Hog-hunting to conserve biodiversity: integrating perspectives on biocomplexity

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INTRODUCTION
Biodiversity Conservation -
Hierarchy of scales

- species within communities
  - (e.g. uplands, slopes, floodplains, flats)
- populations within each species
  - (e.g. trailing phlox in greenhouse & field)
- genotypes within populations
  - (e.g. stress resistant, non-resistant)
## Biocomplexity - Coupled human & natural systems

<table>
<thead>
<tr>
<th>Human Systems</th>
<th>Intervening variables</th>
<th>Natural Systems</th>
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</thead>
<tbody>
<tr>
<td>global scale</td>
<td>Stressors</td>
<td>biome scale</td>
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<tr>
<td>national scale</td>
<td>Interventions</td>
<td>community scale</td>
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<tr>
<td>state scale</td>
<td></td>
<td>species scale</td>
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<tr>
<td>local scale</td>
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<td>genotype scale</td>
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Stressors and interventions are bidirectional interactions between human and natural systems.
Potential Stressors -
Cumulative effects differ at each scale

- global climate change (temp. & rainfall)
- fragmentation (patch size & connectivity)
- fire cycle change (suppression & release)
- construction (oil & gas prospecting)
- contaminants (point source & runoff)
- invasive species (disease, plants, animals)
Invasive species—interventions to control feral livestock (e.g. hogs, goats)

- **eradicate** livestock from stressed communities (e.g. Great Smokey, Channel Is.)
- **reduce** competition with stressed populations (e.g. Pinnacles Nat. Mon.)
- **exclude** access to rare genotypes (e.g. Hawaii Volcanoes)
Diverse stakeholder perspectives—public acceptance of interventions

- managers (private, state & federal)
- conservation advocates (local, state & national)
- users (residents & visitors)
- neighbors (landowners & renters)
Objectives

1. Identify local perspectives re. hog damage interventions
2. Identify outside perspectives (state, national and global)
3. Compare themes between local and outside perspectives
METHODS
Informal scoping process—revision of hog management plan for BITH

- two public workshops
  - Lumberton 2/23/05
  - Woodville 2/24/05
- formal presentations
  - BITH managers
  - TPWD video
- informal communication
  - staff noted comments on flip charts
  - suggestion box: participants wrote comments
  - after workshop: mail, phone & personal comments
**Literature review - Web of Science**

- **keywords**
  - bio* invasion*, invasive species, island invader*, ecological risk assessment, non-native species, biodiversity conservation, animal damage control, pest eradication
  - feral livestock, mammalian introduction*, hog, feral swine*, wild pig*, boar, Sus scrofa,

- **search options**
  - other similar articles (shared citations)
  - forward and backward chaining on citations
Qualitative analysis - hierarchical codes

- themes within thematic clusters
  - values, attitudes, beliefs, actions
- scale - audience
  - local (managers, conservationists, users, landowners)
  - outside (state, national, international)
Users: Shared Values

**GOOD**
- protect the forest for future generations
- as a hunted resource, hogs provide food and recreation
- hog harvest involves family heritage

**BAD**
- too many hogs is not good
- animals should not suffer due to human actions
- meat should not be wasted
Local Perspectives

- Managers
- Conservationists
- Users
- Neighbors
Overlap: Managers & Conservationists (selected list)

- On protected areas, a “dead hog is a good hog”
- Killing hogs will protect biodiversity
- Hunters can help us kill hogs
- If hunters don’t kill enough hogs, hire a professional team
- Carcasses left to rot will restore nutrients to the ecosystem
- Some users can’t be trusted to protect biodiversity
- Animal rights have been an issue in other protected areas
- Fences are ineffective and aesthetically displeasing
- Hogs increase risk of invasion by non-native plants
- Hogs cause extensive damage
- Hunting is a safety risk to hikers
- "Woodspeople" heritage is a thing of the past
Overlap:

Users & Neighbors (selected list)

- hogs are a resource for poor families (food and recreation)
- hogs have been a part of the forest for generations
- hogs will return from neighboring lands after removals
- need a "toolbag" adapted to local climate and landscape
- to kill hogs and let them lie is a sinful waste of meat
- wardens exclude people from family hunting grounds
- the people own public lands, and will treat them as their own
- fences protect vulnerable resources (e.g. cemeteries)
- invasion of non-native plants is more related to birds than hogs
- hogs till the soil => better acorn crops that benefit wildlife
- "weekend warriors" > safety risk than "local families"
- "woodspeople" heritage should be preserved alive
Outside Perspectives

Global

National

State
State Perspectives

- **policy** - "landowner/voter centered"
  - feral hogs are an underutilized resource for landowners
  - educate state policy makers to provide funds for hog control
  - educate landowners on hog biology and control

- **science**
  - landowners reported damages (rooting, wallowing, feeding)
  - economic losses differed by region (total $2.6 million)
  - level and type of control varied by region (total $430,000)
  - hog numbers and sources varied by region (total 1-2 million)
  - support for a control coalition (private and public)

