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Land Use Transition, Livelihoods, and Environmental Services in Montane Mainland Southeast Asia

The present article provides an overview of the status of land use and land cover change science in Montane Mainland Southeast Asia in the context of a Mobile Workshop. Outcomes of the Mobile Workshop highlighted the rapid changes in land use and livelihoods, largely driven by the development of transport links, increasing market access, and trade liberalization. While many of these changes are likely to be beneficial, they must be carefully monitored, and relevant policies should be inclusive of all stakeholders. This is why it is important that land use science be cognizant of the need to make information accessible to policy-makers and land users.

Introduction

MMSEA: A critical area in transition

The Montane Mainland Southeast Asia (MMSEA) eco-cultural region comprises those areas between 300 and 3000 m lying within the basins of the Yangtze, Salween, Irrawaddy, Mekong, Black, Red, and Pearl rivers (Thomas 2003; Fox and Vogler 2005). This region constitutes approximately half of the land area of Cambodia, Laos, Myanmar, Thailand, Vietnam, and Yunnan Province of China (Figure 1). National states have a strong interest in the political and environmental security of

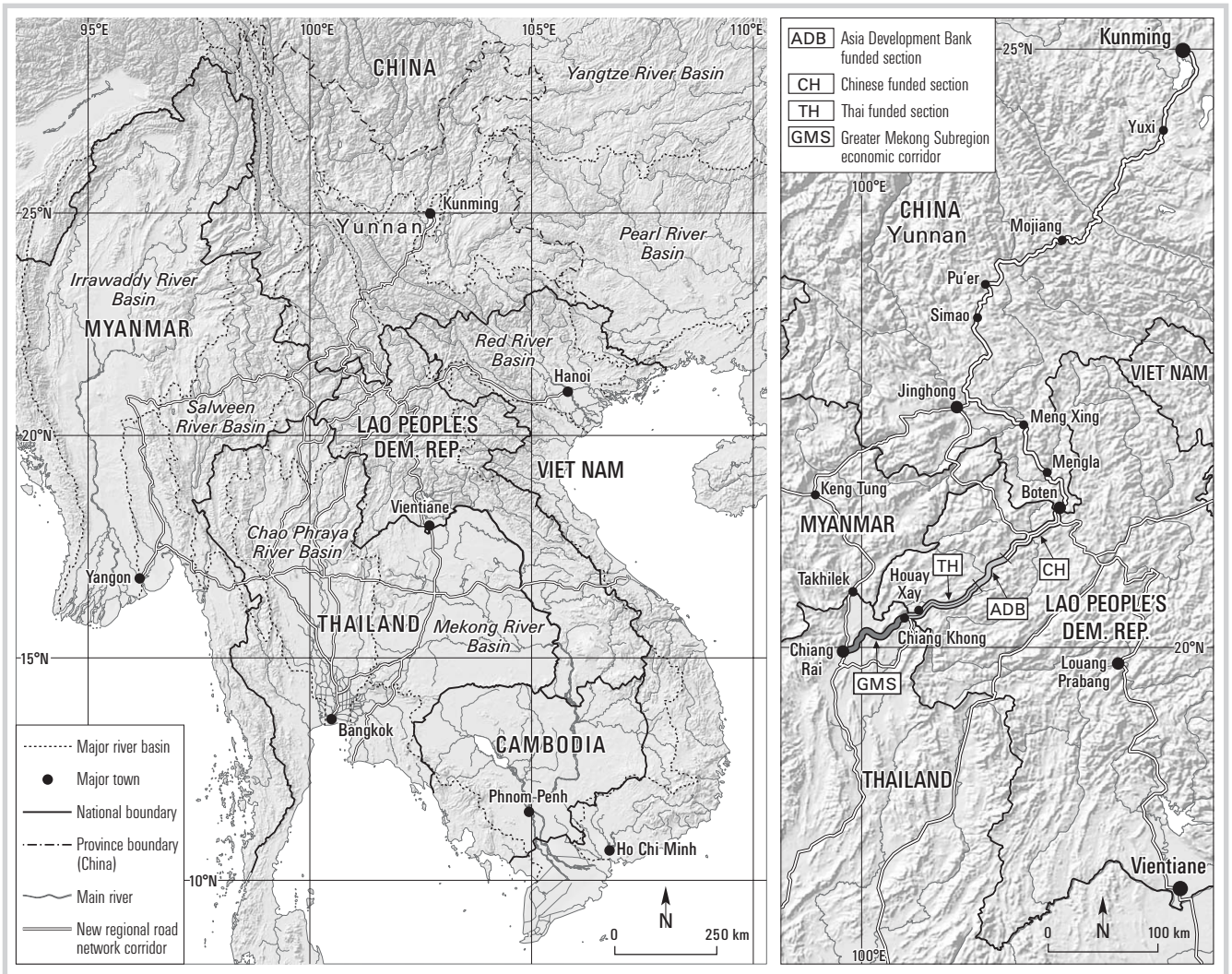


FIGURE 1 The Montane Mainland Southeast Asia (MMSEA) eco-cultural region, showing main river basins and the road network that is being upgraded in the region. The map on the right shows the Kunming–Bangkok highway, an economic corridor linking China, Laos, and Thailand, funded by several parties. (Map by David Thomas and Andreas Brodbeck, based on data from various sources)

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MMSEA, as the rivers it supports affect the lives of more than 600 million people in the Greater Mekong Sub-region (GMS)—an area undergoing rapid economic growth and regionalization.

The ecological health of the "roof" of southwest China and Southeast Asia is rapidly deteriorating: during the past two decades, the Yangtze, Red, Mekong, Tonle Sap, and Chao Phaya rivers have flooded more frequently, causing some of the worst devastation in recorded history. In addition, development of vast communication and transportation infrastructure along the Mekong and other river systems is having great impacts on land use, livelihoods, and environmental services.

There is increasing debate about the need to balance possible over-exploitation of MMSEA's natural resources against the sustainability of the region's ecosystem services. Rising population and consumption will drive competition for diminishing resources, requiring trade-offs between ecosystem goods and services among different stakeholders at different scales. Land use decision-making in this climate is politically and economically driven; therefore, to understand these issues, it is necessary to identify and quantify the links between changes in land use, ecology, and socioeconomics.

From 15–27 January 2005, 60 participants from 8 countries participated in a unique learning process: a 'mobile workshop' on land use history. This workshop traversed the heart of the MMSEA eco-cultural region, from Xishuangbanna in southern Yunnan, overland to Luang Prabang in northern Laos, before flying to Chiang Mai in northern Thailand. Throughout, participants interacted with local villagers and officials to learn about land use history and decision-making, in the context of the local impacts of state policies and emerging market economies. The workshop had several objectives:

- To better understand the land use dynamics and drivers of change in the transition to market economies within MMSEA;
- To assess the impacts of development, particularly road infrastructure, as well as linkages among transportation corridors, marketing networks, and trade policies;
- To build capacity among younger researchers to conduct interdisciplinary research related to land use transition; and
- To provide a forum for policy dialogue and recommendations.

The workshop focused on 3 major interlinked themes: 1) land use change, 2) local livelihoods/markets and trade, and 3) resource governance. Accordingly, 3 thematic working groups were formed to explore and analyze field work and share impressions of the impacts of road building and trade liberalization on land use, livelihoods, and governance in MMSEA.

