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Ecotourism and nature-reserve sustainability in environmentally fragile poor areas: the case of the Ordos Relict Gull Reserve in China

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This article explores the applicability of the conventional wisdom that economic growth is paramount to environmental sustainability by examining ecotourism and nature-reserve sustainability in environmentally fragile poor regions. The discussion focuses on the Ordos Relict Gull Reserve in the Inner Mongolia region of China. The study evaluated reserve records of water and soil conditions and interpreted satellite images to identify lake-level and land-cover changes at the reserve. The Ordos Relict Gulls seem to have abandoned the reserve following ecotourism development and established new colonies in northern Shaanxi. We argue that ecotourism—especially ersatz ecotourism—in certain nature reserves is an unsustainable practice rooted in the conventional wisdom that economic development spurs environmental protection as suggested by the environmental Kuznets curve (EKC). The article concludes that environmental protection rather than economic growth is of vital importance in nature-society interactions in environmentally fragile poor areas. We call for prohibitions on tourism in such nature reserves to enhance sustainability.

KEYWORDS: ecotourism, environmental protection, nature reserves, resource development, human-environment relationships

China has made significant efforts to pursue sustainability, in terms of seeking to reconcile environmental protection and social improvement with economic growth (Liu, 2008; 2009). However, these efforts have not been successful in areas characterized by ecological fragility and poverty (Jiang, 2006; Peng et al. 2006; Yue et al. 2006), conditions that cover 40% of the country's territory and are home to mainly ethnic minorities (Zhang & Ma, 2006). Challenging climates, rough terrain, and depleted soils reduce the resilience of these ecosystems and create situations that are particularly sensitive to human activity and exacerbate desertification, soil erosion, and land degradation (Zhang & Ma, 2006). Widespread poverty in these areas encourages the government to push for rapid economic growth.

Central and provincial governments in China endorse the belief that unbridled expansion and environmental improvement are achievable at the same time. Commitment to this notion encourages local governments to give priority to economic growth rather than to sustainability and this prioritization has led to unsustainability (Peng et al. 2006; Yue et al. 2006). A well-known example of this phenomenon is the dramatic environmental collapse in Maduo County (Qinghai Province) and its portion of the Three-River Headwaters (*Sanjiangyuan*) Nature Re-

serve, at the confluence of the Yellow, Changjiang, and Qiantangjiang Rivers. Prior to 1970, environmental conditions in this Tibetan county were regarded as excellent, with over 4,000 lakes and rich grasslands. Following the "grow first" path during the early 1980s, Maduo accrued wealth quickly and achieved the highest per capita income among all of China's animal-husbandry counties (Ren & Wang, 2004). By 2004, however, 90% of its lakes had dried up due to overgrazing, and the resulting economic decline caused Maduo to become one of China's ten poorest counties despite the fact that the county became part of the Three-River Headwaters (*Sanjiangyuan*) Nature Reserve in 2001 (Wang, 2006). By 2007, most of the population had migrated out of the region as the area became increasingly unsuitable for human habitation due to ecological collapse (Qu Lai Ma Cultural Village, 2007). Conventional wisdom claims that economic growth is the key to environmental sustainability (Esty et al. 2008; The Economist, 2008). Consequently, the Chinese government commonly uses nature reserves as resources for development and ecotourism as the solution to nature-reserve sustainability (Mu et al. 2007). Using the Ordos Relict Gull Reserve (ORGR) in the Inner Mongolia region of China as a case study, this article explores the applicability of this conventional wis-

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dom and examines how ecotourism development may be unsustainable in some nature reserves in environmentally fragile poor regions. We aim to stimulate debate over ecotourism development and its relationship to the sustainability of nature reserves by arguing that reliance on the environmental Kuznets curve (EKC) is at the root of contemporary unsustainable practices.

The EKC is a widely applied theory developed by Grossman & Krueger (1993; 1995) and Roberts & Grimes (1997), based on the work of Nobel Laureate Simon Kuznets (1955). This concept contends that the initial stages of economic growth are accompanied by increasing environmental degradation, but once per capita income exceeds a given threshold, further increments of growth lead to environmental improvement (Beckerman, 1992; Shafik, 1994). Some authors have put forward the EKC as the optimal growth path and this view has contributed to a belief that relatively high income is a precondition for environmental recovery (see, e.g., Chimeli & Braden, 2002). Such ideas have attracted a great deal of attention in various fields situated at the intersection of development and environmental policy (Beckerman, 1992; World Bank, 1992; Ezzati et al. 2001). Some policy makers and researchers have even asserted that the EKC model should serve to steer developing countries' efforts to "grow first and clean up later" (Dasgupta et al. 2006), because wealth is a major determinant of environmental success (The Economist, 2008; Esty et al. 2008).

