



Environmental and visitor management in a thousand protected areas in China



L.S. Zhong^a, R.C. Buckley^{a,b,*}, C. Wardle^b, L. Wang^a

^a Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing 100101, China

^b International Chair in Ecotourism Research, Griffith University, 4222, Australia

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ABSTRACT

China has ~8000 protected areas, with different categories and levels of designation. These include many reserves of global conservation significance. There are more numerous but smaller parks in the more heavily populated provinces of the south and east, and fewer larger parks in the northwest. We sampled 1200 representative parks nationwide, using questionnaires delivered to park managers in person, with 160 categorical or ordinal parameters. Response rate was 92.5%. We carried out three analyses: first, for each parameter independently; second, for five multi-parameter aggregate indices; and third, for two top-level indices of environmental and visitor management respectively. We tested for patterns by category, level, size, age, region, visitor volume and revenue, with >600 individual tests, and >70 patterns significant at $p < 0.0001$. We found that both environmental and visitor management practices are more intensive for large, old, rich, heavily visited parks. A number of parks receive >100,000 visitors per day, and have adopted large-scale infrastructure approaches which successfully minimise impacts and maintain conservation values, as confirmed by on-site audits. Key conservation concerns include off-park air and water pollution sources in some regions, and sale of items including threatened species, in 7% of parks.

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1. Introduction

Management of the natural environment in protected areas (PA's), and of visitors who create environmental impacts in those areas, are critical components of conservation worldwide. Protected areas are key to conservation, and except for the highest-tier IUCN category-I PA's, most PA's in most countries are open for recreational visitation (Lockwood et al., 2012). Many IUCN category-II national parks, as well as providing critical habitat for threatened species and ecosystems, are also popular tourism destinations, and PA management agencies are required to balance the competing and often conflicting demands of conservation management and recreation management (Buckley et al., 2003; Bushell and Eagles, 2007; Buckley 2009a,b, 2010, 2011; Frost and Hall, 2009; Leung et al., 2015; Poudyal et al., 2013; Zhang et al., 2014). Management includes infrastructure, development control, impacts, wastes, education and monitoring. Visitors include independent travellers, tour groups and tourism operators. Protected areas include a range of different public and private land tenures,

recognised either for natural or cultural heritage or both. Parks, tourism and management all have cultural contexts which may differ between and within nations. In particular, research on environmental and visitor management for protected areas within China is limited relative to that in Western nations. Here we address this gap.

China is the world's most populous nation, and many of its citizens now enjoy the wealth and freedom to travel extensively. By far the majority of this travel is domestic, dwarfing either inbound or outbound travel. During 2012, there were 130 million inbound visitors to China, 80 million outbound, and 2900 million domestic tourists (CNTA, 2013). Destinations include a wide range of natural, adventure and cultural attractions (Quan et al., 2009), with some individual parks attracting several million visitors annually. China is a highly biodiverse nation, with a wide range of ecosystems and numerous endemic and threatened species. There are at least 7 different types of protected areas in China, managed by different government agencies. The principal types are: Nature Reserves, Forest Parks, Geoparks, Wetland Parks, Scenic Areas, Water Parks, and Cultural Parks. Each of these types may be managed at three different levels, namely national, provincial or local. Irrespective of formal designation, each contributes to both conservation and recreation. There are ~8000 protected areas in total nationwide,

* Corresponding author at: International Chair in Ecotourism Research, Griffith University, 4222, Australia. Tel.: +61 755528675, +61 417711502.

E-mail address: r.buckley@griffith.edu.au (R.C. Buckley).

with ~2500 designated at national level and the others at provincial or local levels.

Nature-based tourism in China, including ecotourism and tourism to protected areas, has been examined from a range of perspectives in both Chinese- and English-language academic literatures. Topics include: concepts and definitions (Zhong and Xiao, 2000; Zhao, 2002; Buckley et al., 2008; Wang et al., 2012; Yang et al., 2000); ethics (Xu, 2003); geography (Yang and Yin, 2002); evaluation (Xu and Yang, 2005); awareness (Cheng, 2005); economics (He et al., 2008; Yang, 2012) case studies (Yang et al., 2000; Hang et al., 2011); conflicts (Wang et al., 2012; Zhang et al., 2014); and community interest and outcomes (Liu et al., 2012; Zhang and Lei, 2012). Overall, however, only 3.7% of tourism research in China is on ecotourism, including tourism in parks (Bao et al., 2014). The broadest previous study is that by Quan et al. (2009). Here, therefore, we assemble and analyse a large-scale data set for Chinese protected areas, as a basis for international comparisons and to identify priorities for future research in China.

