

EFFECTS OF PAYMENTS FOR ECOSYSTEM SERVICES ON WILDLIFE IN FANJINGSHAN NATIONAL NATURE RESERVE, CHINA



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PROJECT SUMMIT MEETING

LINK PES TO BIODIVERSITY

- Grain to Green Program
- From land cover & land use to biodiversity / ecosystem functions
 - Increased forest cover → improved environment → higher biodiversity?



RESEARCH GOAL & QUESTIONS

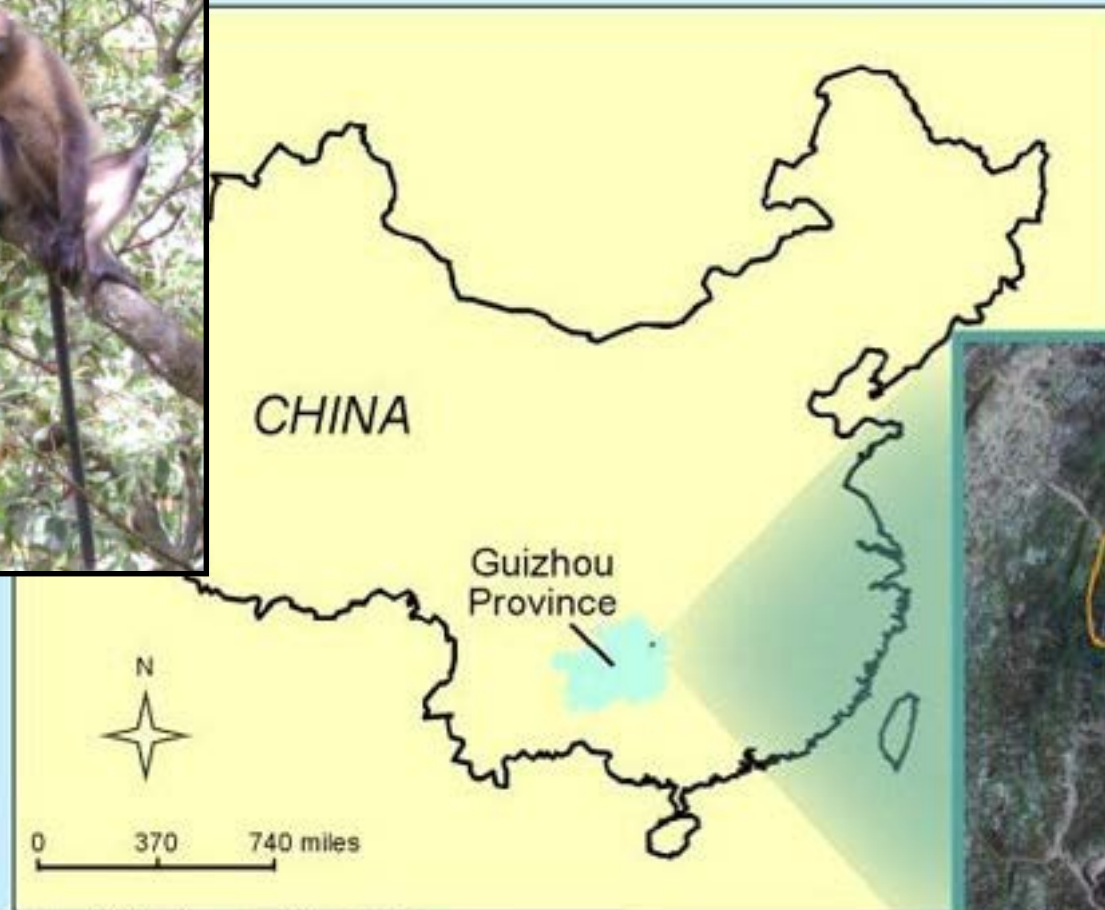
Assess ecological outcomes of PES programs and evaluate whether PES programs are beneficial for conservation of biodiversity.

- How do environment and human activities affect species richness and occupancy of wildlife?
- What are changes in environment and human activities associated with PES programs?
- Are PES programs beneficial for conservation of wildlife?
- Are land cover & land use good enough for monitoring effects of PES programs?