In contrast, Raymond (2004) and Fonkych & Lempert (2005) argue that the EKC is an inadequate guide for environmental policy makers. These authors find strong evidence that the EKC-development path may not be available to today's developing countries (Nahman & Antrobus, 2005). More specifically, Chen & Liu (2004), Cao et al. (2006), and Qu (2006) warn that the EKC may not be applicable to China as, in terms of health and ecological impacts, the country cannot afford the "grow first and clean up later" approach. Ecologically fragile poor areas are particularly vulnerable to environmental degradation and this damage can easily become irreversible so that an EKC may never occur (Prieur, 2007; Liu, 2008; 2009).

The remainder of this article first provides an overview of nature-reserve and ecotourism development in China, with a focus on recent expansion and associated environmental problems. It further examines these issues using the case of the Ordos Relict Gull Reserve in terms of the sharp decline of the gull population and the possible causes of reserve devastation, with evidence of environmental degradation following ecotourism development.

What drove the gulls away from the reserve? Only a couple of articles in the literature include any discussion of the possible causes. The predominant explanation offered by He and his colleagues blames global and local climate change for the decline in water levels in the lake and resultant reserve degradation (He et al. 2004; He et al. 2005; He et al. 2007). This article does not disagree with that literature. It simply examines if the development of ecotourism in the reserve may have played an additional role in reserve decline. The last sections discuss policy implications of the case study and research conclusions.

Nature-Reserve and Ecotourism Development in China

The first nature reserve in China was established in 1956 and 40 years later the country had 1,276 areas that carried this status. Since 1999, there has been a veritable boom in nature reserves as the government has increased efforts to conserve the environment. By the end of 2006, China had 2,395 protected parcels covering over 15% of the country's land area (MEP, 2007). The Chinese Ministry of Environmental Protection (MEP) currently plans to incrementally expand this figure to 16% by 2010 and to 17% by 2015 (MEP, 2006). In a further encouraging sign, the Organization for Economic Cooperation and Development (OECD) (2007) reports that China has established a comprehensive legal framework for managing nature and biodiversity (through the establishment of both terrestrial and maritime protected areas). Though the number of nature reserves and their geographic extent are impressive, they are not well protected, according to reports by Jim & Xu (2003; 2004), the official Chinese media (Li, 2006), and field observations by the second author. Li (2006) points out that lack of funding causes a dilemma for nature reserves in China and nearby poor areas. For example, the Hunchun Nature Reserve that borders Russia and North Korea suffers serious environmental degradation due to insufficient money (Li, 2006). The second author of this article found the same problem during his 2006 visit to the Hunchun Nature Reserve. The four white dolphin reserves established along the Yangtze River failed to protect the Chinese white dolphin, reported by the Chinese official media to have just gone extinct (China Daily, 2007), the first cetacean species to be extirpated by human activity (Laurance, 2007).

A major problem for China's nature reserves is a scarcity of funding. While protected areas in many countries around the world are underfunded, the situation seems to be even worse in China. Developed countries spend an average of US\$2,058 for each square kilometer (km²) of protected area, developing

countries spend an average of US\$157, and China spends only US\$52.70 (Li, 2006). This funding disparity may support the claim that wealth is a major determinant of environmental success and raise questions about the capability of poor countries to effectively conserve nature using legal mandates. With such a meager amount of money, China's nature reserves are under pressure to generate resources to fund themselves (Li & Han, 2001; Jim & Xu, 2003), practices that frequently have the paradoxical effect of intensifying environmental degradation.

How can underfunded nature reserves generate money on their own? Conventional wisdom prescribes that ecotourism is the answer. Ecotourism gradually took shape between the late 1970s and early 1980s and, by the early 1990s, the concept had coalesced into a popular new genre of environmentally and socially responsible travel (Honey, 2008). Ecotourism has arguably experienced the fastest growth of all subsectors in the tourism industry (Randall, 1987; Honey, 2008). Many factors seem to have contributed to this popularity, including a change in tourist perceptions, increased environmental awareness, and a desire to explore natural environments (Randall, 1987). The trend has also benefited from tourist-industry promotion (Honey, 2008) and efforts of institutions such as the United Nations Environment Program (UNEP) and World Tourism Organization (WTO) that have heralded it as an exemplary form of sustainable development (Butcher, 2006). Ecotourism has many definitions and the concept continues to evolve. The International Ecotourism Society (TIES) provides a substantial, contemporary definition of ecotourism. To TIES, real ecotourism involves travel to natural destinations, minimizes impact, builds environmental awareness, provides direct financial benefits to conservation, creates financial benefits and empowerment for local people, respects local culture, and supports human rights and democratic movements (Honey, 2008). However, we do not believe ecotourism in China has these characteristics. According to Wight (1994):

There seem to be two prevailing views of ecotourism: one envisages that public interest in the environment may be used to market a product; the other sees that this same interest may be used to conserve the resources upon which this product is based. These views need not be mutually exclusive.