Historical land uses and cultural exchanges in MMSEA

The northern parts of Thailand, Laos, Vietnam, and the southern part of Yunnan, China support 100 million people, comprised of more than 60 different ethnic minorities. These people practice various forms of land use and livelihood activities. In southern Yunnan these practices include swidden agriculture with rice and rubber by the Hani, Jinuo, and Yao peoples; and paddy agriculture and homegardens with rice, vegetables, and rubber by the Dai in Xishuangbanna. Similarly, in Laos, extensive swidden practices are traditionally conducted by a wide diversity of ethnic groups, including the Hmong, Yao, Akha, Khmu, and Lamet. Meanwhile, lowland agriculture has long been a domain of the Tai-Kadai ethnolinguistic group, centering on paddy rice cultivation. In northern Thailand, there are the well-managed watersheds of the Karen and the now highly natural resource-exploitative practices of some of the Hmong.

MMSEA not only provides diverse 'niches' for specific livelihoods but also accommodates flexible institutions for resource governance. Relationships between these customary organizations have long affected both the highlands and the lowland plains. Historically, valley-based polities have played an important role in organizing the social and economic relationships among the lowland inhabitants and the people living in surrounding mountainous areas (Coward 2002; Chiengthong 2003). The practices of 'rights of occupancy and use' versus 'rights of domination' are also crucial when trying to understand the relations between indigenous peoples and recent migrants.

For more than a millennium, in MMSEA caravans served as market links and created sociocultural networks among mountain and lowland communities. Until the 19th century there were still free movements of ethnic groups across the current borders of China, Laos, Myanmar, Thailand, and Vietnam. Today, the caravan trade has been replaced by modern transportation systems, such as the proposed Kunming–Bangkok highway (see Figure 1), and economic corridors have evolved into transnational highways, riverways, and railway links. These changes have profound impacts on local land use, resource management, livelihoods, and indigenous cultures. Continuing research in MMSEA and elsewhere suggests that land use dynamics and transitions in the tropical uplands need to be analyzed in broader context of political economies (Rambo et al 1999; Fox 2002; Xu et al 2005a).

Land use transition: why should we care?

Transition theory

The pace and intensity of land cover change have increased over the past 3 centuries—and, more partic-

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ularly, over the last 3 decades—due to climate change and increasing human activities, including migration, land use conversion, and agricultural intensification (Lambin and Geist 2006). Land use transitions are pervasive at a variety of spatial and temporal scales; they significantly affect ecosystem services and thus livelihoods, economics, and trade policies. To understand current changes and predict future ones, it is essential to adopt a long-term view of land use history. For these reasons it is necessary to consider the mechanisms of transitions, both environmental and economic.

Transition theory has been generalized from complex socioeconomic phenomena such as changes in population, economics, and health. To trace the transformation of predominantly rural societies into market-driven economies, for example, Kuznets (1955) pointed out that during modernization, income distribution is relatively equal at the initial stages of economic development. However, as the economy grows, income inequality rises as segments of the labor force abandon agriculture for higher-paying industrial and service jobs. However, this inequality later declines as urbanization diffuses and the industrial and service sectors expand. Thus, inequality follows a Kuznets curve (Figure 2).

Similarly, land use and forestry transition theory derives from the notion of 'environmental Kuznets curves' that predict non-linear transitions in resource use as incomes rise over time. Thus, forestry transition theory posits that over time, forest cover exhibits a U-shaped curve: an initial decline in forest cover due to deforestation is later reduced, offset, and eventually outweighed at some point by forest recovery and secondary forest expansion. Mirroring this, agricultural expansion may initially rise, but later starts to decline through increasing agricultural adjustment to land quality and technological improvements. Indeed, such transitions now seem to be occurring: since the early 1990s, forest areas have reportedly expanded in many developed countries (Grainger 1995; Rudel 1998; Mather 2001; Rudel et al 2005).

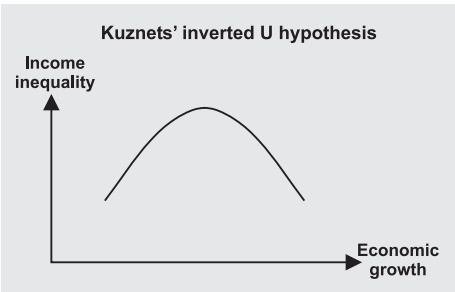


FIGURE 2 Typical income transitions during economic development.

However, in an attempt to more precisely monitor and predict land use and land cover change, national monitoring has been increasingly abandoned in favor of analyses at the sub-national scale (Rudel et al 2002), and even at local micro-levels that directly affect land use practices (Perz et al 2005). Related research attempts to link deforestation to economic development and regional governance by reference to environmental Kuznets curves (eg Mather et al 1999; Zhang et al 2000; Ehrhardt-Martinez et al 2002). Moreover, sustainability studies are increasingly turning towards transition analyses to identify pathways and drivers of change, and to explore alternative trajectories of change that reflect a range of issues including political economies, environmental services, and market transition.

Land use and social transition in MMSEA

MMSEA has experienced widespread and dramatic land use changes. Deforestation, agricultural expansion, urbanization, and, most recently, re-afforestation have resulted from changing government policies and modernization. Such changes are exemplified by China's push to develop industry and become more self-sufficient in natural resources. China pursued self-sufficiency in rubber during the 1960s and 1970s, timber during the 1980s and 1990s, and grain production during the collective periods from the 1950s to the early 1980s (Xu et al 1999 and 2005b; Xu and Wilkes 2005). Similar trends can now be seen in Laos, Thailand, and Vietnam with the development of cash crops and market industries.

When analyzing land use changes, it is very important to recognize that land use and property rights in MMSEA have always been influenced greatly by political perspectives and ideologies. The power bases of land use decision-making are lowland urban areas. Generally, mountain regions are perceived as sources of potential resources; consequently, logging, mining, and hydropower have been operated by state-owned enterprises for the benefit of the lowlands. Construction of huge hydro dams has directly caused the loss of mountain biodiversity and had many negative social impacts. Millions of people have been resettled or displaced from their original homes, and it could take generations for them to adapt to alien environments, meaning that mountain people are further marginalized. Moreover, traditional upland practices are often portrayed negatively in MMSEA. For example, swidden agriculture, rather than being viewed as sustainable land use, is held responsible for deforestation in the uplands, leading to downstream flooding and siltation (Fox et al 2000; Ives 2004; Xu and Wilkes 2005).

Thus, whereas lowlanders have profited from mountain resources, mountain people have often lost out. These losses are often exacerbated by knock-on effects that can further disadvantage mountain communities; for example, deprivation of local livelihoods has forced many upland households to sell their labor in the plains and in foreign countries. In some mountain areas, male outmigration is so widespread that women are now de facto heads

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of households, managing forests and farms in degraded ecosystems, often far removed from social services such as healthcare and education (Xu and Greta 2005).

Land use change science has been intensely discussed at previous MMSEA conferences in Chiang Mai, Thailand (1995, 2000), Lijiang, China (2002), and Sapa, Vietnam (2005). These meetings encouraged interdisciplinary and participatory research to make land use/cover information and knowledge more accessible and usable to research professionals, policy-makers, advocates, and development practitioners. Similarly, the object of this paper is to try and link models and empirical data on land changes in MMSEA with the drivers of specific land use histories. Such links provide some potential for predicting trajectories of change. This discussion is set against the background of the Mobile Workshop, in which a fusion of disciplines worked towards a more complete understanding of the social and environmental outcomes of land use changes.

