

BIODIVERSITY CONSERVATION AND SUSTAINABLE DEVELOPMENT IN SOUTHWEST CHINA

**A National Science Foundation Integrative Graduate Education and
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**中国西南部的生物多样性保护及可持续发展
国家科学基金研究生综合教育与研究培训**

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BIODIVERSITY CONSERVATION AND SUSTAINABLE DEVELOPMENT IN SOUTHWEST CHINA

A collaborative research program of the

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and the

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In loving memory of Joshua Posner (1947-2012)



Introduction

Meeting the major challenges of biodiversity conservation requires understanding the interactions of biological, physical, social, and economic forces. This research program is aimed at understanding these forces and their interactions in the eastern Himalayas of southwest China. The area has been designated a “Global Biodiversity Hotspot,” reflecting rich biodiversity and endangered species that face great pressure from local populations seeking their livelihood on the land, external populations coming in pursuit of new economic opportunities, and the rapid rise of mass tourism.

应对生物多样性保护的挑战需要理解生物驱动力、自然驱动力、社会驱动力和经济驱动力之间的相互作用。本研究项目的目的就在于研究中国西南部东喜马拉雅地区的这些驱动力及它们之间的相互作用。在这些地区、由于谋求生存的当地人口、到此寻求新的经济机会的外地人口以及快速增长的旅游等给当地丰富的生物多样性和濒危物种带来了很大的压力、因此该地区一直被认为是一个“全球生物多样性热点地区”。

This program is a collaborative research program of the Chinese Academy of Sciences and the University of Wisconsin-Madison to:

- Expand scientific understanding of the interactions of natural and human processes integral to biodiversity conservation and sustainable development;
- Develop information and analyses useful to the local populations and to relevant government units; and
- Provide the next generation of scientists with the interdisciplinary skills needed to carry on this important work.

这是美国威斯康星大学麦迪逊分校与中国科学院共同开展的合作研究项目，其目的是：

- 扩展对人与自然相互作用的科学理解、以促进生物多样性保护及可持续发展；
- 探索并分析对当地民众及相关政府部门有帮助的信息；
- 为下一代从事这项重要工作的科学家提供多学科的技能。

From 2006-2012, the program trained 20 PhD “trainees” at the UW-Madison, who were funded by the NSF IGERT program. The program also supported 16 PhD and MS “associates” at UW-Madison and other North American institutions, who received grants funded by the UW-Madison to conduct research projects in northwest Yunnan.

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Part One: Trainees

2006 Cohort

The effects of biomass smoke exposure on blood pressure among adult women and children in the United States and China



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专长: 统计分析, 流行病学, 空气及水质量的监控

院系: 公共健康及环境

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This dissertation investigated the association between biomass smoke exposure and blood pressure (BP) among adults and children in China and the United States. Over half the world's population is exposed to airborne particulate matter (PM) from biomass combustion for household energy or burning tobacco during active smoking. Limited evidence suggests that PM from biomass combustion may be associated with elevated BP, an important risk factor for renal and cardiovascular disease morbidity and mortality.

In the first paper, I use field-collected data to quantify personal PM exposure among women and children living in rural Chinese households using biomass fuels. Our findings suggest that reducing overall PM exposure in this population may be best achieved by reducing winter exposure and, further, that behavioral interventions such as increasing ventilation during cooking or encouraging cookstove maintenance may help achieve these reductions. Next, I built upon the PM exposure assessment and examined the relationship between personal PM exposure and BP. We found that PM exposure was independently and significantly associated with higher systolic (SBP) and diastolic blood pressure (DBP) in women over 50 years old. Among children, we found some evidence of a lower BP with higher PM exposure, however these results were not robust to models accounting for day-to-day exposure variation. In the final paper, I studied effects of environmental tobacco smoke (ETS) exposure on BP in a cohort of U.S. children and adolescents using data from the National Health and Nutrition Examination Survey (NHANES). We found ETS exposure was independently and significantly associated with higher SBP among boys and, conversely, significantly lower SBP among girls. We did not find a consistent relationship between ETS exposure and DBP for boys or girls.

This dissertation provides further evidence that cardiovascular disease may be an additional component of the global disease burden attributable to indoor biomass smoke. Our results show that exposure to PM from burning tobacco and fuelwood may pose a serious health risk for adults and children. Prioritizing issues of energy and indoor air pollution may be an important policy measure for both developed and developing countries as they try to reduce their cardiovascular disease burden.

Collaborators

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What are the main findings of the study?

Our study shows that personal exposure to indoor air pollution is linked to higher systolic and diastolic blood pressure in adult women, with the strongest effects in older women over 50 years old.

Were any of the findings unexpected?

There is growing evidence that outdoor air pollution increases cardiovascular risk. However, we know very little about the cardiovascular effects of pollution exposure at the high levels experienced while cooking indoors with biomass. Our study is the first to link personal exposure to indoor air pollution to increases in blood pressure. This finding has significant public health implications given that almost half the world's population is exposed to indoor air pollution.

What should people take away from this study?

Our study provides further motivation for promoting the use of better stoves and cleaner fuels in low-income countries as a way to improve public health and reduce the cardiovascular disease burden. The clinical significance of indoor air pollution on a single patient's blood pressure may be small. But given that billions of people are exposed, the changes in blood pressure observed in our study would have a large impact on the risk of cardiovascular disease for populations, so it's important for cardiologists and public health physicians to be aware of this relationship.

Publications

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The failure of frog populations to expand into human-created habitat: Frogs do not breed in rubber plantations in Xishuangbanna, China



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Habitat loss is a major threat to tropical biodiversity, yet it can be difficult to identify for species with complex life histories. If all habitat needs of a species are not considered, there is a risk of overestimating the conservation value of altered habitat. Here we investigate whether the conversion of tropical rainforest into rubber plantations constitutes habitat loss for a community of frog species in Xishuangbanna, China. We conducted surveys to quantify habitat use for breeding and post-metamorphic life history activities in rainforest, rubber plantation and other human impacted sites. Post-metamorphic habitat surveys indicated the frog community comprises disturbance-tolerant generalist species that were present in all three areas and disturbance-intolerant species that were confined to the rainforest. Breeding surveys showed no species bred in rubber plantation sites. Canopy cover was the major driver of breeding site selection with disturbance-tolerant species in general preferring low canopy and disturbance intolerant-species preferring high canopy sites. We demonstrate that the absence of species breeding in the high canopy rubber plantation sites is due to a habitat mismatch: species that use the rubber plantation as post-metamorphic habitat breed in low canopy sites and species that breed in high canopy sites never go in the rubber plantation. We corroborate these results with a series of three experiments which demonstrate that rubber plantation aquatic sites are suitable for tadpole growth and survival. Rubber plantations represent complete habitat loss for disturbance-intolerant species, and an absence of breeding habitat for disturbance-tolerant species. Rubber plantations alone cannot support frog populations. Our findings indicate that considering habitat use for disparate life history activities provides a more complete assessment of the conservation value of altered habitat for biodiversity.

Collaborators

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What are the main findings of the research?

Rubber plantations are inadequate replacements for natural rain forests in terms providing suitable habitat for frogs.

Were any of the findings unexpected?

These findings were unexpected because other work has suggested that other types of tropical plantations (like cacao) are suitable for frogs, but all previous work has focused on only one aspect of frogs' habitat requirements. Because we focused on both breeding and non-breeding habitat we were able to demonstrate that rubber plantations are not suitable.

What should people take away from this research?

A collection of planted trees in close proximity to each other does not equal a forest.

Impacts of a changing climate and yak herding practices of alpine rangelands and Tibetan livelihoods in southwest China



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Rapid increases in temperature are occurring in the eastern Tibetan Plateau, southwest China. Regional assessments of change show rates comparable with the arctic region and a decreasing Asian summer monsoon affect. We use meteorological station daily precipitation and daily maximum and minimum temperature data from 81 stations to calculate rates, seasonality, and patches of change over the last 48 years. The last 24 years show significant increases in growing season low temperatures at most sites. Hotspots of increase appear, such as Deqin, Yunnan and Mangya, Qinghai where rates of increase in daily high and low temperatures over the last 24 years exceed 5°C/100 years. Shifts in precipitation also occur as warming temperatures increase March-April rainfall. Locations previously covered in snow experience wet spring rains, with potential impacts on plant communities. These hotspots deserve investigation to determine effects of climate shifts on biodiversity and livelihoods.

Montane regions of Southwest China represent the world's most biodiverse temperate region as well as cultural hotspots undergoing rapid cultural and ecological change. This part of the eastern Himalayas represents the center of origin for many plant groups including horticulturally valuable species of *Pedicularis*, *Rhododendron*, and *Primula*. The region is also the source of important medicinal plants and provides summer pastures for Tibetan yak herders. This grazing can either enhance or diminish diversity in these habitats, both locally and regionally. Yak herders voice concerns over both shrub encroachment into historical rangelands and shrinking grasslands. Although suitable areas for grazing have declined, herd sizes have quadrupled over the last five decades, intensifying impacts on palatable plants. These impacts threaten the rich diversity of the region and raise questions concerning the sustainability of current grazing levels.

To assess how these regions are responding to shifts in grazing practices, we interviewed herders and surveyed plant species cover and richness and cover along a grazing gradient extending away from herder huts in Deqin county, northwest Yunnan. Species richness increases with distance from herder huts (9.9/1m² from 1-50 m, 11.5/1m² from 51-100, and 19.4/1m² at >100 m) demonstrating substantial impacts from grazing. As distance from the huts increases, grasses decline, shrubs increase, and forbs remain similar in cover. Ordination of species and environmental variables shows that grazing intensity parallels an axis reflecting grass cover and bare ground.

Tibetan yak herding practices in Northwest Yunnan, southwest China both maintain and threaten biological diversity. To learn more about local cultural variation and how it might help cultures to adapt to policy changes, we interviewed 37 households in Deqin County on their traditional knowledge and the changes they have observed in ecological conditions, livestock health, and land management. These villages varied in proximity to main roads, farmland quality, and livelihood options. Herd sizes in Deqin have quadrupled since the 1950s, due to commune era policies and subsequent privatization of livestock. The practice of burning shrubs increased during the communal period but has since decreased due to a burn ban. Herders report that the increase in shrublands invading alpine meadows has reduced livestock forage, reducing the productivity of alpine rangelands and yak health. Butter production has declined by 30% over the last two decades. Herders are shifting to diversify sources of income when available, but villagers in remote and protected areas continue to depend on

livestock for much of their livelihood. Scientific data confirm herder reported ecological changes including increased temperature, decreased snowfall, and accounts of increased erosion (which deserves further study). Climate, policy, and economic incentives have interacted to increase pressure on shrinking alpine meadows and reduce dairy production.

