

Conserving Biodiversity on Mongolian Rangelands: Implications for Protected Area Development and Pastoral Uses

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Abstract—Mongolia is a sparsely populated country with over 80 percent of its land used by pastoralists for extensive livestock grazing. Mongolia's wildlife and pastoralists have faced dramatic challenges with the recent rapid socioeconomic changes. Livestock numbers increased dramatically in the 1990s following the transition from communism to democracy and capitalism. Yet, limited industrialization and cultivation and relatively low rates of natural resources exploitation leave geographically large areas of the nation with few adverse impacts. In addition, the nation's heritage is strongly conservation oriented. As a result, Mongolia's protected areas system has been growing rapidly and its grasslands support the largest populations of several globally important species. Alternatively, several challenges exist, including growing pressure to exploit the nation's vast mineral reserves, the potential for conflict between pastoralist and conservation objectives, and insufficient conservation capacity to manage and protect natural resources. Arguably, a unique opportunity exists in Mongolia to develop economically while maintaining healthy and productive grasslands that support large populations of native flora and fauna. We suggest that doing so will require strengthening protected areas management; increasing ecotourism; instituting socially acceptable grazing reform; beginning to manage wildlife throughout the entire nation; and finding ways to integrate solutions for both sustainable pastoralism and conservation while minimizing unproductive conflict.

Keywords: wildlife, endangered species, nature reserves, ecotourism, culture, argali, snow leopard.

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Introduction

Mongolia is a vast (>156 million ha), sparsely populated, central Asian nation of about 2.5 million people (NSO-Mongolia 2004). Over 80 percent of the country, or about 126 million ha, are used by pastoralists for extensive livestock grazing (MNE 2001; Sheehy 1996), and these extensive grazing lands represent the largest remaining contiguous area of common grazing in the world (World Bank 2003). Mongolia has been grazed by livestock for millennia and livestock numbers were estimated at 1.97 million horses, 1.79 million cows and yaks, 0.26 million camels, 10.76 million sheep, and 10.65 million goats in 2003 (NSO-Mongolia 2004). Limited industrialization and cultivation and relatively low rates of natural resources exploitation leave geographically large areas of the nation with little adverse anthropogenic impacts. As such, Mongolia represents an opportunity to realize positive and significant conservation objectives. However, several important challenges also exist, especially as Mongolia embraces a free market system and pressures, both internal and external, to utilize and develop the nation's vast mineral reserves increase without the development of sound environmental laws and regulations. Whether or not Mongolia can balance economic development with nature conservation remains to be seen, but arguably a unique opportunity exists in Mongolia to develop economically while maintaining healthy and productive grasslands that support large populations of native flora and fauna.

The Context of Rangeland Conservation

Adequately conserving Mongolia's rangelands requires a sound understanding of the ecological, social, and cultural context and values of these rangelands. Henwood (1998a; 1998b) stressed the low levels of protection for temperate grasslands. He stated that the world's temperate grasslands were the most beleaguered biome, as only 0.7 percent of the world's temperate grasslands fall within the global system of protected areas. Mongolia represents an opportunity to conserve and protect the biodiversity of its grasslands and provides an opportunity to increase the World's protected grasslands. We briefly discuss Mongolia's biodiversity, protected area systems, current and historical use of rangelands, important cultural considerations, the history of conservation efforts in the country, and threats.

Biodiversity

Mongolia retains a substantial amount of its "natural" biodiversity and although biodiversity values are not as great as in many tropical systems, they are still considered high. Two of the world's most biologically outstanding ecoregions, the Daurian Steppes and the Altai-Sayan Mountains, lie partly within Mongolia (World Wildlife Fund 2000). More than 2,823 species of plants inhabit Mongolia (Gunin and others 1998) and indeed, the Mongolian steppe represents one of the largest contiguous unaltered grasslands in the world (WWF 2000). As a result, some species persist in impressive numbers, such as the millions of Mongolian gazelle (*Procapra gutturosa*) that still roam the eastern steppes, and other wild species persist in relatively healthy population in Mongolia; starkly contrasting neighboring regions (Lhagvasuren and others 1999; Reading and others 2000; 2002). The ability of Mongolia to maintain its natural biodiversity largely stems from its long history of pastoralism, low human population (per-capita land area is the largest in the world; World Bank 2003) and lack of industry and crop agriculture. Mongolia also boasts a long history of protecting special areas and a strong cultural tie to the land. Both flora and fauna have benefited from the small amount of land area transformed by cultivation and from only limited introduction of exotic plants.