FANJINGSHAN NATIONAL NATURE RESERVE (FNNR)

(41,900 Ha)



Fanjingshan National Nature Reserve was created in 1978 in Guizhou Province as a protective measure to save the Guizhou snub-nosed monkeys.

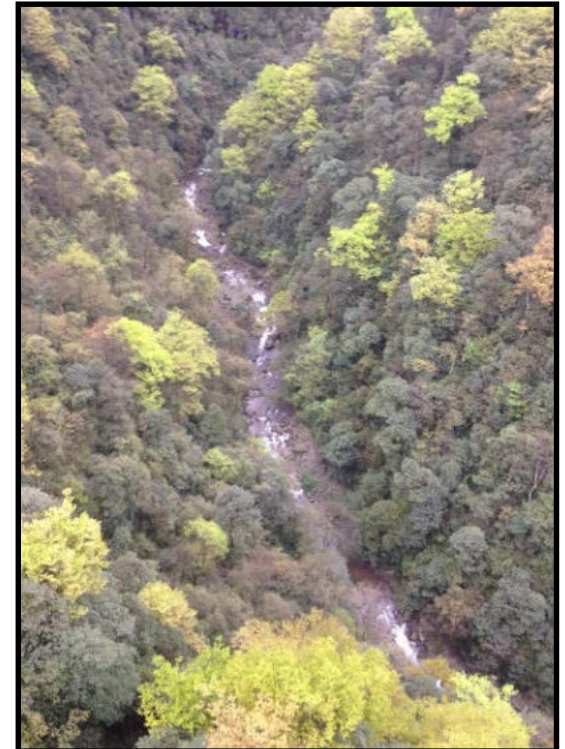


Sarah Wandersee, Feb. 2009
Sources: LANDSAT, ESRI

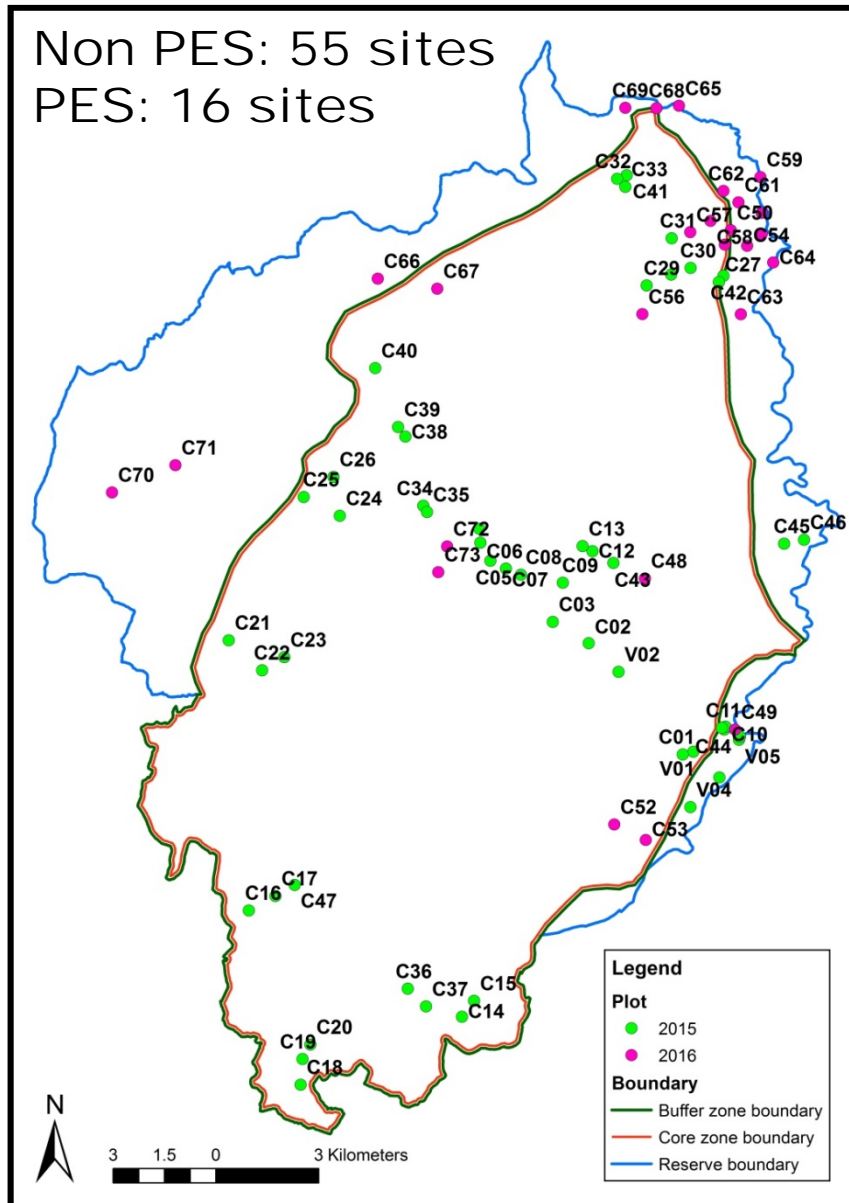
0 5 10 miles

FNNR

- **Elevation: 500 -2500 m**
- **High botanic diversity: ~ 4000 species**
- **Evergreen broadleaf forest to deciduous forest**
- **Local community: 11,000 local residents, > 70,000 tourists, PES**
