Overview on Best Available Technology in Science and Economics for Pre-Import Risk Analysis

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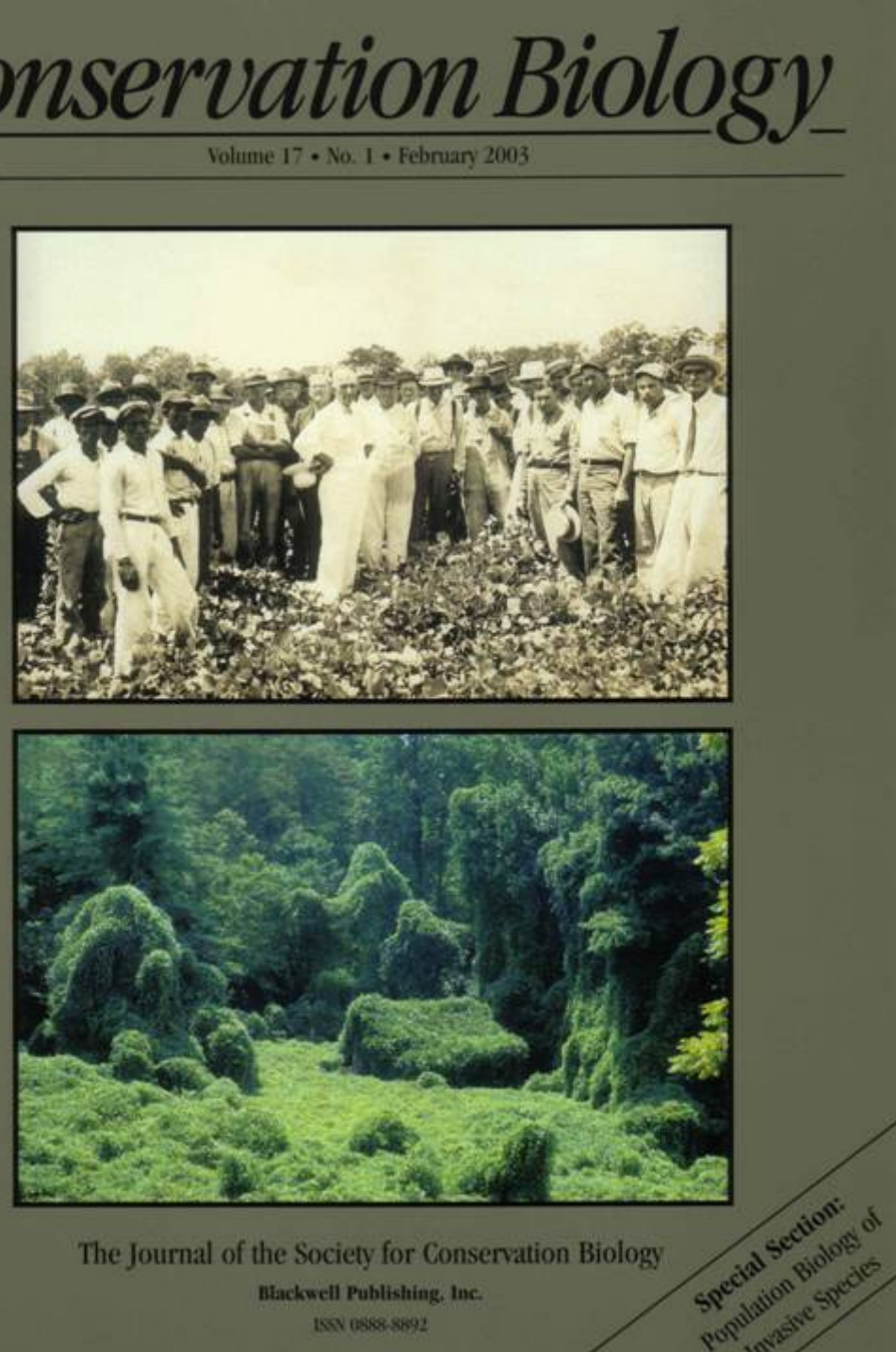
Alien Invasive Species

Problem:

Net Effect =
Harm > Benefit

Solution:

Risk Analysis-guided pre-import decisions



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Could Establishment, Spread, and Harm have been Predicted?