Collaborators

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Publications

Haynes, M.A., Z.D. Fang, and D.M. Waller. Grazing impacts on the diversity and composition of alpine rangelands in northwest Yunnan. *Journal of Plant Ecology*. In revision.
Brandt, J.S., M.A. Haynes, T. Kuemmerle, Z.D. Fang, D.M. Waller, and V.C. Radeloff. Regime shift on the roof of the world: Alpine meadows converting to shrublands in the southern Himalayas. *Biological Conservation*. In revision.
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Haynes, M.A., K.-J. S. Kung, Y.P. Yang, and D.M. Waller. Hotspots of climate change inside the eastern Tibetan plateau. In preparation.



Developing an interdisciplinary restoration plan for Napahai Wetland, Yunnan, China



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We explored opportunities to restore black-necked crane (*Grus nigricollis*) habitat in Napahai wetland, a high-elevation (3,260 m) marsh located in rapidly changing northwestern Yunnan, China. Approximately 250 of the IUCN-listed vulnerable cranes use the shallow marshes of Napahai from October to May each year. We discuss research that is needed to effectively conserve this species endemic to the Tibetan plateau within this internationally important wetland.

Napahai Wetland is centered in the core of the Southwest China Biodiversity Hotspot and is an ideal system for conducting interdisciplinary research at the nexus of ecology, livelihoods, and governance. This 2,000-ha wetland is internationally recognized for its role in maintaining hydrologic function at the headwaters of the Yangtze River, and also provides critical habitat for migrating birds, including the revered black-necked crane (Yu 2004). Residents of the 17 surrounding Tibetan villages use the wetland to graze livestock critical to local livelihoods, but unregulated grazing access may have negative consequences on black-necked crane habitat. The growing tourism industry in the region may present both economic opportunities and incentives for locals to restore wetland habitat, but the costs and benefits of different tourism strategies need to be evaluated. Additionally, wildlife habitat restoration plans need to consider recent changes in forest management policies, as land use in surrounding uplands can have dramatic effects on wetland habitat by influencing nutrient and sediment loads.

Implementation of an effective restoration plan at Napahai needs to account for the interconnected nature of wetland habitat, local livelihoods, and governance. Understanding these relationships will yield context-relevant results that will facilitate the development of sustainable restoration and management strategies. Ultimately, restoration of blacknecked crane habitat could enhance the biological integrity of Napahai and promote sustainable livelihoods for those living near this globally important wetland.

Collaborators

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Publication

Lawrence, B.A., Wu Heqi, Liu Qiang. 2009. Restoration Notes: Developing an interdisciplinary restoration plan for Napahai wetland, Yunnan, China. *Ecological Restoration* 27(1):18-20.

Getting more from forests: The effects of management, competition and spatial characteristics on forest livelihoods



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This project empirically and theoretically explores the harvest of non-timber forest products (NTFPs) and the influence of management, intra-village competition and a forest's spatial characteristics on harvesting behavior. NTFPs are often common pool resources – community dynamics have important impacts on the livelihoods from their harvest. This work addresses gaps in our understanding of the relationship between forest dependence and community characteristics that inhibit better policymaking for conserving standing forests and enhancing livelihoods.

The first paper is an empirical investigation of village rules of use for harvesting matsutake mushrooms and the revenue they receive. I compare 13 villages from Himalayan southwestern China whose forests are managed either privately, as village commons or open access where anyone can harvest. This paper develops a revenue metric that allows us to compare villages side-by-side. Private access villages generally perform best but, surprisingly, open access villages capture more of their revenue potential than common-access villages. I then explore hypotheses that could explain this result.

The second paper uses individual data from the villages in southwestern China to investigate the effect of increased harvest density on labor allocation and profits from matsutake mushroom harvests. I use a theoretical model to derive hypotheses which I test econometrically with survey data from 256 households. Results reveal evidence that competitive pressure (village labor toward harvesting per km² of forest) may decrease harvester profits. Forest labor is negatively impacted by off-farm opportunity costs, but does not seem affected by competitive pressure, likely due to farmland constraints and a lack of off-farm wage-earning opportunities.

In the third paper, I develop a spatially-explicit theoretical model for harvesting forest products under profit-maximizing management and open access conditions with a constraint on labor or the depth of the forest. Through a numerical simulation, I compare labor and profit outcomes as livelihood metrics a) under the two institutional settings b) for a linear 1-dimensional forest model versus a circular 2-dimensional forest and c) with labor and distance constraints. The models show how labor constraints generally increase welfare in open access cases while distance constraints decrease welfare, and how profit maximizing management could negatively impact particular forest ecosystem goods and services.

Taken together, these studies provide new empirical evidence for how communities make decisions about resource use given their internal constraints and incentives. A simple assessment of the rules of use around forest products is not sufficient to judge wise management. Our theory implies that such an assessment is also not a good proxy for community profits or impacts to forest ecology. In the absence of rules, however, increased harvesting may have a negative impact on profits. Policy interventions should not force management on communities, but aim to better understand and help alleviate communities' constraints from deriving greater value from resource harvests.

Collaborators

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What are the main findings of the research?

First, this research develops a method for comparing how well communities maximize the value of their forest harvests and demonstrates this empirical relationship for villages in NW Yunnan that harvest matsutake mushrooms. I also develop new theory about villagers' travel paths throughout forests to harvest resources. Finally, I find that harvesting forest products does not seem to negatively impact agricultural production in the villages studied, but off-farm wage-earning opportunities do.

Were any of the findings unexpected?

We expected communities with open access to their forest products to perform relatively poorly compared to common access systems - as is predicted by the well-known "tragedy of the commons." However, the open access communities studied actually perform better than most villages' common access, suggesting villages do not develop or attempt to enforce rules when they are not necessary.

What should people take away from this research?

Rural communities manage valuable resources in strategic and mindful ways, even when education levels are low. We should rethink the role of external aid for such areas and focus on addressing barriers to better outcomes instead of assuming villages lack the capacity for self-management.

Publications

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Forging a harmonious middle path: The rise of social organizations and the persistence of the authoritarian state in China



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This project explains how non-governmental organizations have emerged in China and why they have not yet had the same character or effect of similar organizations in other parts of the world. Received wisdom suggests that the growth of civil society will serve as a strong challenge to authoritarian regimes. However, my field research focusing on organizations in three issue areas—environmental protection, HIV/AIDS prevention, and gay and lesbian rights—challenges this assumption. The research reveals that while leaders of NGOs in some polities might aim for broad-based political reforms, many in China do not. Those organizations which thrive in the short term have done so by adapting to the political environment, rather than working to change it. Although some authoritarian regimes have repressed domestic NGOs for fear that they would challenge their political monopoly, this is not necessarily so in China. I find that an NGO's success is most easily assured when it works in service of the state, joining with government actors to address vexing social problems. In some cases, the very existence of these organizations can therefore help embolden the state rather than undermine it. In other words, the regime might persist because of these NGOs, not in spite of them.

What are the main findings of the study?

While leaders of NGOs generally aim for broad-based political reforms, many in China do not. Those organizations which thrive in the short term have done so by adapting to the political environment, rather than working to change it. I find that an NGO's success is most easily assured when it works in service of the state, joining with government actors to address vexing social problems. In some cases, the very existence of these organizations can therefore help embolden the state rather than undermine it.

Were any of the findings unexpected?

Prior to the research, received wisdom (and my previous research) suggested that environmental NGOs enjoy the most political space of social organizations in China to engage in their work. In actuality, opportunities for these groups vary significantly across geographic area and time: when local governments believe green groups help meet their interests, they are allowed to operate freely, but when seen to work against these interests, they experience great difficulty in their work.

What should people researchers and policy-makers take away from this study?

Most outsider observers of NGOs (and environmentalism) expect China to be relatively closed to this work, because it is a closed, authoritarian state; but when these NGOs do emerge, observers anticipate a great political change to result. Both assumptions are incorrect. This is perhaps most important for those who believe political change and supporting work to protect the environment go hand-in-hand. Policymakers and aid agencies outside China, in particular, should be careful about expecting too much, too quickly when they provide financial and rhetorical support to these organizations.

Publications

Social Organizations and the Authoritarian State in China, forthcoming from Cambridge University Press.

“The Political Economy of Social Organization Registration in China,” *The China Quarterly*, December, no. 208 (2011): 970-989.

“Same-sex Marriage in China? The Strategic Promulgation of a Progressive Policy and its Impact on LGBT Activism,” *Review of International Studies*, 37 (2011): 1313-1333.

“Development and Division: The Effect of Transnational Linkages and Local Politics on LGBT Activism in China,” *Journal of Contemporary China*, 21, no. 77 (2012), forthcoming.

“Understanding the Challenges and Rewards of Social-Ecological Research in China” with J. Baumgartner, E. Doucet-Ber, B. Robinson, J. Van Den Hoek, and J. Zinda, *Society & Natural Resources*, forthcoming.

“Green Activism? Reassessing the Role of Environmental NGOs in China” with Jennifer L. Turner in *State and Society Responses to Social Welfare Needs: Serving the People*, eds. Jonathan Schwartz and Shawn Shieh (New York: Routledge, 2009).



Mosaics of change: Cross-scale forest cover dynamics in Tibetan Yunnan, China



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研究课题：调查滇西北林业植被再生与文化分布之间的关系

专长：地理信息系统，遥测，计算机编程，交互式地图

院系：地理学

导师：朱阿兴博士

In 1998, the Chinese Central Government introduced a logging ban as part of the Natural Forest Protection Program (NFPP) with the goal of dramatically increasing national forest cover. Since then, over 11 billion USD has been allocated, but the NFPP's success at promoting reforestation is unclear as neither the extent of forest change, nor the potential factors influencing forest change have been examined. This research employs a case study in the global biodiversity hotspot of northwest Yunnan Province, southwest China, to evaluate the spatial variability of forest change under the NFPP and investigate drivers that may have influenced patterns of change. While broad-scale remote sensing analysis shows rather stable forest cover since 1998, the local-scale analysis shows sometimes extreme inter-village forest cover change variability. This local-scale disparity cannot be ascribed to differences in village population or forest access, but is rather a consequence of nascent state-endorsed tourism projects, which asymmetrically benefit villages. Though all research villages continue to exploit local forests for firewood and timber relatively unfettered by policy restrictions, villagers with tourism money prefer to buy forest products collected in outside forests rather than harvest their own; this redistributes local-scale deforestation to the benefit of local and detriment of distant forests. Tourism is often heralded as the solution to rural development challenges in China's southwest, but this research shows unintended consequences that may result from inconsistent participation at the local-scale, consequences which merely redirect, not reduce, forest use pressures, and that are contrary to the goals of the NFPP.

Collaborators

Dr. Zhu Jianguo, Kunming Institute of Zoology

Dr. Ren Guopeng, Kunming Institute of Zoology

Prof. Patrick Hostert, Humboldt University-Berlin

Dr. Daniel Mueller, Humboldt University-Berlin

What are the main findings of the research?