Grazing lands dominate Mongolia's land area, with over 80 percent of the land area categorized as rangeland. Forests represent the next largest land type, with about 10 percent of the area categorized as forest. Arable lands, urban areas, and water each comprise about 1 percent of the land area (Bedunah and Miller 1995; World Bank 2003). Mongolia's vegetation zones based on geography and climate include the High Mountain Belt, the Mountain Taiga Belt, the Mountain Forest Steppe, the Steppe, the Desert Steppe, and Desert (Hilbig 1995; Johnson and others, this proceedings). For more detailed vegetation descriptions see Hilbig (1995) and Gunin and others (1999). Livestock graze all of these vegetation zones, with areas grazed by several of the

"five types" of Mongolian livestock (camels, horses, sheep, goats, and cattle, including yak).

The vegetation zones result from 1) a severe continental climate characterized by very cold winter temperatures (as low as -52°C) and high summer temperatures of $>40^{\circ}\text{C}$ in the Gobi; 2) elevation changes that range from about 4400 m on the western border in the Altai Mountains to 500 m in the eastern steppes; and 3) short growing seasons, especially in the high mountains and northern part of the country. A low precipitation regime (100-400 mm) extends over about 82 percent of the country. For most of the nation, the precipitation is relatively variable, both spatially and temporally, resulting in a "non-equilibrium ecological system. Scoones (1999) provides an overview of non-equilibrium dynamics and how this new paradigm offers opportunities for interactions between social and natural sciences. In these systems, plant-herbivore interactions are weakly coupled and environmental degradation from livestock grazing is often wrongly blamed for "natural" conditions (Behnke and Scoones 1993; Ellis and Swift 1988). However, ecological systems are complex and exhibit a continuum between equilibrium and non-equilibrium characteristics, and livestock can significantly impact vegetation attributes even in areas considered to be dominated by 'non-equilibrium dynamics' (Fernandez-Gimenez and Allen-Diaz 1999).

Mongolia's fauna, like its vegetation, represents a mixture of species from the northern taiga of Siberia, the steppe, and the deserts of Central Asia. The fauna of the country includes at least 136 species of mammals, 436 birds, 8 amphibians, 22 reptiles, 75 fish, and numerous invertebrates (<http://www.un-mongolia.mn/archives/wildher/biodiv.htm>). Animal species inhabiting Mongolia's rangelands exist relatively intact, especially compared to other grassland ecosystems worldwide. People have extirpated few species from Mongolia's grasslands and one species that went extinct in the wild, the Przewalski's horse (*Equus przewalski*), has been successfully reintroduced into 2 regions. Today, of the species known to previously inhabit Mongolia in historic times (the past 1,000 years), only the dhole (*Cuon alpinus*) remains absent from Mongolia's rangelands, although the nominate subspecies of saiga (*Saiga tatarica tatarica*) has also disappeared.

Several additional species are considered threatened or endangered in Mongolia, but even many of these persist in much larger populations than in surrounding nations. For example, Mongolia boasts the world's largest populations of many ungulates, including Mongolian gazelle, goitered gazelle (*Gazella subgutturosa*), khulan or Asian wild ass (*Equus hemionus*), Mongolian saiga (*S. t. mongolica*), argali (*Ovis ammon*), and wild Bactrian camel (*Camelus bactrianus ferus*) (Amgalanbaatar and others 2003; Mix and others, 1995; 2002; Reading and others 2001). Similarly, small carnivores, such as Pallas' cats (*Otocolobus manul*) and corsac foxes (*Vulpes corsac*), appear to exist in relatively large populations. Large carnivores, such as snow leopards (*Uncia uncia*), are faring less well; however, relatively large populations of wolves (*Canis lupus*) are common across much of Mongolian rangelands.