Ecotourism in China seems to subscribe to the first view and is predicated upon a strong economic motive. Tourism, and ecotourism in particular, is often viewed as an ecological approach to development and poverty reduction (Donaldson, 2007; Muhanna,

2007), to conservation of endangered species and habitats in developing countries (Bookbinder et al. 1998), and to managing protected areas (Cengiz, 2007). The United Nations International Year of Ecotourism of 2002 marked the rise of ecotourism from its prior position as a novel niche market opportunity to its current status—at least in the eyes of its proponents—as an exemplary form of sustainable development in the rural developing world (Butcher, 2006). The basis of this advocacy is that sponsors of ecotourism can “provide a leadership role” to the rest of the industry (UNEP & WTO, 2002). However, ecotourism does not always provide a nature conservation solution and its environmental impact has long been a major concern (Bookbinder et al. 1998). Wall & Wright (1977) were among the first to systematically examine the impact of tourism on vegetation and soil conditions. Edington & Edington (1986) pointed out that the negative impact of tourism must be effectively controlled by ecosystem protection. Tourism has been blamed for damaging local environments in Russia (Lunkashina et al. 1996), Belize (McMinn, 1998), Tunisia (Poirier, 1995), and Honduras (Stonich, 1998). In opposition to government plans that encouraged state-operated nature reserves to engage in commercial operations, Russian scientists criticized ecotourism as commercial exploitation of, and a threat to, the protected areas (Levitin, 1994). Svoronou & Holden (2005) cautioned that ecotourism as a tool for nature conservation requires careful monitoring to keep visitation in line with carrying capacity.

The process of designating nature reserves in China puts too much emphasis on nonconservation gains (Jim & Xu, 2004), as conservation is not always the top priority (Zhou & Chen, 2006). Nature-reserve tourism in the country is developing more rapidly than other types of tourism, prompting increases in the number of nature reserves and encouraging nearly all protected areas in China to become actively engaged in tourism (Mu et al. 2007). A significant number of the new nature reserves are in environmentally fragile poor areas in western China. The twelve western provinces contain over 83% of China's land area in nature reserves (Figure 1). Tibet, Qinghai, Gansu, and Sichuan have the highest percentage of land in nature reserves, ranging from 34.1% to 18.6% of their total territory. The six provinces with the lowest percentage in nature reserves, ranging from 2.6% to 4.6%, are all in eastern China. To promote economic growth, the central government launched the Western China Development Program in 2000. Tourism—especially ecotourism—has been one of the program's major components and the growth of visitation in western China is above the country's average (Gan, 2005).

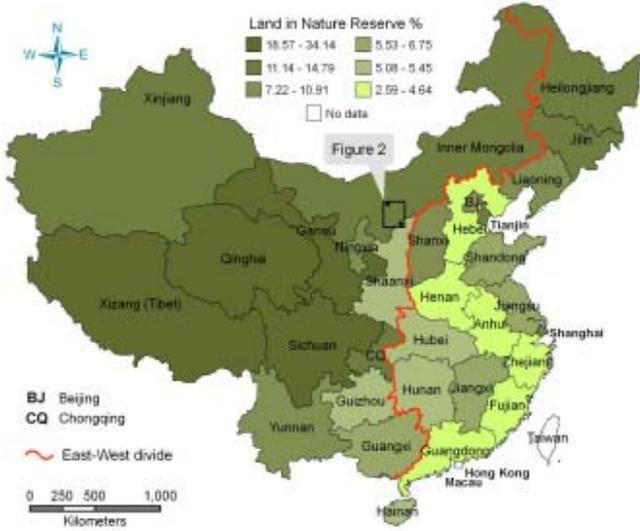


Figure 1 Percentage of land in nature reserves by province, China, 2007 (MEP, 2007).

Several negative impacts from tourism in China’s environmentally fragile areas have been reported, including land degradation, water and air pollution, and destruction of breeding environment and food sources for wild animals (Yang & Ding, 2003). Due to the lack of national funding for nature reserves, managers are often left to depend on local budgets. However, local authorities tend to use their nature reserves to generate money. Many government officials insist that nature-reserve degradation will be controlled when the reserves are wealthy and that ecotourism is the only way to fund nature-reserve management. However, Chinese researchers have found that tourism development is responsible for serious environmental pollution and degradation in many facilities throughout the country. Examples include environmental degradation in Zhangjiajie National Forest Park (Wang & Hao, 1988), parks in Suzhou (Wang, 1986), and E-mei Mountain tourist sites (Jiang et al. 1996). Landscape degradation, water pollution, waste accumulation, and species loss in nature reserves are widely reported (Li & Han, 2001).

