

Pandas, People, and Planet: Coupling Human and Natural Systems for Sustainability

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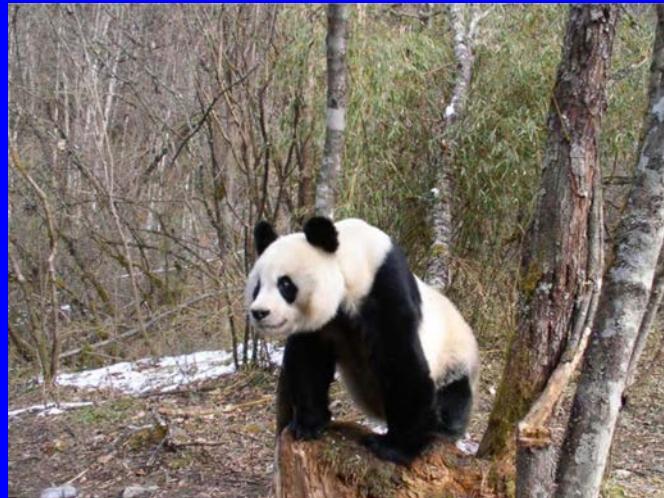
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Outline

- **Background Information**
- **Research Methods**
- **Five Insights**

Background Information

Global Environmental Icon: Giant Pandas



Historic Distribution of Giant Pandas (inset map) and Present-day Distribution (brown)



Traditional Focus: Panda Biology

- Reproduction



- Feeding



Panda Habitat

- Bamboo as staple food
- Forest as cover
- Gentle slope: $< 45^{\circ}$
- Elevation: $< 3750 \text{ m}$



People's Competition for Panda Habitat

- **Timber**



- **Fuelwood**



- **Other non-timber products**



- **Grazing**



- **Convert panda habitat for other human uses (e.g., cropland, residential land)**

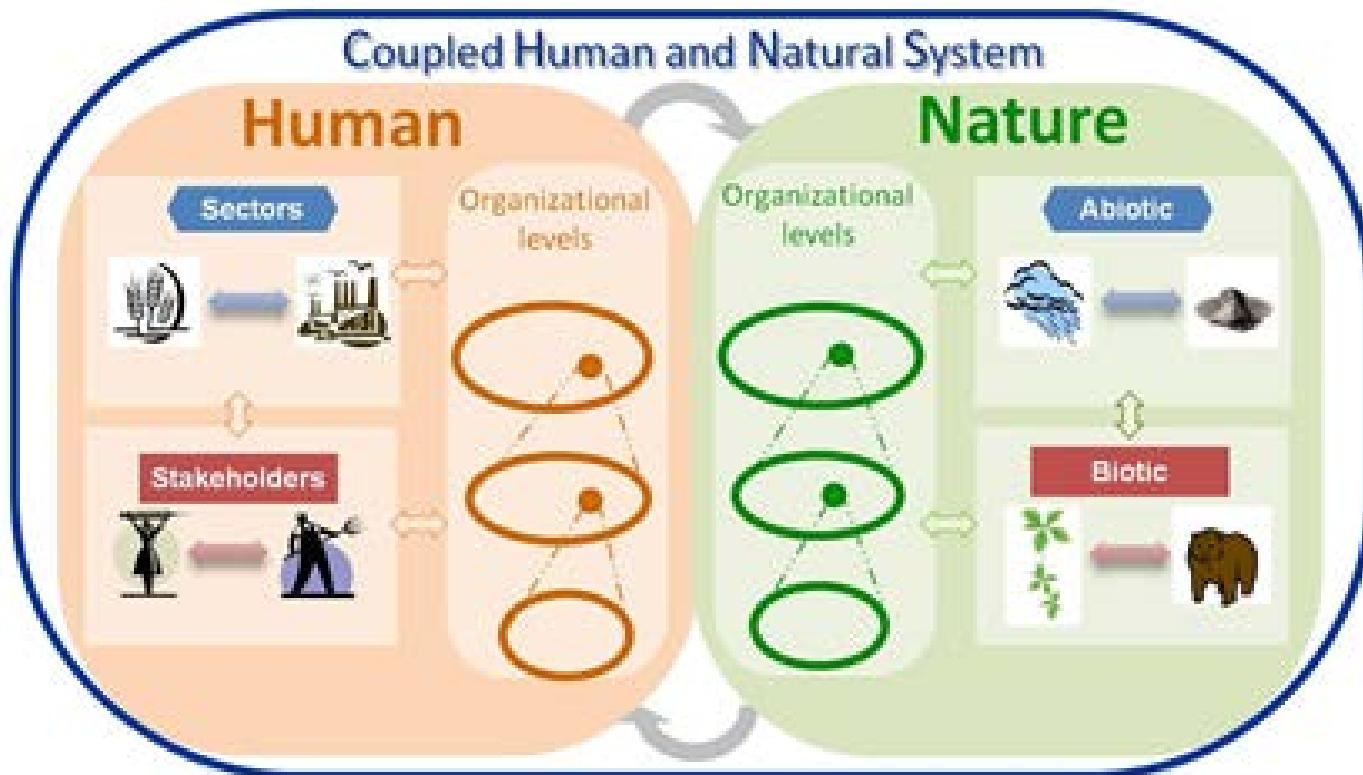
Research Goals

- Understand complex interactions between pandas and people in Wolong Nature Reserve
- Apply results and methods from Wolong to regional, national, and global levels