The situation is similar with the country's avifauna, although many species of birds are declining due primarily to mortality outside of Mongolia. Birdlife International (2003) lists 4 species of grasslands birds that inhabit Mongolia as Vulnerable: the imperial eagle (*Aquila heliaca*), lesser kestrel (*Falco naumanni*), great bustard (*Otis tarda*), and white-throated bushchat (*Saxicola insignis*). The latter may only retain a breeding population in Mongolia. Mongolia's grasslands support relatively large populations of most of those species, as well as cinereous vultures (*Aegypius monachus*) and saker falcons (*Falco cherrug*), especially compared with surrounding areas. Henderson's ground jays (*Podiceps hendersoni*) and Houbara's bustards (*Chlamydotis undulata*) survive in the more arid desert and desert steppe communities.

Riparian and wetland systems embedded within Mongolian rangelands are home to globally significant populations of waterfowl and wading birds, including several species of cranes. Birdlife International (2003) lists seven globally important bird areas in the steppe wetlands of Mongolia. The only breeding population of the conservation-dependent Dalmatian pelican (*Pelicanus crispus*) in East Asia, nests in Airag Nuur in western Mongolia (Birdlife International 2003). In addition, these wetlands are particularly important for breeding populations of several globally vulnerable or endangered species, such as swan geese (*Anser cygnoides*), white-naped cranes (*Grus vipio*), relict gulls (*Larus relictus*), white-headed ducks (*Oxyura leucocephala*), and non-breeding populations of the critically endangered Siberian crane (*G. leucogeranus*) and vulnerable hooded crane (*G. monacha*) (Birdlife International 2003). A wide variety of less threatened species of water birds also depend on Mongolia's steppe wetlands.

The status of Mongolia's herptifauna, invertebrates, fishes, and smaller mammals remains less studied and therefore more poorly understood. In all probability, most of these species are thriving or at least faring better in Mongolia than in surrounding nations because of the small number of dams and other hydrological projects and the previously mentioned low levels of industrialization, cultivation, and exotic species introductions in Mongolia.

Protected Areas

Mongolia boasts a centuries old tradition of nature conservation using protected areas (Johnstad and Reading 2003). Chinggis Khan created Mongolia's first protected area to protect game species nearly 800 years ago and Bogdkhan Mountain Strictly Protected Area, first established in 1778, represents one of the world's oldest continuously protected areas (Chimed-Ochir, 1997; Enebish and Myagmasuren 2000). Nevertheless, creation of a comprehensive system of protected areas developed slowly until the 1990s. Following the political and economic transformation of 1991, Mongolia has shown a strong commitment to establishing a modern network of protected areas based upon principles of landscape ecology (Enebish and Myagmasuren 2000; Reading and others 1999). In 1992, the Mongolian Parliament or "Ikh Khural" adopted a goal of placing 30 percent of the nation in some form of protected status (Chimed-Ochir 1997). Enebish and Myagmarsuren (2000) also provide a time frame and list potential areas for protected designations that will meet the goal of 30 percent of the total area of Mongolia protected by 2030. Since 1992, Mongolia has rapidly increased the number and area of protected areas (fig. 1) and in 1994, the Mongolian Parliament passed a new "Protected Areas Law"