(Adams et al. 2005)
National - Policy perspectives

- managers of federal lands must comply with removal mandate
  - non-native species that threaten native species
  - degree of "removal" may vary for each site

- managers’ responsibility: define stressors & interventions in a management plan for each site
  - enabling legislation (e.g. hunting allowed or not)
  - restoration goals (e.g. communities, species or genotypes)
  - available resources (e.g. funding, manpower)

- ecological risk assessment: estimate damage & prioritize interventions to specific communities

(Gaines et al. 2005)
National - Scientific perspectives

- Hogs stress on systems varies i.e. "wetness"
  - wet systems (well adapted to disturbance, support hogs)
  - dry systems (poorly adapted to disturbance, don't support hogs)

- Stressors depend on fragmentation & connectivity
  - greater stressor in smaller, disconnected fragments
  - lesser stressor in larger, connected fragments

- Intervention success varies i.e. landscape & scale
  - small > large fragments
  - disconnected islands > connected refugia
  - repeated interventions > single applications
Global – Policy perspectives

- Invasives threaten biodiversity (Rio Treaty)
  - Genetic prospecting (living library)
  - Keep all parts of the system or it will break down

- Protecting biodiversity -> loss of income
  - Barricade protected areas; “war” on poverty
  - Economic incentives for conservation

- Costs of invasive control -> burden to society
  - "War" on "non-native", "alien" invasive species
  - "Disease management" strategies i.e. sources, vectors
  - Protecting ecosystem processes is cost effective
Global – Applied science views

- advocates for the poor & environment
- conservation & development: not well matched
  - development serves people
  - conservation excludes people
- strengthen separate rural development and conservation organizations
  - recognize they serve separate goals
  - explicitly shape the partnership where goals overlap
  - honor both the shared perspectives and the differences
  - adapt to local culture, resources and landscapes

(Arambiza & Painter 2006)
Comparisons
Hypothesized similarities - themes that omit poverty

Local Managers & Conservationists

- biodiversity must be protected from hogs introduced by humans
- hog extermination from protected areas is the goal; difficult to achieve
- costs of control are justified in view of the crisis of biodiversity loss

National Literature

- Campbell and Donlan (2005)
- Balmford et al. (2005)
- Hone (2002)
**Hypothesized similarities - themes that include poverty**

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<thead>
<tr>
<th>Local Users &amp; Neighbors</th>
<th>State &amp; Global Literature</th>
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<tr>
<td>hogs = resource for poor</td>
<td>Adams et al. (2005)</td>
</tr>
<tr>
<td>hog hunts = resource for land-rich &amp; cash-poor</td>
<td>Perrings et al. (2002)</td>
</tr>
<tr>
<td>lands without hog control = refugia for disease</td>
<td>Courchamp et al. (2003)</td>
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DISCUSSION
Scientific information is privileged

- not accessible to the public
- the public depends on translations of science & policy
- translations vary with the perspectives of the translator
Implications: interfaces between science & society

- public confusion: which scientific view prevails?
  - variation among local, state, national, global scientific audiences

- accept information that supports users views
  - cognitive rejection of discordant scientific information
  - different lenses: one person's "right" is another's "wrong"

- reject use of “sound science” for making decisions about the control of invasive species
  - undermines credibility of science as a whole
  - opens the decision-making process to more emotions
  - "war on invasives" may acquire symbolic meaning for other societal ills
Case studies: bridging gaps

- **Coalition: state, federal, private**
  - Big Bend National Park (Adams et al. 2005)
  - assist neighbors in control of invasives

- **partnership between organizations with distinct and overlapping goals**
  - Bolivian Chaco- 15 years (Arambizo & Painter (2006)
  - CABI- interests of locals to improve quality of life
  - WCS- represents interests in biodiversity conservation
Interpretive outreach - Community Engagement & Place-Based Education

- Conservation Study Institute
  - place national parks in their landscape context
  - Gateway Communities Leadership Program

- partner with existing social networks
  - work within local culture
  - rugged individualism & reciprocity

- test hypotheses based on local knowledge

- explicitly invite & engage neighbors
  - Pineywoods Experience
  - Citizen science programs of ATBI
Biodiversity conservation: complex & challenging

- coupled human and natural systems
  - be explicit in analyzing stressors & interventions
  - "surgical" vs. "shotgun" approaches to restoration

- scale matters!
  - match the question to the resources ($$ and biology)
  - be explicit about scaling up & down hierarchical levels

- we are not alone, others rise to the challenge
  - learn from other case studies, regional, national, global
  - translate across disciplines- social & natural sciences
  - communicate with interpretive specialists to translate to public
Fellow Scientists:
apply the 10% rule

- dedicate 10% of our efforts to problem-solving initiatives (*Beissinger 1997*)
  - listen to managers to define the problems & target research
  - listen and communicate across disciplines to integrate knowledge
- read widely about case studies (*e.g. Henshaw Knott 1998*)
  - link with interpretive outreach professionals
  - demonstrate utility of science for society
- future generations & public support for science funding depend on us!
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