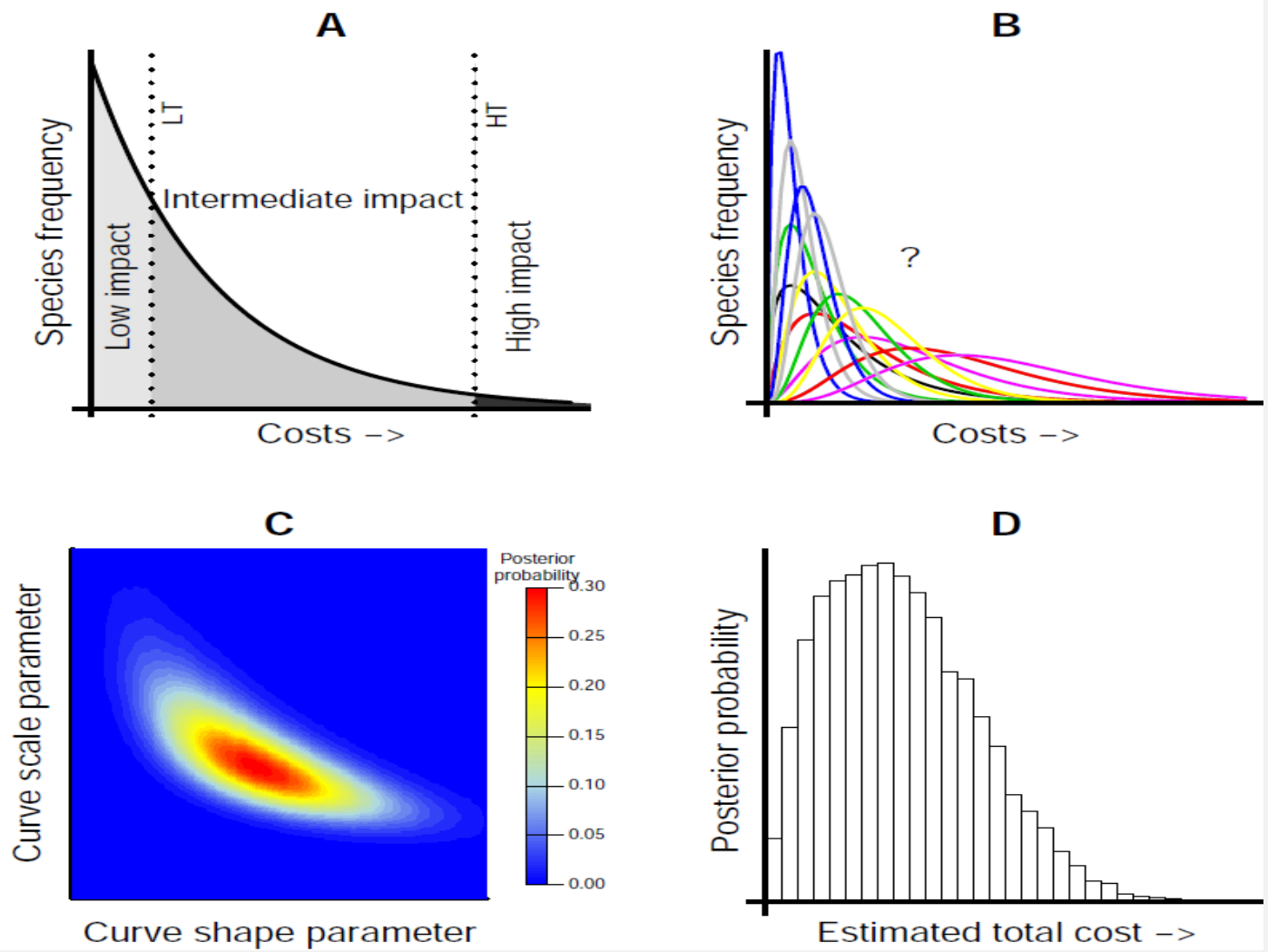

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(from Aukema et al. 2011)