The Case of the Ordos Relict Gull Reserve

Established as a sanctuary for the rare Ordos Relict Gulls (*Larus relictus*) in 1998 and upgraded to a national reserve in 2001, the Ordos Relict Gull Reserve (ORGR) is one of 21 internationally recognized wetland reserves in China. It is also the only protected area in the world for this endangered bird. The Ordos Relict Gull is a medium-sized gull that breeds in the Ordos in China and is believed to make up over 60% of the worldwide relict gull population (Xu et al.

2006). Since 2000, the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species (2008) has classified this species as “vulnerable” because it had a small population that has been undergoing continuing decline due to human development of coastal wetlands and disturbance of its breeding grounds. Incursion has increased the mortality of eggs and chicks. Only 10,000 birds are thought to exist today and this number continues to decline (IUCN Red List of Threatened Species, 2008). The gulls breed in colonies located on islands in saltwater lakes where they are typically out of reach of humans and other animals. These island sites are fragile and nesting does not occur when lakes dry up, water levels are too high, or islands become so large that they join the shore.

The ORGR is located in the Taolimiao-Alashan Lake (Nur) area at the heart of the Ordos Plateau in the upper reaches of the Yellow River (Figures 1 and 2). The terrain is higher in the western plateau and lower in the eastern hills. The north is an alluvial plain and the central land is the Muus Desert and the Khoqi Desert. The Ordos area has a typical temperate continental climate and rainfall concentrates between July and September with sand and dust storms in the spring. The ORGR is about 45 km west of the Ordos City urban district, Dongsheng (2007 population 35,500 people) and occupies 45 km², an area that includes a lake that is 10.2 km² in size. About 80

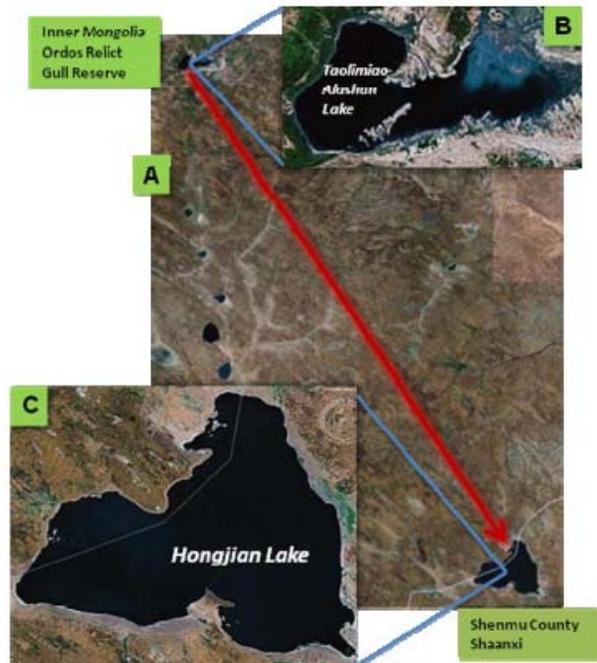


Figure 2 Ordos Relict Gull migration (A) from Taolimiao-Alashan Lake (B) at Ordos Relict Gull Reserve, Inner Mongolia, and Hongjian (Hongjiannao) Lake (C) in northern Shaanxi. Source: <http://earth.google.com> (2008).

other bird species also reside in ORGR, including Whooper swans (*Cygnus Cygnus*), Mandarin ducks (*Aix galericulata*), and Greylag geese (*Anser anser*), as well as rare birds such as Oriental magpies (*Ciconia boyciana*), black-billed magpies (*Pica pica*), and white-tailed sea eagles (*Haliaeetus albicilla*) (Shizhen Garden, 2008; Travel China Guide, 2008).