- **Home to many wildlife species**

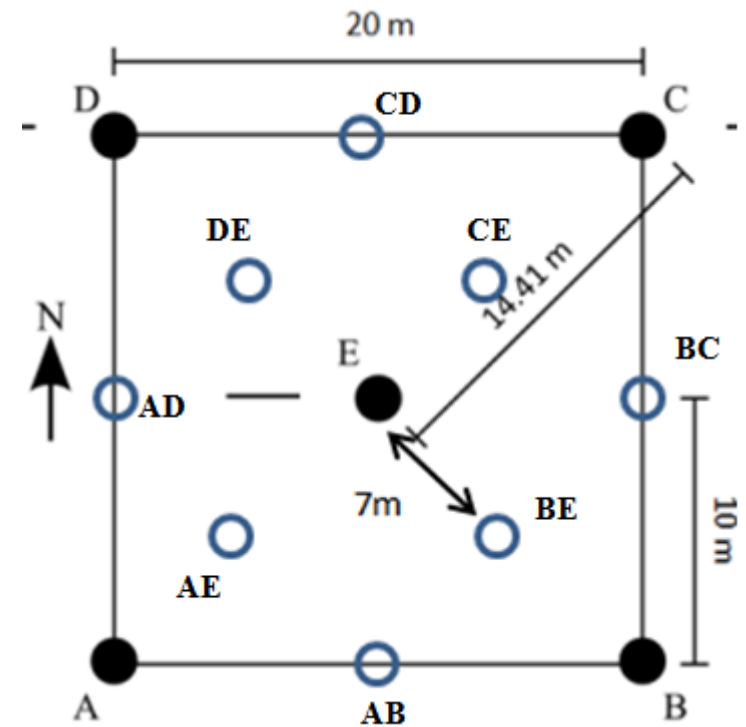


CAMERA TRAPPING



ENVIRONMENT

- **Forest type**
- **Cover**
 - Canopy fractional cover (CFC)
 - Understory cover
- **Diversity & richness of plant species**
 - ground, midstory, overstory
- **Forest structure**
 - Tree height
 - Diameter at breast height (DBH)
 - Number of tree
- **Topography**
 - Slope
 - Aspect
 - Elevation
- **Human activity**
 - Signs of human activity
 - Distance to villages
 - Distance to roads
 - Distance to trails



