Risks of Invasive Species from International Trade

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The NIS problem

Pecuniary damage*

- ~50,000 NIS in United States
- Annual monetary losses:
  - $120 billion/yr.

Citrus Canker

Imported seedlings, 1910. Destroys citrus fruit

Health impacts*

- Human disease control cost:
  - $7.5 billion/yr.

Asian Tiger Mosquito

Tire shipments,1985. Transmits West Nile Virus

Ecological damage*

- Endangered species (42% due to NIS)
- Loss of native species

European Green Crab

Ballast Water, 1817. Eats native bivalves

Challenges for NIS policy

- Most species benign – few with high damage

- Lag between introduction and discovery

- Once you see them, already established

- Only observe damage from those that get through preventive measures.

UGA0024065

Prevention vs. control?

- Prevention: Hard to measure effects*
  - But often most cost-effective
  - 750,000 interceptions by APHIS ('84-'00)**

- Control: Less "risky" for policy-makers*
  - But may be extremely costly
  - Most cited costs are control costs

- Better targeting, preference for prevention

*Finnoff et al., 2007
 **Lichtenberg et al., In Prep

NIS is an *economic* problem

- Trade is the primary vector for NIS introductions

- Policy response depends on the structural relationship between trade and NIS
  - Tariffs?
  - Inspections?
  - Trade restrictions?
  - Certification/Liability?

Photo: Boris Paulien   boris.paulien@web.de

- How *risky* is future trade?
  - *"Marginal invasion risk"*
  - Expected future introductions…translate to damage
  - Cost Benefit ratio of trade reduction