Devastation of the Ordos Relict Gull Reserve

This case study is based on field research carried out in ORGR in 2004. A sharp decline in the population of Ordos Relict Gulls, from 3,594 nests in 1998 to zero nests in 2004 and to 6 nests in 2005, was reported (He et al. 2004; He & Ren, 2006) (Table 1). No Ordos Relict Gulls have been reported at the reserve since 2005 (He & Ren, 2006; He et al. 2007). Meanwhile, a sharp increase in the Ordos Relict Gull population, from 200 birds since they were first observed in 2000 to 11,000 birds (Xu et al. 2006), or 2,460 nests, in 2005 (Xiao et al. 2006) was reported in Hongjian (Hongjiannao) Lake in Shenmu County, northern Shaanxi (Figure 2). Huo et al. (2007) noted an increase from 87 nests in 2000 to 5,038 nests in 2007 and He et al. (2007) similarly found 5,036 nests during the same year. The rapid increases in Ordos Relict Gulls in northern Shaanxi have been attributed to conservation success at Hongjian Lake (Wang & Cao, 2005; Huo et al. 2007), though this population growth is not likely through reproduction. We argue that the increase is mainly due to migration from ORGR where ecological failure has driven the gulls away. It appears that the Ordos Relict Gulls have abandoned the reserve and established new colonies about 100 km southward (Figure 2).

Table 1 Nests of Ordos Relict Gulls Found in Ordos Relict Gull Reserve, 1998-2005.

| Year | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|-------|------|------|------|------|------|------|------|------|
| Nests | 3594 | 709 | 3587 | 2887 | 2269 | 326 | 0 | 6 |

Note: Data for 1998-2003 are from He et al. (2004) and data for 2004-2005 are from He & Ren (2006).

To encourage the return of the gulls, the Ordos City government has started a three-year project to repair the reserve with a grant of 18 million yuan (~US\$2.5 million) with most of the money coming from the central government (Inner Mongolia Government, 2007). Ding (2007) reports that local officials were debating why the Ordos Relict Gulls left the reserve and if they will return. The case holds important lessons that could benefit nature-reserve and ecotourism management in China. Environmental degradation in the reserve is assumed to be the most important reason for the exodus as the gull is very sensitive to interference with its breeding envi-

ronment (He et al. 2004; 2007; IUCN Red List of Threatened Species, 2008).

As discussed earlier, it is reasonable to attribute degradation of the reserve to climate change. This case study attempts to further examine how exactly the environment changed and whether ecotourism development contributed to reserve devastation. Comparison of satellite images of the reserve area from July 1998 and July 2004 highlights a dramatic decline in lake levels (Figure 3). The 1998 image shows islands where the gulls nested that were about 1.15 km² in size (at the center of the 10.25 km² lake). The islands provided a good environment for the gulls and protection during their nesting season from April until July. The 2004 image demonstrates that the original main nesting islands joined the shore and were exposed to declining water levels in the lake. This nesting environment became severely degraded as the lake shrank in size to 2.7 km², less than a quarter of its 1998 extent.

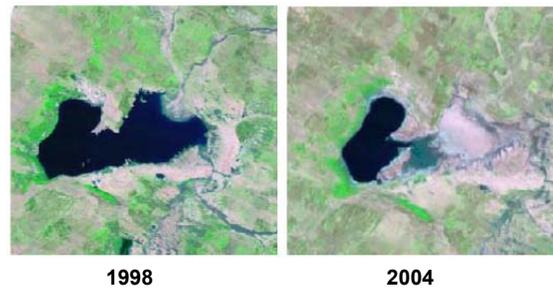


Figure 3 TM images of Ordos Relict Gull Reserve Taolimiao-Alashan Lake area, July 1998 and 2004 (Images purchased from Earth View China Image Beijing, Inc. <http://www.ev-image.com/newslists.aspx?id=97>).

Could Ecotourism be a Possible Cause of Reserve Devastation?

In 2000, the Dongsheng Corporation in Ordos City founded the Inner Mongolian Shizhen (World Rare) Garden Ecotourism Resort on and around ORGR. The company installed a network of Mongolian yurts, or portable huts, on the reserve to accommodate hotels, restaurants, and souvenir shops to support the tourism business. The primary tourist attraction was the Ordos Relict Gulls during their nesting season from April until July. From 2000 to 2003, tourism increased sharply. The reserve management recorded approximately 260,000 visits in June 2003, the peak month of the tourist season. The tourists engaged in gull watching, speedboat riding, boat racing, and fishing. It is reasonable to assume that the noise from tourists, particularly the speedboats, disturbed the nesting birds. Other tourist activities included games, horseracing, archery, sand

skiing, and sand-motor biking on the lakeshore. Most tourists made day trips from Dongsheng while others stayed at the reserve for one or two days. The presence of such a large number of tourists and their activities presumably made the birds feel insecure about their nesting environment. Compared to 3,587 nests in 2000, there were only 236 nests in 2003 to accommodate the 260,000 visits in June, averaging over 1,000 visits for one nest in a month. Is it reasonable to expect that under these circumstances the birds were disturbed, scared, and ultimately driven away? The arrival of the tourists seems to have prompted the gulls to move out (Ding, 2007) and it should be no surprise that no nesting gulls were found in 2004.