HUMAN ACTIVITY



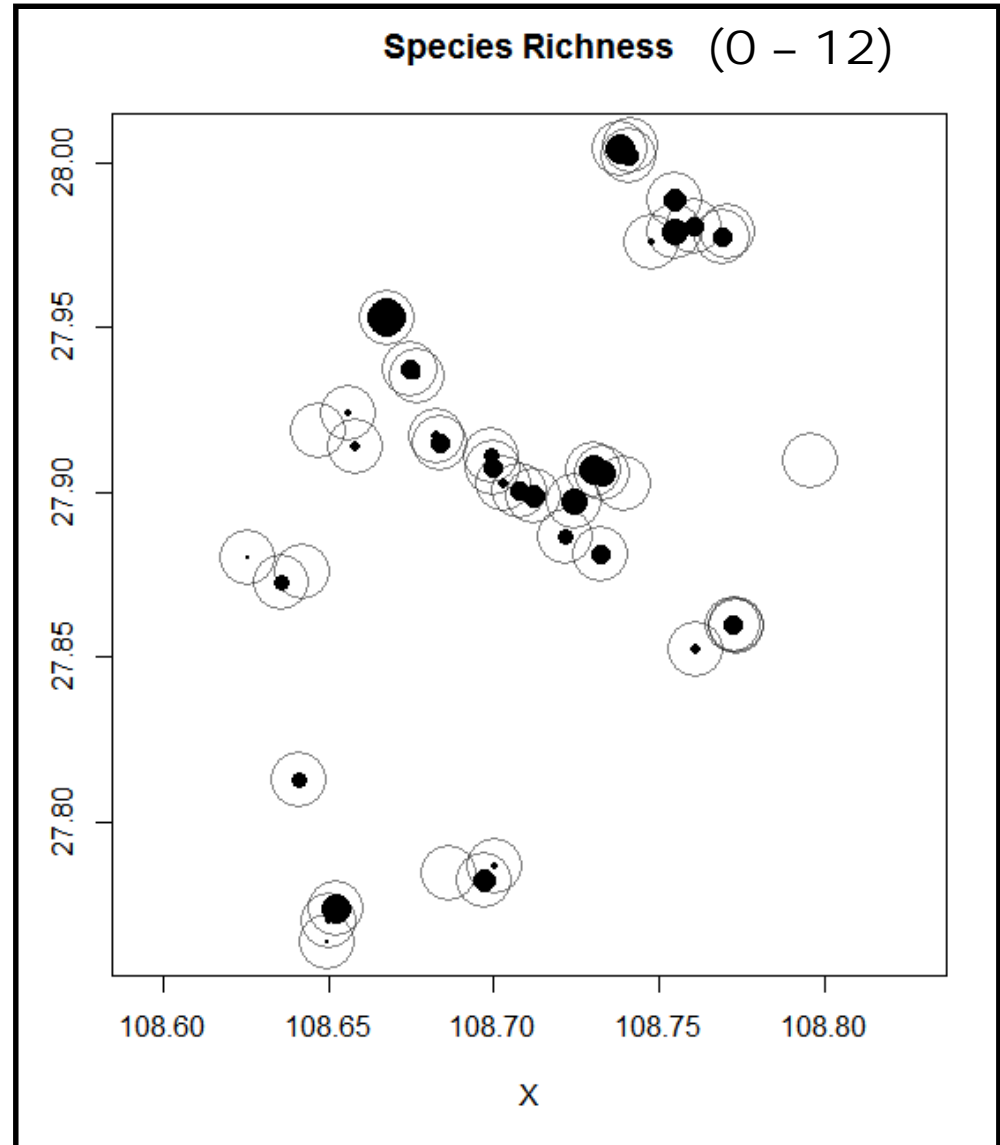
DATA ANALYSIS

- **Poisson regression – species richness of wildlife (n = 42)**
- **Occupancy modeling**
 - Survey covariates: camera settings & season
 - Site covariates: environmental characteristics recorded at each plot
- **PES vs. non-PES: differences in environment and human activity (n= 71)**



RESULTS- WILDLIFE IN FNNR

- 18 species of medium to large mammals and birds, including the golden monkeys.
- 10 species are either protected in China or listed as endangered, vulnerable or nearly threatened on the IUCN Red List.