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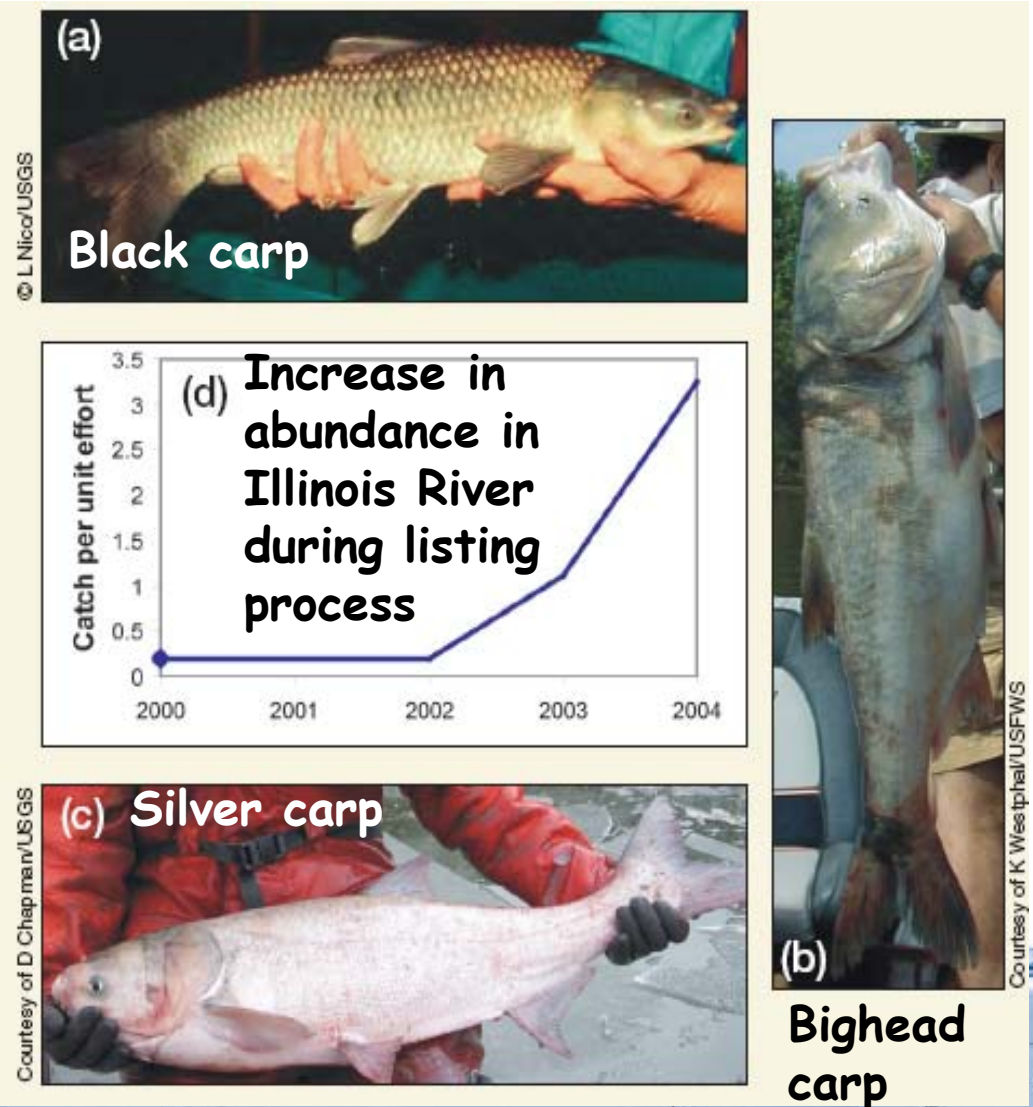

Bighead carp

Potential or demonstrated harm:

- Biodiversity
- Fisheries
- Human safety

(Fowler, Lodge & Hsia 2007)

