

# Impacts of exotic pests in Europe

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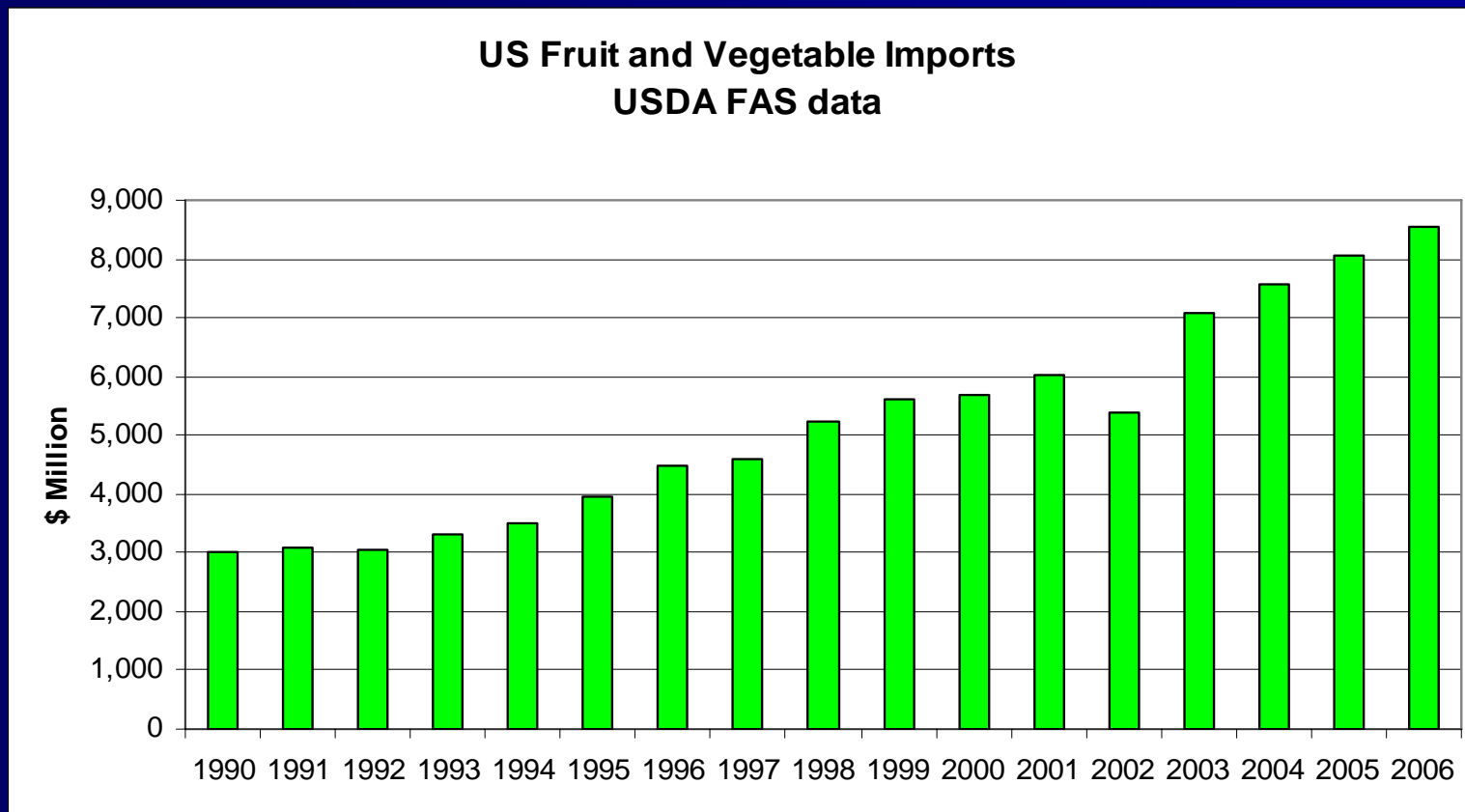
*Parma 6-7 December 2007*