Ornithologists have blamed human disturbances for the abandonment of bird-nesting colonies in many parts of the world, as the following reports show. Research suggests that human interference caused the disappearance of the largest nesting ground for endangered little terns (*Sterna albifrons*) in Britain during the breeding season (BBC, 2003). Little terns are up to 34 times more likely to succeed in breeding without human intrusion (Medeiros et al. 2007). Similar disturbance is also considered a major reason for the disappearance of colonies of the endangered Aplomado Falcon (*Falco femoralis*) in Texas (TPWD, 2008). Unregulated tourism and human interference have been identified as significant threats to the breeding success of Malaysian plovers (*Charadrius peronii*) (Yasue & Dearden, 2006), Yellow-eyed penguins (*Megadyptes antipodes*) (Ellenberg et al. 2007), and hooded plovers (*Thinornis rubricollis*) (Weston & Elgar, 2007).

Based on a comparison using Google Earth images (Figure 2), the Ordos Relict Gulls' new home at Hongjian Lake does not appear to have better breeding conditions than the site the birds abandoned. In particular, the new location does not have many islands out of human and animal reach. The islands are very small and close to the southeastern and southwestern shores. The main difference is that the Hongjian Lake area has not been developed yet, thus

human disturbance is minimal. Compared to ORGR, the advantages of Hongjian Lake include a larger water area and isolation from population centers. The new location probably also provides a better food supply for the gulls due to less human interference. Indeed, it is likely that the gulls would have stayed at ORGR if not for the disturbance they encountered. In addition to adding to the nesting gulls' apprehension, we contend that tourists have made the nesting environment intolerable by causing land and water degradation and reducing the food supply. However, there have to date been no reports of such damage at ORGR and this case study infers whether field evidence supports such a possibility.

Evidence of Environmental Degradation

Based on the 1998 and 2004 Thematic Mapper (TM) images, we used the Earth Resource Data Analysis System (ERDAS) to develop a Normalized Difference Vegetation Index (NDVI) for the Taolimiao-Alashan Lake area and its 3 km buffer zone (Figure 4), following the NDVI classification formulated by Ding & Tiyp (2002) (Table 2). The NDVI is a simple numerical indicator that can be used to analyze remote sensing measurements and to assess whether the target being observed contains live green vegetation. The results show that the area around the lake was dominated by bare land, $NDVI \leq 0$, while vegetation density $0 < NDVI \leq 0.21$ increases with distance from the lake (Table 3). The higher percentage of scattered vegetation cover, $0.21 < NDVI \leq 0.50$, in the less than 1 km zone is the result of a higher density of planted trees around the lake. NDVI changes indicate severe land-cover degradation from 1998 to 2004. The area of bare land increased from between 50% and 59% in 1998 to between 75% and 79% in 2004. At the same time, sparse and scattered vegetation covers decreased in intensity. The decline was almost 50% for this zonal classification. Land-cover degradation was most severe in the 1-2 km zone, possibly due to motorized and horseracing activities. Tree cover around the lake suffered extensive damage as reflected by a sharp decline in vegetation cover from 10% to 4% in the 0-1 km zone.

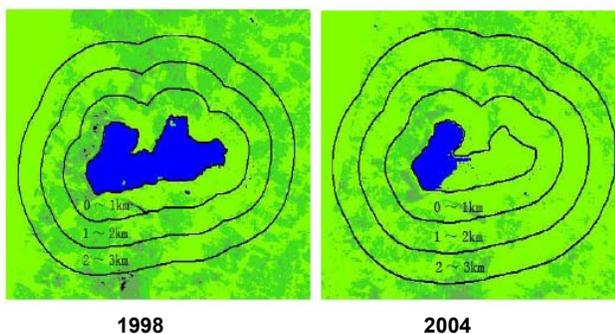


Figure 4 NDVI distribution on TM Images of Ordos Relict Gull Reserve Taolimiao-Alashan Lake area, 1998 and 2004.

Table 2 NDVI intervals and description (Translated from Ding & Tiyp, 2002).

| Intervals | Vegetation Cover |
|-------------------------|--------------------------|
| $NDVI \leq 0$ | Bare land, no vegetation |
| $0 < NDVI \leq 0.21$ | Sparse vegetation |
| $0.21 < NDVI \leq 0.50$ | Scattered vegetation |

Table 3 NDVI derived from Ordos Relict Gull Reserve Lake area, 1998 and 2004.