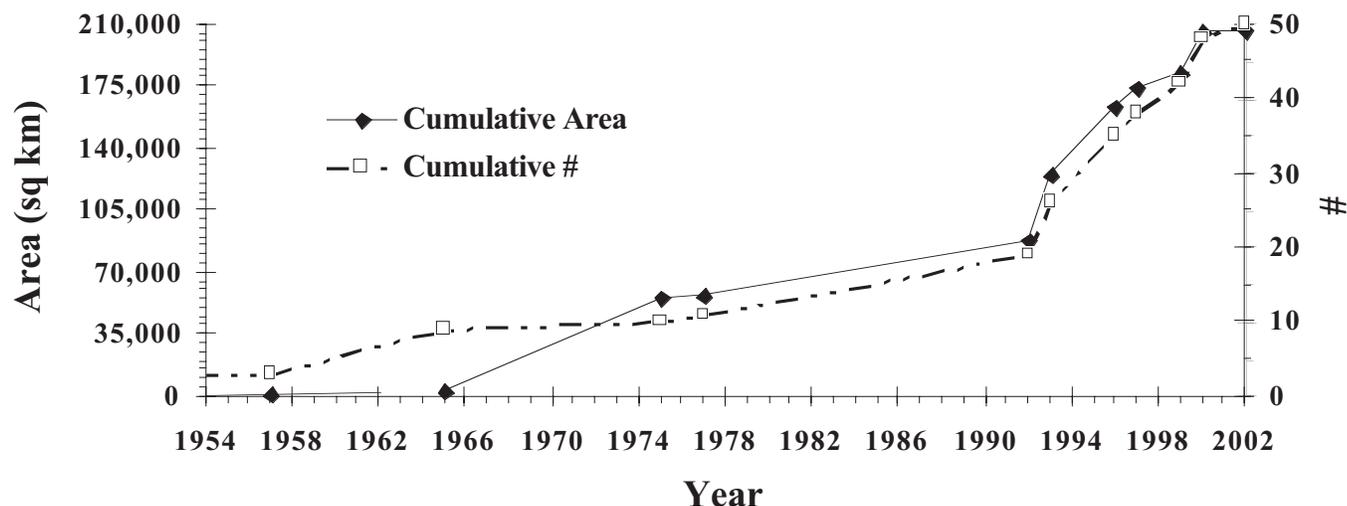


Figure 1—Increase in the area and number of protected areas in Mongolia (1954-2002). Note the rapid increase in both number and area of protected areas from 1992-2002.

(Wingard and Odgerel 2001). This law, which went into effect in 1995, recognizes four primary categories of protected areas in Mongolia: Strictly Protected Areas, National Parks, Nature Reserves, and National Monuments (table 1).

As of 2002, Mongolia's 50 protected areas covered more than 20.68 million hectares -- over 13 percent of the country (fig. 1). The network includes Strictly Protected Areas (50.7 percent of the total area protected in Mongolia), National Parks (40.1 percent), Nature Reserves (8.8 percent), and Monuments (0.4 percent) (Johnstad and Reading 2003). As of 2003, there were also 552 relatively small provincial protected areas scattered throughout the nation, covering 3.1 million ha (Anonymous 2003).

Rangelands remain under-represented in the Mongolian protected areas system, with only 1.97 percent of steppe, 2.73 percent of forest-steppe, and 3.41 percent of desert-steppe ecosystems protected (Enebish and Myagmarsuren 2000; Johnstad and Reading 2003). As is common with most nations, protected areas dominate in regions little utilized by people, such as high mountains, desert, and border regions. Still, the inequity in the distribution of protected areas by biome has been recognized by Mongolian conservationists and many conservationists advocate rectifying this situation with new protected areas proposals (for example, Enebish and Myagmarsuren 2000).

According to the Protected Areas Law, Mongolian Strictly Protected Areas and National Parks should be divided into zones with different management regimes (Wingard and Odgerel 2001). Using the Biosphere Reserve model, Strictly Protected Areas and National Parks are managed with zones that ideally lead to increasing nature protection toward the center of the protected area. Under the law, protected area zonation includes pristine, conservation, and limited use zones for Strictly Protected Areas and special, travel and tourism, and limited use zones for National Parks. The level of protection afforded to natural features, flora, and fauna varies by zone, differing even between limited use zones in Strictly Protected Areas and National Parks. In addition, the 1997 Mongolian Law on Buffer Zones permits the creation of multiple use zones around protected areas that permits even greater development and use of natural resources than do the internal zones of protected areas (Wingard and Odgerel 2001). Thus far, buffer

zones have only been established for Strictly Protected Areas and National Parks.

With the significant land area placed in protected area status and the potential for a much larger area to be placed in protected status, there is a need to understand how well protected areas in Mongolia conserve resources and how they may impact historical communal land use. Management plans and actions within protected areas remain rudimentary for most protected areas in Mongolia (Johnstad and Reading 2003; Reading and others 1999). Notable exceptions do occur where international aid organizations have invested resources (for instance, Khustain Nuruu and Gobi Gurvan Saikhan National Parks) (Reading and others 1999). For example, although most, if not all, protected areas have established management zones where pertinent, these zones have meant little in terms of actual management to date (Bedunah and Schmidt 2004; Johnstad and Reading 2003; Maroney, this proceedings). As we discuss below, most protected areas receive insufficient resources and lack the expertise to even develop management plans, let alone implement management actions that vary by zones. Nevertheless, there is evidence of progress toward improved management and establishment of a system of protected areas is a good first step for protecting and conserving natural resources (Reading and others 1999; Schmidt, this proceedings) and may help pastoralists to maintain their livelihoods (Bedunah and Schmidt 2004).

