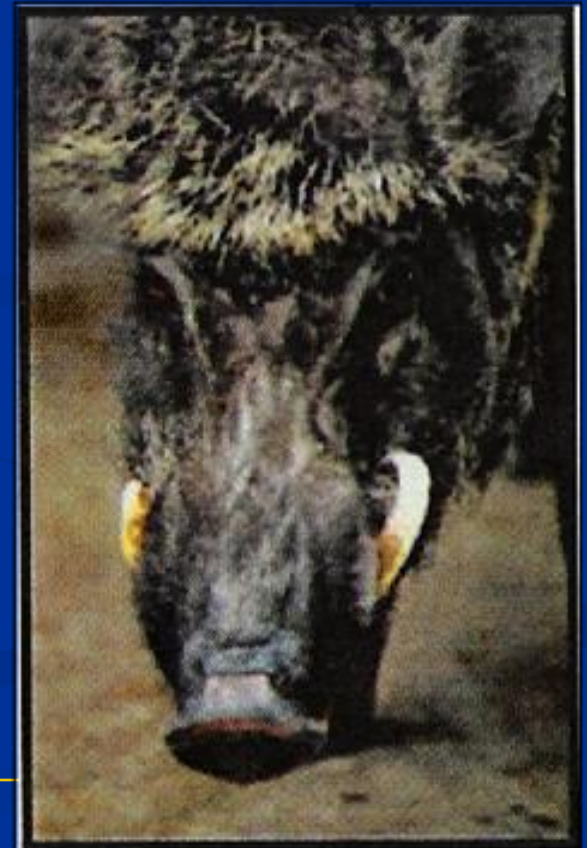


Hog-hunting to conserve biodiversity: integrating perspectives on biocomplexity

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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

Human Systems	<i>Intervening variables</i>	Natural Systems
global scale	<i>Stressors</i>	biome scale
national scale	<i>Interventions</i>	community scale
state scale		species scale
local scale		genotype scale

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 (eg. 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)



RESULTS

Users: Shared Values

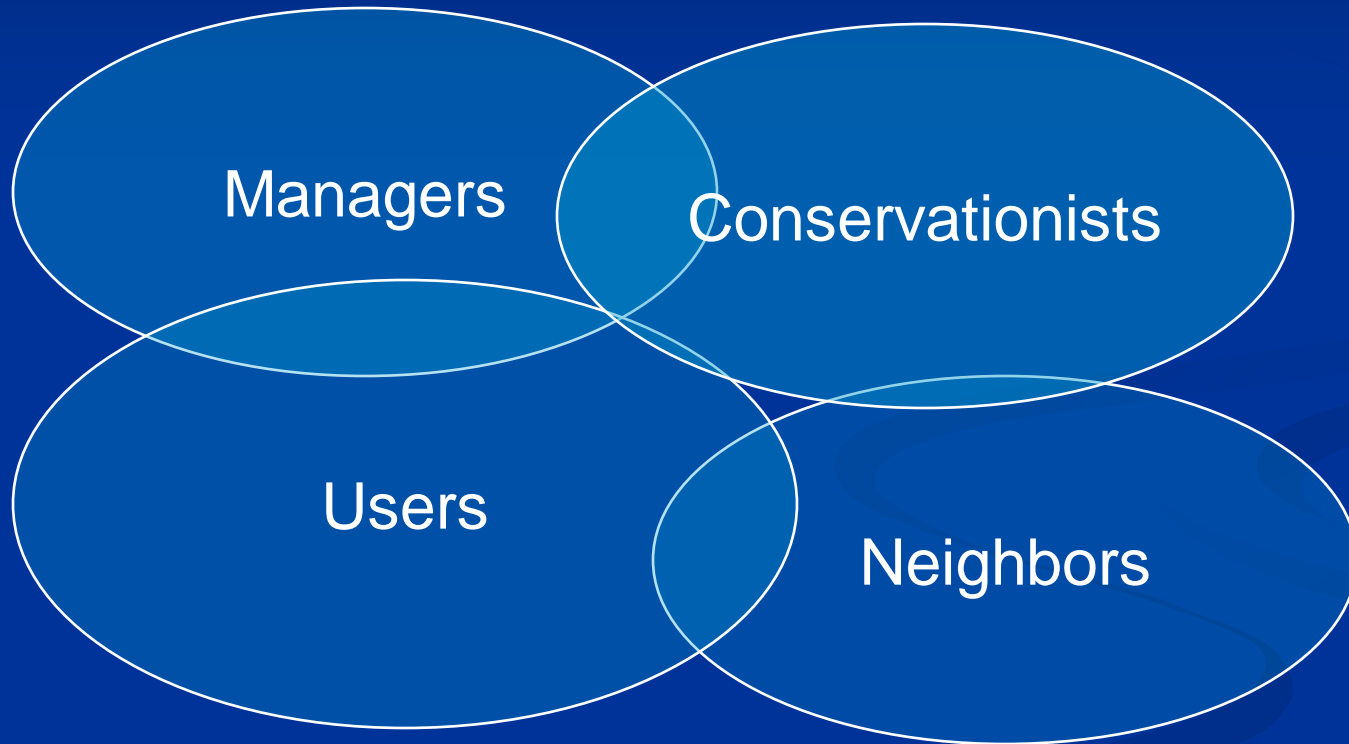
GOOD

- 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



Overlap: Managers & Conservationists (selected list)