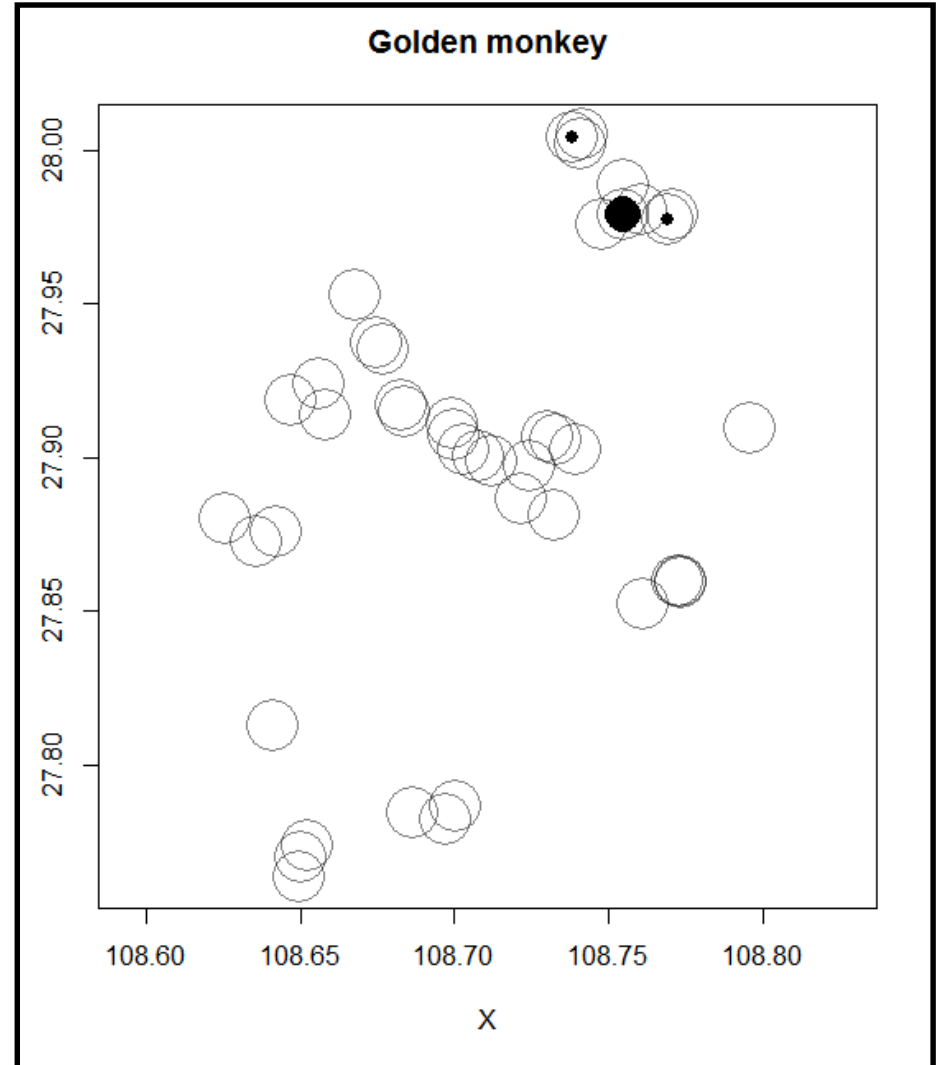
RESULTS- WILDLIFE IN FNNR

- Common species (> = 20 sites): Elliot's pheasant, Golden pheasant, Hog badger, Temminck's Tragopan, Tibetan macaque, Tufted deer, Wild boar