Pathways of Nonindigenous Species in the US

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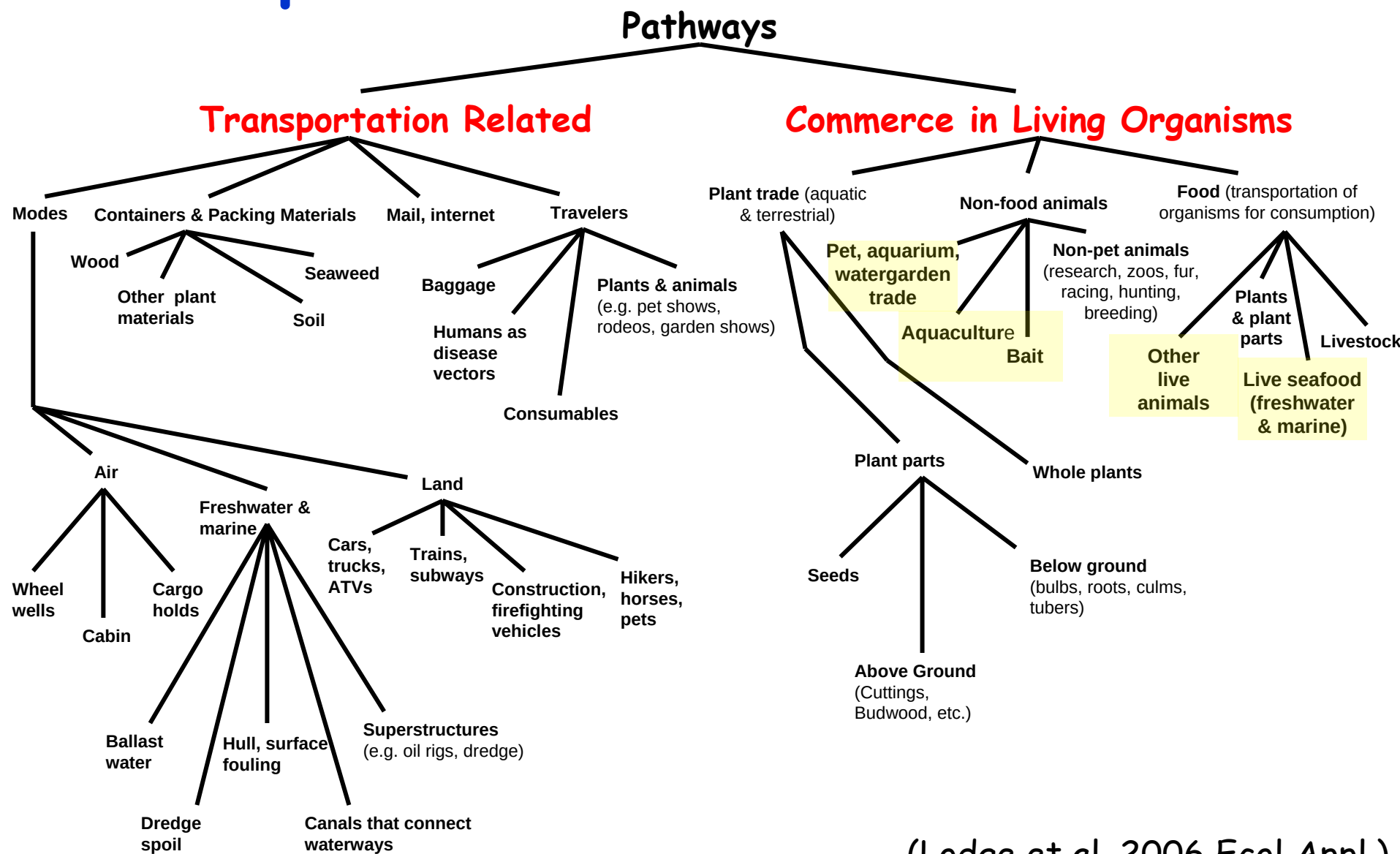


(Lodge et al. 2006 Ecol Appl.)

Invasion Process

Species in Pathway

Transported and Released Alive

Population Established

Spread

Ecological, Human Health, or Economic Impact

Invasion Process	Risk Assessment
Species in Pathway	
↓	
Transported and Released Alive	P = 1 if allowed in trade
	X
↓	P = ?
Population Established	X
↓	P = ?
Spread	X
↓	P = ?
Ecological, Human Health, or Economic Impact	=
	Probability of the undesirable occurring

Invasion Process

Species in Pathway

↓

Transported and Released Alive

↓

Population Established

↓

Spread

↓

Ecological, Human Health, or Economic Impact

Risk Assessment and Risk Management

P = 1 if allowed in trade

X

P = ?

- Limit numbers in trade
- Limit locations
- Genetically modify to reduce survival

X

P = ?

- Specify containment protocols to prevent escape

X

P = ?

