CHAPTER 7

Panda Habitat Transition

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7.1 Introduction

Human activities degrade ecosystems and threaten the long-term survival of many wildlife species around the world (Araujo et al., 2006, Botkin et al., 2007, Thuiller et al., 2008). In response, many conservation efforts have emerged to stop and reverse the degradation of natural ecosystems. The establishment of protected areas is considered one of the most effective efforts (Andam et al., 2008, Hannah et al., 2007, Jenkins and Joppa, 2009). Currently, there are more than 170 000 protected areas (Le Saout et al., 2013). Many are experiencing conservation successes. Increases in forest cover and other natural vegetation types (e.g., grasslands; Brereton et al., 2008, Norton et al., 2012) have translated into an increase in suitable habitat for wildlife (Bruner et al., 2001, Fall and Jackson, 1998, Messmer et al., 1997). As a result of such successful conservation actions, many areas around the world have experienced increases in wildlife habitat and populations (Enserink and Vogel, 2006, Gehring et al., 2010a, b, Pyare et al., 2004). In some cases, populations are larger than a century ago. These areas are in countries such as Mexico and the United States in North America (Dobkin et al., 1998, Martin-Rivera et al., 2001, Taylor et al., 2005), the United Kingdom and Spain in Europe (Aebischer and Ewald, 2010, Kuijper et al., 2009, Lozano et al., 2007, Smart et al., 2013), Ghana and the Republic of Congo in Africa (Adum et al., 2013, Robbins et al., 2011), Colombia and Costa Rica in Latin America (Sanchez-Cuervo et al., 2012, Timm et al., 2009), and China and Cambodia in Asia (O'Kelly et al., 2012, Wang and Li, 2008). However, the limitation or complete prohibition of natural resource use inside protected areas has negatively affected the livelihoods of people living in these areas (Adams et al., 2004, McShane et al., 2011). Consequently, people-oriented conservation activities are rapidly becoming widespread, including programs of payments for ecosystem services (PES). These programs provide alternative livelihood options that reduce the pressure on biodiversity and lead to sustainable use of natural resources. Thus, the programs have the dual goal of simultaneously protecting biodiversity while sustaining and even improving human livelihoods (Berkes, 2004, Hughes and Flintan, 2001).

China is the most populous nation and one of the most biologically diverse countries in the world (Liu, 2010, Liu and Diamond, 2005). China exemplifies the challenging balancing act of biodiversity conservation while supporting human livelihoods. In response to biodiversity loss, the number and spatial coverage of protected areas in China have increased exponentially, particularly since the 1980s (Liu and Raven, 2010). The first nature reserve was established in 1956. By the end of 2012, a total of 2669 nature reserves had been established, covering 15% of China's land surface (Xu et al., 2014). Conventional top-down management is prevalent in these protected areas (Liu and Diamond, 2008), in which the government dictates management decisions without much input from local communities. As a result, the livelihood of tens of millions of poor rural people living in and around protected areas was negatively affected (An et al., 2001, Xu and Melick, 2007). Thus, due to an inadequate consideration of local people's dependence on natural resources, conservation failures are common in China's protected areas, even in flagship reserves (Liu et al., 2001).

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7.6 Lessons learned and their implications for biodiversity conservation

Between the establishment of the reserve in 1963 and the end of the twentieth century, the panda habitat of Wolong exhibited a negative trend. This trend was reversed during the first decade of the twenty-first century, when the panda habitat started to recover. Such habitat transition is concurrent with an observed forest transition (Viña et al., 2011; Chapter 6) and started to occur after the implementation of NFCP. This synchronicity suggests that NFCP has an overall positive effect not only on forests but also on panda habitat. Three potential reasons may explain the effectiveness of NFCP. First, direct payments to local residents compensate the costs of forgoing resource-depleting activities (e.g., timber harvesting). Thus, direct payments may create a strong incentive for conservation activities (Engel et al., 2008, Ferraro and Kiss, 2002). Second, besides constituting a strong conservation incentive, the payments may also encourage additional responses. Examples include making the switch from fuelwood to electricity more affordable and reducing the dependence on fuelwood as the primary energy source (An et al., 2002; Chapter 10). And third, by assigning monitoring duties for forest parcels to household groups, the reserve administration induced a shared responsibility in monitoring activities. This design feature enhanced rule compliance through social norms (Chen et al., 2009, Dietz et al., 2003). As a result, local people dutifully perform their monitoring activities not only to obtain the economic compensation but also to avoid payment reductions that could harm their social relations with other group members (Yang et al., 2013b; Chapter 11). They also recoil from harvesting timber or collecting fuelwood in the parcels monitored by other groups to avoid harming their social relations with the people in those groups (Yang et al., 2013b).

Our results suggest that complementary conservation instruments explicitly incorporating local residents (e.g., through the combination of PES, decentralized management, and top-down regulations) may offer better conservation outcomes than the implementation of a single instrument. In addition to restoring forest cover (Viña et al., 2011), NFCP implementation was also effective in restoring panda habitat. The successful engagement of local residents in forest monitoring activities through adequate economic compensation enhanced such effectiveness. The involvement of local residents in NFCP monitoring efforts is, therefore, generating greater overall conservation benefits than in most other areas of China, where local residents are not involved in monitoring (Yin and Yin, 2010). Thus, this type of household involvement in conservation activities should be encouraged in other parts of China and the world.

7.7 Summary

Conservation policies such as payments for ecosystem services (PES) have emerged to address local people's needs. Some studies have assessed the effectiveness of PES programs at reducing the degradation of natural ecosystems. Few studies, however, have assessed their effectiveness in conserving wildlife habitat. In this chapter, we evaluated panda habitat dynamics using multiple satellite sensor systems (including the Landsat series and MODIS) together with field data and novel remote sensing procedures. The procedures included generating phenological signatures and phenology metrics derived from a vegetation index (i.e., the Wide Dynamic Range Vegetation Index) using imagery acquired with a high temporal resolution by MODIS. They allowed us to analyze the distribution of understory bamboo—the crucial component characterizing panda habitat not included in previous habitat models. Our method showed an overall gain in panda habitat of 2.2% between 2001 and 2007. The most significant driver that may explain this change is the Natural Forest Conservation Program (NFCP), implemented in 2001, that monitors and prevents illegal timber harvesting. In some areas of Wolong, NFCP involves local households and provides them with economic compensation. Compensation was not equal across space, and habitats were more improved in townships where people received higher compensation. Our findings demonstrate the value of including understory vegetation estimates in habitat modeling for evaluation of conservation programs. In addition, our results suggest that conservation actions that successfully engage local residents and provide adequate economic compensation generate higher environmental gains than simple bans on resource use.

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