2. Methods

We analyse patterns and practices for management of visitors and environment at over one thousand individual parks throughout China. Using formal written multiple-choice survey questionnaires, we compiled data from park managers for >160 parameters related to tourism infrastructure, visitor management, community involvement, environmental management and environmental impacts. We selected 1200 individual conservation reserves throughout China, in all categories from scenic and cultural to large-scale forest conservation reserves, covering the full national range in geographic distribution, ecosystems, and

level of government designation (Fig. 1). For each local government area in each Province, we first selected the principal park or parks designated at national level: 659 in all. We then added further parks at national, provincial or local level in each Province, choosing those which are largest, most pristine, or otherwise make the most significant contributions to conservation. Our selection thus covered all biomes and geographic regions, and all reserve categories and designation levels, using a multi-criterion selection process intended to include a nationally representative set of reserves most significant for conservation in China.

For almost all of these, at least one of the authors visited each park, delivered the survey questionnaires in person, and examined management practices on the ground. For a few inaccessible parks, we sent surveys by mail. For the more heavily visited parks, several of the authors visited either jointly or independently. A total of 1110 questionnaires (92.5%) were completed in full. In each case, the respondents are the senior managers of the individual parks concerned. The survey was identified and presented as a research project, not a management exercise, and respondents were anonymous and able to express their views freely and without perceived-desirability bias. Survey questions were framed to allow categorical or ordinal responses, with two to six ranks. This yielded a very large and dense dataset with over 175,000 data cells. This appears to be the largest dataset on protected-area tourism yet compiled and analysed worldwide.

Questions on tourism infrastructure examined: regional planning and park zoning; modes of transportation; and construction standards, level, locations and design of tourist accommodation, catering and facilities. Visitor management questions included: types of tourism development; ecotourism planning and regulation; scale and impacts of built infrastructure; and visitor quotas. Community involvement questions considered: effects on local income; community attitudes; opportunities for employment,

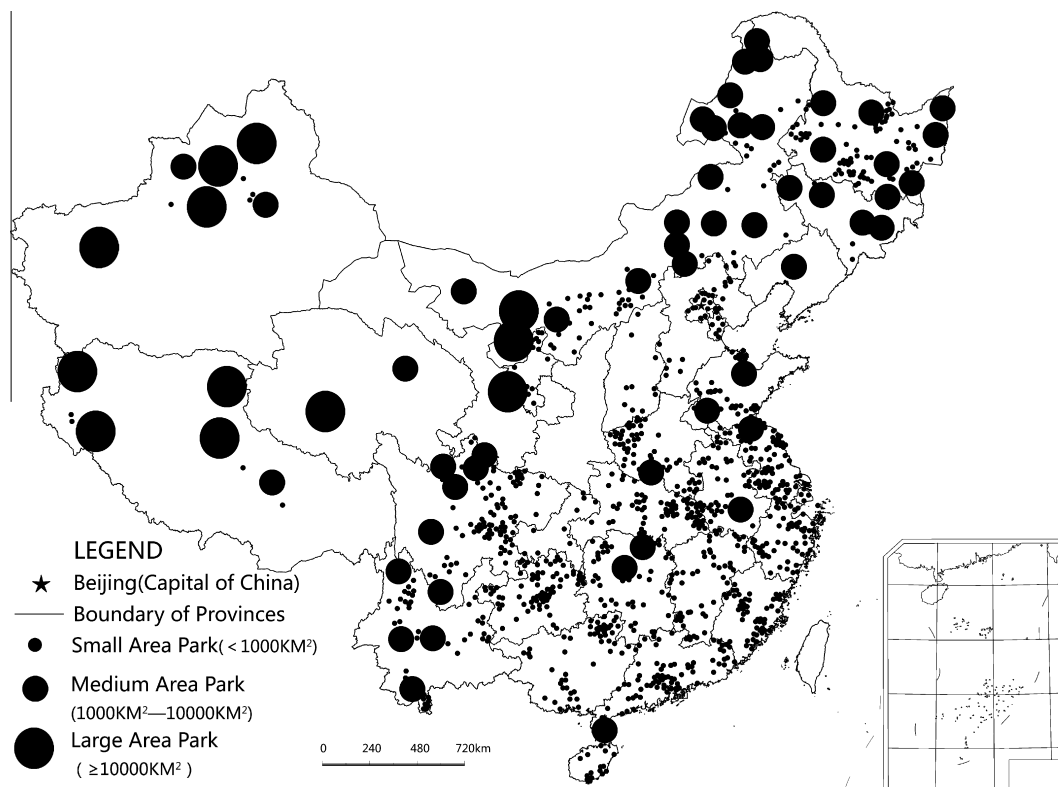


Fig. 1. Map of mainland China showing individual parks studied, in three size classes: large solid circles, >10,000 km²; medium solid circles, 1000–10,000 km²; small solid circles, <1000 km². Lines show boundaries of Provinces.

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