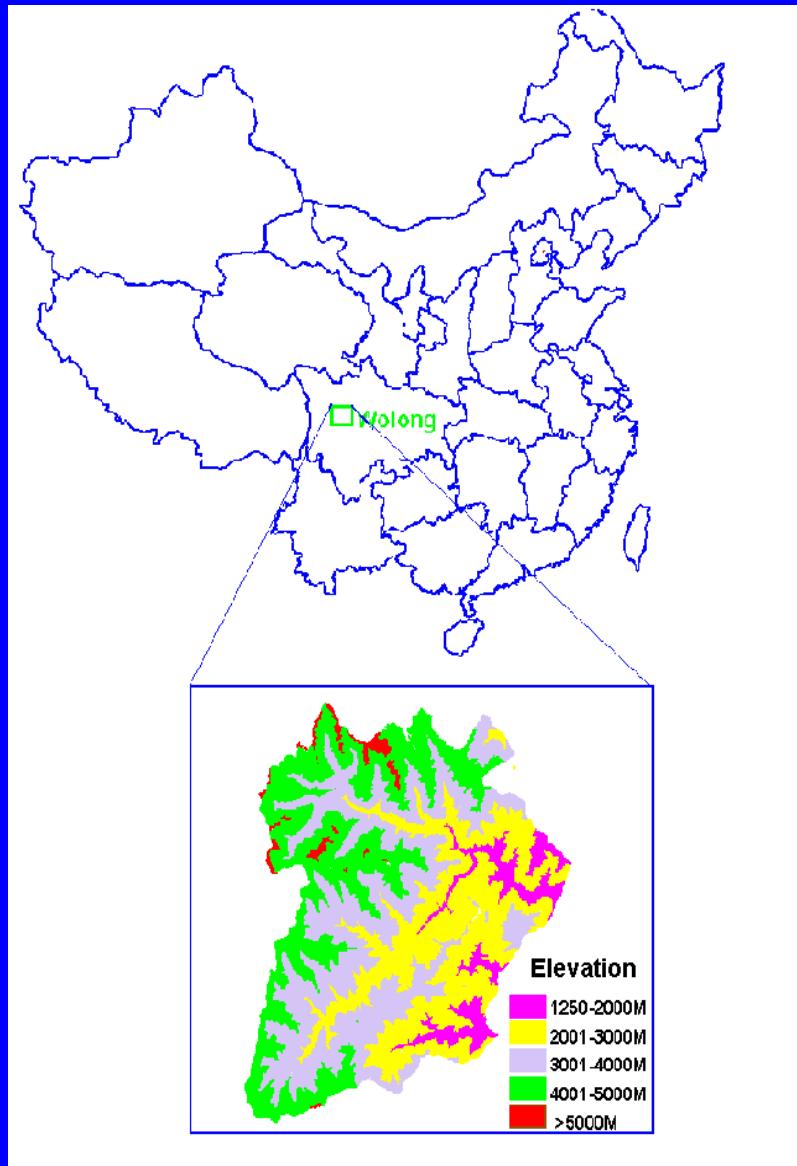
Research Methods

Place as Coupled Human and Natural System

Integrated system in which humans interact with natural components



Liu et al. 2007 Science

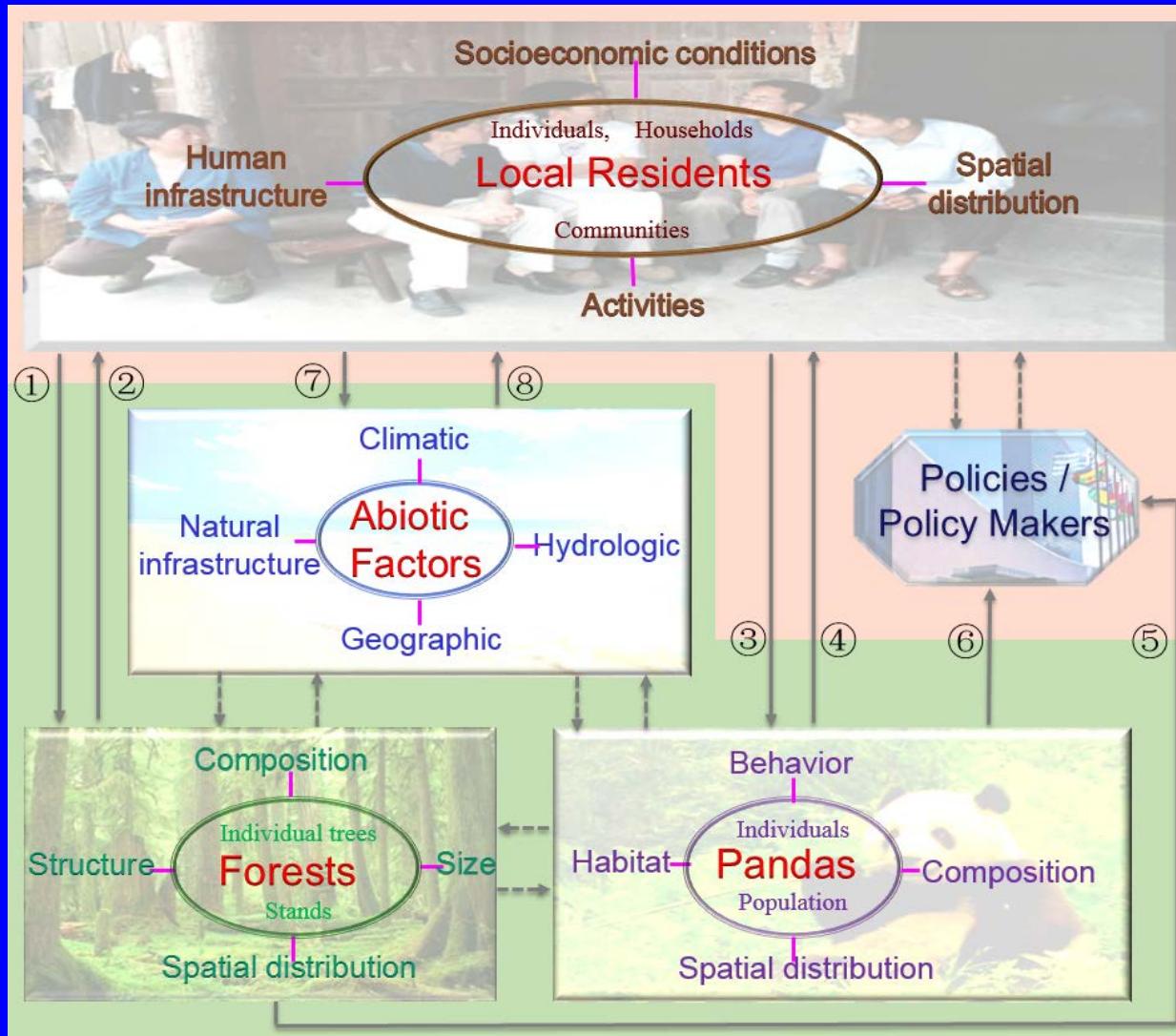


Wolong Nature Reserve



- “Flagship” reserve
- Established in 1975
- One of the largest (200,000 ha)
- 10% of wild pandas (~150)
- Local residents (> 5,000)

Conceptual Framework for Pandas and People



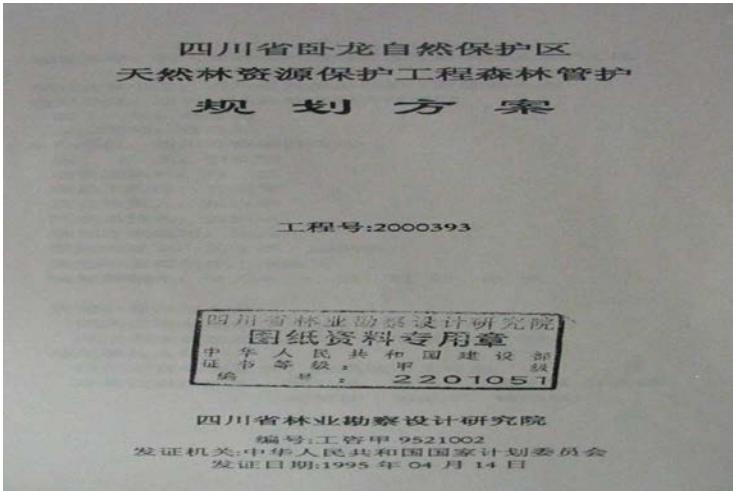
Data Collection Methods



Face-to-Face Interviews



Field Sampling



Government Documents

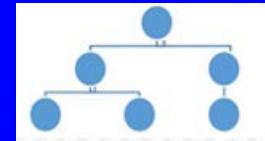


Remotely Sensed Data

Systems Integration

Holistic approaches to integrating various components of coupled human and natural systems