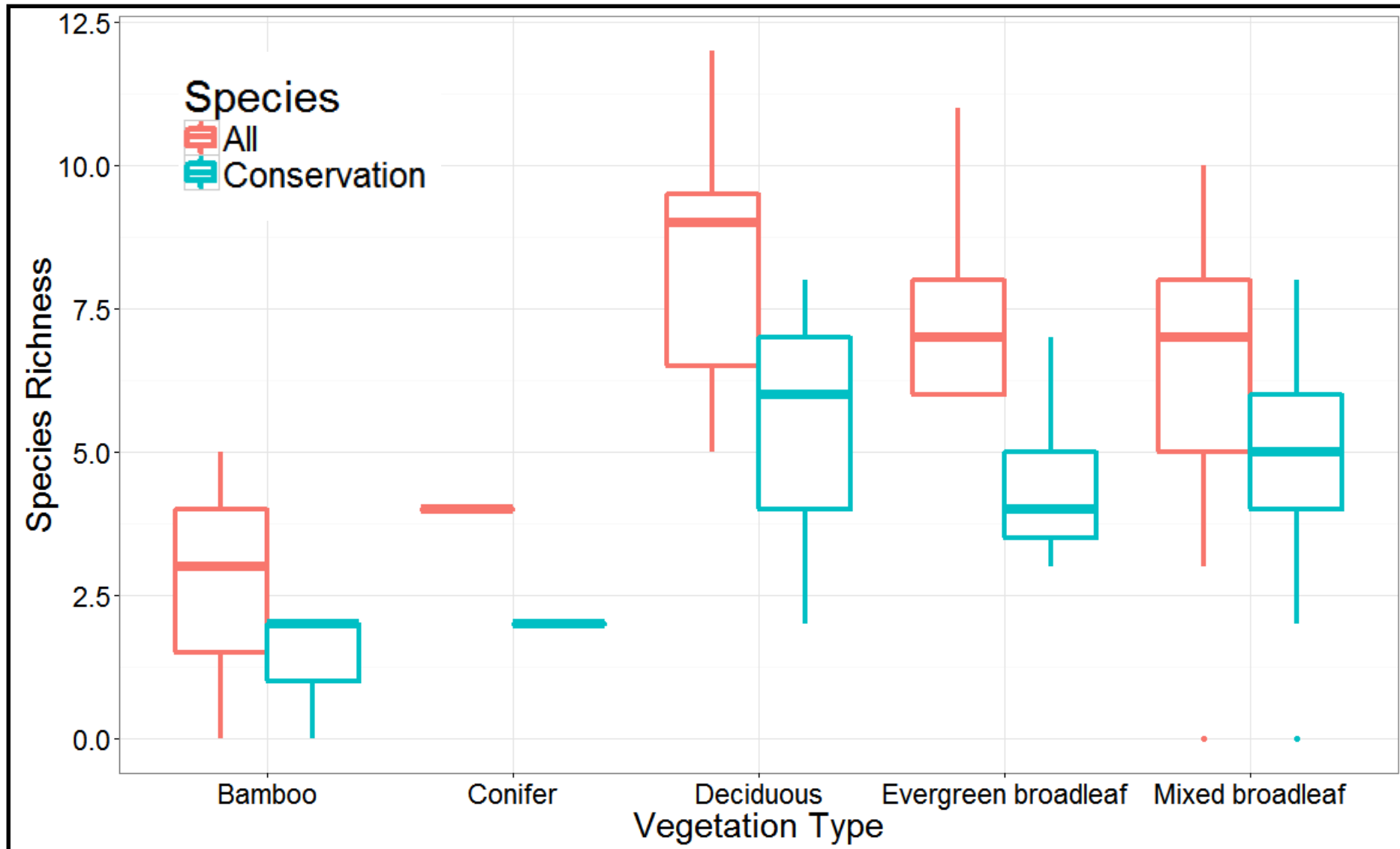


RESULTS- WILDLIFE IN FNNR

- Rare species (< 5 sites): Asian black bear, Chinese ferret badger, crab-eating mongoose, golden monkeys



ENVIRONMENT & SPECIES RICHNESS



ENVIRONMENT & SPECIES RICHNESS

- Overall species richness
 - CFC: **positive** effect
 - Presence of livestock: **negative** effect
- Species richness of wildlife with conservation concern
 - CFC: **positive** effect
 - Number of tree: **positive** effect



