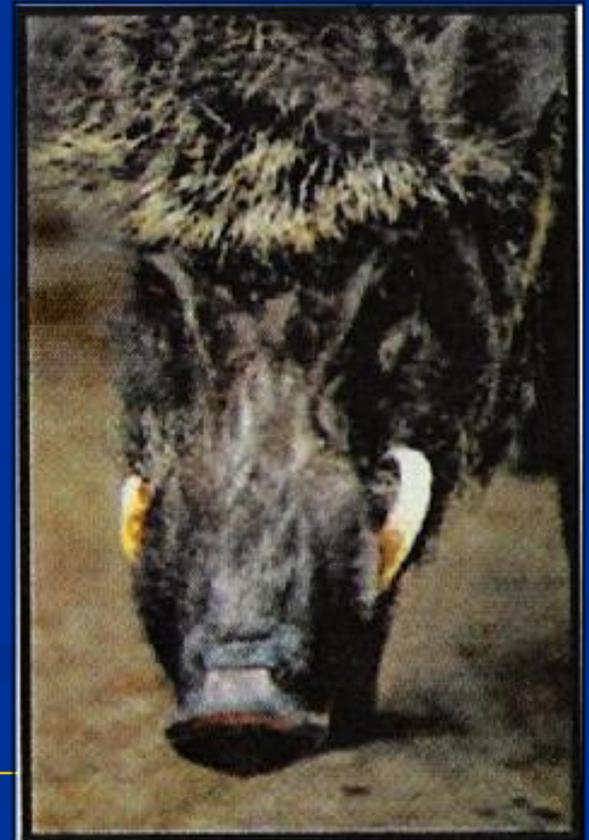


# Hog-hunting to conserve biodiversity: integrating perspectives on biocomplexity

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# INTRODUCTION



# Biodiversity Conservation- Hierarchy of scales

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- 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

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- 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)

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- **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

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



# Objectives

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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

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- 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

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## ■ 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

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



# RESULTS

# Users: Shared Values

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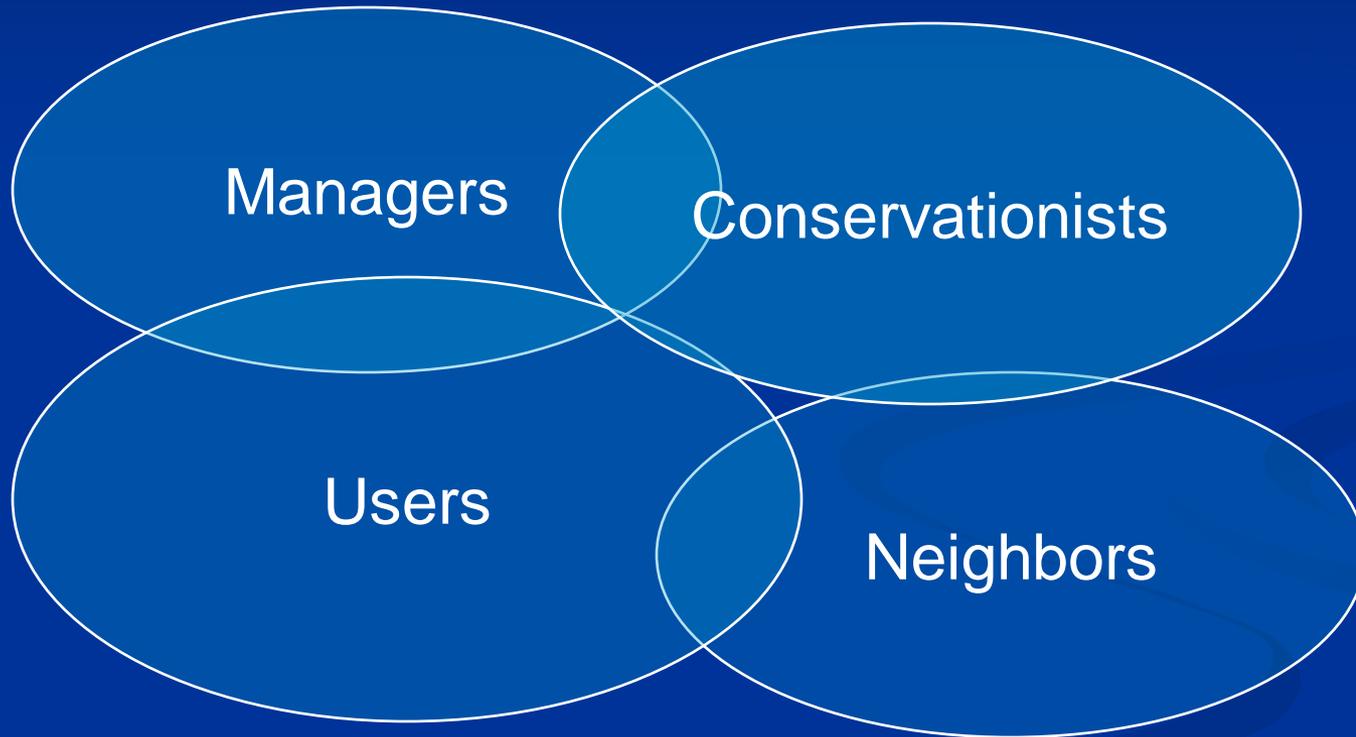
## GOOD