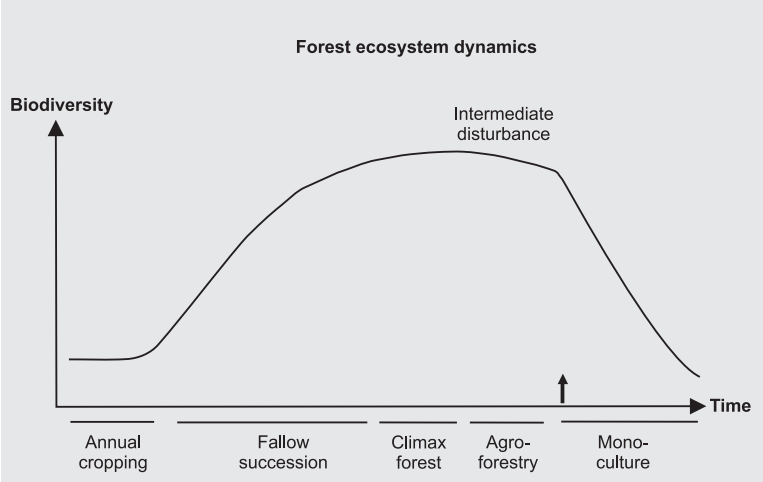
Key findings of the Mobile Workshop

During the workshop, the participants contributed greatly to our understanding of where, when, how fast, and why people change their use of the land in the MMSEA ecocultural region. There were a number of key findings from this Mobile Workshop:

1. Most of MMSEA's ecosystems have now been altered by land use transformation, mainly through human action. Land use change is inevitable, and all 3 countries under consideration have had major changes in recent decades. Various government policies and the expansion of regional, national, and international markets are among the most powerful contemporary drivers of land use and land cover change, further influencing both ecosystem goods and services and household economies. There is a great deal of variation and site specificity determining the positive or negative influence of drivers, the sustainability of land use, the resilience of ecosystems, and the vulnerability of ethnic groups.
2. MMSEA forest decline has been accompanied by a rapid expansion of secondary vegetation and tree plantations. Regionally, deforestation has begun to slow down; there may even be a net gain in forest, although the quality of this forest is debatable. Attempts have been made to promote tourism and other upland development policies to create non-farming jobs to remove farmers from the land. Governments in China, Laos, and Thailand have been pioneering similar land use policies in the uplands, such as creating protected areas, sedentarizing swidden agriculture, banning logging, establishing tree plantations, and decentralizing forestry management. However, policy implementation often fails to stimulate land use transition. Policy-makers could be more successful if they addressed the underlying causes of land use change (technology, market access and trade networks, migration policy), rather than the proximate causes (logging, rubber plantation, road development).
3. Livelihood practices are driven by market demand. People are influenced to replace traditional cultivation with crops that command better prices in the market. Private and state support systems emerge as a result of changes in livelihood, and such changes also create labor mobility. This development process is self-perpetuating, as access to better infrastructure normally results in the expansion of markets and marketing opportunities. Policy intervention should be seen as a controlling agent, preventing overuse or misuse of natural resources.
4. Resource governance in MMSEA is characterized by the increasing decentralization of the state decision-making process and adaptive customary institutions at the village level; however, this has so far failed to give local communities adequate control over their resources. Rather than better access, there is increased public exclusion through the establishment of conservation areas for protection of biodiversity and watersheds, as well as the privatization of public resources (eg forests and land) to individuals, corporations, and companies. This exclusion is also reflected in the double standards that require complex management plans from local communities, while large-scale commercial interests are often granted unfettered access to resources. On the other hand, when given the opportunity, both local governments and people have been able to demonstrate their capacity and initiative in resource management in response to the market economy and cross-border trade liberalization.
5. Local land use decisions, both by smallholder farmers and large-scale plantations, are increasingly driven by globalization (for example, increasing Chinese demand in natural rubber affected other parts of MMSEA, resulting in large-scale rubber plantation in the uplands of Laos). Social connectivity through migration, trade, and other social networks is being accelerated today through free-trade agreements and economic integration in the GMS region.
6. The impacts of land use and land cover on ecosystem functioning, such as hydrological

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FIGURE 3 Changes in species diversity with agricultural development.



cycles and sediment transport, are inversely related to the spatial scale. In contrast, the impacts of land use changes on water quality parameters may be relevant at the higher meso and macro scales. It is also important to note that the impact of these land use changes is temporally variable. While river and lake quality can be restored in a relatively short time, biodiversity will take thousands of years to recover.

7. Mobility and flexibility are often critical to sustainable land use. Long-fallow, rotational shifting cultivation is one well-documented example of how mobility and flexibility underpin the sustainability of extensive smallholder systems; if these attributes are lost, such systems may collapse. Similarly, policies that support mobile lifestyles and flexible livelihood strategies can allow pastures to 'rest' seasonally and thus curb degradation.
8. 'Think globally and act locally' applies to land use policy. Decentralized natural resource management such as community forestry, integrated watershed management, good practices of customary institutions, and application of traditional ecological knowledge can accelerate land use transition. The effectiveness with which land use science communicates results at the grassroots level is of critical importance. One powerful tool for involving actors in sustainable land use is participatory land use planning.
9. Land use is at the center of trade-offs between ecosystem goods and services. Changes in land use often increase the share of energy, water, and nutrients devoted to human needs, but decrease the resources available for other ecosystem functions. Land use that balances poverty reduction and environmental conservation is rare. The emerging conservation paradigm includes the concept of payment for environmental services (PES), in which local landholders and users are rewarded for adopting land use practices that secure ecosystem functioning by direct payment from external environmental services beneficiaries.
10. For land use transitions, sound knowledge transfer among different stakeholders enables them to better understand the dynamics of land use/cover change, its links to ecosystem functioning, and the available policy options and interventions. Decentralized institutions and local communities are playing an increasingly important role in managing land use transitions.
11. MMSEA forest landscapes are the result of many generations of interaction between humans and ecosystems. Indigenous farmers manage deforestation in sequential agroforestry systems that integrate secondary vegetation, which provide not only diverse products for local people, but also habitats for endangered species. Recent trends suggest that most upland areas of MMSEA will eventually see a major change in land use with conversion from swidden agriculture to commercial crops and a change in land cover from secondary vegetation to permanent monocultural agriculture, albeit tree crops in many cases. Permanent agriculture could result in a tree-dominated land cover (eg rubber, fruit trees, tea), or a land cover composed of annuals (eg vegetables, sugarcane, maize, cassava, upland rice). In either case, biodiversity would probably decline (Nagata et al 1996; Figure 3).
12. Rapid economic growth and urbanization in China have not only increased demands on forest resources but also provide an opportunity to move rural farmers to non-farm jobs. In this sequence of events, forests would not decline further because shortages of agricultural workers would prevent further agricultural expansion. Moreover, rising farm labor prices discourage further intensive use of marginal lands such as forests. Growing economic power also enables government to compensate farmers to protect forests in the headwaters of river basins; however, this can increase timber imports and promote deforestation in the other parts of MMSEA (eg Myanmar). Opening cross-border trade and regionalization can be a double-edged sword for smallholder farmers in the MMSEA region. There is increasing opportunity for upland farmers from Southeast Asian countries to send non-timber forest products to

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huge Chinese markets, but they also have to risk competition in the temperate fruit market from Chinese farmers; these used to be 'niche' products produced by upland farmers in northern Vietnam, Laos, and Thailand.

Managing land use transition: from theory to practice

Land use change science and its policy applications include land use/cover change assessment, and forecasting based on the views of different stakeholders, including non-scientific people. Increasingly, non-state actors such as NGOs and civil society are shaping government policies. Successful links between land use science and policy require action-oriented research that involves all stakeholders. Different actors' points of view vary with their knowledge systems, objectives, and incentives in land use decisions; these different perspectives often create a cultural gap hindering the use of research findings. In the case of shifting cultivation, for example, the common perception held by policy-makers attributes deforestation to a rapidly growing population of poor shifting cultivators who are hungry for new land, while another view, often held by scientists, blames corporate greed.