At the prefectural, county, township, and local levels, indications of a temporal lag in policy implementation as well as an overall limited policy implementation effectiveness are apparent in forest cover change trajectories that often show peak rates of forest cover loss since the policies' introductions. Even though commercial logging enterprises left Diqing by 2000, there remains a considerably high rate of forest resource extraction albeit in a spatially redistributed manner compared to the pattern prior to the policies' introductions. Overarching forest resource scarcity, restrictions on customary forest resource use, and an influx of money from state-sponsored tourism activities collectively promote the spatial redistribution of harvest sites and, in some cases, an overall increase in the amount of forest harvesting, which have led to surprisingly high levels of forest cover loss at the local level despite NFPP restrictions.

Were any of the findings unexpected?

Local-scale findings concerning the limited impact of the NFPP and SLCP on changing forest cover changes are in line with previous research, though the mechanisms by which forest resource use and forest cover change sites have spatially distributed and influenced forest cover trends since the policies' introductions were unexpected.

What should people take away from this research?

People should take away the message that the success of recent state forest policies at promoting forest cover expansion has been highly spatially variable across the priority conservation area of Diqing Prefecture. This results from overlapping “green development” initiatives: a logging ban, a grain-for-green program, and the increase of state-sponsored environmental and cultural tourism. Collectively, these mechanisms produce locally differentiated and sometimes contradictory incentives for forest resource conservation and use, yielding diverse patterns of forest cover change.

Publications

Van Den Hoek, J., Baumgartner, J., Doucet-Beer, E., Hildebrandt, T., Robinson, B.E., Zinda, J.A. Understanding the Challenges and Rewards of Social-Ecological Research in China. *Society and Natural Resources*. Accepted.



2007 Cohort

Nutritional ecology of the Yunnan Snub-Nosed Monkey (*Rhinopithecus bieti*)



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Colobine monkeys are distinguished from other primates by their utilization of foregut fermentation to digest their food. As in ruminants, this dietary strategy increases the animals' ability to obtain energy from low quality foodstuffs. One of the most extreme examples of this is *Rhinopithecus bieti*, the world's highest-altitude-living primate, which lives at elevations of 3,000 - 4,650 m.a.s.l. in temperate montane conifer forests in the eastern Transhimlayas in southwestern China, and consumes a diet that consists largely of lichen. Lichen is considered an extremely poor-quality food, rarely consumed by mammals except when other foods are unavailable. Reindeer consuming lichen during winter lose body mass, likely due to lichen's low protein content and its tendency to depress intake. If *R. bieti* is as lichen dependent as several studies imply, this species exists at the extremes of primate, indeed, mammal, nutrient requirements. If, however, the lichen component of the diet is not as large as reported, this will have implications for the execution of ongoing habitat conservation efforts for the monkey. This study will evaluate lichen as a diet item for *R. bieti* and model the unique digestive process of colobine monkeys.

Collaborators

Xiao Wen, Dali College

Jiang Xuelong, Kunming Institute of Zoology

What are the main findings of the research?

Lichen is highly digestible, but contains compounds that inhibit microbial fermentation. As fermentation is an important step in colobine monkey digestion, *R. bieti* likely has microbial flora adapted to the lichen toxins they eat. In addition, a new method for estimating the digestibility of diets by colobine monkeys has been developed.

Were any of the findings unexpected?

It was not known whether the lichens consumed by *R. bieti* contained antimicrobial compounds, although other related lichens contain them. Currently, there is no method that can accurately estimate the digestibility of diets by colobine monkeys, and so the development of such a method will be a useful tool for scientists and captive animal managers to better understand the nutritional physiology of this group of monkeys.

What should people take away from this research?

Colobine monkeys such as *R. bieti* have a unique digestive system that enables them to make use of unusual fallback foods such as lichen. The digestive system of colobine monkeys is best modeled at particular pHs and fermentation lengths.

Landscape change in southwest China's Himalayan mountains: Implications for alpine meadows, forest ecosystems, and avian biodiversity.



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Land use and land cover change is the main cause of biodiversity declines worldwide, but its drivers and consequences are often unclear. China is undergoing massive land cover change, threatening the exceptional diversity of Northwest (NW) Yunnan, a biodiversity hotspot in the remote Chinese Himalayas. NW Yunnan is subject to many forces of change acting at multiple scales, and my overarching goal was to identify effective strategies of biodiversity protection in this rapidly changing region. To this end, I used satellite imagery to investigate the patterns and drivers of land cover change from 1974 to 2009, and I integrated ecological field data to further understand how the observed changes influenced biodiversity. My results showed that the two highest-diversity ecosystems in my study area were especially affected by rapid land cover change. First, old-growth forest logging accelerated despite the national logging ban, especially in areas of tourism development. Second, alpine meadows were rapidly colonized by rhododendron shrubs, driven by feedback mechanisms involving climate, fire cessation and overgrazing. Finally, I collected breeding bird and habitat data in six Tibetan sacred forest sites to understand the implications of forest clearing for Himalayan forest birds. Old-growth forests had the highest bird species richness, tree species richness, and bird abundance compared to all habitats we sampled, and the sacred forest patches provided habitat for a distinct Himalayan forest bird community. Interest at the local level in our bird research was so great that local collaborators and I published a bird field guide “A Handbook to the Common Birds of Shangrila”, that will be distributed widely in the region, especially to local schools and visiting tourists. The book is in Tibetan, Chinese, and English, and features 70 of the most common birds in the area, as well as Tibetan art and folktales about those birds.

Collaborators

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Han Lianxian, Department of Conservation Biology, Southwest Forestry University, Kunming, Yunnan, P.R. China

Publications

Brandt, J.S., T. Kuemmerle, H. Li, G. Ren, J. Zhu, V. C. Radeloff. Using Landsat imagery to map forest change in southwest China in response to the national logging ban and ecotourism development. *Remote Sensing of Environment*. Accepted.

Brandt, J.S., M.A. Haynes, T. Kuemmerle, Fang Zhendong, D. Waller, and V. Radeloff. (In review). Regime shift on the roof of the world: Alpine meadows convert to shrublands in the southern Himalayas. *Biological Conservation*. In review.

Brandt, J.S., Han Lianxian, Fang Zhendong, E.M. Wood, A. Pidgeon, V. Radeloff. Sacred forests are keystone structures for Himalayan birds in Tibetan China. *Conservation Biology*. In preparation.

Brandt, JS, Li Haomin, V. Radeloff. Tibetan sacred sites versus government protected areas for old-growth forest protection in Tibetan China. *Biological Conservation*. In preparation.

Brandt, J. S., and E. Barte. “A Handbook to the Birds of Shangrila”. Yunnan Minorities Publishing House. 266 pages. In press.

Cultural, socioeconomic, and environmental influences on Tartary Buckwheat (*Fagopyrum tataricum*) landrace diversity in Yunnan, China



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Crop genetic diversity is a necessary resource for the future adaptability of agricultural systems. Traditional farming communities are reservoirs of crop germplasm and farmer knowledge, and are particularly important in crop centers of origin. My research examines in-situ landrace conservation of a native Himalayan crop, tartary buckwheat (*Fagopyrum tataricum*) (TBW) in Yunnan, China. TBW farming in Yunnan is often associated with mountain agroecosystems and the Yi ethnic group. We wish to understand social, economic, and environmental factors underlying on-farm maintenance of TBW genetic resources, and test the importance of Yi ethnic identity in use, management, and valuation of TBW. Using a landscape genetics framework, we sampled a representative range of Yunnan agroecosystems where TBW is grown. We conducted household surveys and collected seed in 230 households across 45 villages. Survey responses will be analyzed with molecular genetic and spatial environmental data. Preliminary results indicate geographic overlap between Yi communities and mountain environments associated with TBW farming, as well as the persistence of Yi cultural rituals using the crop. Yi villages at high elevation appear to serve as sources of tartary buckwheat germplasm for lower elevation farms. Results indicate an overall downward trend in TBW planting, but farmers with commercial markets for the crop tend to plant more area. This study provides a theoretical basis for identifying priority areas for in-situ TBW conservation, and suggests the effectiveness of market-based and/or culturally targeted interventions.

Collaborators

Mr. Jiangchong Wu , PhD

Research Institute of Resource Insects, Chinese Academy of Forestry, Kunming, China

Professor Duoyi Peng, PhD

College of Development Studies, Yunnan University, Kunming, China

What are the main findings of the research?

TBW and Yi people tend to share an agroecological setting in Yunnan. Yi households maintain traditional practices that promote conservation of TBW genetic resources. Farmers with a commercial market for TBW tend to plant more. Markets will play a role in the future of TBW on the landscape, across ethnic groups.

Were any of the findings unexpected?

For some Yi groups, TBW's value for culturally prescribed uses may reduce their willingness to sell the crop.

What should people take away from this research?

Cultural diversity plays an important but often overlooked role in creating and maintaining agricultural biodiversity

Publication

Saunders, M. (2010). Losing ground: An uncertain future for buckwheat farming in its center of origin. In V. Zotikov & N. Parakhin (Eds.), *Advances in Buckwheat Research - Proceedings from the 11th International Symposium on Buckwheat* (pp. 60-68). Orel, Russia: All-Russia Research Institute of Legumes and Groat Crops.

Understanding conservation management and tourism development in China's protected areas



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研究课题：中国自然保护区自然保护管理与旅游开发制度研究

院系：社会学、社区与环境社会学

Tourism development is transforming China's parks. My dissertation is about how China's conservation institutions are changing and the impacts of these changes on resource conservation and rural development. Between 2008 and 2011, I interviewed participants in policymaking processes; conducted in-depth case studies of two differently managed protected areas, supplemented with household surveys in five affected communities; and examined the management models of six other major protected areas with different conservation targets and tourism operations. In Yunnan, as domestic actors have gained financial and scientific resources, international conservation organizations have lost much of the leverage they once had, while local governments and expert tourism planners increasingly direct protected area development. A second chapter examines how, in China's context of high pressure for local economic growth, local governments aggressively promote nature tourism, usually through models built around bus tours operated by state-affiliated companies. These operations displace smaller-scale concerns often run collectively by residents of rural communities and channel revenues to local state investment projects. Tourism operations seldom contribute directly to conservation management. The remaining chapters examine how, in one park that has converted this management model and one in which residents operate tourism, residents' resource use, livelihood diversification, and levels of inequality vary.

In 2011, with the support of a linkage grant from the Biodiversity Conservation in Southwest China IGERT program, I worked with Chinese collaborators to design and conduct a survey in five villages in two protected areas, addressing questions about incentives and institutions in conservation. A central argument in the literature on alternative livelihoods and payments for ecosystem services is that tourism can provide a source of income that either substitutes for benefits from farming and resource withdrawal or helps make residents accept foregoing these practices. Institutionalist scholarship, on the other hand, focuses on the kinds of rules present and the residents' roles in making and enforcing those rules. Our findings show how residents' livelihoods vary across villages differently situated in relation to tourism. To the extent that tourism is a substitute for other activities, it is because of its labor requirements—but villagers with tourism income often hire labor to maintain other practices.