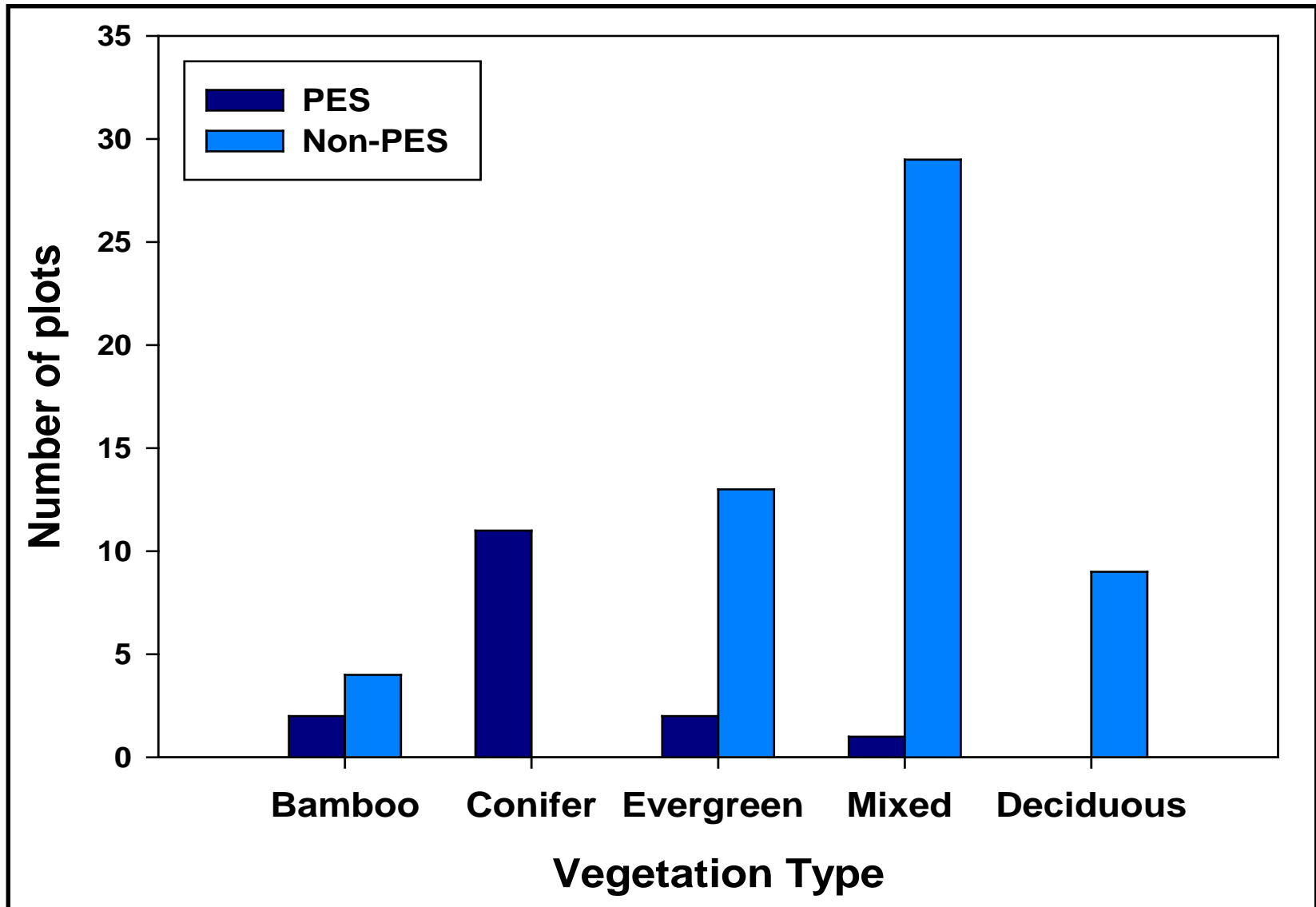
WILDLIFE OCCUPANCY

2015/4/17-2016/4/15, 26 surveys, each survey is 2 weeks, single season

- **Vegetation type:** not so important
- **CFC:** influential on occupancy of 7/16 species
 - **Positive:** Tibetan macaque, Temminck tragopan, porcupine
 - **Negative:** Wild boar, palm civet, weasel, golden pheasant
- **Plant diversity:** not so important
- **Forest structure:** influential but has mixed effects
- **Human activity:** influential on occupancy of 10/16 species
 - **Positive:** 3 species
 - **Negative:** 7 species