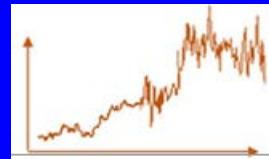
- Among organizational levels



- Across space



- Over time



- Across disciplines

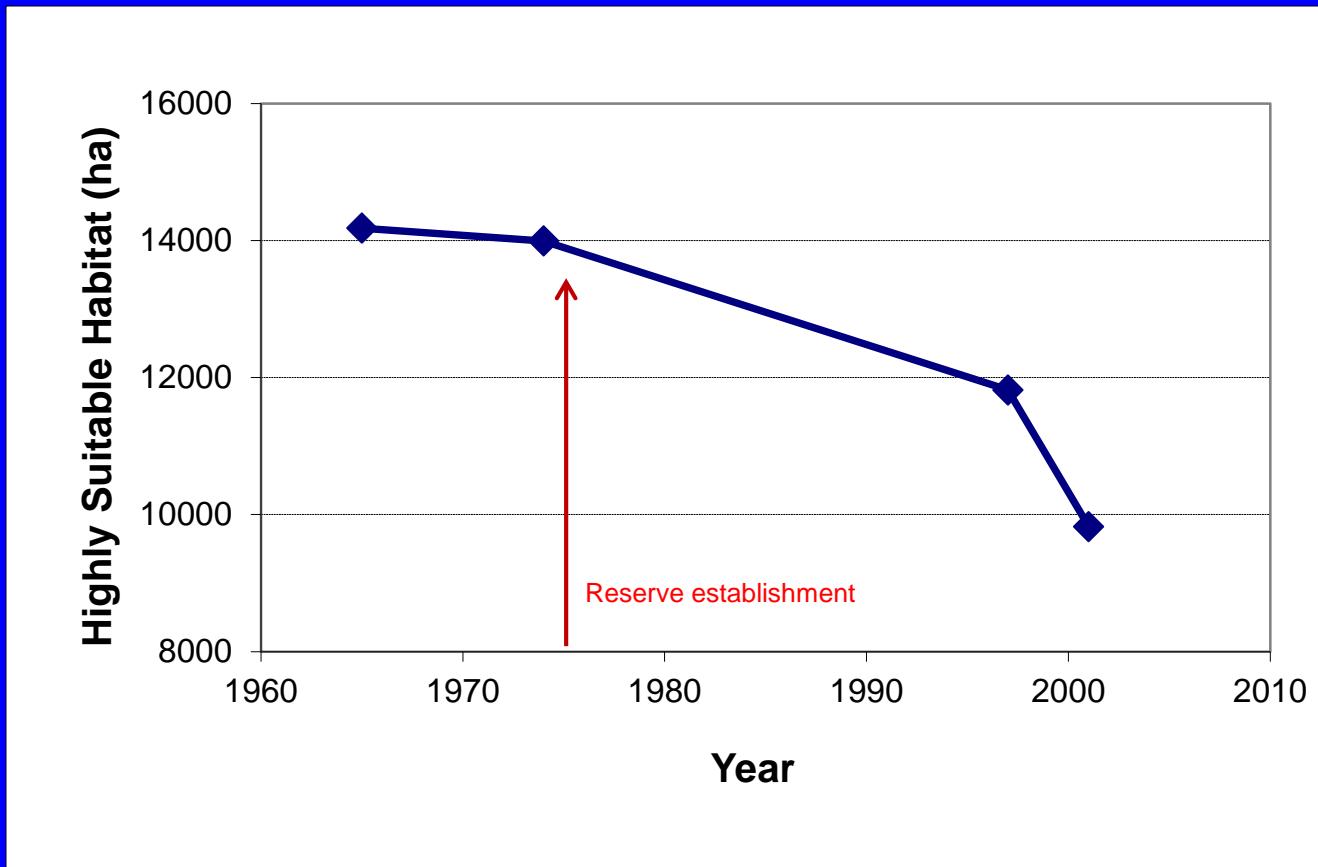
Liu et al. 2015 Science

Five Insights from Research on Pandas and People

Insight 1:

**Transforming Panda Habitat
from Loss to Recovery**

Panda Habitat Before and After Reserve Establishment

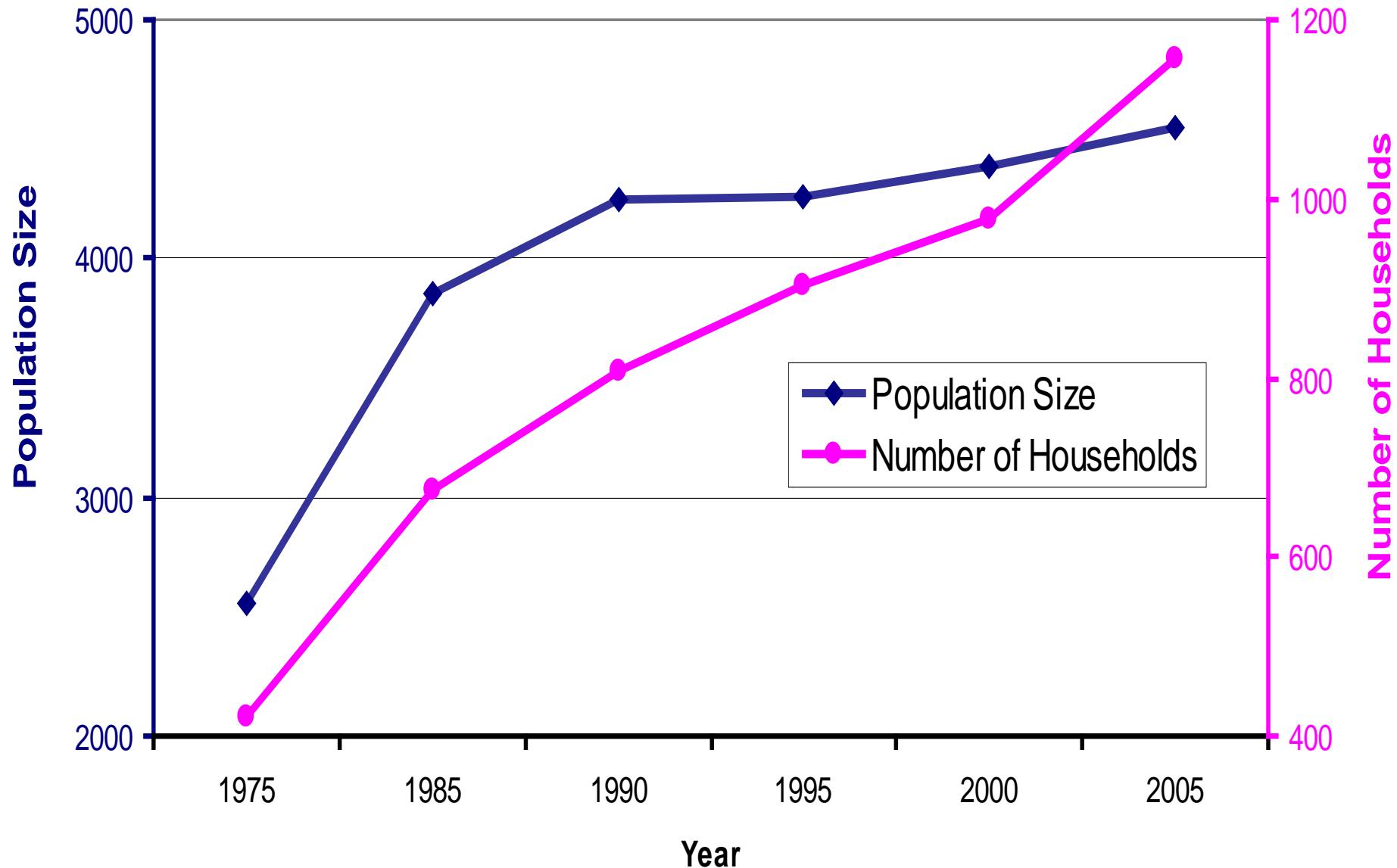


(Liu et al., 2001, Science)

Why?