Collaborators

Yang Jianmei, Faculty of Ecotourism, Southwest Forestry University

Cheng Hai, Ph.D., Faculty of Ecotourism, Southwest Forestry University

Xue Ximing, Ph.D., Faculty of Ecotourism, Southwest Forestry University

Ye Wen, Ph.D., Faculty of Ecotourism, Southwest Forestry University

What are the main findings of the research?

- The leverage that transnational NGOs exert on protected area management depends on the demands of provincial and local governments. While they have limited impact on protected area organization, NGOs have an important consulting role in policy development and staff training.
- Protected area tourism operations have largely switched from community-managed enterprises to monopoly operations run by companies affiliated with prefecture-level governments. While local authorities emphasize conservation in word, they often transfer revenues from tourism to infrastructure projects outside protected areas rather than reinvesting them in conservation. As a result, promoting active conservation management depends on provincial conservation agencies.
- The effects of tourism development on rural residents' incomes and resource use activities depends on how tourism is organized. Collective organization creates more evenly spread income within village, whether managed by residents or by a company that employs them.

Were any of the findings unexpected?

- The findings on NGOs contrast with literature portraying NGOs as heavy-handed agents of hegemonic globalization, showing their particular capacities in context.
- The local growth coalition dynamics I found operating in local governments are commonly seen in urban areas but unexpected in rural areas, particularly in protected areas without liberalized land markets.
- The community-level findings show that, contrary to common statements in scholarship on conservation and development, resident-led operations may be neither sufficient nor necessary to secure development and conservation goals.

What should people take away from this research?

- Promoting biodiversity conservation requires a multi-pronged approach, engaging the interests and capacities of government agencies at different levels.
- Tourism development generates resources that can support conservation, but ensuring that those resources support conservation is difficult because the people who oversee tourism have weak incentives and knowledge related to biodiversity.
- Income from tourism is itself insufficient to cause households to change resource use, and there are trade-offs to different ways of organizing tourism operations.

Publications

Zinda, John Aloysius. 2011. "Hazards of Collaboration: Local State Co-optation of a New Protected-Area Model in Southwest China." *Society & Natural Resources* 25(4):384–399.

Van Den Hoek, Jamon, Jill Baumgartner, Elena Doucet-Ber, Tim Hildebrandt, Brian Robinson, and John Zinda. Forthcoming. Understanding the Challenges and Rewards of Social-Ecological Research in China. *Society & Natural Resources*. Accepted 2 November 2011.

Zinda, John A. Under Review. "Taking an Idea and Running with It: How State-Driven Tourism Development Affects Resident Welfare and Biodiversity Conservation in Southwest China." Submitted to *Organization & Environment*. Under review.



2008 Cohort

Household biogas in China: Opportunities to facilitated sustained usage



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Chinese laws and policies promote the construction of rural household biogas digesters for diverse social and environmental reasons ranging from rural development to greenhouse gas emission reductions. Over the last decade, China has significantly increased the scope and funding of household biogas programs, but in its support of biogas, China has concentrated on increasing the number of biogas digesters constructed. Because farmers abandon digesters for varied reasons, if the central government expects biogas programs to have significant social and environmental benefits, it needs to promote not only the construction of biogas systems but also the sustained usage of these systems. It could do so by providing economic incentives for complete-system installment and maintenance and by monitoring and evaluating methods for improving biogas usage.



Monitoring landcover change in a rapidly expanding region of western China in the post-reform period



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Department of Zoology

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Due to a combination of economic growth, industrialization, and rural-urban migration, China's landcover has changed at astounding rates over the last two decades. Nearly all primary forest is gone in densely-populated eastern coastal China, but China's southwest still retains unique and diverse ecosystems. However, these ecosystems are highly threatened, as cities expand and roads fragment natural areas. The process of deforestation and fragmentation can be complex, having both spatial and temporal components. Remote sensing has emerged as a powerful tool to monitor rates and patterns of landcover change. To deal with high temporal and spatial variability as well as complex, multi-signature classes within forests, this research presents a newly developed approach that exploits the multi-seasonal information in dense time stacks of Landsat imagery. The method relies on a supervised classification that exploits training data of stable/changed areas interpreted from Google Earth images, and a 'brute force' approach of providing all available Landsat data as input, including scenes with data gaps due to the Scan Line Corrector (SLC) problem. This research is part of an ongoing initiative to monitor the rates and patterns of forest cover change outside of Kunming, China. Remotely sensed data are used to map land cover change in the region, and spatial pattern metrics are exploited to measure fragmentation of forests. Initial results indicate that forests in the region have experienced significant changes in the last decade, following trends observed in eastern China during the same period.

Collaborators

Annemarie Schneider, University of Wisconsin-Madison

Yang Xiaojun, Kunming Institute of Zoology

Publications

Van Den Hoek, J., Baumgartner, J., Doucet-Beer, E., Hildebrandt, T., Robinson, B.E., Zinda, J.A. (Forthcoming)

Understanding the Challenges and Rewards of Social-Ecological Research in China. *Society & Natural Resources*.



Climate-driven change in phenology, pollination and distribution of Himalayan rhododendrons



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Unsurpassed rhododendron diversity, dominance, and beauty in the eastern Himalaya make the genus iconic for scientists, horticulturalists, and indigenous peoples. Informal observations by all three of these groups suggest that rhododendron flowering patterns (phenology) are changing with the rapid effects of climate change experienced in the Himalaya.

Hundreds of years of indigenous knowledge and more than a century of collections from Western plant hunters comprise a baseline from which to analyze the long term effects of climate change on the genus and its characteristic and distinctive distribution and phenology. As distribution and phenology change, so too do (a) pollination and reproduction, and (b) the function of this genus as a keystone to plant communities, pollinators, and the indigenous peoples. To these people, rhododendrons are ritual objects, medicinal plants, honey sources, wood for fires and craft, and key indicators of seasonal change, timing agricultural and livelihood cycles.

My thesis examines how phenology, pollination and reproduction of rhododendrons are being altered by a changing climate on Yulong Mountain in Northwest Yunnan, PRC. To accomplish this, I am taking field measurements of distribution, phenology, and climate; gathering historical phenological and pollinator data from museum and herbarium collections worldwide; and conducting ethnobotanical interviews about traditional phenological knowledge of local peoples. Together, these will help to elucidate the intricate spatial and temporal patterns of rhododendron species, and how climate-driven change in these patterns affects plants, pollinators, coevolutionary synchronization, and plant-people interactions.



Oblique paths to environmental protection in rural southwest China: How law and local leadership shape citizen choices



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Only a Shadow of the Law: Environmental Regulatory Failure and the Future of Yunnan’s Polluted Plateau Lakes

My primary, qualitative dissertation research asks how poor, rural citizens identify an environmental harm, who they blame for that harm, and how they then choose to take action. I explore the consequences of this process for those citizens and for institutional development and social stability in China, and also consider what it means for China’s environmental future. There has been a rapid expansion of both regulations and legal institutions to manage environmental damage. Scholars and policymakers are currently emphasizing legal institutional expansion as a tool remediate and prevent pollution. My research among villages on the shores of five polluted lakes in Yunnan shows this expansion not only contributes little to efforts to manage and remediate pollution, but instead has exacerbated environmental harm.

Law as a concept of justice and as a method to navigate disputes has been appropriated by local economic and political actors, who use new regulations to control villager behavior—such as crafting fishing bans to prevent villagers from consuming fish being bred by a large fish farm, rather than in order to protect a lake’s ecological balance. Villagers identify law as being another method of political and economic control by these more powerful actors, rather than as a way to seek remediation or protection from the pollution. This then further empowers the polluters and undermines the capacity of law to be a tool to prevent pollution in the future.

Gatekeepers of Rural China: The Role of Village Leaders in Environmental Policy Implementation and Environmental Activism

After completing a majority of my qualitative research, some patterns and questions emerged. This second collaborative project was aided by an IGERT linkage grant, which included a mostly quantitative survey. How do villagers understand environmental pollution and potential health consequences? And how do village leaders function as gatekeepers for information, policies, and complaints between villagers and local government and shape perceptions? Village leaders link villagers and government, but there has been little research about their roles in influencing environmental management challenges, nor have comparisons been made between their perceptions and actions and those of villagers within their communities. In order to further explore these questions and patterns, I collaborated with several Chinese scholars and a colleague from the University of Wisconsin–Madison to conduct a survey of villagers’ and village leaders’ understanding of health, environment, and governance in rural Yunnan, Hubei and Jiangsu provinces. This study utilized a two-level stakeholder approach at the local level, unique in contemporary Chinese political research.

Publication

“Compensation in the Shadow of the Law at Yangzonghai: Legal Reform, Interested Actors and Pollution in Yunnan’s Lakes.” Notes from the Field, *China Environment Series 12—Special Energy and Water Issue* (forthcoming).

2009 Cohort

Wetland change at Napahai using fine-scale remotely-sensed data: applications for conservation, management and policy analysis



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The wetland of Napahai is located on the Zhongdian plateau and is a mountain-valley wetland with seasonal and annual fluctuations in water extent and inundation period. The wetland hosts >90% of the central wintering population of Black-necked Cranes, a migratory species of concern protected nationally and internationally. Immediately adjacent to the urban center of Xianggeli-La (Zhongdian), Napahai is also very important to local human communities who utilize the wetlands for agriculture production and domestic animal grazing. The proposed work attempts to quantify the amount of wetland change within Napahai between 1975 and 2010 for the following applications: (1) quantify the amount of wetland gain or loss in Napahai and adjacent wetlands (2) link the distribution of wintering Black-necked Cranes to land cover classifications derived from satellite imagery and (3) use these identified change patterns to assess the evaluation of multiple national policies aimed at the conservation of wetland systems and their efficacy at Napahai. With partners at the Kunming Institute of Zoology, this work will build on wetland change estimates calculated at the national level, address gaps in current knowledge regarding Black-necked Cranes habitat selection patterns in and around Napahai and provide the tools to evaluate ongoing use practices within the Napahai basin.

Collaborators

Professor Yang Xiaojun, Kunming Institute of Zoology

Dr. Wu Heqi, Kunming Institute of Zoology

Dr. Li Fengshan, International Crane Foundation

Dr. Eric Wood, University of Wisconsin-Madison

What are the main findings of the research?

Analysis and interpretation are still in the preliminary phase, but some interesting findings have been made. In addition to wetland areas lost in China since 1975, there have also been many wetlands created due to the construction of water reservoirs and dams. The impact of these created wetlands on wintering Black-necked Cranes is currently unclear, but reports from colleagues in the area indicate that they are used by the birds and could help explain the growing number of Black-necked Cranes counted in regular surveys for the species.

What should people researchers and policy-makers take away from this study?

The socio-political, economic and ecological change that is occurring in China is happening at an unprecedented rate. This research attempts to use large, charismatic waterbirds with a great deal of cultural significance to gain insight into how dynamic wetland environments are changing in China and how future changes may affect waterbird and human users of these systems. The hope is that the conclusions of this work can inform policy makers, resource managers and conservationists on more sustainable and efficient uses of wetlands in southwestern China.