McAusland & Costello, 2005
Costello et al., 2007

International trade pathways

- Intentional Introductions
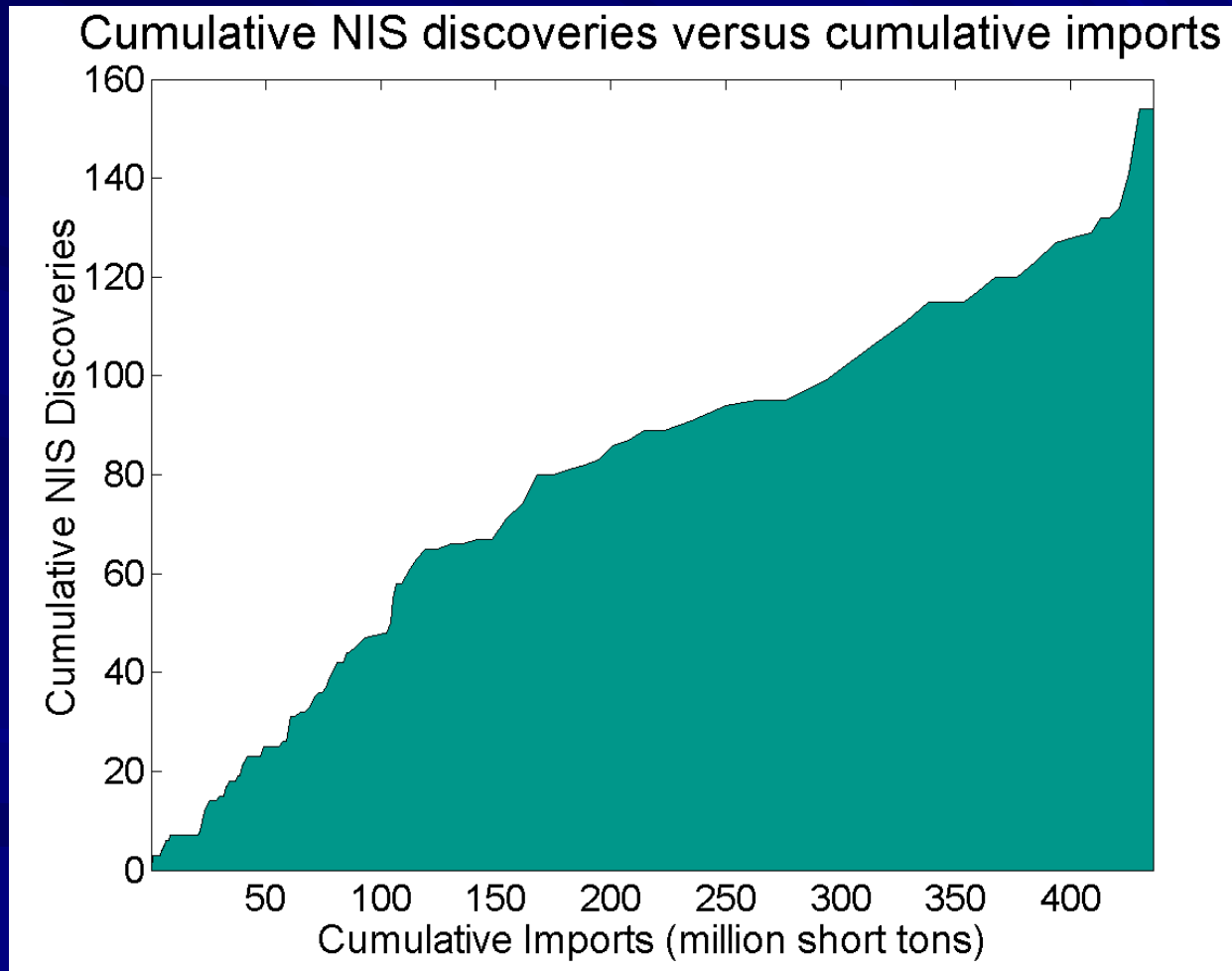 - Agriculture/Horticulture
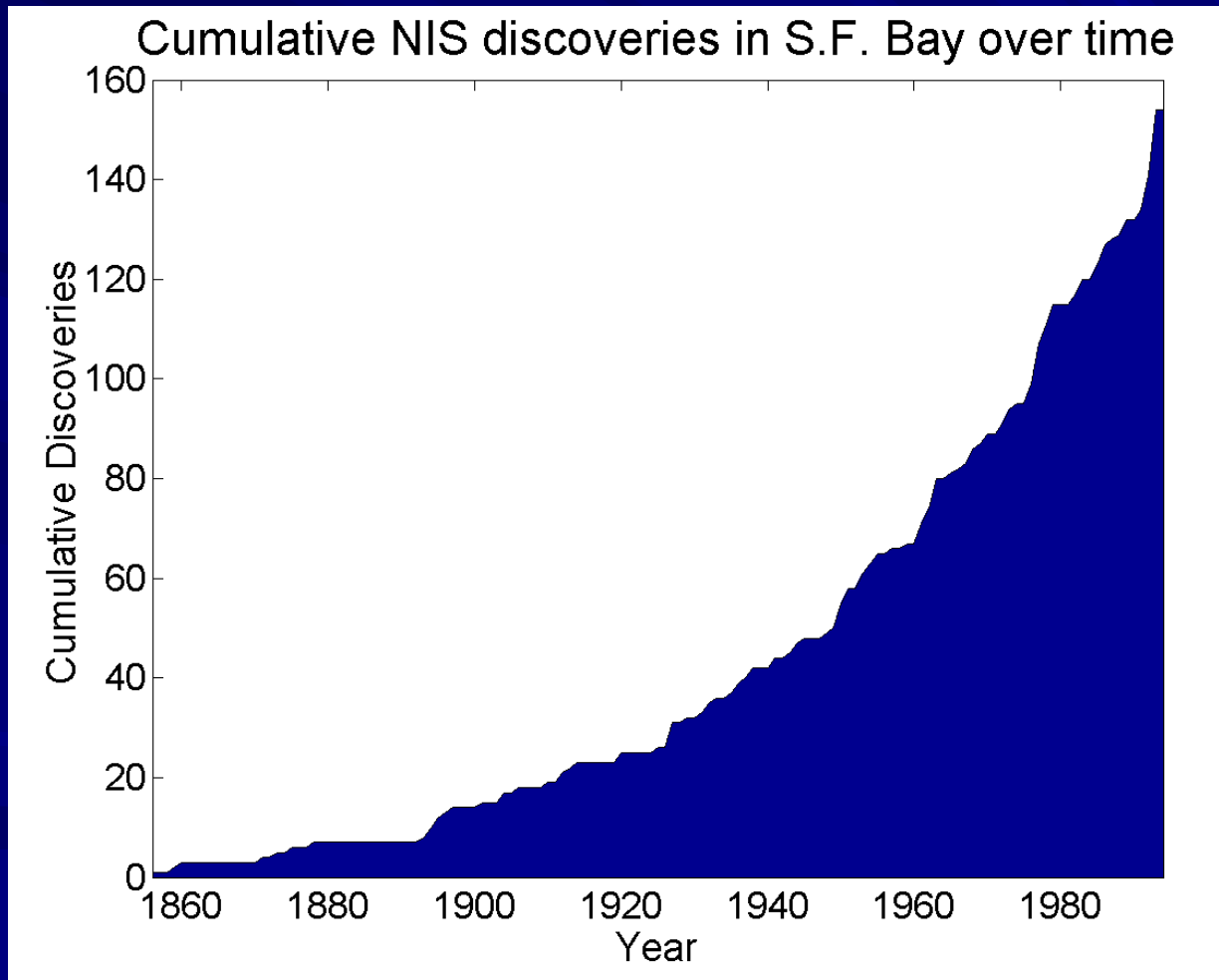 - Pest control