# Measuring impacts?

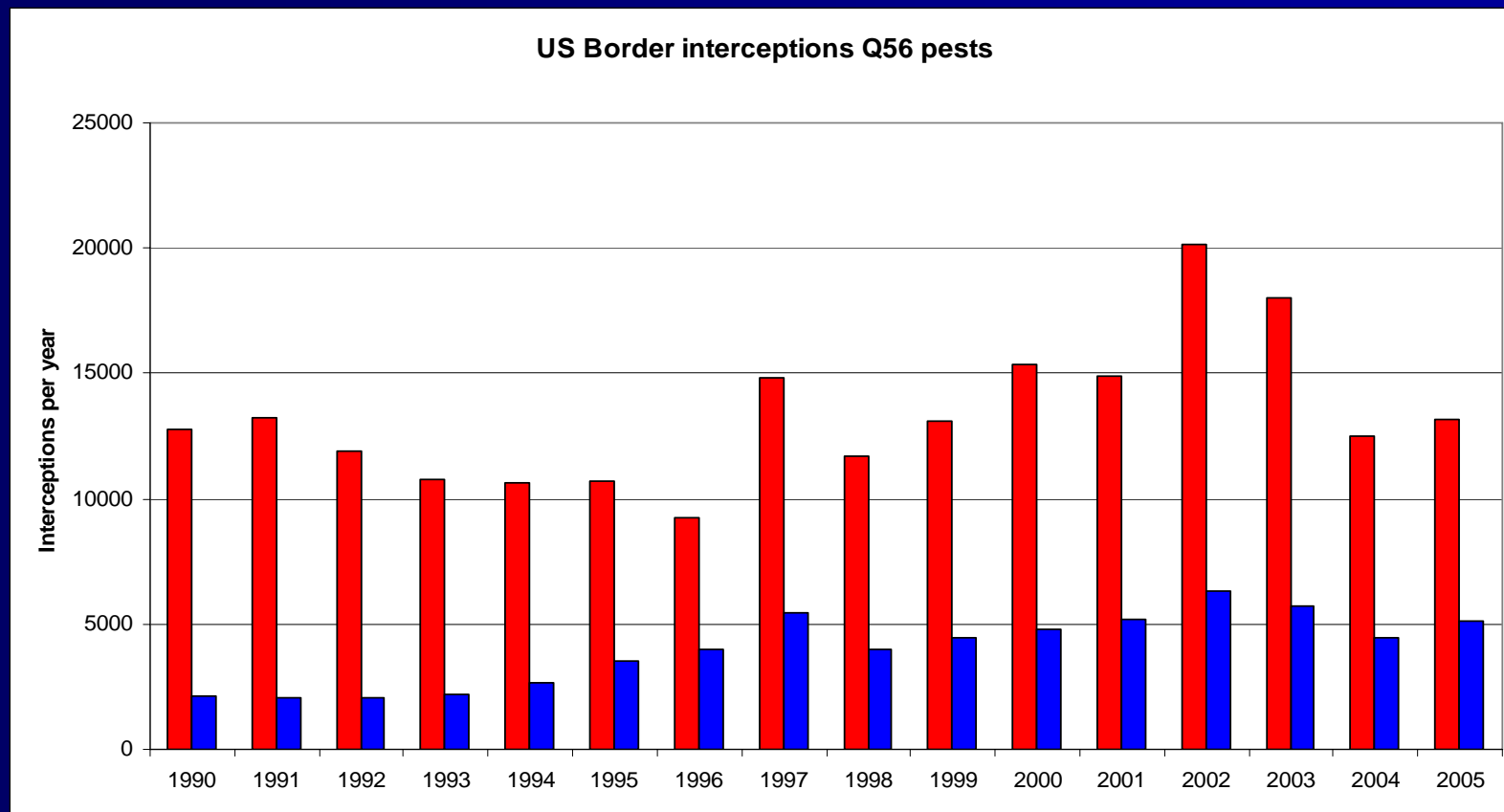
- PRAs for pests of agriculture
  - Trade volume a key theoretical driver of risk
    - Many “new” risks are extensions of old risks
  - Changing trading patterns may be more serious
- PRAs in the natural environment
  - Often long time lags in impacts
  - Higher proportion are intended introductions
  - Greater diversity of organisms
  - More intangible impacts (social, moral)
  - Higher uncertainty