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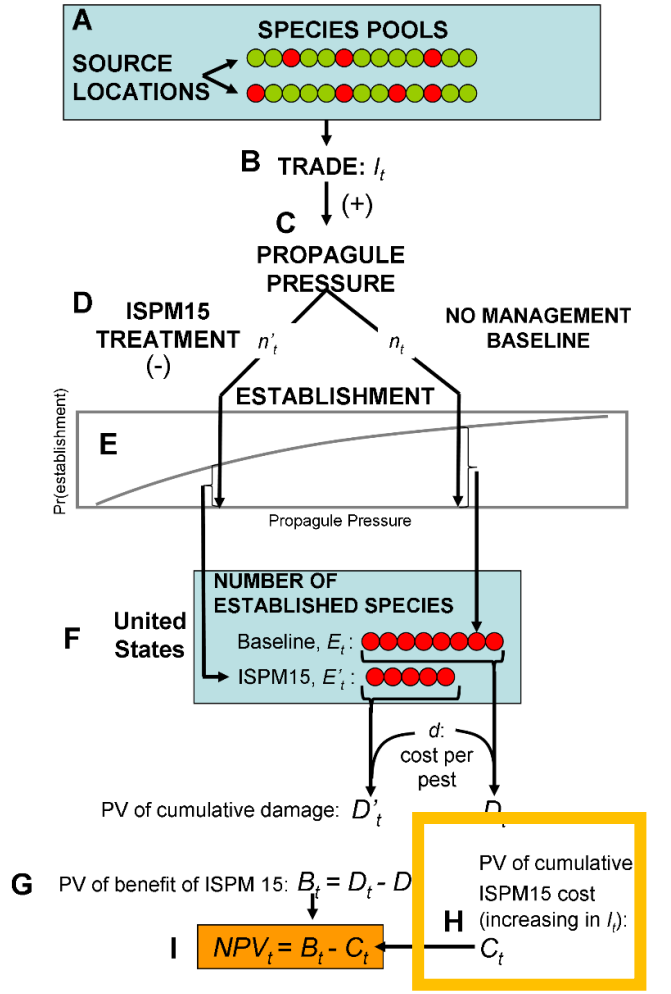
- Wood borers worse (1.7 Billion)
- Local Government/Residential pays most

Cost of ISPM15



- GTAP-M economic model
- Incorporates feedbacks in economic flows
- 437M initial cost of ISPM15

Strutt et al. 2013. Forest Policy Economics

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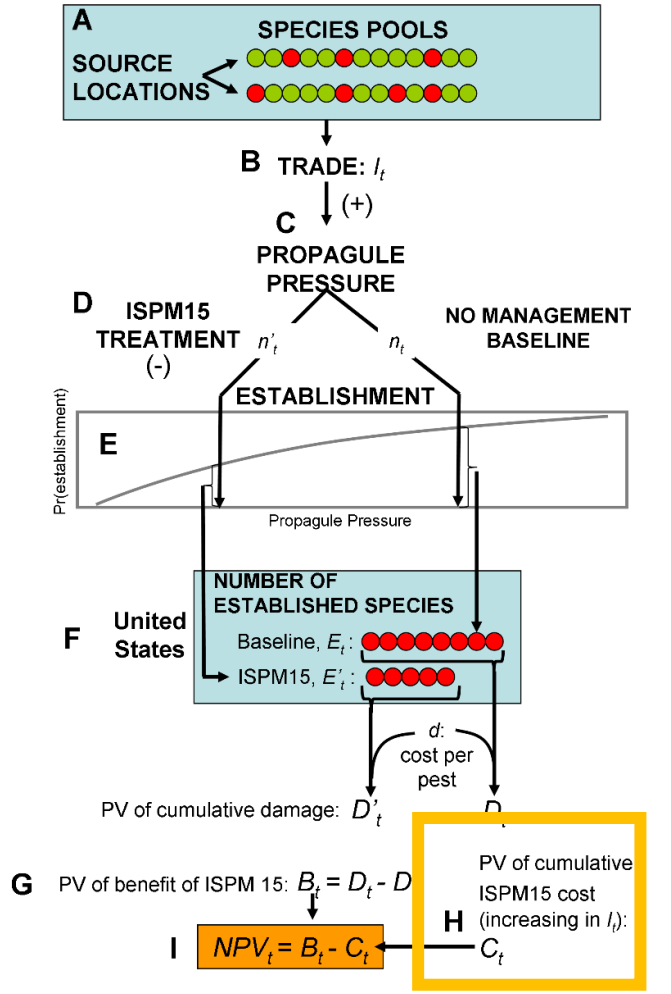

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Strutt et al. 2013. Forest Policy Economics

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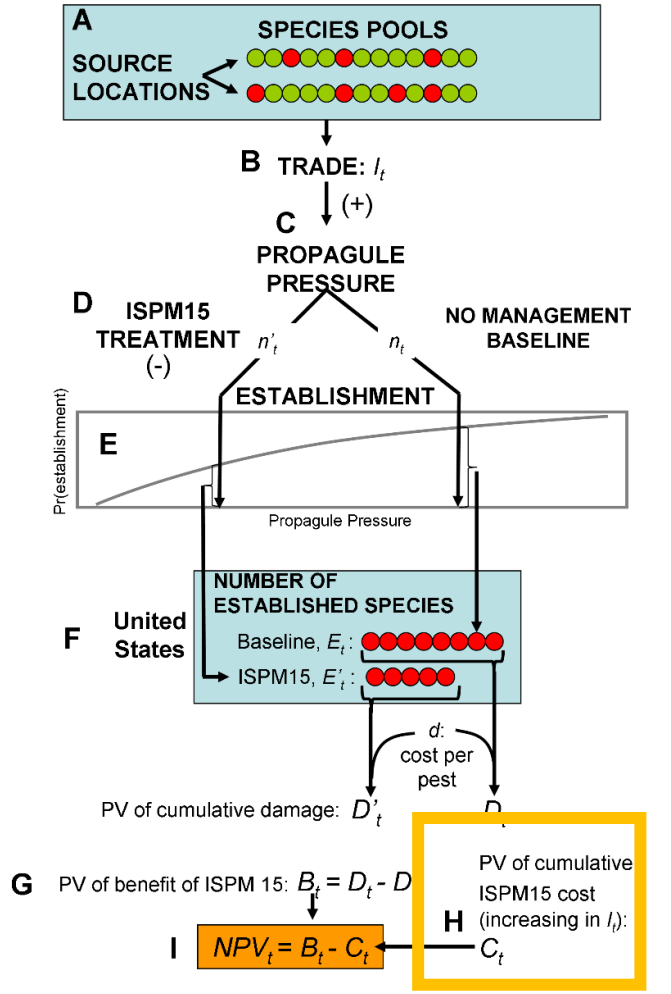

