



## ECOLOGY

# Protecting China's Biodiversity

Jianguo Liu,\* Zhiyun Ouyang, Stuart L. Pimm, Peter H. Raven,  
Xiaoke Wang, Hong Miao, Nianying Han

China is the most populous country, has one of the largest territories, has a booming economy (1), and recently has significantly changed its political leadership. As China's new top leaders begin to develop socioeconomic priorities, initiatives, regulations, policies, and legislation, it is important for them to expand the support for biodiversity conservation.

China has so many ecosystem types that it has >30,000 species of vascular

plants [behind only Brazil and Colombia, (2)] and ~2340 species of terrestrial vertebrates (3), >10% of the world total in both cases (2). Perhaps half of China's species are found nowhere else; these include many archaic and distinctive evolutionary lines, like giant pandas and ginkgoes (4).

As elsewhere, China's biodiversity suffers from the explosive increase in the intensity and extent of human activities. Forest cover now accounts for only 16.5% of its area (5). Its rangelands are severely overgrazed, its wetlands are shrinking rapidly, and invasive species are an increasingly serious problem. Poaching of plants and wildlife is still common despite government bans. For example, tourist shops near some nature reserves conspicuously display skins of the endangered snow leopard. Air and water pollution are among the most severe in the world. The World Conservation Union (IUCN) 2002 Red List places China among the countries with the most threatened birds and mammals (6). Perhaps

a quarter of its species are threatened (7).

To protect its biodiversity, China has established 1757 national and local nature reserves, most within the last 20 years (see figure, next page). They cover about 13% of the nation's area (8). Among them, 171 are national reserves (9), 21 have been designated Biosphere Reserves of the United Nations Educational, Scientific and Cultural Organization's (UNESCO's) Man and the Biosphere Programme (10), and 7 have been designated globally significant wetlands (11). China has set an ambitious goal of increasing the number of reserves to 1800 (covering 15% of the area) by 2010 and 2500 by 2050 (12). These achievements are remarkable given China's population and the pressing need for economic development. Nonetheless, the nature reserve system faces serious challenges. We (11, 13–18), together with others (19), have begun to address the major issues.

### Enhance the National Plan and Administrative System

For the most part, lower-level government organizations have established national and provincial reserves, with ultimate approval by upper-echelon government organizations (11). This bottom-up approach rescued many threatened ecosystems and endan-

J. Liu is in the Department of Fisheries and Wildlife, Michigan State University, East Lansing, MI 48824, USA. Z. Ouyang, X. Wang, and H. Miao are at the Key Lab of Systems Ecology, Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, Beijing, People's Republic of China. S. L. Pimm is at the Nicholas School of the Environment and Earth Sciences, Duke University, Durham, NC 22704, USA. P. H. Raven is at the Missouri Botanical Garden, St. Louis, MO 63166, USA. N. Han is on China's National Committee on Man and Biosphere, Beijing, People's Republic of China.

\*To whom correspondence should be addressed. E-mail: jliu@panda.msu.edu

gered species from immediate loss, but it has been opportunistic. It lacks systematic planning and an adequate conceptual base. Most reserves are too small to ensure species survival and sustain ecosystem function. Many important areas are excluded. For example, no land managed by the military has been incorporated into the reserve system, even though some of it is ecologically diverse and contains many endangered and threatened species. In some countries (e.g., the United States), the military's primary mission still permits a secondary responsibility for stewardship (20). National reserve planning would identify priorities and gaps in the existing system, and the need for new reserves that could follow ecosystems across provincial and national boundaries. It might strengthen cooperation among reserves and regional bureaucracies.