| Distance from lake | 1998 | | | 2004 | | |
|--------------------|------------|-------------|----------------|------------|-------------|----------------|
| | NDVI≤0 | 0<NDVI≤0.21 | 0.21<NDVI≤0.50 | NDVI≤0 | 0<NDVI≤0.21 | 0.21<NDVI≤0.50 |
| 0~1 km | 11.42(57%) | 6.60(33%) | 1.99(10%) | 15.75(79%) | 3.46(17%) | 0.80(4%) |
| 1~2 km | 12.64(50%) | 11.51(46%) | 0.85(4%) | 19.80(79%) | 5.18(20%) | 0.11(1%) |
| 2~3 km | 15.70(51%) | 14.01(45%) | 1.33(4%) | 23.22(75%) | 7.45(24%) | 0.37(1%) |

The first author took randomly selected water samples from the northern and southern ends of the lake to test the level of water pollution. The northern shore was developed for tourism activities, while the southern shore has remained undeveloped. This comparison was designed to detect the impact of tourism on water quality. A Hanna Instrument for water and soil testing was used to test the samples. All seven indices tested pointed to poorer water quality at the northern end of the lake than at its southern end (Table 4). Tourist activity provides the only explanation for the difference in pollution levels as there were no other known human or animal activities around the perimeter of the lake. We also tested randomly selected soil samples from the northern and southern shores of the lake using the Hanna Instrument. The test results indicate that soil at the northern shore had significantly higher pH values and lower levels of such soil nutrients as nitrogen, phosphate, and potash, which means that soil quality was higher at the southern shore than at the northern shore. We contend that tourist activities at the northern shore contributed to soil-quality degradation because there were no other known human or animal activities around the lake. This claim is consistent with other reports by Wall & Wright (1977) and Yang & Ding, (2003) that tourism activities cause soil degradation.

Policy Implications of the Case Study

Borg (2008) reports that Chinese officials in Sichuan Province acknowledge that mass tourism at some nature reserves has harmed the quality of landscape and scenery. As a result, other reserves have begun to discourage mass tourism and are receptive to the notion of (real) ecotourism. An ecotourism project launched in Wanglang Nature Reserve in

2001 has become a prototype of this trend. Officials admit that developing (real) ecotourism in China is difficult, because of the pressure on individual nature reserves to raise money. China's current conception of ecotourism suffers from problems similar to those experienced in more developed countries. As Honey (2008) describes:

Much of what is marketed as ecotourism is simply conventional mass tourism wrapped in a thin veneer of green. Ecotourism lite is propelled by travel agents, tour operators, airlines and cruise lines, large hotels and resort chains, and international tourism organizations, which promote quick, superficially "green" visits within conventional packages.

Current ecotourism in China is overwhelmingly "ecotourism lite" which this article simply refers to as "ersatz ecotourism." It is possible that ersatz ecotourism is one of China's growing pains and that the situation will improve in the future, as it did in the United States and Costa Rica where the ecotourism industry has become more developed and sustainable (Honey, 2008). The problem is that nature reserves in China may suffer irreversible damage due to ersatz ecotourism, as has been the case at ORGR. It may be too late to recover if the situation does not improve soon. Han & Ren (2001) point out that, along with opportunity, ecotourism presents challenges as China's nature reserves may suffer irreversible losses in environmental quality and biodiversity in the name of a false sense of ecotourism. As there are so many nature reserves in a large country with varied environmental, economic, and social conditions, it is understandable that stories of many successful nature

Table 4 Water quality (mg/L) near the northern and southern shores of Ordos Relict Gull Reserve Lake, 2004.

| | Alkalinity | Solidness | Sodium sulfite | Iron content | Chloride content | Dissolved oxygen | pH |
|-------|------------|-----------|----------------|--------------|------------------|------------------|-----|
| North | 840 | 600 | 10.0 | 1.2 | 7600 | 6.0 | 8.8 |
| South | 630 | 570 | 6.0 | 1.0 | 5000 | 7.0 | 8.6 |

reserves have been widely publicized. For instance, China's State Forestry Administration (SFA) accredited 51 Chinese National Forestry Model Nature Reserves in 2006 (SFA, 2008). Among the most successful nature reserves in China, many of these have effectively incorporated ecotourism, such as the Songshan Nature Reserve near Beijing, Xishuangbanna Nature Reserve in Yunnan Province, and Jigongshan Nature Reserve in Henan Province (Luo & Zheng, 2008; The Nature Conservancy, 2008). This article focuses on one case and draws attention to others reported in the literature. We believe the Ordos Relict Gull case is emblematic of many nature reserves in environmentally fragile poor areas in China. However, it would be useful to analyze all of China's 2,395 nature reserves: their comparative status, the importance of the biodiversity they are protecting, the different land-use types/biomes they are managing, and the different levels of sustainability inherent in their activities. We would encourage further examination of how and why other well-known Chinese nature reserves have failed to achieve their objectives. For example, it is curious there has been no known investigation on the extinction of the white dolphin in their four nature reserves.