# Trade volume: US imports (\$mn)

Fresh produce



# US fresh produce interceptions



Little change in interceptions/year on cargo since 1997

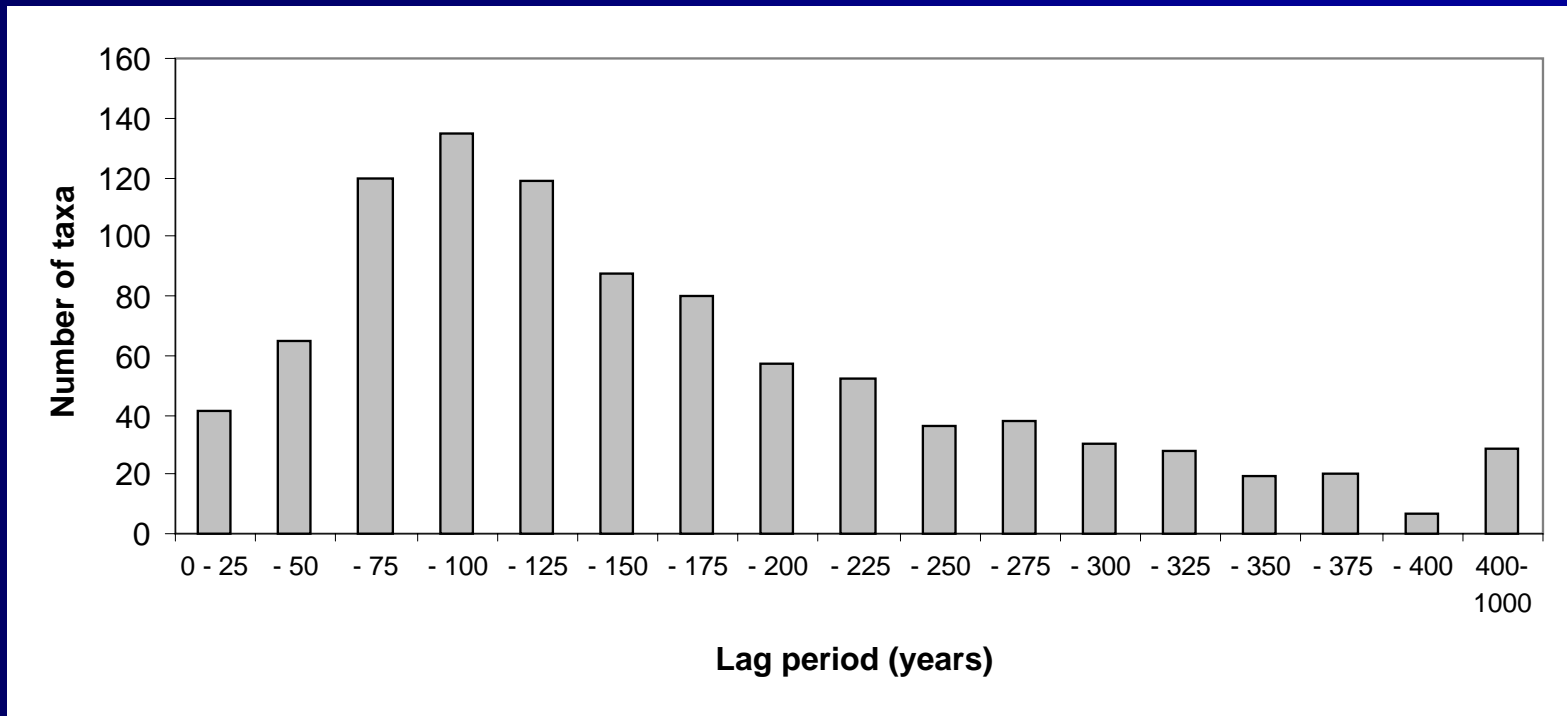
# Changing pest ecozone sources

- EU-China imports grew from €75 bn to €195 bn from 2000 to 2006, while EU-US imports fell from €206 bn to €177 bn