Policy-makers must understand land use to address pressing policy issues. Some policies directly affect land use (eg policies that create protected areas) or land-based activities such as agriculture or forestry. Other policies, not intended to affect land use, can have profound but indirect impacts. These include trade, sector, and public investment in infrastructure, and macroeconomic policies. For example, China's soaring rubber demand (imports rose 550% in the 20 years up to 2002) was serviced mainly from Southeast Asia. This rubber plantation expansion causes widespread deforestation and conversion of secondary vegetation into monocultures in MMSEA.

Although we often focus on the negative environmental impacts of increasing globalization, marketization and modernization, these changes can have positive effects. International migration and the remittance economy provide US$ 43 billion for Eastern, Southeast and Pacific Asia (World Bank 2005). This external income promotes small enterprises in the original communities, such as family-based tourism, which further reduces pressure on uplands in MMSEA. Moreover, labor-intensive technological progress such as new irrigation techniques can intensify use of existing agricultural areas and increase rural incomes through double cropping or vegetable cultivation in dry seasons. These increases in productivity help reduce land clearing, therefore conserving forest cover on marginal land.

In rare cases, land use transition may help reduce poverty and conserve nature. Where it is commercially viable, ecotourism is one such 'win–win.' Matsutake (*Tricholoma matsutake*) collecting is another win–win situation. Increasing demand for these mushrooms has encouraged Tibetan collectors to shift from logging to mushroom harvesting, reviving customary institutions that manage forest resources and regulate access to mushroom habitats (ie oak and pine forest). Another positive outcome is the improved management of traditional agriculture by the Hani (Akha) people in Xishuangbanna to incorporate marketable products such as rattan and tea in swidden and natural forest (Xu 2005).

Conclusions

The Mobile Workshop reinforced the notion that land use change science must be more inclusive and have greater impact on policy and public debates. During the course of the workshop we saw the effects of recent transitions, both positive and negative, on local communities and ecosystems. It was particularly instructive to view these changes through each of the 3 thematic groups: land use change, livelihoods, and governance. Quantifying changes is vital (land use change), but we must be cognizant of the socioeconomic effects of these changes on the ground (livelihoods), together with a long-term view of the sustainability and equity of such changes (governance). Bringing people together, particularly younger researchers from diverse disciplines and cultures, helps build a better appreciation of the need to have a multi-prong approach to land use science. When viewed holistically, preconceived notions—such as: swidden agriculture is destructive, cash cropping builds wealth, more forest gets more water, or afforestation benefits biodiversity—were shown to be generalizations that are not applicable in many systems or communities.

It is also important that we understand the power of land use science and the need to use it responsibly. Land use is often a political decision, and science is present as a political voice in land use decisions at local, national, and international levels. Science must be made accessible to land users and policy-makers, and accompanied by an appreciation of specific local viewpoints and knowledge systems. Moreover, there is need for long-term and proactive thinking. Improving forest cover and agricultural yields is fine, but this must also be matched with increasingly sophisticated ecological, marketing, and socioeconomic analyses, to ensure the viability and sustainability of such improvements. Finally, land use science must constantly reassess and review changes: land use transitions to improve incomes are highly desirable but these must be balanced against environmental quality and the sustainability of ecosystem services. An understanding of the strengths and limitations of land use science will enable constructive input to responsive policy-making.

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Tai Valley-based Polities and the Uplands in Montane Southeast Asia

The domains of earlier Tai muangs*—the social spaces governed by various Tai groups—in the highlands of montane Southeast Asia frequently incorporated both upland valleys and the flanking, sloping lands used by various Tai and non-Tai groups. The articulation of the land uses and livelihood activities of these two landscapes of the* muangs *served to reproduce these Tai polities. The ideas and actions of both the ruling Tai groups and the subaltern upland groups contributed to the construction of the highland* muangs *that typically incorporated status differences, ethnic diversity, and ecological variety.* Muang *polities achieved governance of both a diverse network of peoples and a diverse*

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natural habitat. Since contemporary upland peoples and resources remain within administrative entities where lowland political and economic power is dominant, the shape of these regions continues to be influenced by lowland interests and actions but with consequential, and in some cases increasing, engagement by upland minorities.

Prelude

The administrative village of Mengsong is located in Jinghong County in the Xishuangbanna Dai Autonomous Prefecture in southern Yunnan Province, China. In the summer of 1999 I visited this village with a Chinese colleague who spent many years conducting fieldwork among the Akha families, who are the predominant ethnic group in Mengsong. Mengsong farmers are actively engaged in modifying their upland land use in response to both the new constraints and unfolding opportunities arising from the previously erratic but now more stable policies of the Chinese government.

In the course of our brief stay in Mengsong, we visited a rattan forest managed by one of the hamlets and locally known as *sangpabawa* (Xu et al 1999). The term *sangpabawa* appears to be a local corruption of the Dai terms meaning rattan forest (*paa wai*) and the name of a local earlier Dai official (*sangpa*). The experience of this rattan forest visit caused me to think further about the connections between this upland Akha community and the surrounding lowland Dai groups: why was this parcel of the uplands labeled with Dai terminology and why was it associated with a local Dai officer?

Historically, the Dai had issued orders to this upland village to preserve this rattan habitat and provide rattan items as part of the Akha tribute to the local Dai rulers, whose *muang* domain included this upland region (Gao 1998). The Dai rulers derived their authority in the upland habitat by virtue of their position in a regional Dai polity composed of a number of confederated *muangs* and known as Sipsongpanna, along with their incorporation into the bureaucracy of the Chinese court in the role of *tusi*—an institution that allowed the Chinese state to employ a form of indirect governance using existing local power centers.

Since Tai *muangs* have long existed throughout a large swath of the region referred to as Montane Mainland Southeast Asia and continue to exist in various forms in the several nation-states of which they are now a part, it became of interest to me to learn more about the *muang*–upland connections that are implied in Mengsong's rattan forest. The present article is the initial result. It draws on materials describing Tai *muangs* as they were organized in the 18th and 19th centuries, as well as materials concerning contemporary state–upland relations.

Tai valley polities: *muang*s past and present

Thongchai (1994) defines a *muang* as a governed area. Across the upland and mountainous landscape reaching from the contemporary regions of northern Laos, Thailand, and Vietnam, as well as southwestern China and northeastern Myanmar, in the 18th and 19th centuries there were scattered Tai *muangs*, or "principalities," of various sizes (Figure 1). These *muangs* had complicated—and unsteady—tributary relations with one another and with non-Tai entities, any given *muang* likely receiving tribute from various vassals while simultaneously paying tribute to one or more superior entities.

Keyes (1999) has noted 2 important characteristics of the premodern *muang*: the rulers were all speakers of one Tai language or another and they included people who spoke diverse languages and were organized in hierarchical relationships. Thus, in addition to dealing with other *muangs* and kingdoms, as Wyatt (1984) pointed out,

FIGURE 1 Approximate location of Tai principalities. (Map by Andreas Brodbeck)



"There was also another world nearer at hand"—other ethnic groups occupying the upland areas, some of whom may have been displaced by the Tai from the valley lands. Turton (2000) recently has suggested that the second portion of the well-known Lanna Tai phrase usually translated as, "gather vegetables in baskets, gather *kha* in *muang*," could be rendered as "put non-Tai in Tai domains." These upland non-Tai—who differed from *muang* to *muang* but included Mon-Khmer, Tibeto-Burman, Karenic, and other language speakers—typically occupied the higher, sloping, and forested lands that flanked the upland valleys in which the Tai practiced their wet-rice agriculture.