Publications

Burnham, J. and E. Wood. A first record for Woolly-necked Stork (*Ciconia episcopus*) in China. Submitted to Forktail January, 2012.

Regulating China’s sustainable development: Agricultural governance and natural disaster management in southwest China



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Advisors: Professors Edward Friedman and Melanie Manion

An enduring question in the social sciences is whether decentralized governance arrangements help or hinder environmental and regulatory outcomes. Existing explanations suggest that multiple governmental and societal actors working together can forge partnerships and provide accurate local knowledge, but fall short in explaining how such arrangements overcome free riding and blame avoidance. The politics of food safety and natural disaster management in southwest China represent a genuine test case for evaluating the effects of decentralized versus centralized governance structures. Local prefectural and municipal-level governments in Yunnan have adopted varied regulatory arrangements to manage food production and processing in their localities. As a result of the province's persistent drought --- the worst since the 1950s --- Yunnan's prefectures differ in the degree of decentralization of agricultural and natural disaster governance. In areas of Yunnan where the drought is most severe, such as Qujing prefecture, the central government has taken “command-and-control” authority where centralized bureaucracies directly issue mandates for environmental and agricultural regulation. In places such as Diqing prefecture, where the effects of the drought are less pronounced, regulation of farming and animal husbandry is largely decentralized. This provides a natural laboratory for comparing the effects of different regulatory arrangements on the production and processing of food products.



Evolution, pollination biology and ethnobotany of *Rhododendron* in the Himalayas of Yunnan Province, China



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This research aims to document some of Yunnan's many wonders, before development further threatens the resources that make Yunnan unique. To do this, fieldwork is conducted in four prefectures (Lijiang, Diqing, Nujiang, Dali; Fig. 1) which have been chosen on the basis of biodiversity and ethnic diversity. These prefectures were well explored in the late 1800s and early 1900s, but since that time there have been few studies and an increase in industrialization of the area warrants updated research. Many alpine species are poorly known, including those of the vast genus *Rhododendron*, which has its greatest diversity in the Himalayas (Goetsch et al. 2005). *Rhododendron* is thought to have speciated rapidly (Milne et al. 2010), yet sufficient studies of drivers of speciation in this genus are lacking. In addition to incredible biodiversity, Yunnan contains 25 of the 56 ethnic minorities in China, thus making it the perfect location for an ethnobotanical comparison of knowledge about rhododendrons within and among different ethnic groups. Unfortunately, similarly to alpine biodiversity, the uniqueness of these ethnic groups appears to be diminishing due to development causing assimilation in rural areas (E.G. pers. obs. 2011).

The objectives of this research are to 1. produce a well resolved backbone phylogeny of *Rhododendron* L. subgenus *Hymenanthes* (Blume) K. Koch and determine the monophyly of subsection *Neriiflora* Sleumer, 2. study the pollination biology of three species in subsection *Neriiflora* and map characters to look at evolutionary patterns associated with pollination biology, and 3. compare the ethnobotanical knowledge relating to *Rhododendron* within and among ethnic groups and determine whether this knowledge is threatened.

Collaborators

Kunming Institute of Botany (CAS)

Royal Botanic Garden Edinburgh, the Yunnanese



Economic development and changing croplands: A survey of local livelihood strategies in southwest China



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My project is chiefly concerned with charting transformations in the livelihoods of Nakhi farmers who have been recently divested (both voluntarily and involuntarily) of their croplands. This project will explore the indigenous Nakhi farmers' capacity for resilience in the face of disturbances caused by both the implementation of new government policies as well as private economic activity in Lijiang, a region in southwest China. More specifically, I plan to explore how changes in livelihood strategy have acted as response to transformation in the utilization of croplands over the last three decades. The goal of this study is to identify the forces at work in the determining of cropland change, and corresponding transformations in household livelihood strategies. It asks three interrelated questions: 1. How have government policies (esp. land reforms) impacted Nakhi farmers' livelihoods over the last three decades? 2. Are Nakhi farmers content with these processes of land reform? 3. What kind of livelihood strategies have local Nakhi farmers employed to adjust to cropland transformation?



A study of economic development initiatives in Yunnan Province upon the Mosuo traditional environmental knowledge, livelihood strategies, land use, and governance

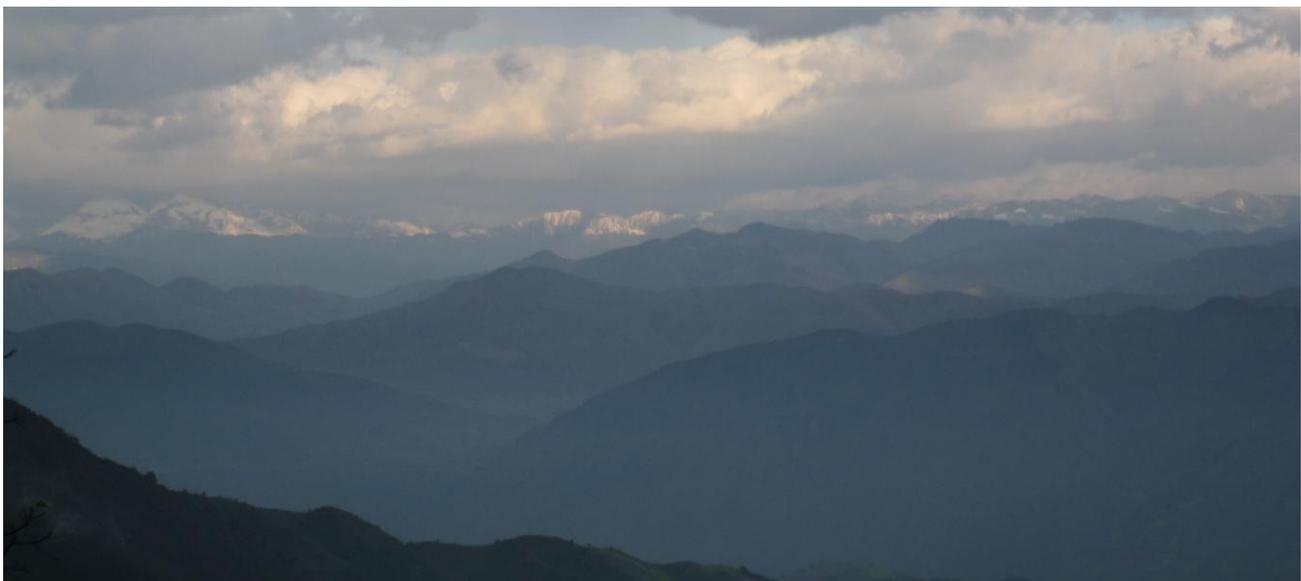


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As Yongning's cash economies grow from increased out-migration and tourism, traditional Mosuo subsistence agricultural and pastoral practices must conform to these new labor and land use demands. I will document how changes in physical, social, political, and economic landscapes shape and are constructed by cultural shifts as traditional economic production meets new livelihood strategies. For over 1,600 years the matrilineal Mosuo have resisted radical changes in kinship structure yet today members of matrilineal, extended, consanguineous households are entering into conventional marriages and forming nuclear households with profound consequences for land and labor use, economic production and consumption, and social, political, religious, and biological reproduction. As they accelerate contact with patrilineal societies, I hypothesize that Mosuo men will begin dominating decisionmaking with far-reaching consequences for Mosuo traditional, sustainable livelihood practices and its unique culture.

Collaborators

Dr. Gang (James) Chen, Executive Director, Center for Social and Economic Behavior Studies, Yunnan University of Finance and Economics



Part Two: Associates 2007-2012

Biocultural diversity of tea production and consumption systems in Yunnan, China



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Persistence and Change of Butter-Tea Food Systems in Tibetan Yunnan

This study explores the persistence and change of butter-tea food systems in rural Tibetan communities in northwest Yunnan in response to socio-economic and political change. Surveys were implemented to identify components of traditional butter-tea food systems that have persisted and changed and, to examine the consequences of these patterns for land use and community health. Research was carried out between 2008-2010 in three Tibetan communities of Upper Adong, Reshuitang, and Hanpi in the Qinghai-Tibetan Plateau in Diqing Tibetan Autonomous Prefecture in northwest Yunnan, China. Participant observation and open-ended and structured interviews were carried out to understand dietary diversity, land use, socio-economic, and community health dynamics. Findings support that increased market integration has clearly impacted diet, nutrition, and wellbeing at the study sites. The partial adherence to butter-tea diets can be attributed to local preference, cultural identity, accessibility, and adherence to Tibetan Buddhist worldviews and practice. This study provides an example of how worldviews influence land use, dietary choices and associated wellbeing. It further provides an example of the integral role of commodity networks in the distribution of quality product. Lastly, long-term prospects of butter-tea food systems are discussed.

Variation of Cultural Resilience and Adaptation in Tea Commodity Networks with Increased Market Integration in the Highlands of Yunnan, China

This paper assesses the persistence and change of traditional tea (*Camellia sinensis* (L.) O. Kuntze; Theaceae) production and consumption practices and commodity networks in indigenous montane communities in southwest and northwest Yunnan, China. It examines how cultural resilience and adaptation of montane communities vary spatially in the highlands of Yunnan by tracing tea through commodity networks. Semi-structured interviews were conducted from 2007 to 2010, over a period corresponding to a regional tea market boom cycle, to determine producer and consumer responses to expanded tea commercialization. Increased market integration of tea agro-forests in southwest Yunnan is associated with reconfiguration of land use, intensified management, reorganization of labor structures, generation of knowledge and product innovation. Resilience of indigenous agro-forest managers to state reforms calling for monoculture plantations and introduced cultivars, and adaptation of livelihood strategies and social networks, have allowed communities to take advantage of emerging market opportunities. Increased market value of tea in northwest Yunnan has redirected quality tea to urban areas and reduced the quality of tea available in montane areas. Concurrently, increased market integration has been accompanied by new dietary choices. While traditional tea producing and consuming communities variably adapt to socio-economic and political change, findings in both areas indicate the reorientation of values toward market-based ideologies and present risks to the social institutions that support environmental and human health.

Collaborators

Professor Long Chunlin, Kunming Institute of Botany, Chinese Academy of Sciences

Professor Xue Dayuan, Chinese Ministry of Environmental Protection

Yang Lixin, Kunming Institute of Botany, Chinese Academy of Sciences

What are the main findings of the research?

Increased market integration into national and global economies has impacted diet, nutrition, and wellbeing at the study sites. The partial adherence to butter-tea diets can be attributed to local preference, cultural identity, accessibility, and adherence to Tibetan Buddhist worldviews and practice. Increased market value of tea in northwest Yunnan has redirected quality tea to urban areas and reduced the quality of tea available in montane areas. Concurrently, increased market integration has been accompanied by new dietary choices.

Were any of the findings unexpected?