Eurostat

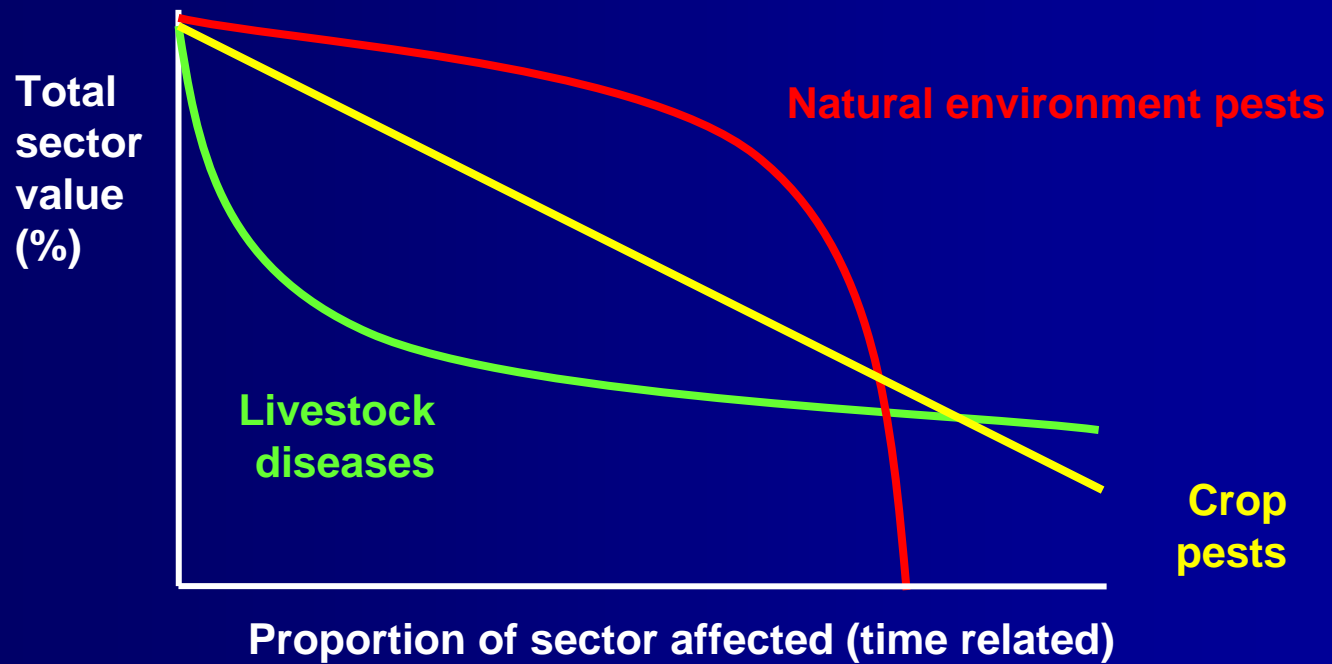


# Long time, no see



Lag from first introduction to first record in the wild for new plant species  
in the British Isles. Preston *et al.*, 2002

# Generalised invasion impacts



# NNRAP risk assessment reviews

2007

<http://www.nonnativespecies.org/>

- Mammal
  - Siberian chipmunk
- Bird
  - Eagle owl
- Amphibian
  - N American bullfrog
- Crustaceans
  - Chinese mitten crab
  - Spiny cheek crayfish
  - Signal crayfish
  - Red swamp crayfish
- Aquatic weeds
  - New Zealand pygmy weed
  - *Ludwigia* spp
  - *Sargassum muticum* (Wireweed)
  - Water hyacinth
  - *Azolla filiculoides* (Mosquito fern)
- Terrestrial weeds
  - Japanese knotweed
  - Himalayan balsam
- Insect
  - *Bombus terrestris* subspecies



# Non-native species risk analysis

- Consistent approach across taxa
- Outputs on comparable risk scales
- Build a common interpretation of risk
- Develop outputs that express uncertainty
- Integrate risk assessment, management, communication in comprehensive analysis