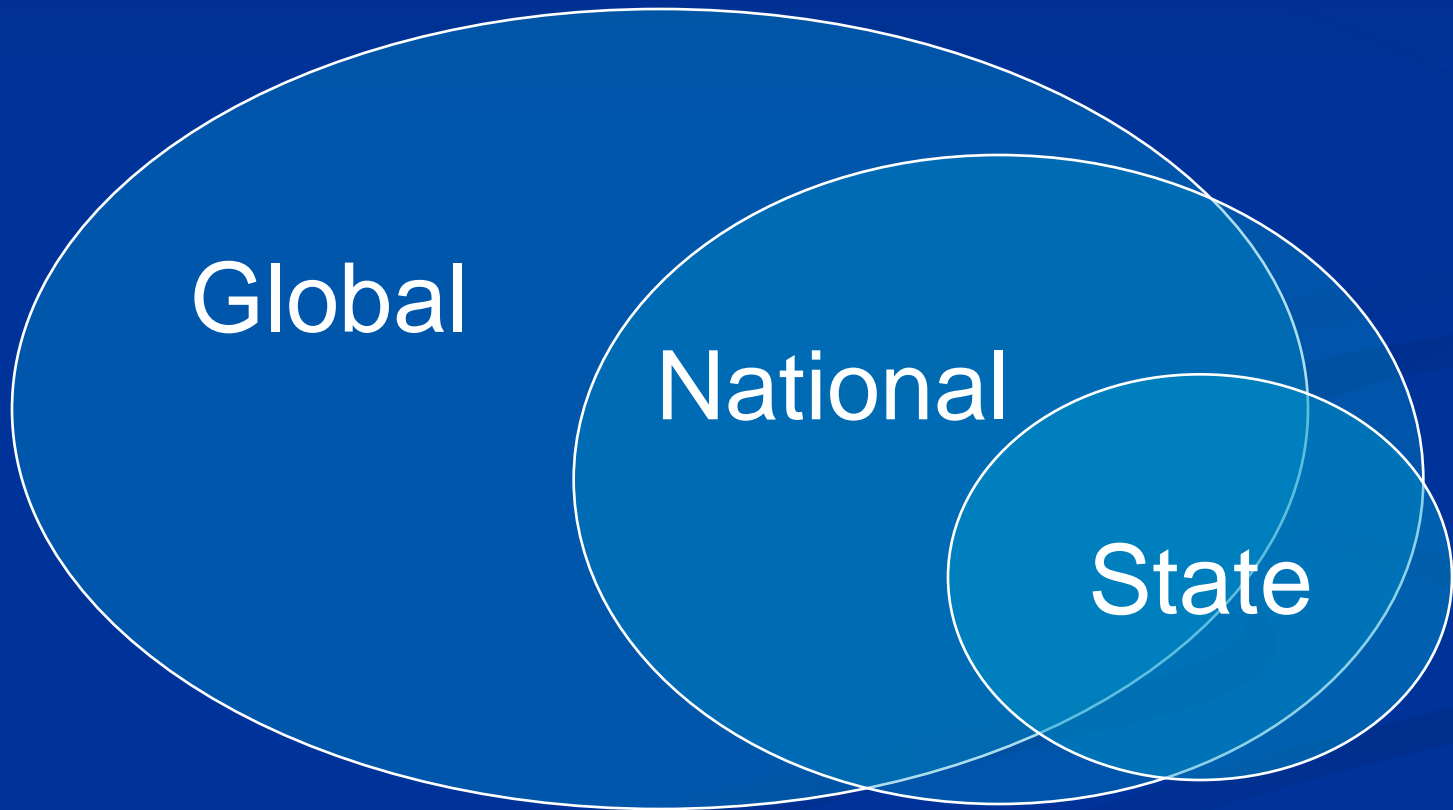
- on protected areas, a "dead hog is a good hog"
- killing hogs will protect biodiversity
- hunters can help us kill hogs
- if hunters don't kill enough hogs, hire a professional team
- carcasses left to rot will restore nutrients to the ecosystem
- some users can't be trusted to protect biodiversity
- 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



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

Local Users & Neighbors

- hogs = resource for poor
- hog hunts= resource for land-rich & cash-poor
- lands without hog control = refugia for disease
- public & private coalitions needed to proactively manage sources & vectors of invasive species outbreaks

State & Global Literature

- *Adams et al. (2005)*
- *Perrings et al. (2002)*
- *Courchamp et al. (2003)*
- *Richerzhagan and Holm-Mueller (2004)*

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
 - Pinewoods Experience
 - Citizen science programs of ATBI

SUMMARY: RECOMMENDATIONS



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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