National and local reserves are under the jurisdiction of several ministries and state agencies, including the State Forestry Administration (SFA) and State Environmental Protection Administration (SEPA) (11). Although most reserves are under the jurisdiction of SFA, SEPA is currently responsible for their coordination. Local governments manage most of the national reserves. The central government provides reserves only limited financial support; a third have no clear boundaries, no management teams, and no staff (11). The reserve system needs centralized management and coordination under the State Council. A new State Administration for Nature Reserves should be established with increased authority and funding, as well as a comprehensive Nature Reserve Law at the national level.

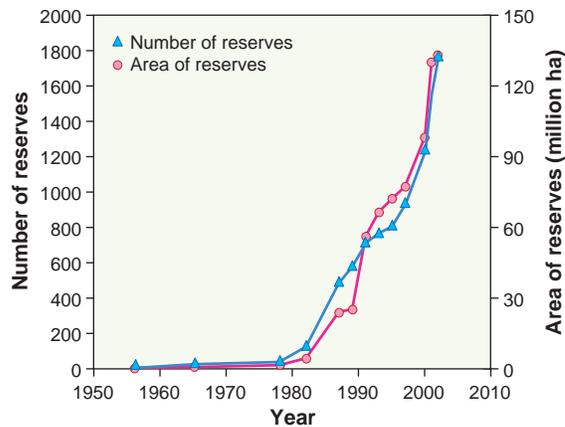
### Increase Investment

National reserves received only \$113/km<sup>2</sup> (operating and construction funds), much lower than the world average (\$893/km<sup>2</sup>), and even lower than the average of reserves in developing countries (\$157/km<sup>2</sup>). Local reserves receive only \$53/km<sup>2</sup> (13). Of 85 reserves surveyed, the government covered only about a third of their needs.

Economic activities of reserve staff (such as harvesting and selling resources unavailable to others) have caused severe damages (14), yet managers must pursue such practices to pay their staff. When local government assumes the management of national reserves, the central government should provide adequate funds (11). Similarly, locally owned and operated reserves should be accorded higher levels of attention by the per-

tinental governmental units (21). Based on carefully considered national priorities, additional funds should be sought from the private sector and from nongovernmental organizations and international organizations for the proper management of all reserves (22). A separate national budget should cover the operational expenses of national reserves, and local reserves deserve a separate budget from the local governments.

Tourism creates opportunities for employment and revenue (23), but it has also caused harm, including habitat destruction,



Growth of reserves in China.

landscape fragmentation, increases in pollution, and the introduction of exotic species (23). In the 11 high-profile reserves surveyed (13), visits increased from 942,000 in 1995 to 1,770,000 in 1998 (13). Tourism is being developed in the central regions of many reserves, which are often the most sensitive and biologically significant areas (21). Tourism must be managed to ensure long-term health and sustainability of the reserves, not short-term economic gain (15).

### Help Local Communities

China's reserves are mostly in its poorer areas (13). Residents, neighbors, and local governments often view reserves as obstacles to human welfare and economic development. As elsewhere in the world, reserves will survive only if the residents' and neighbors' legitimate concerns are respected and addressed (24). Tourism and resource development should benefit local communities. Reserves should also help through technology transfer, such as replacing wood harvested for fuel with other, alternative-energy sources (24, 25). In the short-term, however, direct payments may be necessary to offset local communities' costs in forgoing extractive activities (26).

Conservation education has traditionally focused on increasing stakeholders' awareness to make them agree with and participate in conservation actions; it has not been very effective. There is another di-

mension of education that might prove much more cost effective. In the Wolong Nature Reserve, for example, the government has offered conservation education (and economic incentives) for residents to move out and thus to protect the giant pandas. Young people cause the greatest harm to the reserve, so encouraging their leaving will achieve the greatest benefit. This will not happen unless the quality of their education improves so that they can pass entrance exams to college or technical school. We recommend increased investment in schools (17, 18).

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- Most funds have come from the Chinese government, which has increased the budget. For instance, the State Forestry Administration contributed \$2.4 million to reserves in 2000 and \$29 million in 2002. International organizations have also contributed, but it is difficult to estimate their total support.
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