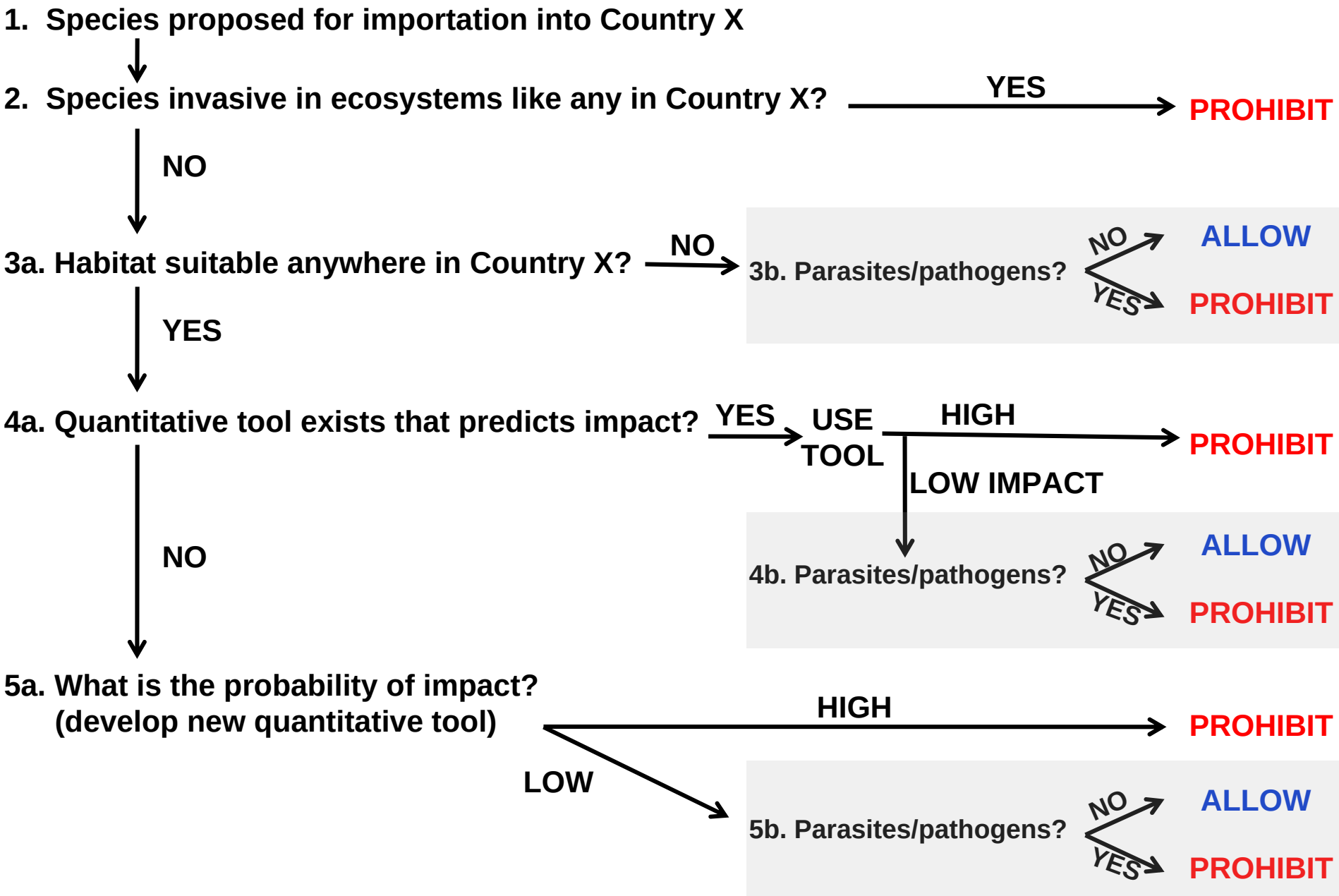
- Consider costs relative to benefits
- Decide on acceptable risk = decision threshold
- Decide how to enforce

=

Probability of the undesirable occurring

Invasion Process	Risk Assessment	Best Available Technology
Species in Pathway		
↓		
Transported and Released Alive	P = 1 if allowed in trade	
	X	
↓		
Population Established	P = ?	Environmental niche modeling (Simon Barry talk)
	X	
↓		
Spread	P = ?	Spread modeling (Jon Bossenbroek talk)
	X	
↓		
Ecological, Human Health, or Economic Impact	P = ?	Trait-based impact modeling (Jon Bossenbroek talk)
	=	
	Probability of the undesirable occurring	Cost:benefit analyses of RA (Reuben Keller, Jamie Reaser talks)

Pre-Import Risk Assessment Framework



Qualifications/rationale for RA framework

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- As much as possible, RA should be peer-reviewed, quantitative, transparent, and repeatable
- Questions ordered from least to most demanding of data, expertise, time, and resources
- Decision rules at the points of allow/prohibit would be more complicated than diagram suggests, depending, e.g., on acceptable level of risk
- Risk management at some of the steps could change the answers, e.g., steps for removing parasites/pathogens, containment procedures
- Economic analysis could guide policy choice on how to balance accuracy vs. cost of RA

Recent Advances in Risk Assessment

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1. Recent scientific advances allow 80-90% accuracy for some risk assessment tools.
2. Importation can be banned only for harmful species, increasing net benefit of trade in benign species.
3. Screening can provide environmental *and* economic benefits (Keller, Lodge & Finnoff 2007).