Tai *muangs* usually endeavored to bring these people into their economic, political, and ritual networks, and the uplanders variously acquiesced to, resisted, reshaped, or otherwise dealt with these demands and opportunities. Within these principalities there were important internal connections, exchanges, and rights and responsibilities between the valley-based polities—usually one or another Tai group—and the upland communities of Khmu, Karen, and so forth. Leach (1954) described these internal complexities in the *muangs* in the region of Burma the British called the Shan states: along with the Shan wet-rice villagers, there were large numbers of non-Shan living in hill

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villages and practicing swidden agriculture.

More recently, Turton (2000) has assembled a group of papers that specifically explore the internal composition of these early Tai polities, with special attention to the non-Tai groups within *muang* domains. Turton is particularly interested in the manner in which these groups "were constituted in, by and for these domains—both by their own agency and by that of dominant others." This volume provides useful detail concerning the views and actions of specific upland groups with regard to the valley-based polities with which they were entangled.

Turton and others suggest that understanding the character of the variety of connections between the Tai and non-Tai groups starts with understanding 2 important Tai constructions: *muang-pa* and *tai-kha*. The first pair separates the domain into 2 areas—the civilized, cultivated, and governed portion, the *muang*, and the uncivilized, wild, and lightly controlled area, the *pa*, literally "forest." What the Tai characterized as forest, most contemporary writers choose to label "upland"—an emphasis on altitude and slope over land cover. The parallel pair, *tai-kha*, refers to 2 broad categories of people: the civilized people of the *muang* center, the *tai*, and the others who inhabit the forested uplands, the *kha*. These 2 social categories then create what Renard (2000) has succinctly called the "Tai-Kha world." As he notes, the Tai names for many of these upland groups incorporate this Kha category—Khachin, K(h)mu, K(h)ren. The implications of this construction of a Tai-Kha world for the shaping of upland communities and landscapes are the subject of the current essay.

In sum, *muangs* were important organizing entities in the Tai uplands—both the upland valleys and the flanking hill lands. The connections between valley and upland land use and livelihood activities served to reproduce the valley-based *muang* polities, including the upland regions and communities. These connections are socially constructed patterns of interdependence that take on recognizable forms and styles. The uplands were both peripheral and important, necessary to the wellbeing of the *muangs*.

A persistent *muang*: Muang Sing and its uplands

Muang Sing is significant as an early and enduring Tai Lue center in what is now Laos. Today's Muang Sing is a district in the northern province of Luang Namtha in Laos. It used to be something different.

It once was the seat of a somewhat autonomous Tai Lue polity, Chiang Khaeng, whose domain was situated on both sides of the Mekong River. The present-day district of Muang Sing is very near the border with Yunnan Province, about 14 km by road. Muang Sing is also connected by road to the provincial center at Namtha and to Chiang Kok, a market town on the Mekong. The entire district covers an area of 1650 km^2 (165,000 ha) but the valley of Muang Sing itself is a mere 60–80 km^2 (6000–8000 ha) with an elevation of nearly 700 m. The surrounding mountains reach 2000 m.

The total population of the district is 23,500 (Cohen 2000). In addition to 3 Tai groups in 32 villages, there are a number of upland groups including Akha (68 villages), Yao (5 villages), Hmong (3 villages), and some number of Khmu. While the Akha are numerically dominant, the Tai Lue are the politically powerful; their historical dominance continues into the present. In the past, special administrative arrangements were made to govern the upland people within the *muang*'s domain.

The basic economy of the district is set by the distribution of the population across the landscape; the Tai Lue (and other Tai groups) almost exclusively occupy the valley lands and cultivate wet rice. The upland groups are on the surrounding hillsides and produce a number of upland crops, including cotton and opium.

The subaltern position of the upland peoples is long-standing, as is their role in the development of the Tai wet-rice fields. In prior eras, the dominant Tai Lue nobles imposed corvee labor requirements on the upland people, and much of that labor was used to develop and cultivate their wet-rice fields (Nguyen 1998). Corvee labor, to be used by the *muang*, was the major tax placed on the upland people—the most valuable resource they had from the point of view of the *muang* nobles. This ethnic hierarchy continues today with the upland peoples in subordinate positions.

In the contemporary period, upland labor, especially the labor of the Akha, continues to be mobilized for developing the wet-rice fields of the Tai. Much of this labor now comes from Akha villages that have been encouraged to resettle along the periphery of the valley. While the government promised them access to wet-rice lands, few such lands have been made available. As a consequence of their economic distress and the associated addiction to opium, they have now become a "dependent labor force for the Tai villages in the lowlands" and continue contributing significantly "to the expansion of wet-rice production and the lowland surplus rice economy" (Cohen 2000, p 180).

Another persistent exchange between the Tai and the Akha involves the cotton produced in the upland Akha villages. They exchange this cotton for woven cloth, pigs and chicken, and prepared foods such as cakes and noodles (Cohen 2000, p 191).

While the contemporary period is slightly confounded by the recent policies of Laos to resettle upland people and reduce swidden cultivation (a policy now apparently no longer strongly pursued), the basic pattern of past Tai–upland relations

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can be easily discerned in the present. The uplands are assigned to the production of low-yielding dry-rice production, cotton for market exchange, and opium that can be consumed or exchanged. The Tai polity also maintains the upland people as a regular labor pool for operating and expanding wet-rice cultivation to the direct benefit of the Tai cultivators. A new use of the uplands as a forest reserve is being experimented with by the central government. If followed, this policy also would likely construct an upland domain that would disadvantage the upland people and provide benefits to the Tai.

In this region, the Tai conceptualized the upland people as a part of their *muang*. The upland people were given a place in the administrative structure, but the system also defined these people as inferior and marginal, never as full players in the core arrangements. In this case we see clearly that the ethnic differences and hierarchy were mirrored in the different natural assets to which the groups had access— perhaps these are simply 2 sides of the same coin. Here, as elsewhere, we see the Tai constructing a *muang* dependent on the exploitation of both lowland and upland people and natural resources, and producing social arrangements that restrict the lowland resources to the Tai and the less productive mountain resources to the socially marginalized upland people.

Uplands and the valley-based *muang*

The example of Muang Sing illustrates the ways in which valley–upland connections shape the nature of land use and livelihood activities in the upland communities—corvee labor, opium and cotton production, and so on. A description of the Kingdom of Luang Prabang during the latter part of the 19th century also depicts the close relationship between this *muang* and its surrounding uplands. In Luang Prabang the upland area controlled by the *muang* both produced for and was produced by the *muang*'s requirements. Smuckarn and Breazeale (1988) write that the labor, forest produce, and other agricultural products supplied by the uplanders significantly added to the Kingdom's wealth generated among the lowland population.

What the uplanders sold at markets or produced to exchange in multiple ways with valley-dwellers (Bowie 1992) was, of course, a function of what they could grow, what the lowlanders would buy or exchange, and what they could find to take home for their needs and not try to produce themselves. In that manner, the market exchanges that were possible in the *muang* helped produce, or shape, the patterns of upland land use. In short, the social organization within, and perhaps between, the *muangs* allowed the need for upland products on the part of the valley dwellers to produce labor and land uses in the upland communities that responded to that demand.

Tai principalities either small, like Muang Sing, or larger, such as Luang Prabang, each produced a surrounding upland zone that helped meet a variety of the economic needs of the aristocracy and the commoners. The look of the upland areas, the daily activities that occurred there, and the meaning that people gave to their lives were all shaped, in part, by their relationship with people in the core places of the governed areas called *muangs*.