- 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)

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- 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

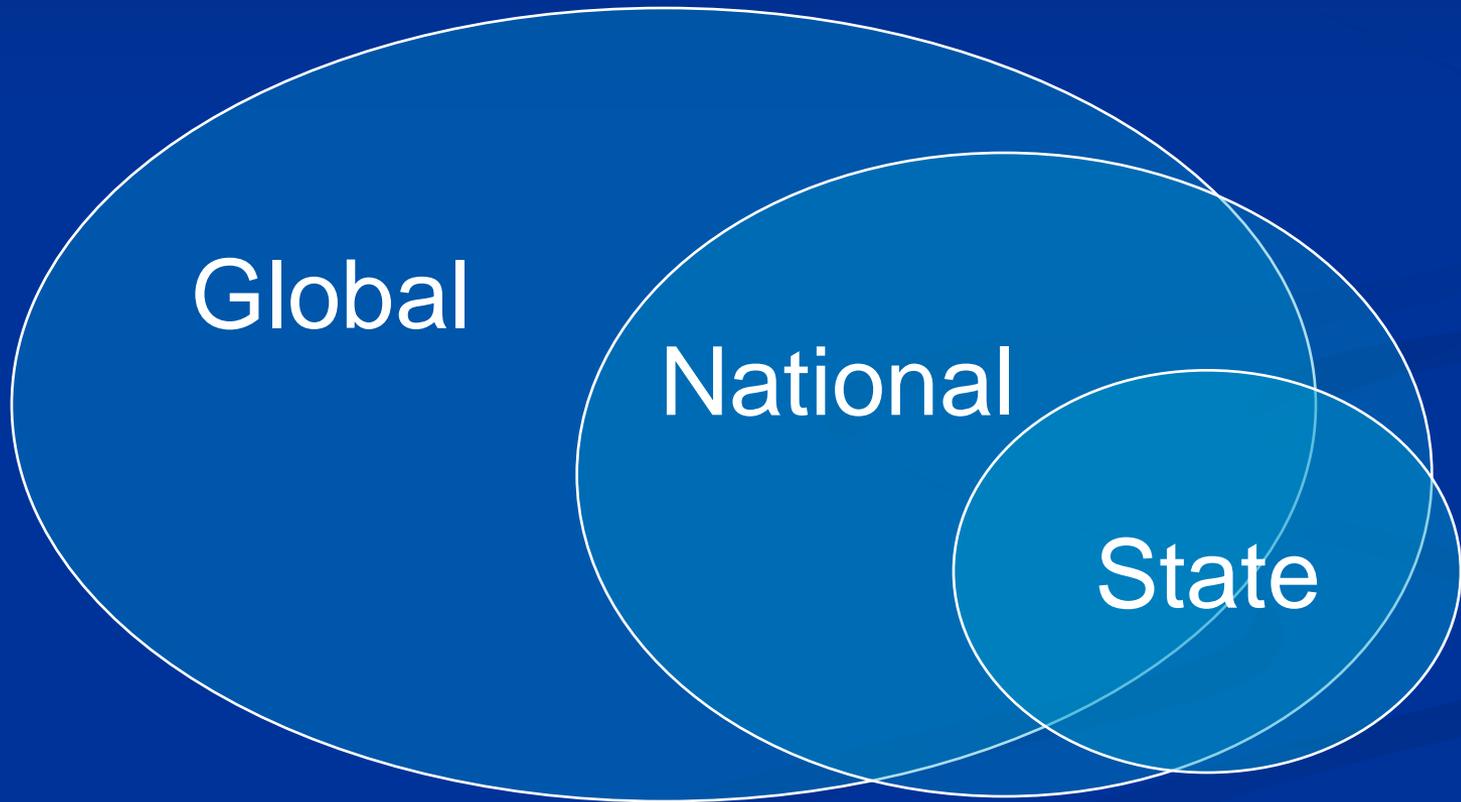
# Overlap:

## Users & Neighbors (selected list)

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- 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

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- 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

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- 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

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- 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

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- 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

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- 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

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## 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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## 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

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- 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

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- 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

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- 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

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- 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

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- 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

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- 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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