Communities and members within a community variably adapt to socio-economic and political change. Age, accessibility to commercial centers, and adherence to Tibetan Buddhist worldviews and practice are notable factors determining adaptation to socio-economic and political change.

What should people take away from this research?

While communities variably adapt to socio-economic and political change, findings indicate the reorientation of values toward market-based ideologies and present risks to the social institutions that support environmental and human health.

Publications

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The social, economic and ecological effects of community-based ecotourism development in NW Yunnan



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This paper surveys the impacts of an ecotourism project initiated by The Nature Conservancy (TNC) in the Lashihai watershed nearly 10 years after it was initiated in 2001. Several possible effects are hypothesized, including a positive income effect, negative income effect, secondary benefits effect, regulation effect, and information effect. The results indicate that the strongest effect has been beneficial to conservation and derives from income earned from tourism (and is associated with an increase in the watershed's protected migratory bird population), but not through the mechanisms expected by TNC. The paper concludes that given the uncertainty of development patterns in China, NGOs' most important contributions may often be the broad-based capacity building and training programs they sponsor and organize, as opposed to the specific conservation projects they initiate.

The main finding of the research conducted is that horseback riding tourism exploded in the Lashihai watershed since 2002. Villagers report that this development has enabled and encouraged the local communities to live more in "harmony" with the migratory bird population, which previously had been seen primarily as a threat to local agriculture. This horseback riding was not planned for or anticipated by TNC's tourism planning process, although several local people who participated in eco-guide training programs organized by TNC are directly involved in the growing business. Building on their training experiences, they have been working to maximize the environmental benefits of this new industry while minimizing its environmental costs. Several other developments in the watershed further demonstrated the value of TNC's training programs, and the importance of capacity building programs more generally, as local people who participated in these programs have become important leaders and entrepreneurs in the region. They described how these programs gave them both the knowledge and confidence to work on and encourage stronger conservation efforts in Lashihai, Wenhai, and Lijiang. This is surprising because the capacity building efforts were originally envisioned as means to particular ends – supporting specific project objectives – but they ultimately became useful ends in themselves.

Collaborators

The Nature Conservancy, Lijiang County Tourism Bureau, Lashihai Nature Reserve, Yulongxueshan Nature Reserve, Lijiang Xintuo Ecotourism Company, Lashi Township, Wenhai Administrative Village, Yunnan Academy of Social Sciences.

Characterizing urban expansion in Kunming after post-reform era



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In order to understand the urban expansion during post-reform era in Western China, this work investigated the urbanization range from small-sized, medium-sized cities and the large city Kunming in Yunnan Province as a case study for exploring urbanization of hierarchy under institutional shifts. By using remotely sensed images in multiple time points, the study covers three aspects quantitatively and qualitatively: a) monitor and characterize urbanization by applying remote sensing and spatial analysis; b) investigate land use changes and land development in small towns and peri-urban regions; c) explain rates and patterns of urbanization based on variations in socioeconomic structure, policy initiatives and land management, infrastructure development, domestic and foreign investment. The research find that urban expansion in Kunming follows a similar restructuring of coastal cities in a smaller extent and slower rate, while different institutional impact shapes the new built-up area in a different way.

Collaborator

L. Yimin, Associate Professor, Institute of Geography, Yunnan University

What are the main findings of the research?

My results revealed some characteristics of spatial and socioeconomic restructuring in Kunming. The rate of expansion shows the city did not change much from 1988 to 1995 and expanded significantly from 1995 to 2000. Large infrastructure construction before the Horticulture Expo should have positive effects on development. On the other hand, the industrial parks were once regarded as an effective way to attract entrepreneurial investment and foreign direct investment where the local government provided a favorable land tenure or tax reduction for companies. Nonetheless, urban expansion was constrained after 2000 for all types of parks (industrial, high-tech, or economic zone). This indicates that planned industrial zones may not always succeed to improve development.

Were any of the findings unexpected?

The impact of favorable policies on urban expansion is ambiguous in Kunming. Favorable policy from central government did not always work for development as well as domestic and foreign investments usually keep uncertain on how to affect urban growth.

Neither host nor guest: Reconfiguration of space, ethnicity and the politics of performance in southwest China



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I am a cultural anthropologist studying performance and its relation to social changes. My dissertation investigates the ways Han and non-Han groups engage in the placemaking process in the Old Town of Lijiang, a famous UNESCO world cultural heritage site located on China's southwest "frontier." How the diverse touristic performances in Lijiang convey the multiple meanings of a place becomes my thematic question of my dissertation research. In my research, Lijiang is more than a homeland of Naxi ethnic minority people; it is portrayed as a place of encounters for Han and Non-Han groups. By exploring the lives of Lijiang's indigenous residents, settlers, migrant workers and tourists, I aim to understand how the different groups of performers have become the agents on the stage to present Lijiang as their home on the "Non-Han frontier." I also inquire into how the different performers' off-staged lives have actually disrupted their sense of taking Lijiang as a home. I seek to address the reconfiguration of the relationship between people and home in Lijiang, and southwest China at large, due to the increasing flows of people, capitals, and touristic imaginations.

Collaborators

Center for Studies of Chinese Southwest's Borderland Ethnic Minorities, Yunnan University

Tibetan medicinal plant management and ethnobotany, conservation projects that involve Tibetan doctors



Jennifer Dinaberg
Geography, University of Colorado

My research investigates projects that incorporate Tibetan doctors and other herbal medicine practitioners in medicinal plant management in order to understand how these two stakeholders collaborate with one another and are affected by their relationship with each other. The medicinal plant conservation projects that I have studied attempt to include the knowledge of herbal medicine practitioners in environmental management and stimulate them to lead community-based conservation initiatives. Project's designers have argued that Tibetan doctors and other herbal medicine practitioners are natural conservation allies and can serve a critical leadership role in community-based conservation initiatives. However, my results show that participants can feel that they did not have leadership roles in relationship, do not see themselves as plant stewards or conservationists, and are uncomfortable with teaching villagers about medicinal plant conservation. While participants were supportive of the project, they wanted the project to be more focused on village healthcare needs and the transmission of Tibetan medical knowledge, wherein medicinal plant conservation is an integral component of the project as opposed to the only focus.

Many aspects of my findings demonstrate that the relationship between markets and management of wild medicinal flora is not well understood and requires further investigation. Business models used in the projects introduce new strategies for cultivating and trading medicinal plants in these villages that do not take into account how medicinal plant management is currently handled in these villages. They also are not based on commodity chain analyses. Instead, they are premised on the assumption that producing certain marketable species at a larger scale will pose viable and environmentally sustainable sources of income for participants as long as, in the words of one implementer, "we find a way to bring the market to the village."

Identity politics play an important role in collaboration among scientists and medical practitioners. For the medical practitioners, the origin of one's training as well as their medicinal plant knowledge and their application of this knowledge in treating patients is a point of contention and a significant stumbling block in regional collaborations among doctors. Moreover, the identity of the plants themselves was also conceptualized in many different ways among my informants. The meaning and commodification of a "Tibetan" plant versus just *a* plant or Chinese medicinal plants and the implication of these conceptualizations for how plants were marketed, managed and protected was a grey area in the understandings of project implementers and participants. These perceptions not only have implications for the meaning and commodification of these plants, but also for the rules governing intellectual property and bioprospecting.

Linkages between habitat and aquatic macroinvertebrate biodiversity in a circum-Himalayan glacier catchment: A case study of a Mekong River headwater



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Examining glacial headwater habitat mosaics and aquatic macroinvertebrate ecology is crucial due to the large percentage of the world's population relying on freshwater stored in mountain reserve ice. At a global scale, basic mountain aquatic biological reference data is key to developing a Biological Condition Gradient (BCG) model. Yet, basic research to identify species and assess water pollution is lacking even in the western United States where damming and diversion can be found on streams draining more than a few tenths of a km² (Heinz Center, 2002; Wohl, 2006). Reference conditions can still be found on the edges of the Tibetan Plateau in the Three Parallel River region, a biogeographic mountain corridor linking several biogeographic realms in Asia. Glacier headwater streams in other alpine regions of the world have been well studied (i.e., Alaska and European Alps), yet there has been minimal investigation in the eastern Himalayas (Füreder, 2006). This leaves a large gap in pristine habitat and unknown aquatic invertebrate data, which could represent top-tier biological bioindicators of environmental change and habitat rehabilitation reference sites. ARISE, an alpine stream management system based on water source contributions of krenal, kryal, and nival water (Brown, et al) links physiochemical properties of alpine streams to invertebrate communities. This study examines additional linkages of surrounding habitat variables to physiochemical and biological properties. The basis for an expanded application of the ICI indices and headwater classification in an alpine region is being evaluated. "Why do we see differences in extreme coldwater benthic macroinvertebrate communities in Alaska, Europe, New Zealand, and the Mekong headwater region?" and "How do we incorporate invertebrate cold tolerance physiology, geologic data, and insect life cycles into a biological condition gradient?" are questions being examined based on initial findings. The answers will aid in the development of a global mountain Biological Condition Gradient model that could be utilized to protect mountain water resources around the globe.

Collaborators

Professor Yao Tandong, Chinese Academy of Science Institute of Tibetan Plateau Research, Beijing, China

Professor Yang Yongping and Yang Zhiwei, Chinese Academy of Science Kunming Institute of Botany Research, Kunming, China

Professor He Yuanqing, Chinese Academy of Science Yulong Xueshan Glacier Research Station, Lijiang, China

Professor Wang Genxu, Chinese Academy of Science Institute of Mountain Hazards and Environment, Mt. Gongga Research Station, Chengdu, China

What are the main findings of the research?

Seasonal shifts in glacier melt results in varying habitat mosaics supporting different biological communities. This, in combination with the spring and snow-melt stream habitats found in glacierized catchments contain a high degree of beta diversity. These are locations where population and tourism development pressures are threatening pristine habitats housing potentially rare and endemic biodiversity.

Were any of the findings unexpected?

My research over the last three years in the Chinese circum-Himalayas has resulted in a glacierized catchment benthic invertebrate community structure that differs from the Milner & Petts model (1994). Species are exhibiting cold tolerance in the Mingyong glacier mainstem, with a comparatively higher community diversity close to the glacier at year round low

water temperatures.

What should people take away from this research?

Tibetan and other cultural traditions signify sites as sacred. Sacred spring sites in this research have been found to contain sensitive taxa. Sacred beliefs in mountain regions could be a key headwater management conservation measure to be explored in greater depth.

Publications

Fair, H. 2010. Headwater Landscape Variations and Biodiversity: Applicability of Ohio Habitat Indices in a Glacier Catchment of the Mekong River. Thesis. The Ohio State University.