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- Incorporates feedbacks in economic flows
- 437M initial cost of ISPM15
- Re-use of pallets (6 yr average lifespan)
- New pallets due to economic growth

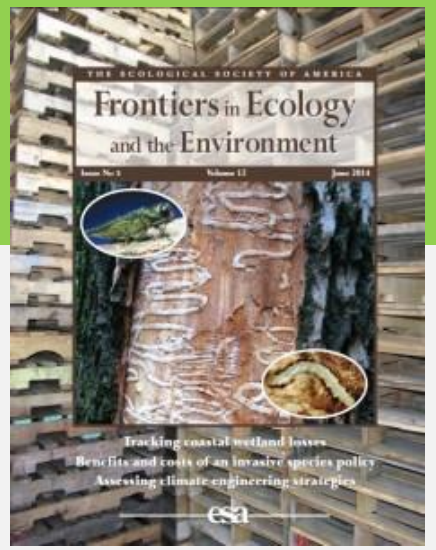
Strutt et al. 2013. Forest Policy Economics

Data and Model Summary

- 100 years of pest establishments
- Half century of interception data
- Trade growth projections
- Empirical estimates of policy effectiveness
- **Integrated models**

Pathway Level Economic Risk Analysis

Wood packing material and borers (ISPM15)



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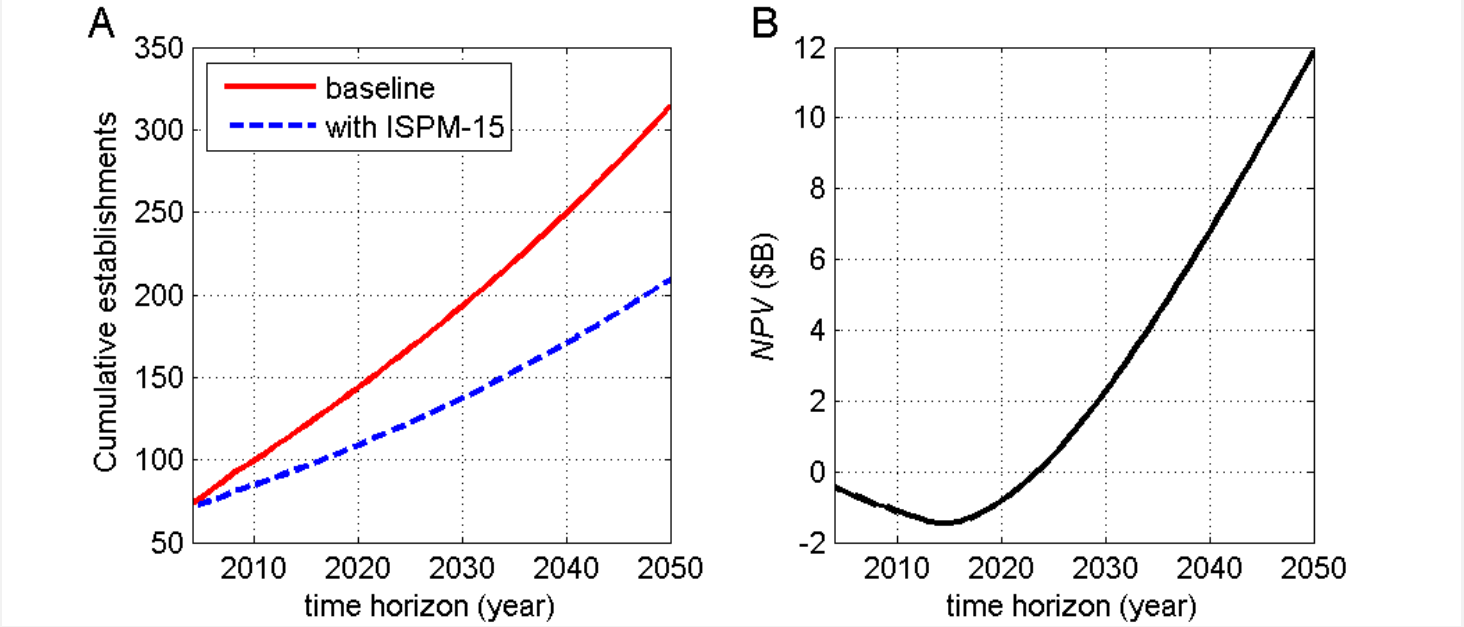
- Temporal aspect critical consideration
- Uncertainty affects range of outcomes and expectations



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