- Reasons behind Habitat Loss

Population Size and Household Dynamics in Wolong







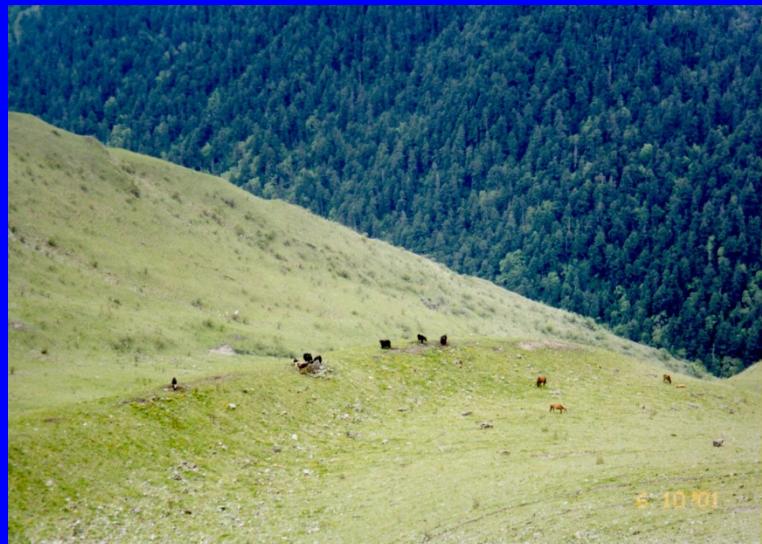
House Construction



Road Construction



Hydro-power Plant



Grazing



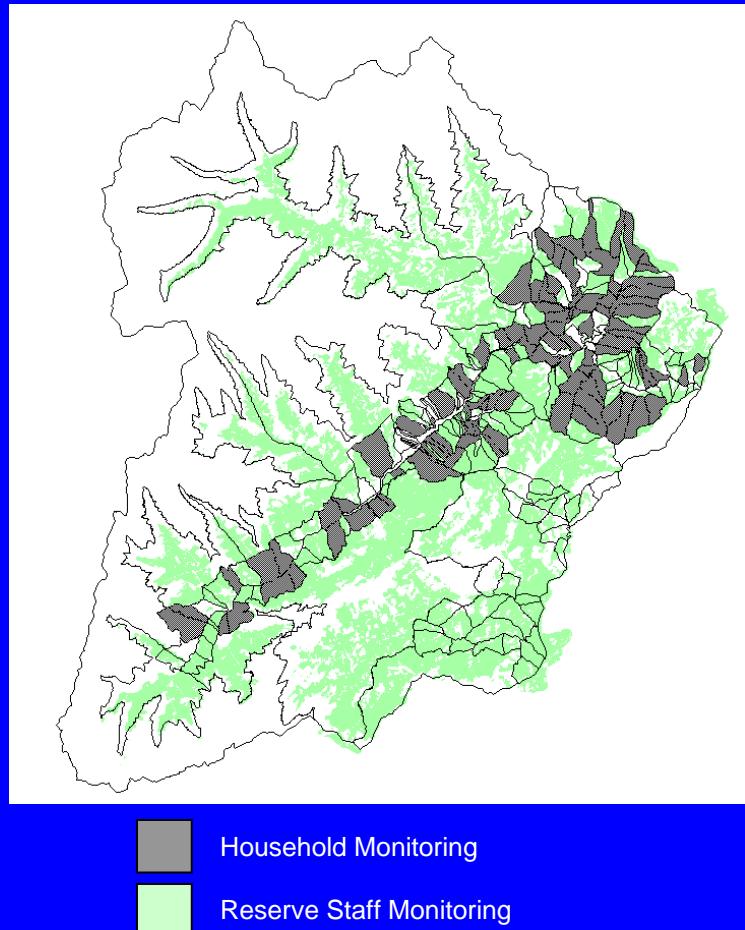
Fuelwood Consumption





Natural Forest Conservation Program

- Started in 2001
- To prevent illegal harvesting
- Households assigned to monitor forest parcels
- ~900 yuan subsidy, 20% of the annual household income in 2001

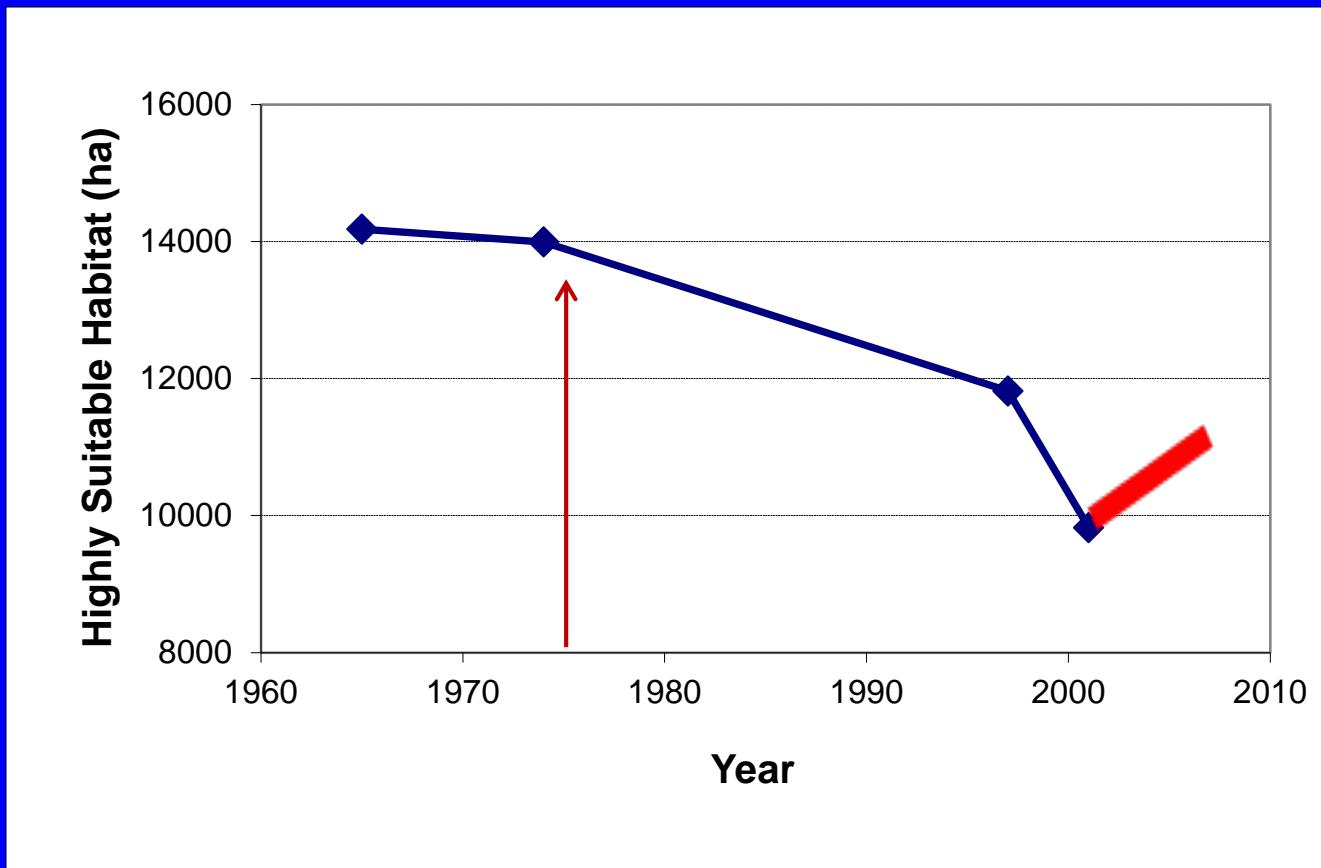


Eco-Hydropower Plant

- Started in 2002
- To provide cheap electricity for residents
- To reduce fuelwood consumption