Uncovering matsutake (*Tricholoma matsutake*) harvester livelihood preferences in Yunnan, China



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The commodification of natural resources affects how we interact in a global society, with neighbors and with the land. Japanese consumption of matsutake mushroom has exceeded the supply from their domestic forests to the point where they now import more than they produce. For this study 126 matsutake harvesters in Yunnan, China completed Conjoint Choice Experiment surveys that were used to indirectly uncover how matsutake harvesting livelihood priorities were relatively valued. Survey data was analyzed using Latent Class Analysis which uncovers groups of respondents based on their answers. Four classes of harvesters were uncovered. Three of four classes showed preferences similar to their current conditions. Between four different matsutake harvesting livelihood priorities harvesters did not consider biodiversity or market selling price to be important. Instead annual income from matsutake and harvesting regulation schemes were their focus.

Collaborators

XU Jianchu, HE Jun, YANG Xuefei, YANG Xueqing of the World Agroforestry Centre, Centre for Mountain Ecosystems Studies & Kunming Institute of Botany
HU Xiping of China Agricultural University

What are the main findings of the research?

Matsutake as a natural resource in Yunnan has a wide spectrum of regulation. When presented with different hypothetical harvesting livelihood arrangements the majority of matsutake harvesters in Yunnan, China chose livelihood conditions similar to their current situation. These harvesters were mostly focused on harvesting regulations schemes when considering livelihood scenarios. About one-third of the survey looked for scenarios with higher seasonal income and no restrictions on harvesting days so they could pick seven days a week.

Were any of the findings unexpected?

Market selling price was hypothesized to be an important livelihood consideration for matsutake harvesters. The insignificance of market selling price indicates that harvesters in Yunnan Province are price takers with little bargaining power in the market. It was also hypothesized that more matsutake harvesters would desire higher incomes and choose harvesting regulations schemes such as private management that could yield higher income. It turns out harvesters had varying opinions about which regulation schemes were best, and income was not the main criteria. As mentioned before, most chose scenarios similar to what they currently experienced.

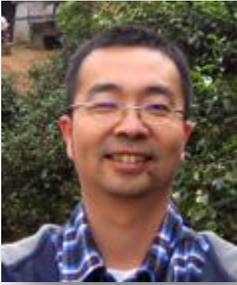
What should people take away from this research?

Non-timber forest product harvesters such as matsutake harvesters should be consulted when imposing new regulation schemes such as the National Forest Tenure Reform Program. Forest users will be slow to adopt and abide by new regulations. Understanding and explaining the tradeoffs of various regulation schemes could help improve adaptation and success of forest tenure implementation, especially if livelihood-dependent stakeholders are involved in tenure design. Additionally cooperation among harvesters could improve their market bargaining power.

Publication

Geslani, Cheryl. (2009). Uncovering matsutake (*Tricholoma matsutake*) harvester livelihood preferences in Yunnan, China. Thesis, University of Hawai'i at Mānoa. Ann Arbor: ProQuest/UMI. (Publication No. AAT 1468495.)

Mountains of green gold: Tea production, land-use politics, and Bulang people in southwest China



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I am a human geographer, who uses agricultural practices as a lens to investigate the relations amongst people, place, and environment. My dissertation investigates the relation between cross-regional tea trade and ongoing physical and symbolic changes in China's southwest frontier environment. By focusing on the landscape of what is deemed "ancient tea forest" (guchalin), I aim to understand the interactions among tea trees, entrepreneurs, the state, and an ethnic minority population (the Bulang or Blang). In this research, I also seek to address the resulting politics over land-use practices in southwest China. I analyze the material and ideological components of the tea forest by looking into the ecological changes, market forces, and state interventions. In addition to conducting interviews and archival research, I conducted intensive ethnographic research to engage in local Bulang villagers' everyday life, where the tea landscape in southwest China is symbolically and materially reproduced. Overall, my research aims to re-conceptualize southwest China, not as a peripheral frontier, but as a relational space, where the nature-society relations have been significantly affected by the (re)regionalization of cash-crop trade with other places.

Collaborator

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Phytochemical variation in *Fritillaria cirrhosa* D. Don (Chuan Bei Mu) in relation to plant reproductive stage and timing of harvest



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Economic development in southwest China and the increasing use of traditional Chinese medicine (TCM) worldwide have led to intensified collection of native medicinal plants. *Fritillaria cirrhosa* D. Don (Chuan Bei Mu), commonly used for the treatment of cough in TCM, is endemic to the Hengduan Mountain region of southwest China and is under increasing pressure from over-collection and decreasing suitable alpine habitat. The bioactive compounds in *F. cirrhosa* bulbs, isosteroidal alkaloids, are greatly influenced by environmental conditions and fluctuate in content and concentration with plant age and reproductive stage. Aiming at obtaining useful information for the sustainable management of wild *F. cirrhosa* populations, we evaluated how the phytochemical composition of *F. cirrhosa* bulbs varies at various stages of plant reproductive development. Using chemical methods and high-performance liquid chromatography, we extracted and analyzed two major bioactive alkaloids from *F. cirrhosa* bulb samples collected throughout the Hengduan Mountain region. Plant reproductive stage was found to affect the concentration of bioactive alkaloids in *F. cirrhosa* bulbs. Bulb alkaloid concentration was highest during the early stages of fruit development and decreased significantly with fruit maturation. These results lend biochemical support to the practice of harvesting *F. cirrhosa* during the early stages of plant senescence (i.e., early fruit development).

Collaborators

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What are the main findings of the research?

Biochemical research supports traditional medicinal plant harvesting practices and local ecological knowledge; Active components of *Fritillaria cirrhosa*, a heavily harvested medicinal plant for Traditional Chinese Medicine, are highest during the traditional harvesting period and correspond with later stages of plant reproduction.

What should people take away from this research?

Local indigenous communities are often valuable resources of knowledge and insight into site specific conditions. By respecting the value of existing local knowledge, scientists can gain insight to place-based environmental conditions and aid in the preservation of traditional practices.

Publications

Konchar, K., Li, X.L., Yang, Y.P., Emshwiller, E. 2011. Phytochemical Variation in *Fritillaria cirrhosa* D. Don (Chuan Bei Mu) in Relation to Plant Reproductive Stage and Timing of Harvest. *Economic Botany* 65(3) pp. 283-294.

Assessment of biogas programs in northwest Yunnan villages



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Central and provincial Chinese governments have promoted biogas programs across rural China in expectation of significant economic, social, and environmental benefits. This project intended to examine biogas implementation in NW Yunnan to determine: (i) why biogas digesters are used versus abandoned, (ii) how current biogas programs could be improved, and (iii) whether it makes sense for China to continue to promote biogas as a means to improve environmental conditions and human livelihoods. During the fieldwork, most households expressed positive responses to the biogas program. It is also obvious that the program efficacy is politically sensitive that there is very little publicly available data on this topic. The insights from the field, nevertheless, suggests that the existing biogas program, in some circumstances at least, does not suit local need or lacks of adequate maintenance services. In order to improve the biogas program, it is imperative for the policymakers to focus on maintenance rather than construction, and to adopt program evaluations to track the effectiveness.

Collaborators

Professor Duoyi Peng at Yunnan University

What are the main findings of the research?

During the fieldwork, most of the biogas facilities function well, and no widespread abandonment was discovered. Yet, some informants commented that the biogas program lacks of maintenance services; some others never used once after the installation.

What should people take away from this research?

The Chinese biogas program will benefit from more focus on program evaluation and maintenance services.

Nature reserves conserve mast-producing forests that are linked to fecal glucocorticoids in free-ranging Asiatic black bears



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Despite their generalist ecological niche and adaptable foraging behavior, Asiatic black bears (*Ursus thibetanus*) are declining throughout much of their range due to the loss of suitable habitat and unsustainable, illegal hunting fueled by demand for bear products. Bears in central China rely heavily on hard mast as a food source leading up to the winter denning and may compensate for shortages in natural foods by raiding agricultural crops and killing livestock more frequently. Conflicts with and disturbance by humans, protection afforded by nature reserves, and natural food abundance may relate to circulating levels of hormones associated with stress. During the late summers and autumns (2008 – 2010), we collected 832 fecal samples from free-ranging Asiatic black bears in and near 8 nature reserves in Sichuan, Yunnan, and Shaanxi Provinces, People's Republic of China and quantified their glucocorticoid content to test for these relationships. We recorded fine-scale habitat characteristics at the location of each fecal sample and categorized samples based on undigested content. Simultaneously, we tracked spatial and annual differences in hard mast abundance and measured densities of mast-producing tree species preferred by bears. Fecal samples collected outside the boundaries of nature reserves, those from bears that consumed fibrous diets, and samples more distant from roads contained elevated concentrations of glucocorticoids. With other variables held constant, samples collected in areas where mast abundance was high in a given year contained the lowest concentrations of glucocorticoids, those collected in areas with moderate mast abundance contained intermediate levels, and those from areas where mast was scarce contained the most elevated hormone levels. Our findings indicate that nature reserves play a valuable role in reducing circulating levels of hormones associated with stress, either by conserving superior habitat, providing refuge from human activity, or both. Glucocorticoid concentrations during periods of mast failure could reflect behavioral changes that increase conflicts between humans and bears and expose bears to greater risk of being poached.

Collaborators

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Heather Bacon (Animals Asia Foundation)

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Li Jiao (Peking University)

Wu Lan (Peking University)

Qi Ruijuan (Peking University)

Sarah Putman (Smithsonian Conservation Biology Institute)

Carolyn Rindahl (UW-Madison)

What are the main findings of the study?

Main Findings: Chinese nature reserves play a role in fostering a reduction in circulating levels of hormones associated with stress in Asiatic black bears, either by conserving superior habitat, providing refuge from human activity, or both. Stress hormone levels in Asiatic black bears are related closely to natural food abundance.

Were any of the findings unexpected?

Where any of the findings unexpected? Detecting differences inside and outside of reserves and also finding that fluctuating natural food abundance had an effect was exciting. Several other studies have shown that failures in hard mast (the primary natural food source for Asiatic black bears in many areas) result in increased conflicts between Asiatic black bears and humans. Finding that hormone levels in fecal samples differed depending on whether they were collected within or outside of reserve boundaries was new and informative.

What should people researchers and policy-makers take away from this study?

What should people take away from this research? Nature reserves in China provide some of the least-disturbed remaining habitat for large carnivores in that country, including Asiatic black bears. Black bears living in these protected areas produce lower concentrations of stress hormones, a pattern that may be related to protection from humans, superior food, or both. These hold-outs for large carnivores are deserving of continued, and in some cases increased, protection from development, poaching, and intensive resource extraction.

Publication

Malcolm, K.D., W.J. McShea, J.L. Brown, T.R. Van Deelen, D.L. Garshelis, S. Luo, and X. Zhu. Nature reserves conserve mast-producing forests that are linked to fecal glucocorticoids in free-ranging Asiatic black bears. In preparation.