# Non-native Species Risk Assessment Scheme in Great Britain

- Common questions across all taxa
  - Documented responses
  - Common 5-point scale for risk; 3-point scale for uncertainty
- Entry (14 questions)
- Establishment (17 questions)
- Spread (4 questions)
- Impact (16 questions)
- Overall assessments
  - Calculated and subjective summaries on 5-point scale
  - Subjective component (5-point); total risk (3-point scale)

Baker *et al.*, 2008

# Impact question template

- Economic, environmental, social losses in existing range
- Potential new economic, environmental, social losses
  - Potential loss of consumer demand, export markets
  - Potential for other economic losses
  - Potential synergism with existing harmful organisms
- Potential genetic transfer
- Effect of any existing natural controls
- Potential for managed control
  - Potential negative impacts of control efforts

# Chipmunk pets/pests

“Chipmunks have many positive pet qualities...



To chipmunk proof rooms, close doors and windows, conceal electrical wires (to prevent electrocution) and bar access under refrigerator or dishwasher.”

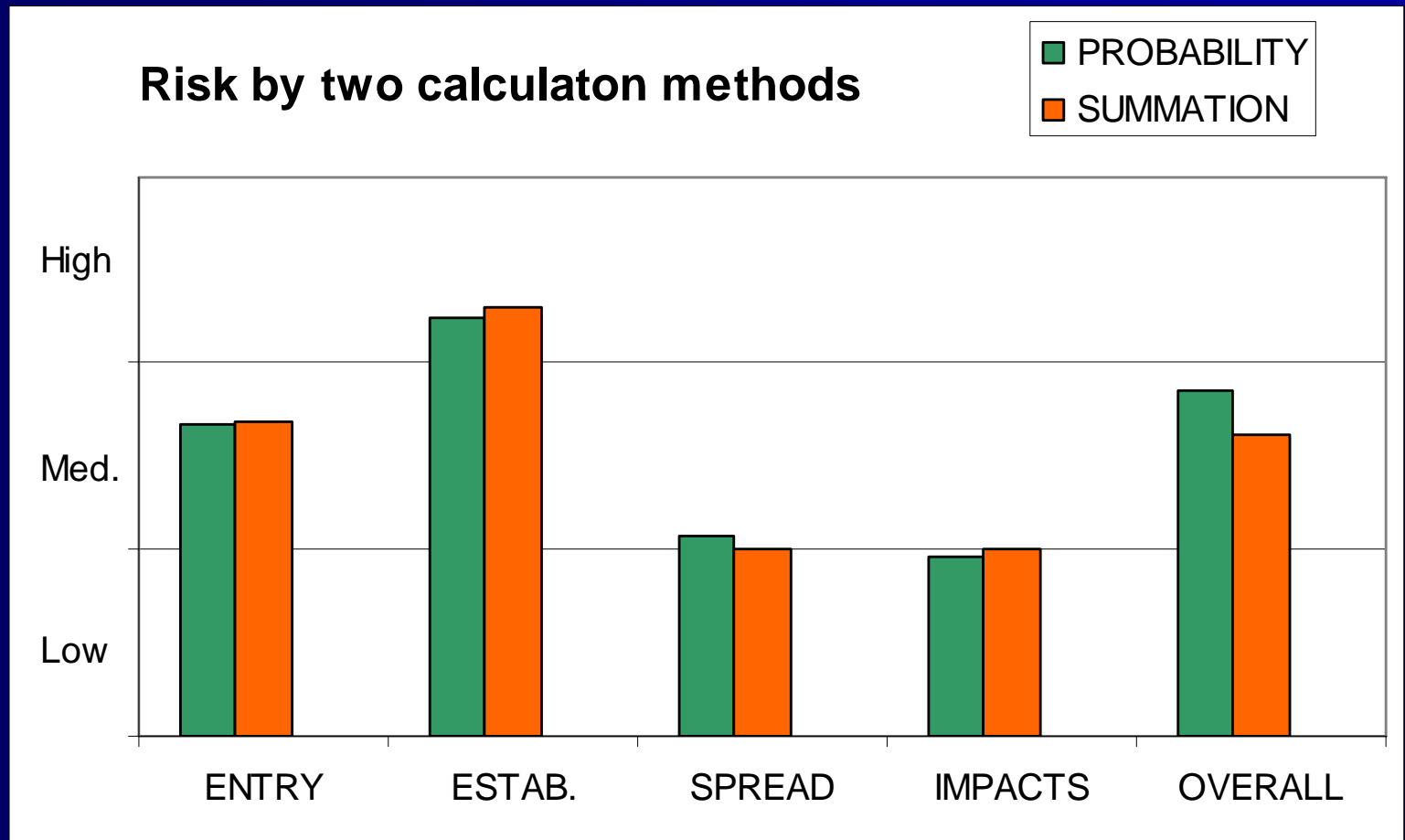
# Chipmunk impact

“Most people enjoy watching chipmunks... they dig up and eat bulbs and seeds... their food habits influence the growth of various plants... burrowing activity of chipmunks can cause significant structural damage by undermining foundations...”

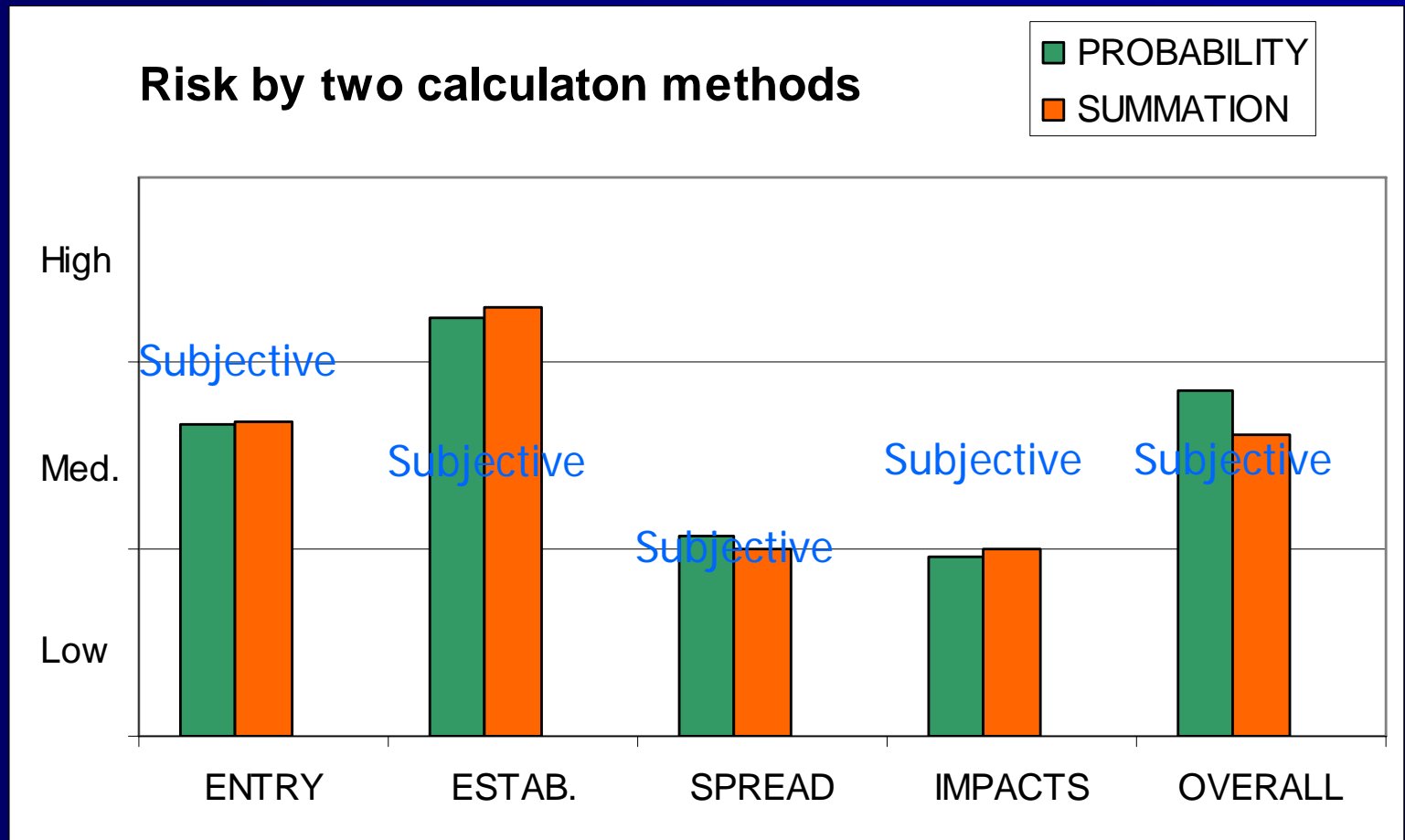
[www.entm.purdue.edu](http://www.entm.purdue.edu)