Recovery of Panda Habitat

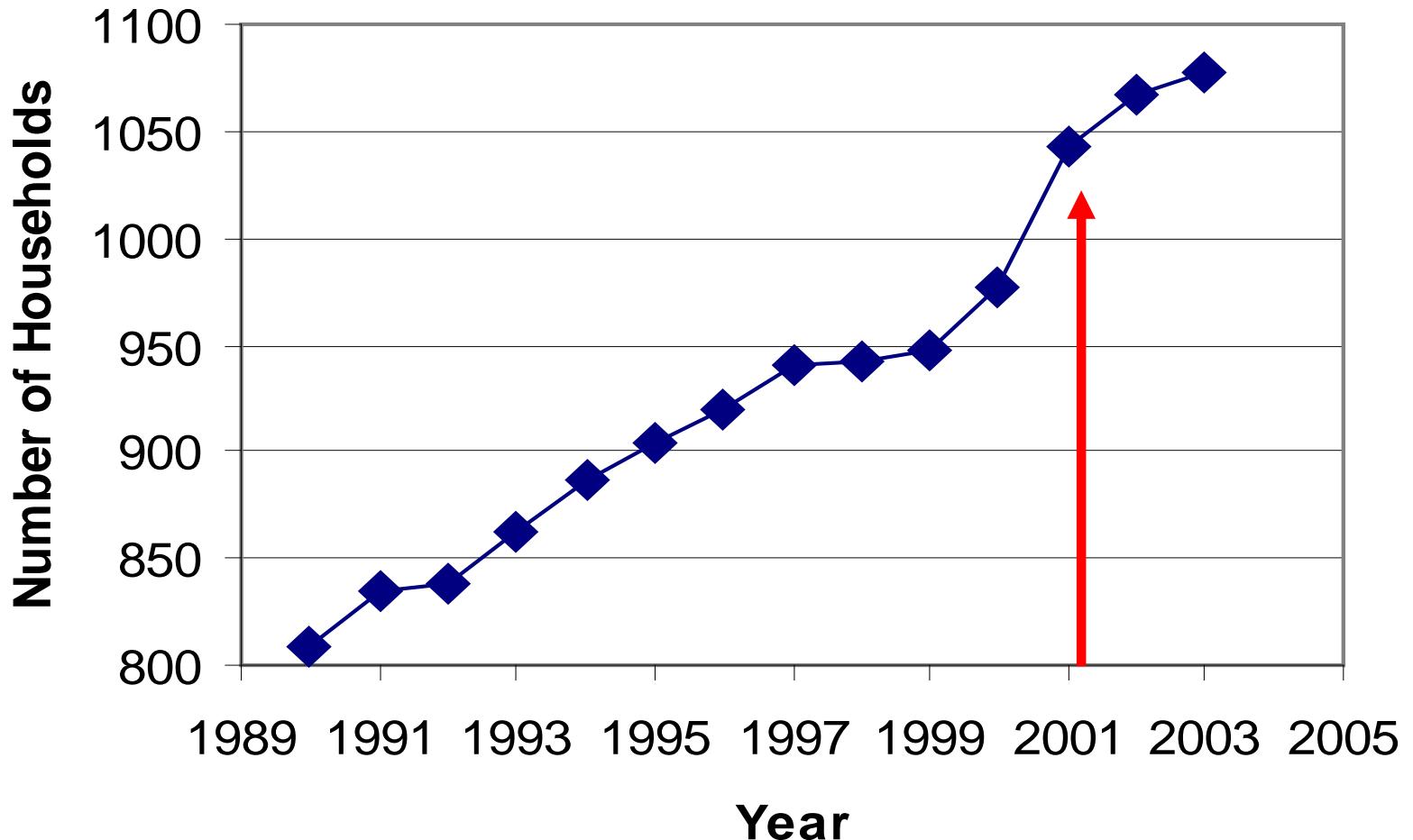


(Liu et al. 2001, Science; Vina et al. 2007 Ecological Applications)

Insight 2:

**Good Conservation Incentives Can Lead to
Bad Conservation Behaviors**

Dynamics of Household Numbers



Insight 3:

Investing in Conservation Wisely

Apartment Complex for Panda Conservation?



Suggested Approach: Improve School Education to Help Children Go to College



Benefits of Going to College

- Economically Efficient
- Socially Acceptable
- Ecologically Effective



Insight 4:

**Wolong is Connected with the Rest of
the World Socioeconomically and
Environmentally (“Telecoupling”)**

Panda Loans



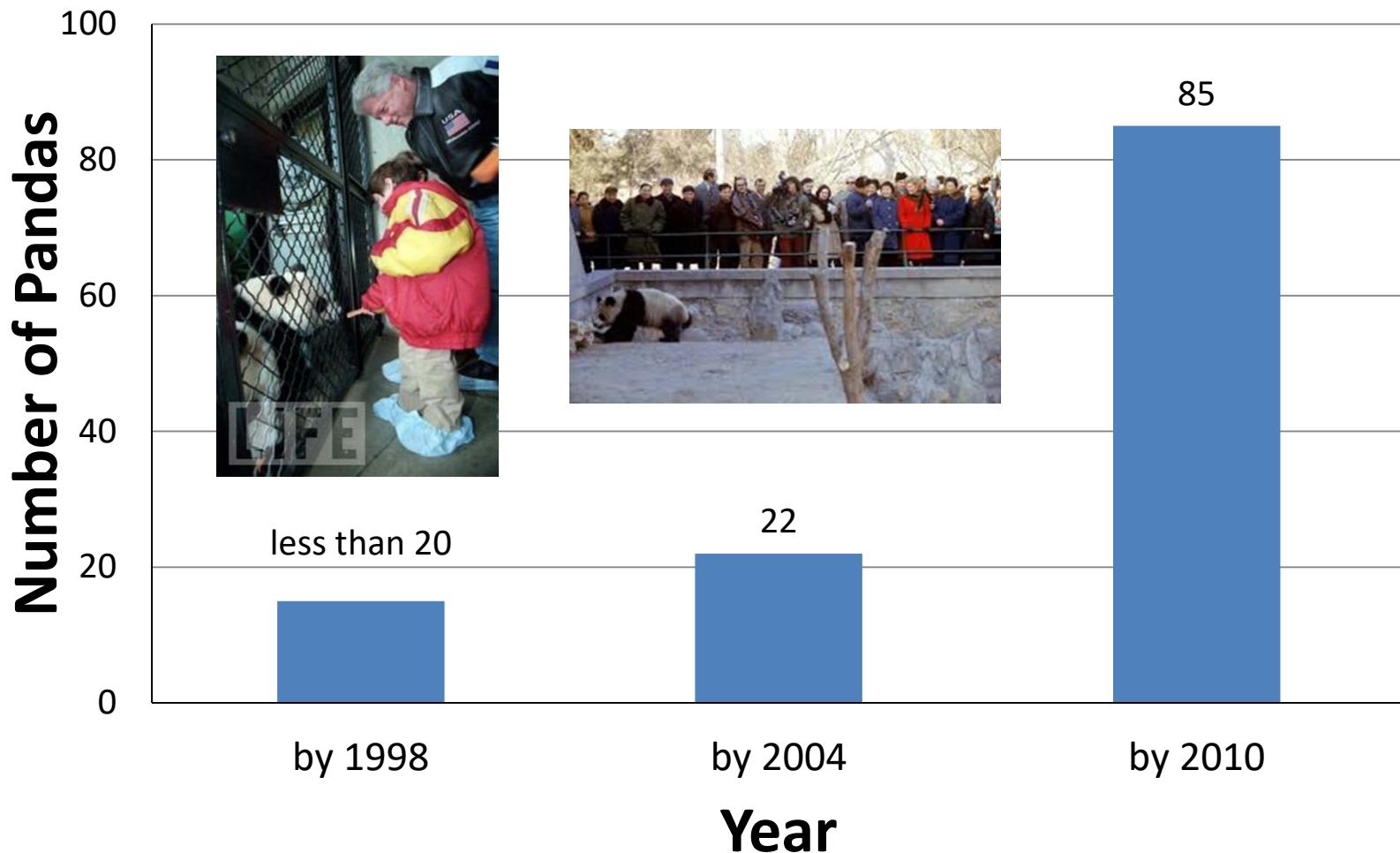
Pandas



The World



Number of Pandas Living in Zoos outside Wolong



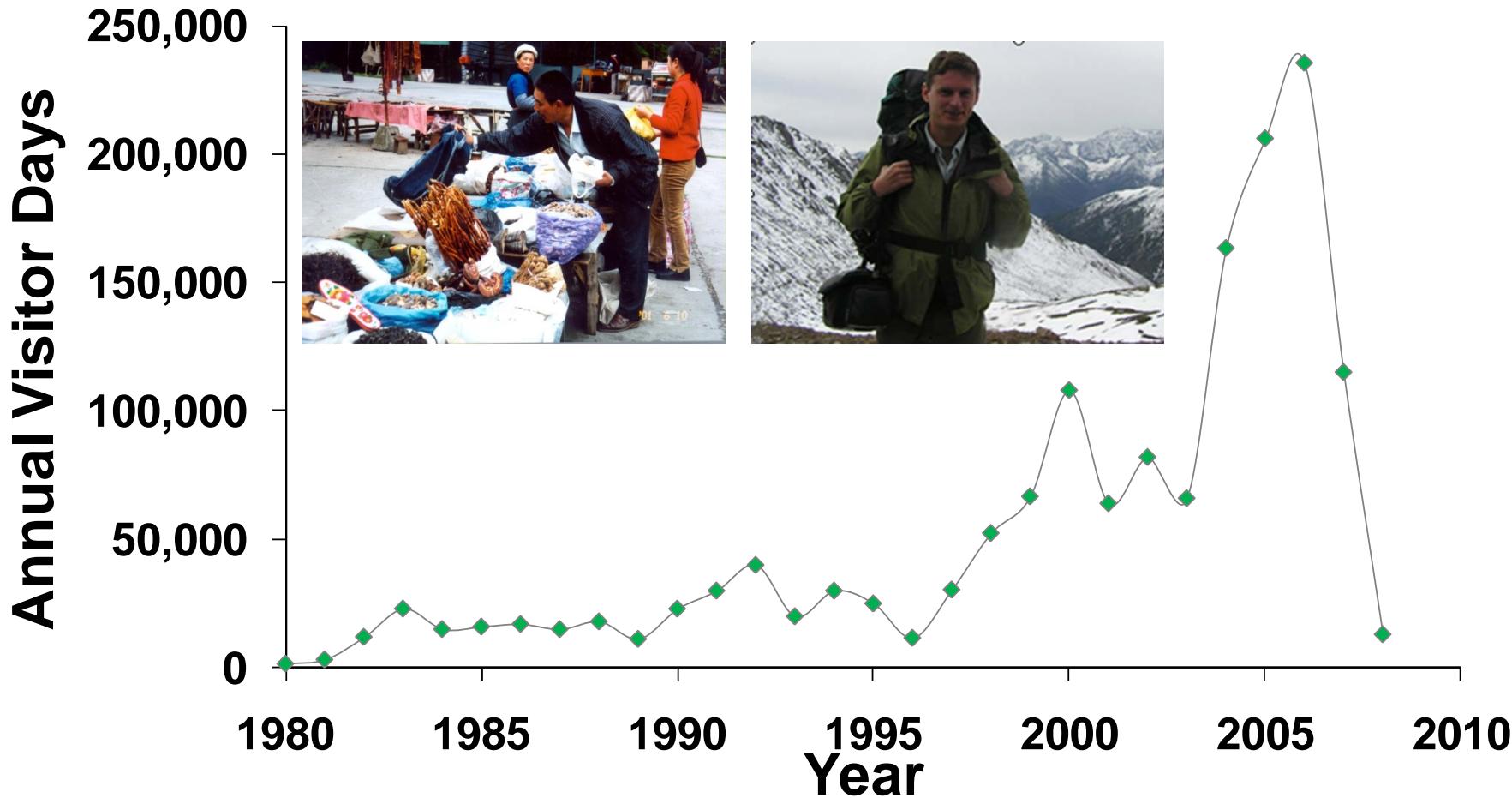
Tourism



Tourists



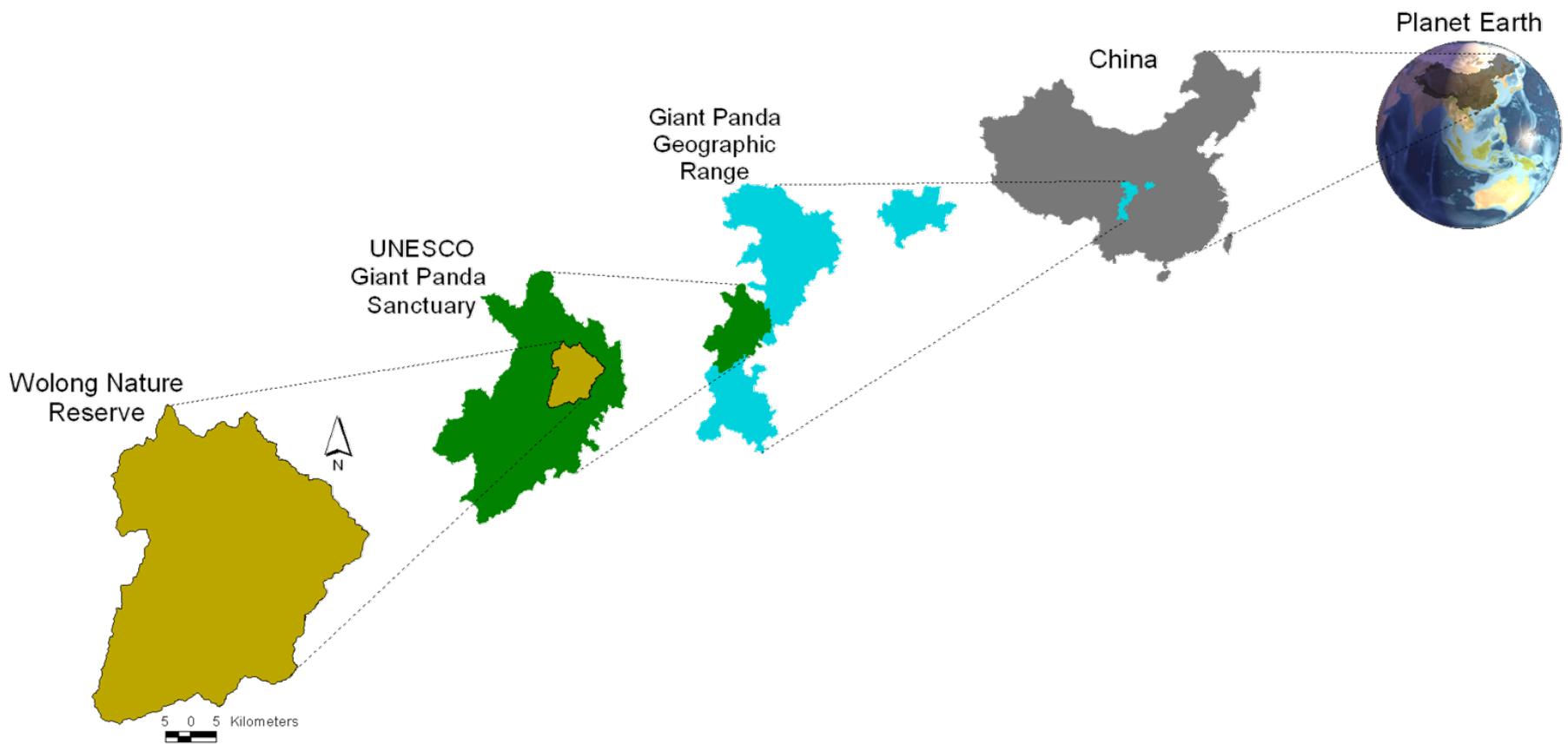
Wolong's Tourism Dynamics over Time



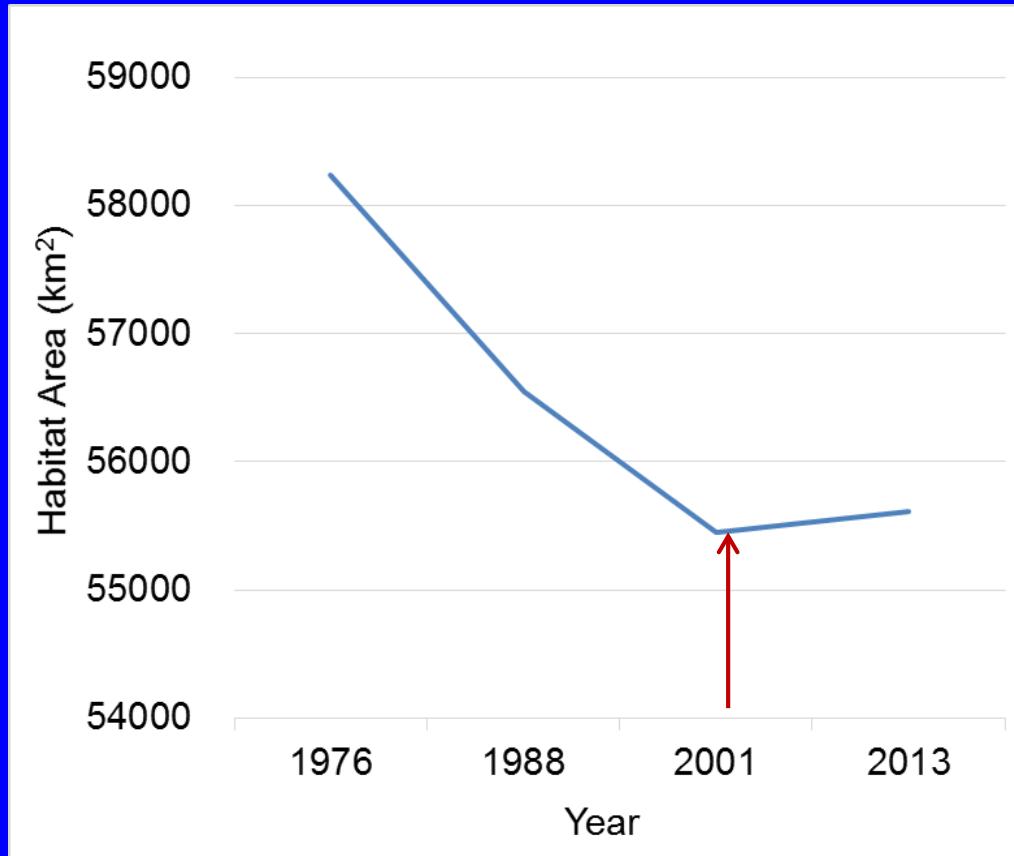
Insight 5:

**Results and Methods from Wolong are
Applicable to Other Places**

Scaling from Local to Global Coupled Human and Natural Systems



Loss and Recovery of Panda Habitat Across the Entire Distribution Range



(Xu et al., 2018 Nature Ecology and Evolution)

Removal of Pandas from the Endangered Species List (IUCN, 2016)

Giant Panda no longer 'endangered' thanks to conservation efforts

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Credit: Wikimedia Commons

Humans have pushed countless species to the brink of extinction and beyond, but we're also capable of nurturing wildlife. Case in point, the Giant Panda — China's national animal — has been delisted as 'endangered' from the International Union for Conservation of Nature (IUCN) Red List thanks to conservation efforts.

Giant Pandas rebound

Being so adorable, the Giant Panda has a superstar status in the animal kingdom. Yet, like lions or elephants, being a popular wildlife species doesn't necessarily come with perks. Human expansion through deforestation, farming, and urbanization has made the forests pandas in China call home smaller and smaller, making food and mates harder to find.

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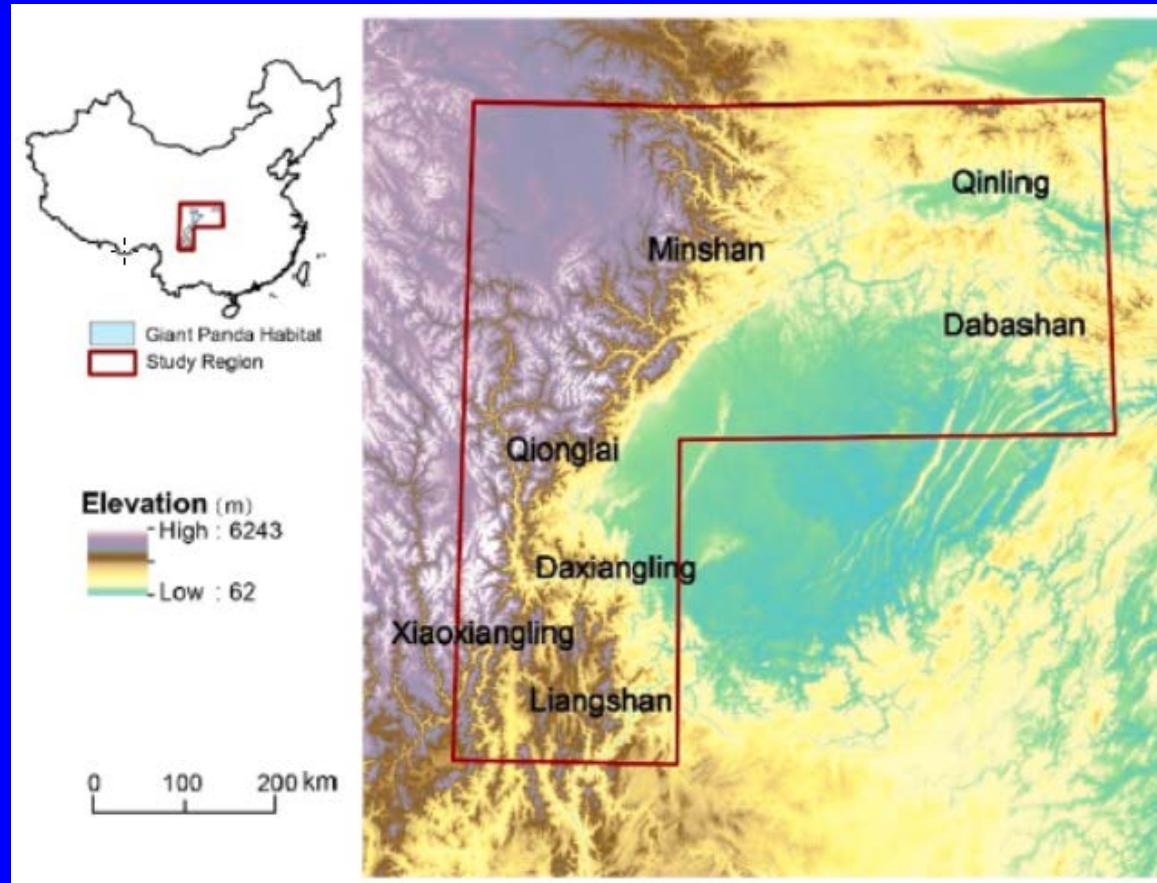
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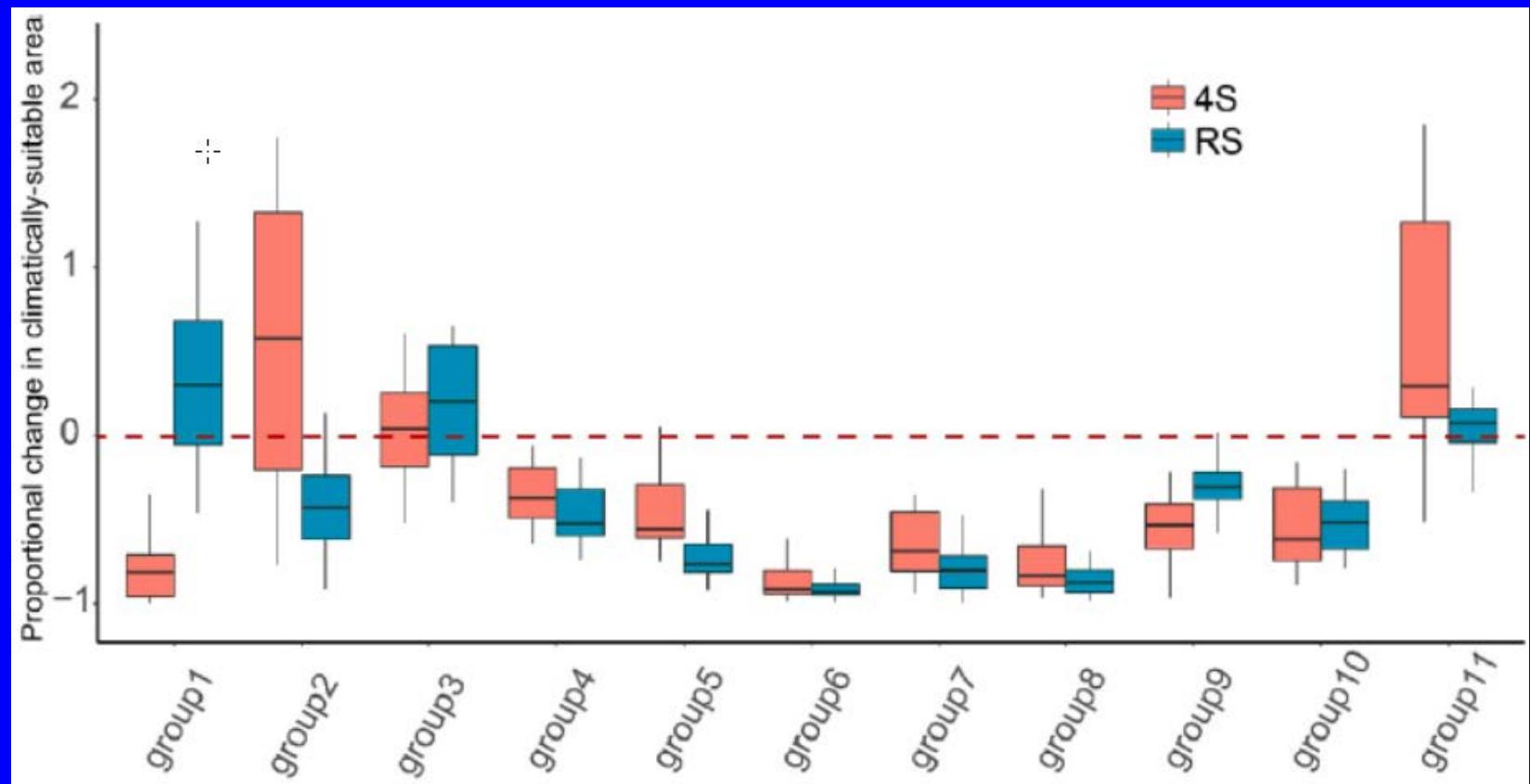
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Impact of Climate Change on Bamboo Species across the Geographic Region