Muangs, ethnicity, and natural resources

As the above examples illustrate, the Tai *muangs* almost invariably reached across diverse ethnic identities. Thus one major governing task was to construct within their realm a working pattern of social and economic relations among these multiple cultural groups. Markets and other forms of exchange were one mechanism for doing this but Tai *muangs* also helped produce their upland peripheries by arranging the ethnic diversity in their realm into hierarchical patterns that gave the various groups identity and purpose relative to the Tai core. This linkage was often expressed in one ritual form or another, sometimes played out with great pageantry.

Students of ethnicity have suggested that ethnic identity has much to do with the interrelations among groups of people and their competition for scarce resources. A group of people with a common relationship to some valuable resource—either having or not having access to it, for example—will develop ideas and explanations for that resource relationship that provide to them ethnic identity and distinctiveness. This suggests that the mix of ethnic groups found in the *muangs* of this mountainous region reflects the historical, and continuing, competition for scarce natural resources, as well as the rivalry that may have existed in regions from which people have migrated. For example, the nearly exclusive access to upland rice valleys by the various Tai groups may be "explained" and "given meaning" in the cultural ideas held by both the Tai and their upland neighbors—cultural ideas that typically are taken for granted by those who use them. Since the processes of competition are themselves subject to change and alteration—whereas in one era the emphasis may be timber extraction from the uplands, in another period it may be to conserve the same areas for tourists, both activities in competition with the agricultural uses of the local people—it follows that ethnic identity may also be altered.

The agency of the upland peoples

While this discussion has emphasized the impact of the Tai valley-based polities on the upland peo-

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ples and environments, one should not assume that the upland peoples are mere products of the lowlands. Much writing about the upland ethnic minorities has underscored the internal dynamics of these groups, the complex cosmologies and oral histories that inform their understanding and interpretations of the world around them, and the choices that they make to be both proactive and reactive in their relations with others (eg Leach 1954; Kirsch 1973; Keyes 1979; Jonsson 2000; Turton 2000; Sprenger 2004).

Many upland groups were, and are, able to balance marginality, dependence, and cultural distinctiveness. We know from the literature (eg Tapp 1989; Proschan 2001; Benjamin 2002) that upland people have devised their own ethnic maps—both identifying the others with whom they relate and providing explanations for similarities and differences—while also operating within the ethnic hierarchy created by powerful outsiders such as the *tai-kha* formulation of the Tai *muangs*. In other words, when interacting in and with highland *muangs* and their Tai social order, the uplanders contributed to the construction of *muang* polities by providing their own explanations of their place in those polities, as well as interpretations of the pattern of resource access organized by the *muangs*.

In sum, the Tai highland *muangs* were ordered not only by the imagining and acting of the dominant Tai but also by the conceptualizing and acting of the subordinate Akha and other upland groups. The upland people and environments were shaped in a *tai-kha* world in which both valley- and upland-based groups acted separately and jointly.

Summary

The present article has examined the proposition that highland Tai polities, *muangs* and *muang* federations, played an important role in the 18th and 19th centuries in shaping the activities of the upland peoples, usually non-Tai ethnic groups, within their domains. Choices regarding crops to be grown, animals to be raised, and natural products to be harvested from the forests were determined, in part, by the requirements of the valley-based Tai polities as expressed in local and regional markets, through informal exchanges and forced labor requirements. The upland peoples also were incorporated into ranked ethnic networks with the Tai groups at the apex, and displayed through various ritual activities. These networks, and their associated ethnic identities, gave the various groups identity and purpose relative to the Tai core. On the other hand, while being connected with these Tai polities, the upland peoples also brought their own histories, world views, and agency—the ability to make choices within the context of the *tai-kha* world in which they participated. Their ideas and actions contributed to the construction of highland *muangs* that typically incorporated both ethnic diversity and ecological differences.

Through these social, political, and economic means the highland Tai *muangs* were able to exploit a diverse set of natural assets found in the valleys that the Tai occupied and in the upland habitats occupied by others. *Muang* polities achieved governance of both a diverse network of peoples and a diverse natural habitat. The upland portion of the habitat was constructed to meet the needs not only of the upland ethnic groups but also the Tai occupants of the valley lands. Consequently, to a considerable extent, historically the shape of the uplands was the epiphenomenon of their inclusion in *muang* domains of governance.

The historical arrangements in which upland and non-Tai peoples were embodied in Tai-constructed *muangs* finds contemporary expression in the manner in which upland communities interact with the local districts, as well as the nation-states of which they are a part. Many, though not all, of the local districts in the Tai cultural area retain vestiges of the earlier *muang* arrangements. Since contemporary upland people and resources remain within administrative entities where lowland political and economic power is dominant, the shape of these regions and peoples continues to be effected in significant part by lowland interests and actions, but with increasing, and in some cases consequential, engagement by upland minorities.

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Community-based Watershed Monitoring and Management in Northern Thailand

Conditions in Mae Chaem are indicative of many problems and challenges facing upper tributary watersheds in northern Thailand. Recent changes in land use include the growth of commercial agriculture associated with opium crop substitution and decreased rotational shifting cultivation. Changing land use has led to increased tensions, as downstream populations blame practices in the mountains for floods, droughts, sedimentation, and a perceived decline in water quality. To help address these issues, the World Agroforestry Centre (ICRAF) is working with local sub-watershed management networks to develop ways to increase communication, trust, transparency, and accountability among communities and government units.

One focus of this work is on the use of simple, locally managed science-based methods for monitoring watershed services. Upper tributary landscapes are composed of fairly complex mosaic patterns of various cultivated and non-cultivated land use practices. The net impacts of these various configurations on watershed services are subject to considerable speculation and much debate, the vast majority of which is based far more on theory, emotional impressions, and/or vested interests than on empirical evidence. Thus, the project has sought to test a set of simple science-based tools employed by members of local villages in the context of their sub-watershed management network, in order to produce information useful for:

1. Feedback on the impacts of local land use management on watershed services;
2. Helping manage watershed service-related tensions and conflicts among local communities; and
3. Facilitating communication and negotiations between local upland communities and downstream communities and the broader society regarding the impacts of land use in upper tributary watersheds.

Study sites

The 12 sites in this project were located in 4 sub-watersheds (Mae Raek, Mae Kong Kha, Mae Suk, Mae Yot) of the nearly 4000 km^2 Mae Chaem watershed in northern Thailand's Chiang Mai Province. Mae Chaem is a major sub-basin of the Ping River Basin, which is the largest tributary of the Chao Phraya River system that feeds the famous irrigated agricultural production systems of Thailand's central plains region, as well as Bangkok.

Testing the monitoring toolkit

Four basic sets of tools were selected for this initial exploration in community-based monitoring.

Climate and stream flow

The first set of tools focused on daily measurements of basic climatic variables, including rainfall, maximum and minimum temperatures, and relative humidity, along with weekly indicators of stream flow. Rainfall, temperature, and relative humidity were measured with simple devices. Simple structures or shelters were made for these instruments at a location within or near the village settlement area where daily readings could be made and recorded with minimal inconvenience.

Stream flow was monitored by measuring stream depth and surface flow velocity. Water depth was a simple weekly measurement at the same point using an improvised staff gauge. Surface velocity was estimated using a leaf or foam float and a stop watch to time its travel time along a 5–10-m measured distance, averaged over a series of at least 5 runs. Water temperature was also measured.