PES VS. NATURAL FOREST

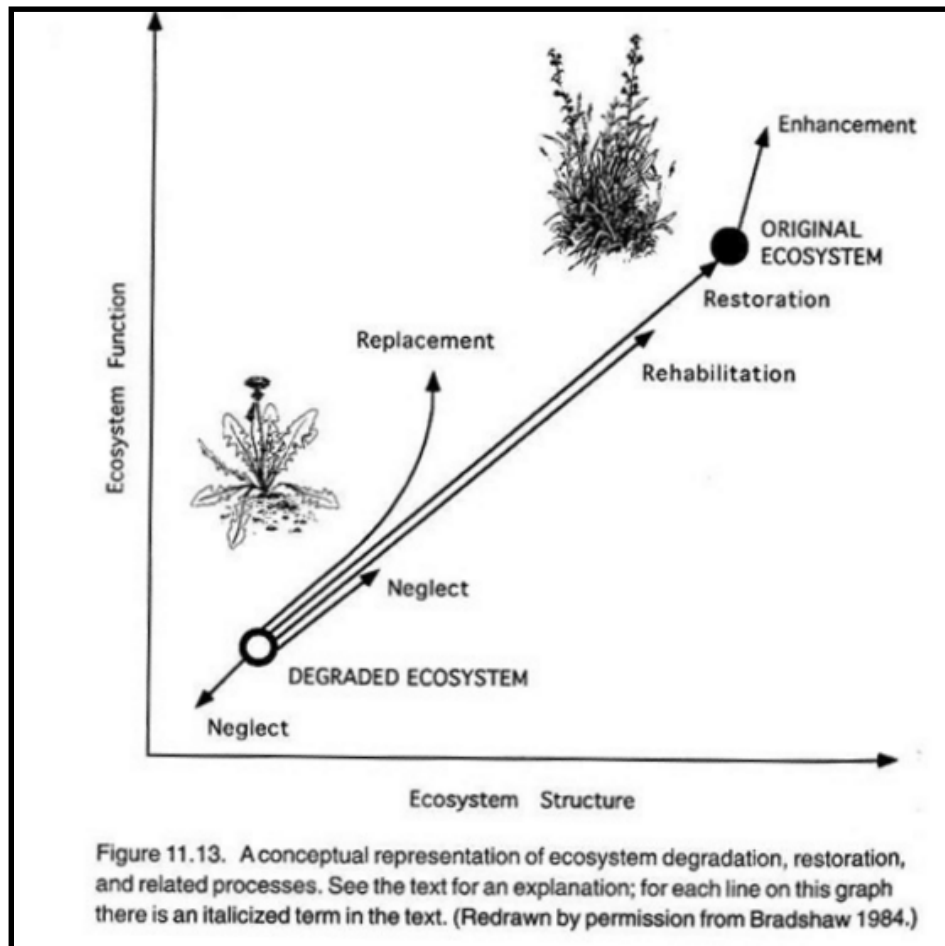


PES VS. NATURAL FOREST

Environment	PES
Cover	Average no difference, lower variation
Plant diversity	Lower overstory diversity & richness
Forest structure	Lower Max. DBH Lower SD. Of DBH
Elevation	Lower
Human activity	More signs of human activity Higher detection of human & livestock Closer to roads & village

CONCLUSION

- Can PES programs be beneficial for conservation of wildlife? **YES!**
 - By increasing CFC, increasing the number of tree, reducing human activity
 - May provide habitat for some species of wildlife



CONCLUSION

- Can PES programs be beneficial for conservation of wildlife? **YES!**
 - By increasing CFC, increasing the number of tree, reducing human activity
 - May provide habitat for some species of wildlife
- But...is **not restoring** original landscape (rehabilitation vs. restoration)
 - Vegetation types in PES areas are different than natural forest
 - PES sites are still impacted
 - Lower species richness of wildlife
 - Higher human activity
- Are land cover & land use enough to monitor effects of PES programs?
 - Land cover & land use are **important** as wildlife does respond
 - But...**not enough**
 - To track true ecological effects of PES requires more information on other ecological dimensions

FUTURE PLAN

- **Papers:**
 - Effects of PES on wildlife biodiversity, community
 - Effects of human activity particularly livestock on presence of wildlife
 - Effects of PES on conservation of golden monkeys
- **Plan (Oct. 2016 – March 2017)**
 - Collecting camera trapping data: Dec. 2016
 - Finish most of data analysis for both papers by Dec. 2016
 - Submit 1st paper by the end of Jan. 2017
 - Submit 2nd paper by the end of Mar. 2017

DATA WANTED

- **Maps of locations of PES (GTGP and NFCP) with attributes obtained by household survey, including time of enrollment of PES (by the end of Oct. 2016)**
- **Information about PES programs in FNNR**
- **Conditions before implementation of PES programs (land cover, land use)**
- **Wildlife observed near farmlands**

THANK YOU!

National Science Foundation



Fanjingshan National Nature Reserve, China

Chinese Academy of Sciences



San Diego State University

