ABSTRACT OF THE DISSERTATION

The Eastern Himalaya Region is one of Earth's "biodiversity hotspots," with much of that diversity residing in the region's temperate broadleaved forests. As recently as forty years ago, these were some of the most inaccessible forests in the world. But after centuries of spreading subsistence agropastoralism, and more recently commercial logging, ecological degradation is pervasive, and in many areas only patches of primary forest remain. Unfortunately, empirical ecological knowledge of the region, and governmental capacity, are in nascent states of development, and ill-equipped for the task of simultaneously conserving regional biodiversity and improving the livelihoods of local people. In many areas, governments have recently initiated forest co-management programs, where local user groups manage the forest according to "indigenous wisdom" and government oversight. Presumably, scientific knowledge will be integrated as it becomes available. With this study, I advance our knowledge of the effects of indigenous forest resource use on plant and animal communities in the Temperate Sikkim-East Nepal Himalaya.

In Chapter 1, I introduce the overall goal of the study: to model how subsistence use of Temperate Sikkim-East Nepal Forest changes indigenous plant and animal communities. I describe the region's rich biodiversity, when and by whom it was discovered, how seriously it is threatened, and how institutions of rural development and nature conservation are responding. I also provide background information on the conceptual, theoretical and methodological approaches I take, and I delineate the geographic, biotic, and cultural scope of the work, which was conducted at Chitre Village, in the Makalu Barun Buffer Zone adjoining Makalu Barun National Park, northeastern Nepal.

In Chapter 2, I assess household collection and consumption of woody plant resources, including fuelwood, timber, tree fodder, bamboo, pollarded stems, and leaf litter, and I investigate how these harvests impact resource supplies and natural habitats around the village.

In Chapter 3, I analyze plant species assemblages along a gradient of anthropogenic disturbance extending out from the village. I hypothesize the non-random distributions of woody plant species are more influenced by anthropogenic disturbance than by environmental heterogeneity. I investigate large relict stumps and trees near the village center and conclude the entire study area (entire length of the distance/disturbance gradient) was formerly covered in mixed broadleaved forest. Chapter 3 provides botanical and phytoecological foundations for the chapters that follow.

In Chapter 4, I study habitat associations of animal species and species assemblages (51 bird and 8 small mammal species) in order to establish baseline quantitative knowledge of species-habitat associations for the Temperate Sikkim-East Nepal Himalaya, and to better understand how forest use practices impact the composition and structure of the region's wildlife habitats.

In Chapter 5, I investigate changes in woody plant and small animal communities that result from the harvest of woody plants, using distance from the village center as a surrogate for period and degree of anthropogenic disturbance. I estimate the intensity of resource harvests across three progressively disturbed habitat zones, and I assess the effects of resource harvest on wildlife habitats and the abundance, diversity, and composition of woody plant and small animal communities.

In Chapter 6, I use data from Chitre Village to create a graphic model of generalized changes in plant and animal communities at successive stages of rural development, at both

landscape and patch scales. The model's four stages depict landscape-scale changes in vegetation and village development as an area transitions from seasonal pasture to commercial outpost. Six additional figures depict patch-scale habitat conditions associated with the changing landscapes. Corresponding changes in animal communities are presented in narrative, and referenced to supporting evidence from the preceding chapters.

Noteworthy accomplishments of this work - all novel for the temperate Himalaya - include: field experiments to determine weight loss and weight:volume ratio of hearth-dried fuelwood (Chapter 2), analysis of historic forest composition from relict stumps and trees (Chapter 3), analysis of woody plant associations formed by anthropogenic disturbance (Chapter 3), quantitative analysis of the breeding habitats of 51 bird and 8 non-volant small mammal species (Chapter 4), use of territorial spot mapping to determine microhabitat associations (Chapter 4) and breeding densities (Chapter 5) of "known" understory passerines (Design II habitat analysis), use of binary logistic regression to model habitats of selected understory passerines (Chapter 4), identification of direct links between resource harvest and changes in the composition and structure (niche-gestalt) of animal species' habitats as well as compositional changes in plant and animal communities (Chapter 5), and use of photorealistic terrain visualization software to create generalized models of long-term anthropogenic change in mixed broadleaved forests of the Temperate Sikkim-East Nepal Himalaya.

The results of this study can be instrumental in identifying needs, priorities, and methodological approaches for future research. My investigation of the ecological effects of subsistence agropastoralism should be followed up with studies on the effects of swidden agriculture, where it is still practiced, and effects of cash crops, where they are being introduced. My investigation of animal species-habitat associations should be followed up with studies of taxa I omitted for various reasons. My approach to studying anthropogenic effects on animal guilds should be used to develop guild-based environmental monitoring in the region. Finally, much sociological work is needed to determine how best to encourage local forest users to trade off traditional forest use liberties for environmental conservation, and how best to train local people to implement science-based environmental monitoring.