- Likeable, but social amenity loss in gardens
- Environmental competition
- Economic damage to structures
- Competition and predation limits populations
- Feasible but expensive for managed control

# Siberian chipmunk risk summary



# Siberian chipmunk risk summary



# USDA APHIS priority on invasion

- Entry (.108)
  - Frequency of arrival (.042); volume of imports (.027)
  - Frequency of contamination of import (.027)
- Establishment (.179)
  - Host range (.108)
  - Survival in adverse conditions (.030); tolerance of abiotic conditions (.030)
- Spread (.234)
  - Rate of spread (.149)
  - Reproductive potential (.060)
- Impact (.479)
  - Foreign trade impact (.206)
  - Domestic trade impact (.151)
  - Impact on natural ecosystems (.058); public costs (.056)



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# GB Non-native Risk Scheme

## Implied weights

- Entry (.20)
  - 5) Survival during transport?
- Establishment (.47)
  - 1) Adaptability?
  - 3) Local spread aids establishment?
  - 4) Current controls will not prevent establishment?
- Spread (.16)
- Impact (.18)
  - 2) Environmental harm?

# GB Non-native Risk Scheme

## Implied weights

- Entry (.20) (.11)
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- Spread (.16) (.23)
- Impact (.18) (.48)
  - 2) Environmental harm?

(Comparative USDA values, mostly agricultural)

# Most divergent from summary:

- **Entry**
  - Volume of movement along the pathway?
- **Establishment**
  - How likely is it that transient populations will be maintained?
- **Spread**
  - How difficult would it be to contain the organism?
- **Impact**
  - Can genetic traits transfer to native species?

# Uncertainty (0-2 scale, Low to High)

- Impact (.70)
  - Questions on economic impacts? (1.08) (34<sup>th</sup>)
- Entry (.45)
  - Volume, frequency of movement? (1.10) (44<sup>th</sup>, 35<sup>th</sup>)
- Spread (.33)
  - Role of human assistance? (.62) (46<sup>th</sup>)
- Establishment (.27)
  - Competition won't stop establishment? (0.62) (15<sup>th</sup>)

# Uncertainty (0-2 scale)

- Impact (.70)
  - Genetic traits transferred? (.08) (43<sup>rd</sup>)
- Entry (.45)
  - Survival in transport, (.10) (9<sup>th</sup>)
  - Many entry points? (.10) (18<sup>th</sup>)
- Spread (.33)
  - Difficulty of containment? (.15) (47<sup>th</sup>)
- Establishment (.27)
  - Same climate, abiotic factors, hosts, habitats? (0.08) (7<sup>th</sup> to 19<sup>th</sup>)

# Some implications

- Agriculture
  - Impacts justify management
  - Immediacy of agricultural trade impact
  - Inspections driven by frequency, volume of contaminated trade
- Natural environment invasives
  - Lower perceived impacts, less a driver in overall risk
  - Greater need for pre-establishment controls
  - Few manageable factors high on the list of weighting
    - Intended use; Time of year
  - Entry frequency, volume less significant than adaptability
  - Natural competition most significant uncertainty issue