- Unintentional Introductions
  - Bundled with traded goods
  - Infested packing material
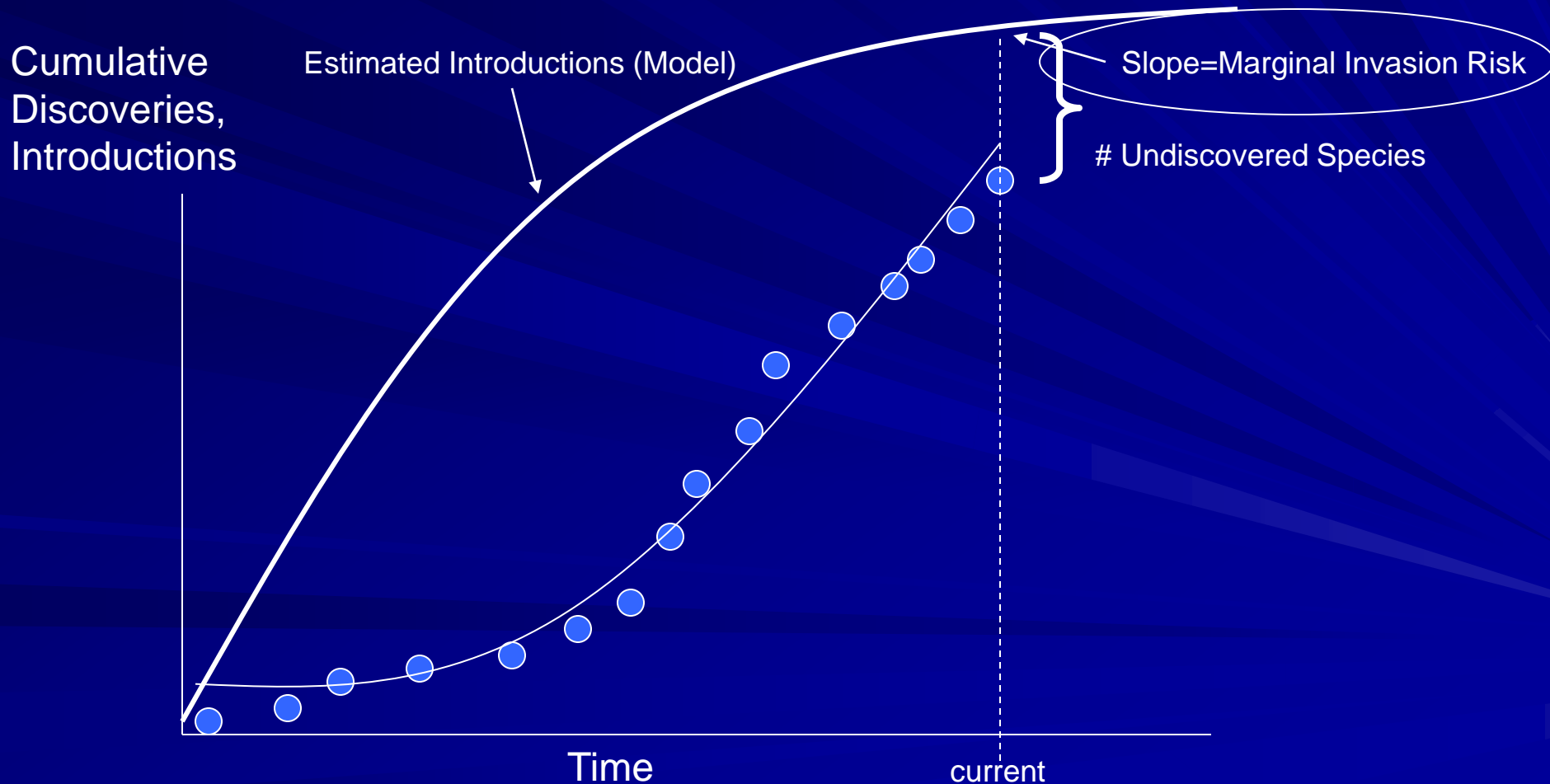 - Transport method
  - Tourism