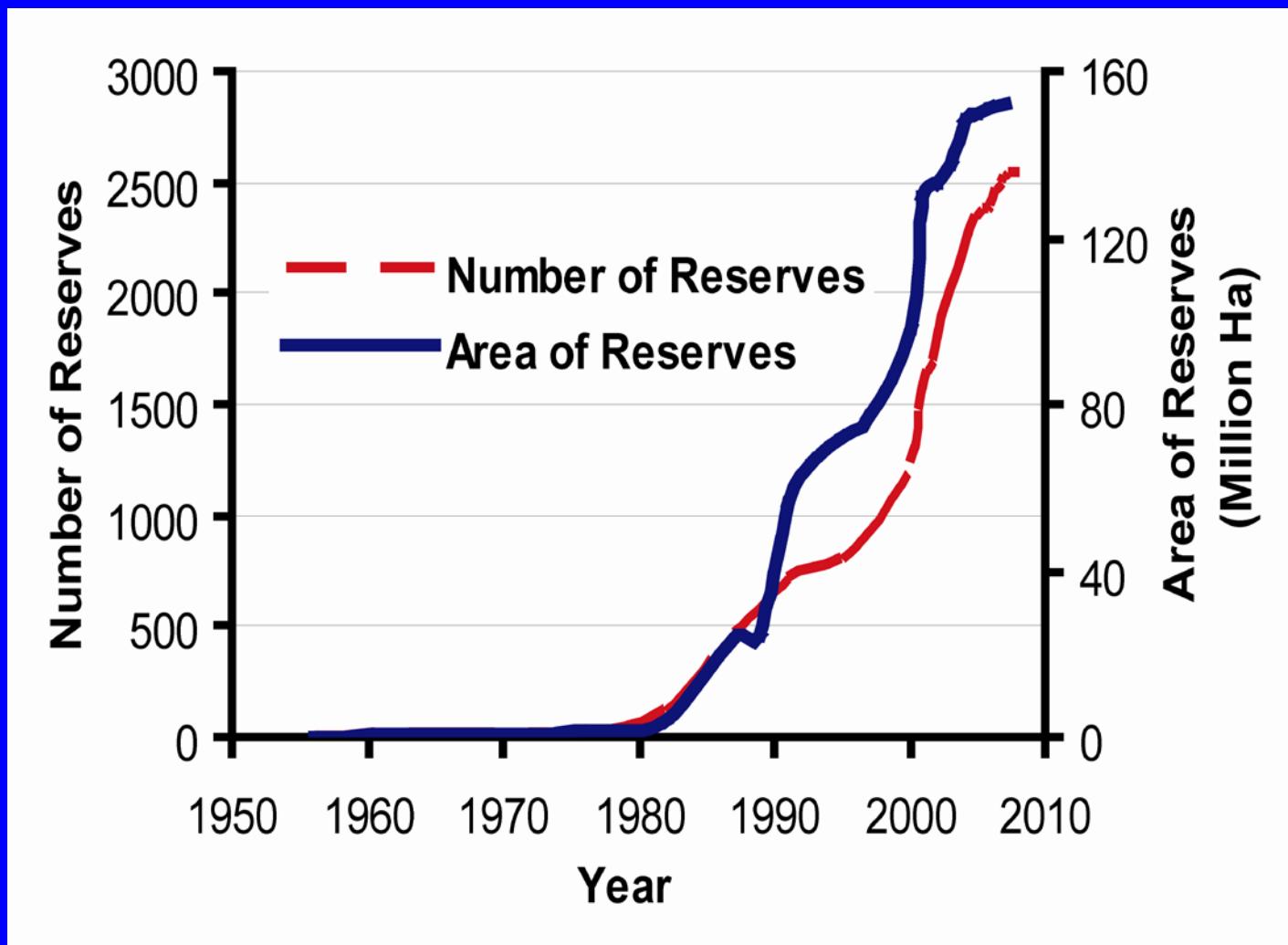


Proportional Change in Climatically-Suitable Area for the 11 Bamboo Groups



Beyond Pandas and People at the National and Global Scales

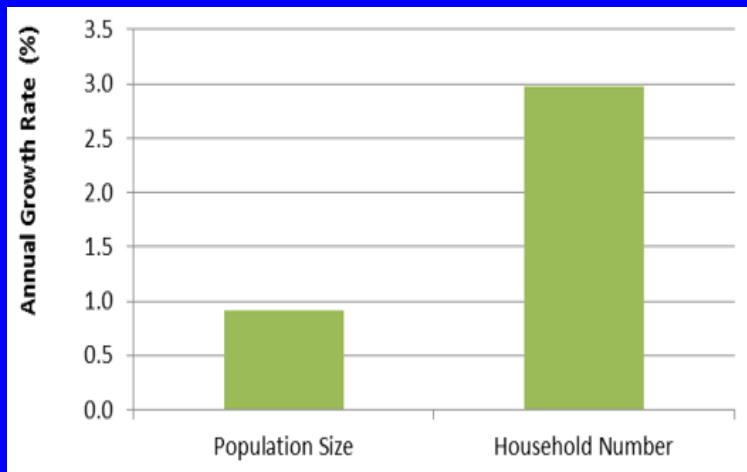
China's Nature Reserve System



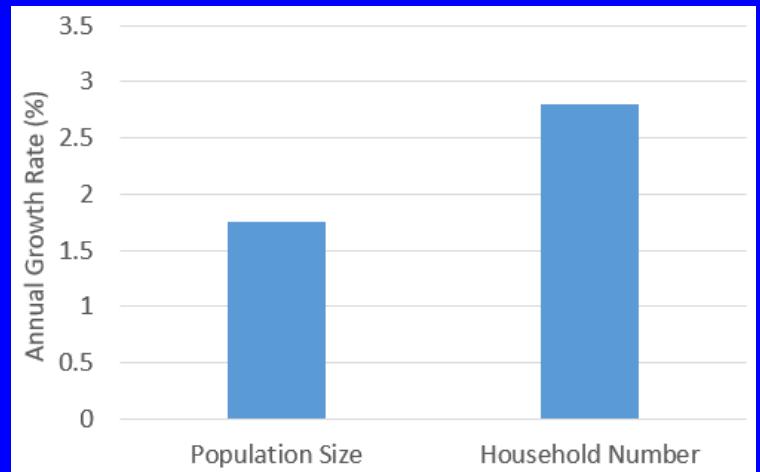
Global Changes in Human Population Size vs Number of Households

Rates of Growth in Population Size and Household Number in Wolong and the World (1985-2000)

Wolong



World



Summary

- The interactions between pandas and people are complex and full of surprises
- Successful conservation efforts are those that benefit both pandas and people
- Results and methods from the local level are useful for research and conservation at regional, national and global levels
- Importance of coupling human and natural systems for meeting human needs and achieving environmental sustainability



Web Sites

<http://csis.msu.edu>

<http://telecoupling.org>

- Publications

- Events

- News