It is China's national policy to promote ecotourism as a sustainable approach to nature conservation. By using natural beauty to attract affluent foreign visitors to poor areas of China, ecotourism is frequently regarded as a bright spot in China's often chaotic and unpleasant tourism business (Blanchard, 2008). It is common for Chinese literature to recognize both the merits and challenges of ecotourism in national nature reserves (Han & Ren, 2001; Wu et al. 2007; Blanchard, 2008; Luo & Zheng, 2008). However, the IUCN categories suggest that Category I (Strict Nature Reserve and Wilderness Areas) are protected lands managed mainly for scientific research and/or environmental monitoring (IUCN, 1994). Though there are no IUCN category designations for ORGR or many other similar facilities, Luo & Zheng (2008) assert that nature reserves in China fall into the ambit of Category I where tourism—including ecotourism—should be excluded. China's State Nature Reserves Regulations (published in 1994 and still in effect in 2009 as no new regulations have been developed) strictly prohibit any tourism in designated tracts that have no zoning, or in the core or buffer zones in those parcels that do have zoning (MEP, 1994). As with most nature reserves in China, ORGR does not have zoning, but should follow the regulations. China has no dearth of regulations or definitions, but there is a notable shortage of implementation and enforcement. We call for the imposition of bans on ecotourism (especially ersatz ecotourism) in nature reserves similar to ORGR. Fur-

thermore, China should adopt IUCN categories and associated management recommendations for all its nature reserves. Current literature (especially Chinese material) tends to blame the lack of clear definitions, regulations, funding, and enforcement for failures in nature reserves and ecotourism management (see, e.g., Han & Ren, 2001; Luo & Zheng, 2008). It is true that China has no official definition of ecotourism. In addition, ecotourism in nature reserves has been managed by a variety of governmental agencies that control nature reserves, including MEP, SFA, the Ministry of Water Resources, and the Ministry of Land and Resources, along with their provincial and municipal counterparts. This complex division of responsibility causes confusion regarding the use of a single definition of ecotourism or common set of nature-reserve regulations. However, Chinese academic publications often use the TIES definition of ecotourism (e.g., Wu et al. 2007). In practice, ecotourism is used as a marketing tool to promote any form of nature-related tourism in China (Wu et al. 2007).

Conclusion

This article argues that ecotourism development does not always facilitate sustainable nature-reserve management and focuses on a case study of efforts to protect the Ordos Relict Gull. This finding supports the contentions put forward in many other publications on the negative impacts of tourism on nature reserves. Environmental protection, rather than economic growth, may be the key in the relations between environment and development in environmentally fragile poor areas. If nature reserves are not well protected, the country loses them and their direct and indirect contributions to economic growth. Due to their fragile environments, nature reserves are vulnerable to irreversible destruction. Wildlife like the Ordos Relict Gull are extremely sensitive to interference and do not do well when forced into close contact with tourists. In particular, human disturbance devastates the breeding environments favored by these birds and funding for reserve management is vitally important for the success of nature reserves. However, developing ecotourism to generate money may not be practical in all locations. Since these are national reserves, the state should be responsible for providing adequate funds for reserve success. Funds from wealthier areas in China and international sources should also be sought. China is no longer a poor country and the government should revise its policy to take full responsibility for nature reserves in environmentally fragile poor areas.

Lake shrinkage caused by climate change is an apparent cause of reserve degradation. We contend that tourism is also a likely cause of degradation in

land cover, water quality, and soil quality in ORGR. Definitive identification of what drove the gulls from the reserve requires further research so that other protected areas can learn from this experience. This point is particularly important for the gull's new home in northern Shaanxi. We urge immediate establishment of a new reserve for the Ordos Relict Gull at Hongjian Lake, and the mobilization of efforts to secure the gulls' nesting environment from human disturbances so that this vulnerable species will not become extinct. The central government should fully fund this new reserve as ecotourism is growing, with an estimated 150,000 tourists arriving in 2007 to this environmentally fragile and economically impoverished area (Huo et al. 2007). The outcome in Inner Mongolia will likely be replicated in northern Shaanxi if ecotourism is not strictly limited and managed to protect the gulls' nesting environment from disturbance.

The chaotic situation of ecotourism in Chinese nature reserves is due less to a lack of definitions or regulations than to deliberate neglect of these provisions. Moving beyond conventional perception, this article links the failure in nature-reserve protection to the development policies and practices based on the "grow first and clean up later" belief. The problems in nature-reserve sustainability and ecotourism development in China will not be solved until sustainability concepts and approaches are adopted in policy and practice.

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