

Appendix I. Alpine Biodiversity and Sustainable Development

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Northwest Yunnan is renowned for its mountains, great rivers, and outstanding biodiversity, all of which are caused by the same continuing geological process: uplifting of the Asian tectonic plate on impact with the Indian subcontinent. The continuing rise of the Himalayas causes orographic lifting of wet monsoonal weather systems causing heavy rains, particularly in the eastern Himalayas, which form the great rivers. Through the millennia these rivers have cut deep gorges in the high plateau forming a steep mountain terrain. In turn this well watered, heavily dissected terrain provides habitat for both extensive Asian temperate and Southeast Asian tropical floras and fauna, which intermix and give rise to this global hotspot for biodiversity. This mountain habitat is also the foundation of diverse human cultures and livelihood systems. Thus, the southern Hengduan Mountains of NW Yunnan are an ideal focus for interdisciplinary studies of biodiversity conservation and sustainable development including all of IGERT's themes: biodiversity, livelihoods, and policy.

To summarize attributes of the Alpine ecosystem and potentials for interdisciplinary research, I will briefly review disciplinary research interests (from which to launch interdisciplinary efforts), the multitude of available collaborators, the range of alpine sites in NW Yunnan, the potential for comparative studies, and the attractive features that will draw students to this study area.

1. Alpine Research

Botanical research in NW Yunnan is long established including such famous botanists as Kingdon-Ward, Wilson, and Joseph Rock, all of whom spent extended periods collecting plants in NW Yunnan. Over the last 20 years, Kunming Institute of Botany (KIB) continues the botanical tradition with numerous expeditions to the area. Many rare and endemic species and taxa in need of systematic revision are found in the area, which could inform our understanding of biodiversity and conservation.

Ethnobotany is another field of research that thrives in NW Yunnan. Several professors and their students are studying how traditional people use plants and their environment. This research ranges from inventories and population ecologies of single useful species to gradient analyses and land use studies of entire landscapes. There are a myriad of species and analyses that ethnobotanical studies could address – from the most economically important plants (e.g., matsutake mushrooms) to domestication of traditional crops (e.g., buckwheat) – to increase our understanding of traditional livelihoods and sustainable development.

Zoological studies, largely by KIZ, in the mountains of NW Yunnan center on the snub-nosed monkey, snow leopard, blue sheep, black-necked crane, pheasants and other endangered species. Nonetheless, inventories and studies of other birds, fish, herps, and insects are on-going. Studies detailing adaptations to the exigencies of alpine

environments are in their infancy.

Land use studies have been carried out around Zhongdian and Deqin comparing highland and lower elevation farming systems and non-timber forest product collection (CBIK/KIB, MBG). The Chendu Institute of Biology (CIB) is carrying out studies on pastures. Extensive GIS analyses have been coordinated with on-the-ground surveys. Future studies will add to our understanding of the widespread concern for overgrazing of summer pasture lands, as well as other issues less commonly dealt with in China (e.g., loss of traditional crops and their varieties).

Most geology and soil studies in NW Yunnan relate to immediate development projects—e.g. dams and mining. However, since the Himalayas are so geologically active and complex, there are many studies on geology and soils which would have direct bearing on biodiversity, livelihoods, and policy.

Social sciences are richly represented in NW Yunnan from classical studies to the human impacts of recent changes. Anthropology focuses on traditional cultures including Tibetan, Lisu, Naxi and others and also on diverse issues including the recent cultural revival and the effects of tourism on local populations. Policy studies have diverse issues and government decrees to investigate including: bans on cultivation of steep lands, burning, and hunting; reforestation and pasture improvement; and forming policy on global warming and incorporating sacred lands in conservation.

2. Collaborators for Alpine research

Collaborating institutions and scientists with interests in Alpine areas abound in NW Yunnan. If the difficulty of funding for Chinese counterparts can be overcome, their cooperation should be available to the University of Wisconsin. Alpine research is currently being conducted at KIB (botany), KIZ (zoology), CIB (botany), SW Forestry University (forestry and soils), Shagrilu Alpine Botanical Garden (SABG, botany), and LABG (Lijiang Alpine Botanical Garden in collaboration with the Royal Botanical Garden of Edinburgh). In addition, there are several NGOs (including CBIK, TNC, WWF) working in the area, several government ministries (forestry, hydrology and mining), and many international organizations (ICIMOD, GLORIA, UN World Heritage).

3. Alpine research sites

Alpine areas exist in all four of the counties in NW Yunnan. In Lijiang there is the fine research station at the Lijiang Alpine Botanical Garden. In Shangri-la there is the outstanding Shangri-la Alpine Botanical Garden with research efforts throughout NW Yunnan. In addition, Jisha is the Alpine site where KIB/CBIK work and Da Xue Shan is a GLORIA research site. Bai Ma Nature Reserve spans Weixi, Benzilan and Deqin. The most notable site in Deqin is the Menri (Medicine Mountains in Tibetan or Meili Snow Mountains in Chinese) including the highest peak in Yunnan and sacred Tibetan mountain Khawa Karpo.

4. Comparative Alpine studies

Descriptive studies in any field are less informative than comparative studies. NW Yunnan offers many comparative Alpine variables. Spatial comparisons across NW Yunnan include separate mountain chains with varying climate and soils. NW Yunnan was well photographed in the early 1900s by botanists and explorers, which allow us to make temporal comparisons (with some unexpected results – forest cover in NW Yunnan is actually increasing and glacial retreat is faster than anywhere except Mt. Kilimanjaro). Comparisons of steep elevational gradient are predominant in the work done by KIB and the Missouri Botanical Garden. Cultural comparisons with peoples of different traditions living in similar mountain environments also allows one to identify nuances in land use. Human impacts on Alpine environments can be compared with respect to overgrazing and deforestation. If dissertations are designed to take advantages of these comparisons, results should be meaningful beyond case studies and singularities of SW China.

5. Outstanding features of the eastern Himalayas

The outstanding features of the Alpine areas of NW Yunnan will impress students and their audiences. The Hengduan Mountains are an international hotspot of biodiversity including magnificent plants and animals. Alpine plants include the famous Snow Lotus, Blue Poppies, Matsutake mushrooms, and a host of familiar horticultural plants brought back to Europe over a hundred years ago (lilacs, peonies, primulas, rhododendrons, etc.). Alpine animals include the charismatic megafauna (snow leopard, blue sheep, snub nosed monkey, etc.). Human cultures and sacred mountains are picturesque and impressive to even the most jaded world traveler; Tibetan studies seem to capture everyone's imagination. And then there are predominant hot button issues like Global Warming that are evidenced in Alpine Yunnan with glacial retreat, increasing river flow for glacial run-off, tree line advance, and ever decreasing "sky islands" for alpine flora and fauna. The Alpine program should capture the imagination of students and faculty alike.