Trade delivers NIS

Cumulative NIS discoveries versus cumulative imports

But shipping increasing over time

Cumulative NIS discoveries in S.F. Bay over time

Discoveries vs. Introductions: Problem worse that it seems

Cost/Benefit of *trade restrictions*

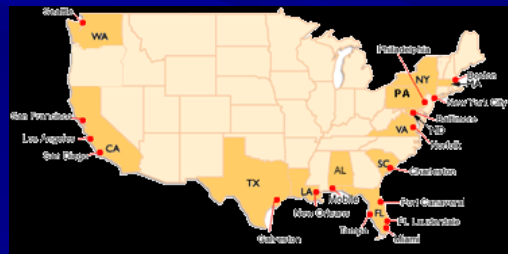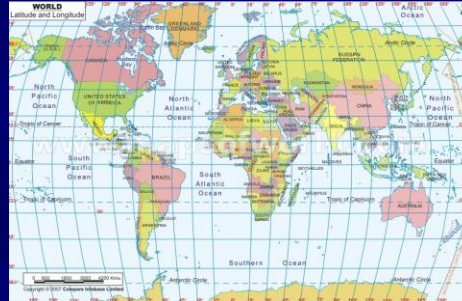| Region	# Species to date	Marginal Invasion Risk	Damage per species to achieve C/B=1
Partner 1 (ATM)	80	0.11	$1 Billion
Partner 2 (WPC)	60	0.38	$8.3 Million

- MIR relatively low
- Rough average annual costs/NIS: $2.4 M (most benign)

- *Blunt trade restrictions* too costly given benefit

Costello et al., 2007

Empirical research supporting policy design

- **Important differences in risk across trade regions**
  - Biogeographic similarity
  - More history ….less risk of new invaders

- **Historical measures may be poor predictors of future:**
  - Baseline infectiousness
  - Number species introduced in past

Costello et al., 2007

Heterogeneity in risk

- Exporter

- Route of import

- Products

- Port of entry

- Transport method & timing

Proceeding with risk assessment

False (-), False (+)

- <u>Too strict</u>: Reject or clean benign shipments
- <u>Too lenient</u>: Accept infected shipments

- Formal risk assessment balances these effects
  - But requires information

What we need to improve risk assessments

- **Empirical analysis of risk:**
  - New partners? Products?
  - Trade history? Routes?
  - Trade vehicle?
  - Likelihood of re-infection?
  - Effectiveness of existing measures?
  - Ability to clean prior to export?

- **Applies to**
  - <u>Intentional</u> introductions (Black, White, Grey Lists)
  - <u>Accidental</u> introductions (Port Screening, Exporter Liability)

Conclusions

- Relatively small MIRs in some regions the result of successful intervention
  - Not from raw trade, from "smart" trade
  - Incorrect to think we can back off current intervention

- Risk may be (-) correlated with history
  - New partners/products may cause most damage

- NIS risk varies across trade partner, product, time, delivery mechanism
  - Data for formal Risk Assessments
  - Risk Assessments should capitalize on heterogeneity not rely on blunt instruments