The tree on the mountain: An overview on the conservation of sacred peaks in northwestern Yunnan



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My project explores the relationship between pre-modern Chinese religious strategies of environmental stewardship and modern conservation policies in NW Yunnan Province. This study will focus on the episteme and policies which shaped the identification and preservation of “sacred” or “pristine” natural sites in pre-modern Yunnan, and the conservation strategies employed at two contemporary nature preserves located in the Three Parallel Rivers of Yunnan Protected Area: the Baima 白馬 Snow Mountain Nature Reserve and the Haba 哈巴 Snow Mountain Reserve. The goals of this study will first reveal that the sacred mountains of NW Yunnan have, like much of the traditional Chinese religious system, been “converted” into objects that conform to modern values and suit modern goals; more specifically Yunnan’s sacred peaks have been transformed into either tourist sites, nature preserves, or a combination of the two. Secondly, I hope to argue that if these newly formulated “mountain preserves” are to be successful undertakings in NW Yunnan, policy makers and conservationists need to deepen their engagement with the regions’ indigenous inhabitants on more “traditional terms” which are for the local populace more readily recognizable, and ultimately more compelling.



Green civilizers on tour: Making meaning of ecotourism in Zhongdian



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This project examines the cultural politics of a heritage tourism site and boutique hotel near Dali, Yunnan. It explores of the role of its American owner-operator in the practice of "sustainable tourism", and its implications for the development of the region. I ask what conditions allow an American businessman to become an authority not only on environmental conservation, but also also for the preservation and redevelopment of Chinese cultural and architectural heritage.

It is has become axiomatic that heritage is not simply a continuation or preservation of materials or practices from the past, but is, as Barbara Kirshenblatt-Gimblett writes, "a mode of cultural production in the present that has recourse to the past". Like any other mode of cultural production, heritage is enabled by and in turn enables relations of power, with winners and losers, contestations and compromise.

As economic alternatives to tourism recede in the region, that a Western entrepreneur is able to stimulate significant development in the name of environmental and cultural heritage conservation deserves careful attention.

What are the main findings of the research?

Small-scale foreign entrepreneurs can play a large role in the reinterpretation of Chinese cultural heritage and environmental tourism sites, affecting the development plans of local government agencies.

Were any of the findings unexpected?

The "foreign expert" entrepreneur can play a major role in determining a rural destination's identity and destiny.

What should people take away from this research?

The politics and practice of "sustainable tourism" require care, caution, and constant reflection, especially when initiated by international entrepreneurs.

The Political Ecology of Sacred Landscapes in Northwest Yunnan, China



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This research explores the ways in which notions of the sacred are variously constructed through the sacred landscapes of Kawagebo, the *beyul*, and Shangri-la County, and with what effects on land use and resource management. The sacred value of Kawagebo, a revered peak in Buddhist, and perhaps Bön, traditions is celebrated among conservation practitioners for protecting and conserving biological diversity. At the foot of Kawagebo, Nyingmapa Buddhists understand the landscape to be a *beyul*—a sacred valley protecting the Buddhist people and practice in times of turmoil and need. Buddhists believe Guru Rinpoche, a revered Indian Buddhist teacher, hid as many as 108 valleys to be revealed as sanctuaries as needed. Buddhist teachings and texts, as well as oral traditions, explain that the beyuls are places of peace and security where war, disease, killing, stealing, fighting, hunger, want, and sin do not occur. In addition to the sacred peak of Kawagebo and the hidden valley at its base, this research will consider mobilizations of the sacred and the myth of Shangri-la through the landscape of Shangri-la country, renamed in 2001 from Zhongdian County. It is expected that this research will reveal complex, socially- and politically-situated, contested understandings of Northwest Yunnan as a sacred landscape. Further, it is expected that these understandings shape diverse human-environment relationships with impacts on land use and resource management.

Cordyceps sinensis, the “Himalayan Gold” of contemporary Tibetans in Yunnan, China



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My dissertation research examines environmental governance and sustainability-related aspects of the *Ophiocordyceps sinensis* economy across three townships in northwestern Yunnan, China. *O. sinensis* is a highly valued fungus endemic to the Tibetan Plateau that has become increasingly valued in China’s market economy. The income Tibetan harvesters earn during the six-week harvesting season accounts for 40-80% of their annual household cash income, making the fungus the cornerstone of the rural Tibetan economy and thus a critical issue for conservation and development in the region. The findings from this research are useful for comparative research examining the human-environmental relationships emerging around the *O. sinensis* economy across China (TAR, W Sichuan, Qinghai and Gansu Provinces) and Himalaya (Nepal, India, Bhutan), and engage with broader scholarly and practice-based interests in the mutual constitution of rural livelihood/environmental relationships and political economic transitions.

The IGERT associate award was used to conduct a preliminary study of *Ophiocordyceps sinensis* conservation and harvesting in Yunnan in Adong, Dongwa and Shusong Townships. The purpose of this preliminary investigation was to understand how rising Chinese market demand for *O. sinensis* was influencing harvesters’ livelihoods and interactions with high alpine grasslands in northwestern Yunnan. Research findings revealed that *O. sinensis* harvesting in Yunnan is a major component of rural livelihoods in the region, the sustainability of the resource is uncertain and ecological and social science research was lacking on this critical resource. Building on the 2007 preliminary findings, I examined (i) governance arrangements and perceptions of resource change across three harvesting areas in northwest Yunnan and (ii) who and how harvesters collect *O. sinensis*. The findings from this research informed dissertation research design and will appear as inter-annual data in the final dissertation and related publications. Finally, I conducted (i) collaborative ecological and molecular biological research examining *O. sinensis* genetic diversity and reproductive strategies, and (ii) interviews examining *O. sinensis* governance processes. In collaboration with Dr. Kathryn Bushley, a postdoctoral fellow at Oregon State University’s Cordyceps research lab and fellow at Beijing’s Mycological Herbarium, 75 fungal samples were collected from three harvesting sites in Yunnan and are being analyzed by Dr. Bushley. The findings from this research will result in two articles (*tentative submission 2012*). The interviews suggest that village-owned harvesting areas have an array of governance institutions in place, many of which clarify harvesters’ access and ownership of the resources based on village origins. Governance rules are flexible and change based on social norms and political economic contexts. A portion of these findings will appear as a chapter in a forthcoming edited volume examining development-related cultural and social transitions in northwestern Yunnan, and the remaining findings will appear in the final dissertation and related publications.

Collaborator

Yang Yongping, Deputy Director of Kunming Institute of Botany

Publication

Stewart, M.O. 2009. The ‘Himalayan Gold’ Rush: Prospectors’ Practices and Implications for Management. In Brandon Dotson, Kalsang Norbu Gurung, Georgios Halkias and Tim Myatt (Eds.). *Contemporary Visions in Tibetan Studies: Proceedings of the First International Seminar of Young Tibetologists*. Chicago: Serindia Publications, 67-93.

Changing Tibetan waste management practices and railway construction in Shangri-La NW Yunnan China



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Recently, China and railway corporations are pushing through a new waste management agenda in order to achieve environmentally friendly development. However, state appropriation in new waste policies troubles those concerned with Tibetan cultural conservation under China's assertive development. My research is an ethnographic study of environmental activism by Tibetan monks and aim to show how conflicting ideas, understandings, and cosmologies shape local experiences of social and environmental change in contemporary Shangri-La, a Tibetan Autonomous County in China's eastern Himalaya. I argue that Tibetan monks' environmentalism does not simply reflect a vernacular form of ideas that have been imposed by the state and by global capital; rather, their ideas and practices profess an indigenous cosmology that profoundly differs from waste management science. Moreover, Tibetan monks' activism emphasizes collaborative cosmologies and multiple environmental representations of waste management.

What should people researchers and policy-makers take away from this study?

1. In the Tibetan monks and laymen's understanding, waste is not something that falls out of the cycle of things; rather, waste is in constant changing, and thus burning waste is common in Tibetan villages, especially the household waste. 2. In the forest adjacent to the sacred forest, illegal logging creates a large amount of waste timber, which is abandoned in the wild. This is caused mainly by the illicit timber trade between ethnic groups such as Tibetan, Yi, Han, and others. Commercial logging embodies the idea of disqualified timber as waste, which conflicts with the Tibetan understanding of timber; that is, timber wood is used in every possible way, including household firewood, fertilizer, housing, ranch, and etc.

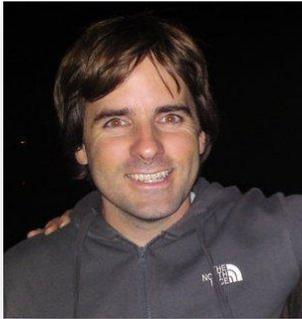
Were any of the findings unexpected?

1. Collaborations between Tibetan monks, villagers, and Han government officials are common in the Shangri-La county, especially when personal connections facilitate the decision-making process of environmental policies, such as waste management.

What should people researchers and policy-makers take away from this study?

1. Tibetan cosmology of waste shows one possibility that human and environmental waste relationship appears in different forms in various cultural contexts. 2. Successful waste management should adopt the local approach that is developed based on the indigenous knowledge of waste.

Tree-species use patterns by breeding birds in Tibetan sacred forests: conservation implications of traditional forest management



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Tibetan sacred forests are renowned as keystone structures for biodiversity preservation. In addition to high bird diversity, Tibetan sacred forest harbor higher tree richness and larger trees than surrounding landscapes. However, bird-tree relationships are poorly understood and this is important to characterize in order to recommend informative conservation decisions. To explore tree-species use patterns, foraging observation data were collected from late-May to late-June in 2011 on thirteen focal bird species at six Tibetan sacred forest patches in northwest Yunnan, China. To gain information on tree composition, the point-center quarter method was used at 101 random points within the six patches and importance values of ten tree species was calculated. Sikang Pine (*Pinus densata*), Chinese Aspen (*Populus davidiana*), Willow (*Salix balfouriana*), Evergreen Oak (*Quercus* spp.), and Maple (*Acer* spp.) were used in higher proportions than they were available as foraging substrates. Himalayan Birch (*Betula utilis*), Spruce (*Picea* spp.), Larch (*Larix potaninii*), and Fir (*Abies georgei*) were used in lower proportions than they were available. Understanding tree-use patterns by breeding birds in Tibetan sacred forests is important in order to better understand ecological interactions among birds and their habitat. This study provided baseline information for informed conservation in Chinese Himalayan forests.

What are the main findings of the research?

Bird species used trees in varying proportions to their availability on the landscape. Although this is not a novel finding, understanding tree-use relationships by birds in Tibetan sacred forests provides important baseline information for informed conservation in Chinese Himalayan forests.

Were any of the findings unexpected?

A study like this has never been completed in the Greater Himalaya, and therefore, we were unsure of the patterns and outcomes. Thus, on one hand, all of the findings were unexpected and our results provide important information about a poorly understood bird community (i.e., Chinese forest birds).

What should people take away from this research

Tree-use patterns by bird species are well understood in North America and Europe and the results from those continents were similar to what we found. Most importantly, oak (*Quercus* spp.), Pine (*Pinus* spp.), and Aspen (*Populus* spp.) were important for Chinese birds. Similar patterns are found in other portions of the world. In addition to discovering core ecological relationships of Chinese forest birds, our work highlights the global importance of these (and a handful of other) tree species.