

Chapter Six

A Model of Anthropogenic Change in Mixed Broadleaved Forests of the Temperate Sikkim-East Nepal Himalaya

I use data from human, plant, and animal communities at Chitre Village (pop. 50) to create a graphic model of anthropogenic environmental change in mixed broadleaved forests of the Temperate Sikkim-East Nepal Himalaya. The model's four sequential stages depict landscape-scale changes in vegetation and village development at a scale of $\sim 18 \text{ km}^2$. Future conditions are based on satellite images of nearby Salleri Village (pop. 5368). Six additional figures depict associated patch-scale habitat conditions at a scale of $\sim 40 \text{ ha}$. Corresponding changes in animal communities are presented in narrative, and referenced to supporting evidence in the preceding chapters.

In the transition from seasonal *khArka* (pasture) to commercial outpost, closed-canopy forest is largely replaced by cropland, pastures, and open-canopy secondary forest. In the early stages of development, most resident plant and animal species are associated with closed-canopy forest and natural canopy gaps. At intermediate stages, the proliferation of anthropogenic habitats results in peak habitat diversity and, consequently, peak animal species diversity, although woody plant diversity declines. Croplands and pastures become colonized by disturbance-tolerant species common in open habitats at lower elevations, and are particularly attractive to birds that nest in ground cavities or have herbivorous diets (Table 5.15). The proliferation of open secondary forest increases available habitat for bird guilds that nest or forage near the ground or in the mid-canopy, or forage facultatively on nectar, insects, or fruit (Table 5.15), and all small mammal dietary guilds except carnivores (Table 5.16). At the commercial outpost stage, open

anthropogenic habitats predominate and primary closed-canopy forest is reduced to small remnants. Animal species that utilize weedy thickets or ruderal patches, or are commensal with humans, become more common and diverse. Forest-interior species and endemic habitat-specialists become rare or absent, and available habitat declines for avian guilds that forage strictly on fruit or nectar, forage in the high canopy, or forage and nest strictly in the mid-canopy (Table 5.15).

Model predictions regarding future conditions should be field tested at villages of greater size. Coupled with careful negotiation, community education, and outside support, this model, and the supporting research, could be instrumental in curbing the degradation of biodiversity and high-value forest resources where forests are co-managed by local communities.