Data collected by villagers appear comparable to data collected by more sophisticated techniques. Data patterns are comparable to official sources at similar elevation, and differences among elevations are similar for both sources.

Stream water quality

Overall water quality monitoring used a bio-indicator approach based on work conducted by researchers

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FIGURE 1 Water quality monitoring demonstration at a village site. (Photo by Theerasak Sangsrichan)



seeking to adapt similar approaches used in the United Kingdom. Background materials and methods are detailed in handbooks and guides that are packaged along with an identification key and associated materials in a Stream Detectives Package, originally published in Thai, and now available in English from the Green World Foundation based in Bangkok.

Scores assigned to organisms collected at a particular site and time are aggregated to provide an overall index of water quality based on weighted scores of the resulting 'suite' of species. The index has a 10-point scale that can place water quality into one of the 5 categories. This method requires only simple equipment, and identification of specific organisms is facilitated by local knowledge and familiarity with many of them. An identification key helps match the system with local names and provides a score for different groups of organisms, based on their relative sensitivity or tolerance to factors contributing to poor water quality. Earlier trials showed aquatic invertebrates compared favorably with other types of bio-indicators, including algae, diatoms, and aquatic plants, but the former are easier for villagers to learn and implement. Although many villagers were initially apprehensive about the difficulty of this method, it has become one of the most popular and highly regarded of our monitoring tools (Figure 1).

Soil erosion and stream sediment

The third category of data focused on simple measurements of stream sediment, and on soil movement in cultivated fields. Stream sediment data were collected weekly and reflected the project's effort to contribute to compilation of data to verify linkages between stream water turbidity and its actual sediment content. Soil movement in cultivated fields was measured monthly, using a simple soil 'bridge.' This method allows the detection of both soil loss and soil accumulation, and replicate pairs of such sites were established at upper, middle, and lower slope locations of selected cultivated fields.

Local environmental knowledge

The fourth category of monitoring data focused on identifying local environmental knowledge related to the watershed measurements. Most initial information was on local indicators of weather conditions, particularly indicators of rainfall or drought events. Fewer data were collected on factors affecting soil characteristics related to soil erosion. Village data collection volunteers made efforts to record the time, place, and prediction associated with a given indicator and the person making the observation. Data records from rainfall and temperature monitoring activities could then be used to systematically verify the accuracy of the prediction. Villagers at several locations are finding this a very interesting activity for helping to analyze the range of local indicators.

Assessing performance quality in the use of monitoring indicators

To assess monitoring efforts, scientific and field staff collaborated in developing basic criteria for evaluating the completeness and consis-

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tency of data records generated by village monitor volunteers at each of the 12 main monitoring sites over a 30-month period. While none of the sites were able to achieve a complete high quality data record, results of these initial pilot efforts conducted by village volunteers were quite impressive at many sites. Village volunteers were able to explain reasons for a number of the gaps and inconsistencies in their data records by describing some of the problems they encountered during the data collection process.

Lessons for further use of watershed monitoring tools

Participating villagers were also asked to give their opinions about the different measurements, based on their perceptions of how useful the data would be for them in the context of their local issues and watershed management network. All villagers agreed on the relevance and utility of collecting temperature, humidity, rainfall, and water quality data, as well as relevant information on local knowledge. Opinions were split on the usefulness of data on stream depth and water temperature.

In addition to opinions about the various types of simple science-based tools, volunteers gave these additional suggestions about collecting data on watershed services:

- Authority for data collectors needs to be derived from relationships with a network or a local sub-district government unit.
- All relevant ethnic groups in the local area should be included.
- It is important to have periodic meetings among data collectors in various sub-watersheds, in order to exchange data and information.
- Persons providing extension support services must give sufficient time to training in collecting, interpreting, and using data, building understanding and answering questions, and helping point out its importance.
- Data collectors should have sufficient basic knowledge or ability to learn quickly.
- An appropriate modest amount of compensation is necessary.
- Activities should be coordinated with village headmen to help them appreciate the usefulness and importance of the data.
- The need for data by researchers, watershed managers, or technicians must be matched with the needs of local people from the outset in order to prevent conflicts, as the data needs of watershed managers probably differ from the needs of villagers.

Use of science-based tools, together with local environmental knowledge in participatory watershed monitoring and management, is possible, and communities have seen that knowledge from these 2 sources can be combined to increase their usefulness. But 2 issues need careful consideration:

1. Confusion about use and interpretation of data from science-based tools; and
2. Study of factors that can help support emergence of these activities, considering that volunteers must manage their time carefully.

There will likely be a need for adaptation to local contexts that may affect what data are collected, as well as the completeness of data records. Local monitors also want to exchange knowledge and experience. Thus, future efforts need to emphasize easy tool use and data interpretation, and ways to support information exchange, in order to facilitate the widespread use and acceptability of data among villagers, technicians, other stakeholders, and policy decision-makers at various levels.

Additional biological indicators of environmental quality

Given the importance of and interest in use of biological indicators, among villagers and our colleagues at governmental and non-governmental institutions, additional work in this area was led by Dr Pornchai Preechapanya of the Northern Watershed Research Center. He and his staff printed and distributed a *Handbook for Inspecting Environmental Quality* that catalogs 133 entries of biological indicators of water, soil, forest, air, and general environmental quality. Entries cover a range of indicator organisms, including aquatic invertebrates, fish, algae, plants, mammals, amphibians, reptiles, birds, and insects. Information includes local and scientific names, pictures, and details about what they can indicate in terms of environmental quality characteristics.

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Establishing Long-term Biodiversity Assessment and Monitoring in Northwest Yunnan, China: A Growing Need for Baseline Information

Increasing attention is being paid to land use changes in the mountain environments of southwest China. Yet it is essential to develop a network of relevant sites for long-term analysis and comparison. For this reason an important part of an ongoing ethno-ecological project being undertaken by the Kunming Institute of Botany is the establishment of permanent vegetation plots across key environmental gradients in northwest Yunnan. These sites are envisaged as a model for a network of permanent plots that will provide baseline data to help delineate the potential effects of climatic and land-use changes in this region. Northwest Yunnan is important—not only as a biologically and culturally significant area in its own right, but, since it forms the headwaters of major rivers in Southeast Asia (ie the Mekong, Irrawaddy, Salween, and Yangtze), this region has immense regional significance as an upstream provider of ecosystem services (Figure 1).



FIGURE 1 Map of northwest Yunnan, showing the parallel mountain ranges and the position of the Qianhu–Haba transect. (Map by Andreas Brodbeck)

To some extent, shortfalls in China's land-use policies are inevitable, because relevant research is constrained by a lack of fundamental baseline data. Although great strides are being made in introducing high-tech managements tools (eg GIS and remote sensing), most temporal land use modeling is based on image analysis, which is often superficial. The paucity of long-term ecological records is especially notable in China, because large amounts of

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scientific data and experience were lost or purged during the turbulent post-revolution period (Shapiro 2001). It is with a view to filling these gaps—now and for the future—that we are establishing long-term monitoring sites.

A biodiversity and cultural refuge

As an internationally recognized biodiversity hotspot, the mountains of southwest China have been prioritized for conservation and ecological research (Mittermeier et al 2004). In particular, the Critical Ecosystem Partnership Fund (CEPF), which is supporting this project, aims to safeguard Earth's biodiversity hotspots and enhance biodiversity conservation. Our project addresses 2 of the main strategic directions of CEPF:

1. Developing hotspot-wide monitoring and evaluation projects; and,
2. Integrating biodiversity conservation concerns and benefits into the implementation of policies and programs.

