Factors Affecting Human Responses to Exotic and Invasive Species

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Purpose of Talk

- Developing effective strategies for management of invasive species is dependent in part on how the public will respond.
- By understanding the type and importance of various factors, managers may be able to choose or fine tune strategies.
- Preliminary list with examples based on previous research, case studies, anecdotes.
Examples

- Alewives in Great Lakes
- Zebra Mussels in Great Lakes
- Introduced trout and salmon
- Milfoil & other aquatic weeds
- Government ("friendly") flies
- Gypsy moth NE vs Midwest
- ALB, EAB
- Purple loosestrife in wetlands
- Buckthorn in Chicago prairies
- Black cherry in Chicago prairies

- Feral cats in WI
- Feral pigs in Hawaii, etc.
- Red foxes in SF
- Eucalyptus in SF
- Wild horses & burros in W US
- Grey squirrels in Europe
- Geese in urban areas
- Pigeons in urban areas
- Monk parakeets in Midwest
- Rats everywhere
- Cockroaches everywhere
\[ R = \sum C_i S_i \left( \frac{V}{T+I} \right) - M \]

(WARNING: a first approximation!)

- \( R \) = response to the exotic/invasive species
- \( V \) = value of the exotic/invasive
- \( T \) = threat
- \( I \) = impact or value of the exotic/invasive on the species/ecosystem/object of concern
- \( M \) = impact of management control mechanisms
- \( C \) = context
- \( S \) = stakeholder group factors

The equation represents a model for assessing the response to exotic/invasive species, taking into account various factors and their interactions. The formula calculates a weighted sum of context and stakeholder factors, adjusted for threat and impact, and then subtracts the impact of management control mechanisms.
Value (of the species of concern)

- Charismatic-aesthetic-recreational
- Utilitarian-economic-cultural
- Alternative ecologies (e.g., non-native trees filter air pollutants and offer shade-cooling)
Threat

- Familiarity (length of establishment, degree of exoticness, fear factor)
- Spatial/temporal factors—Proximity of Threat/Rate of spread and distribution

http://www.fs.fed.us/ne/morgantown/4557/gmoth/atlas/#spread
Impact (value of human and ecological factors affected by species of concern)

- Personal
- Social
- Economic
- Ecological

Table 1
Estimated annual costs associated with some alien species introduction in the United States (see text for details and sources) (×millions of dollars)

<table>
<thead>
<tr>
<th>Category</th>
<th>Nonindigenous species</th>
<th>Losses and damages</th>
<th>Control costs</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLANTS</td>
<td>25,000</td>
<td>—</td>
<td>—</td>
<td>45</td>
</tr>
<tr>
<td>Purple loosestrife</td>
<td>10</td>
<td>100</td>
<td>110</td>
<td>—</td>
</tr>
<tr>
<td>Aquatic weeds</td>
<td>NA</td>
<td>3–6</td>
<td>3–6</td>
<td>—</td>
</tr>
<tr>
<td>Mealeuca tree</td>
<td>24,000</td>
<td>3000</td>
<td>27,000</td>
<td>—</td>
</tr>
<tr>
<td>Crop weeds</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Weeds in pastures</td>
<td>1000</td>
<td>5000</td>
<td>6000</td>
<td>—</td>
</tr>
<tr>
<td>Weeds in lawns, gardens, golf courses</td>
<td>NA</td>
<td>1500</td>
<td>1500</td>
<td>—</td>
</tr>
</tbody>
</table>

Pimentel et al., 2004
Management Factors (Costs and Benefits of intervention)

- Impact of control mechanism (personal, social, ecological, ethical)
- Probability of success of control mechanism (limited – complete eradication)
- Duration of control mechanism (short term, cyclic, perpetual)
- $$ cost and who pays for it
Context

- Physical setting—site and adjacent areas
- Remoteness (urban to wilderness)
- Previous site disturbance(s)
Individual and Stakeholder Group Factors

- Social context
- Stakeholder centrality (e.g., income/recreation dependent, NIMBY)
- Education
- Urban-rural residence
- Ideas of nature
- Degree of consensus/divergence in perceptions
Example 1: Feral cats in WI

- High charismatic value to many people
- Threat low; impact acknowledged but disputed
- Shooting as a mgmt strategy highly contentious
- %hunters who favor shooting outweighed by % general public opposition
- Significant urban-rural split

62. Do you favor the DNR take steps to define free roaming feral domestic cats... as an unprotected species?

NC--People all over the US should boycott Wisconsin. Stop buying cheese and stop supporting the Packers.
TX--Face the reality Wisconsin. Cats are part of a world we all share and deserve a chance to survive. Only cowards and ill-behaved children target the defenseless. For shame!
CA--Obviously Wisconsin is slipping back into it's 19th century yahoo, redneck history. There are plenty of modern, humane ways to control the population of feral cats. What a laughingstock they are.
WI--I am embarrassed and ashamed to admit that I am a Wisconsinite.
Example 2: ALB in Chicago

- ALB low value
- High threat and impact—many trees in neighborhood, city and beyond
- Management impacts of removal severe; injection labor intensive
- Urban context of complete removal is severe; stakeholders homogeneous
- Generalizability to EAB? Other insects and diseases?

It was a cold February morn I had to see it; I bundled up and went out. It looked like snow falling down; it was the limbs of the trees I grew up with, falling to the ground...
Conclusions

• Public response to invasives based on a complex number of factors and relationships
• Even if a species has little perceived value, management impacts can be contentious
• Use preliminary list of factors to think about approaches, communications
• Please send feedback on factors, esp. the math part (see handout)