The mountains of southwest China have been subject to changing land-use practices. Fast-track modernization has driven the exploitation of natural resources, denuding the once expansive forests and polluting waterways. Currently, the main threats to biodiversity are livelihood activities, including agricultural production, livestock grazing, and the collection of fuelwood, construction timber, and non-timber forest products (NTFPs; Xu and Wilkes 2004). To redress such problems, these rural regions are now subject to drastic resource management and conservation policies. Some of these policies are paradoxical—for example, the government's push to increase livestock, while at the same time hamstringing grazing by discouraging rangeland burning and promoting plantations at the expense of pasture. Similarly, there are concerns that unrealistic forest protection measures could actually result in more intensive and unsustainable wood collection practices.

A number of questions have arisen. Are the current proscriptive policies going to achieve the best balance of resource utilization and conservation? How successful is reforestation, in terms of forest cover and forest quality? How will recent shifts in land use affect habitats critical for local livelihoods? Are there significant changes to biodiversity? How rapid, widespread, and profound are these changes?

Monitoring a continuum of mountain habitats

Northwest Yunnan is dominated by parallel mountain ranges that run north–south and form 3 major river valleys. This altitudinal and latitudinal range gives rise to the wide variety of habitats. In terms of site selection, this diversity is most parsimoniously captured with transects across the mountains. Consequently, we will place monitoring sites in key ethno-botanical zones along these transects. The first permanent monitoring sites were established last year on a transect from the Qianhu to the Haba mountain ranges (Figure 1).

Eleven sites on the Qianhu–Haba transect were selected to be representative of important factors, including: indicators of climate change (alpine wetlands, alpine rangelands); climax reference (mature forests); post-disturbance effects (wildfire, insect-affected); importance to local livelihoods (headwater forest, grazing lands, sources of NTFPs or wood) (Table 1).

Permanent sites have been GPS-located, photo-recorded, and marked with concrete posts. A nested quadrat system is employed to record information appropriate to the major vegetation (forest, shrubland, or grassland). At each site, floristic, structural, and environmental attributes are recorded. These include species richness, biodiversity indices, community structure, landscape, and edaphic conditions. For forest sites, stand basal areas were determined, making possible forest dynamics and biomass calculations. In addition, woody debris is measured (significant as an index of ground habitat diversity and potentially affected by wood collection). The methods minimize subjectivity so that measurements can be repeated by different observers; for example, point quadrats are used in grasslands and photo points are designated.

This information will be stored in a database for comparative studies to help make informed decisions on land use management. Such information may include the ecological tolerances of plant communities to ongoing fuelwood or fodder collection, the long-term implications of grazing or burning, the regeneration of replanted forest, and/or restored rangeland communities.

Working towards a monitoring network

The value of ecological reference sites is unquestionable. Experience around the globe has shown that long-term plots and monitoring are a reliable source of baseline data, which can vastly improve modeling accuracy and resource management (Bakker et al 1996). Moreover, for changes that affect land users, on-the-ground sites are an effective way to communicate and demonstrate changes.

This project dovetails with other conservation research on sustainable management (eg use of forest products and grazing studies) being carried out by a number of other agencies, and hopefully some of this research can be piggybacked with long-term monitoring. Certainly, cooperative research is envisaged, as our partners include the Shangri-La Alpine Botanic Gar-

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TABLE 1 Overview of the major vegetation habitats across the Qianhu–Haba mountain transect.

Major aspect	Elevation (m)	Vegetation type	Width of the zone (km)	% of transect	Monitoring plot
East	~4000	Alpine mosaic of lake–grassland–*Rhododendron* shrub–*Abies* forest	1.4	3.25	Yes
East	3800–4000	Mosaic of grassland–*Abies* forest	5.6	4.88	Yes (2)
East	3600–3700	*Abies* forest	1.5	5.69	Yes
East	3400–3600	Forest mosaic of *Abies–Picea–Quercus–Betula*–bamboo	2.0	6.50	Yes
East	3200–3400	*Pinus densata* forest	0.8	2.44	
Flat	~3200	Mosaic of agriculture–grassland	2.0	3.25	
East	3000–3200	*Pinus densata* forest	3.0	7.32	
Flat	~300	Xiaozhongdian River			
West	3000–3300	*Pinus densata* forest	4.0	14.63	Yes (2)
Flat	~3000	Mosaic of agriculture–grassland	2.5	6.50	Yes
Varied	3100–3500	*Pinus densata* forest	4.0	11.38	
West	3500–3600	Forest mosaic of *Pinus densata–Quercus pannosa*	0.4	1.63	
West	3600–3700	Forest mosaic of *Quercus pannosa–Abies*	0.4	1.63	Yes
West	3700–3900	Rangeland–forest mosaic (*Abies–Larix*)	1.0	1.63	Yes
West	3900–4000	Alpine mosaic of *Rhododendron* shrub–grassland	0.4	2.44	Yes
West	>4000	Alpine scree	0.4	1.63	

den, Zhongdian; Zhongdian Tibetan Research Institute; Center for Biodiversity and Indigenous Knowledge (CBIK), Kunming; and World Agroforestry Centre, Kunming. This work will also complement ongoing alpine assessments in this region by the Nature Conservancy, who are establishing permanent plots on mountain summits as part of a coordinated global monitoring effort (Pauli et al 2004).

It is envisaged that a permanent plot program will be expanded to cover other ranges at various latitudes. While far from complete, these sites will form an invaluable resource in coming years to track the effects of climate change and varied land use. In the long term, we want a mechanism in place to monitor the status of key ecosystems in northwest Yunnan, with a view to targeting policy changes in land use practices that reflect local conservation and community development needs.

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MRD Founding Editor Jack D. Ives Honored by the Royal Geographical Society

Professor Jack D. Ives is the founding editor of Mountain Research and Development. *Many* MRD *readers, and certainly the wider community of mountain specialists, scholars, and development experts, are familiar with Jack Ives's international reputation as an advocate for the world's mountains. His influential career as a renowned teacher, scholar, editor, and public advocate has now been acknowledged with a very high honor—the award of the Patron's Medal of the Royal Geographical Society.* MRD *has received the official information printed below in connection with this award. The* MRD *editorial staff is proud to have been entrusted with continuing the work that Jack began in founding* MRD*, now in its 26th year of publication. We would like to take this opportunity to offer our heartiest congratulations to* MRD*'s founding editor on the occasion of his receipt of this award!*

Patron's Medal of the Royal Geographical Society

Her Majesty Queen Elizabeth II approved the award of the Patron's Medal of the Royal Geographical Society (RGS) to Professor Jack D. Ives for his mountain and arctic research, extensive publishing, teaching, and especially "for his role internationally in establishing the global importance of mountain regions."

The presentation was made on 5 June 2006, at the RGS headquarters, Kensington Gore, London, by Sir Neil Cossons, OBE, President of the Society.

The RGS annually presents two Royal Medals of equal rank and dating back to 1831. The Founder's Medal (HM King William IV, the Society's founder) was awarded to Professor Derek Gregory of the University of British Columbia.

In making the presentation, Sir Neil referred to Jack's founding and editing of *Mountain Research and Development* (1981) and the quarterly journal *Arctic, Antarctic and Alpine Research* (1968). He went on to emphasize his contributions to ensuring the inclusion of Chapter 13 in Agenda 21 during the 1992 Rio de Janeiro Earth Summit and the UN dedication of 2002 as The International Year of Mountains, also to his coordination, with Bruno Messerli, of the UNU Himalayan research and training mission.

The second edition of Jack's book *Himalayan Perceptions: Environmental Change and the Well-being of Mountain Peoples* is due for publication in Kathmandu later this summer.



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