Pastoralism—Pre 1990s

Pastoralism has been the dominant land use in Mongolia for millennia, and at first appearance, Mongolian's maintain livestock in much of the same ways as their ancestors. Grazing systems are transhumant with winter bases for protection of livestock from severe winter conditions. Traditionally, herders moved their livestock to make the best use of available forage and water on their allotted spring, summer, autumn and winter pastures, and they required skill to ensure that livestock were sufficiently fat going into winter to reduce winter losses. However, changes during the 20th century altered pastoral systems with ramifications for sustainable use of grazing lands. We briefly describe some of the historical aspects of the pastoral

Table 1—Mongolian Protected Area Designations.

Designation	Definition
Strictly Protected Areas	Areas whose natural conditions are very well preserved; represent areas of natural and scientific importance; and are protected to ensure environmental balance. Human use is severely restricted.
National Conservation Parks	Areas whose natural conditions are relatively well preserved, and which have historical, cultural, scientific, educational, and ecological importance.
Nature Reserves	Areas protected for conservation, preservation, and restoration of natural features, resources, and wealth. Reserves are designated as Ecological, Biological, Paleontological or Geological.
National Monuments	Areas protected to preserve the natural heritage of unique formations and historical and cultural sites. Areas are designated as Natural Monuments or Historical and Cultural Monuments.

system, recent changes, and ramifications for sustainable use of rangelands. For detailed reviews of pastoral social economic units, historical land tenure and pastoral systems see Bazargur and others (1993), Fernandez-Gimenez (1999), Germeraad and Enebish (1996), Humphrey (1978), and Jagchid and Hyer (1979), Muller and Bold (1996), and Sneath (1999).

For several centuries prior to the communist era (pre-1921), land tenure was feudal and stock management transhumant with family groups as units. Livestock were herded using seasonal migrations and a rotation of moves, often fairly rapidly, over an area. Each herder owned a winter camp that usually included a corral and at least a small amount of shelter. In years of poor forage, herders traveled further to find adequate pasture. The distance herders moved their livestock or camps depended on the ecological characteristics of their grazing lands; herders in less productive zones, e.g., the Gobi, moved livestock greater distances and were “more nomadic” than herders in the steppe. Also, herders with many livestock would move more often and over greater distances because the number of livestock necessitated more moves. Feudal officials allotted grazing areas on the principle that a person with many herds should have more and better land (Humphrey 1978). Grazing was allowed only within the circuit of common lands (khoshuun) held by the feudal lord and migration outside would bring some kind of punishment for the herder and possibly his prince.

With Mongolia’s independence from China in 1921, and a move toward Soviet communism, the feudal system was abolished, religion strictly suppressed, and administrative units altered from the larger khoshuun to the smaller *sum* districts. In general, little formal regulation occurred during this period, migrations of livestock were reduced, but some customary rights remained within administrative units and traditional neighborhood groups worked together (Fernandez-Gimenez 1999). The first attempt to form herding collectives was in 1928. However, the majority of the herders refused collectivization and the policy of compulsory enforcement was abandoned. In the 1950s, the government gave existing collectives massive aid and strongly encouraged people to join. Private herders were heavily taxed, but at this time, joining a collective permitted some ownership of private stock. By 1960, the government enacted a compulsory law that required all herders to join a collective. The goal of collectivization was to create a surplus of livestock products to feed urban populations, both in and out of Mongolia. These herding collectives, called “negdels,” occupied territories the size of a *sum*, a subdivision of a province. The government assigned each collective herds and a territory. It further subdivided each territory into land assigned to herding brigades to carry out the main work. Brigades were specialized to manage only certain kinds of herds and further divided into units called “suur,” which generally consisted of three or four households. Suur were further specialized to manage one area, perhaps only castrated rams, or one- and two-year-old lambs, or rams and male goats, or cross-bred sheep, or goat kids separated in autumn.

During collectivization several livestock and range management problems were reported. Separating goats and sheep in winter apparently caused heavy winter losses of goats in some

areas because the sheep kept the goats warm in winter. Large, specialized herds also concentrated grazing use and changed forage use patterns. Herders preferred to remain close to the services provided by *sum* centers, threatening to overuse nearby pastures, but apparently the brigade councils sent suurs out to distant pastures (Humphrey 1978). Livestock movement was strongly regulated, but the long distance movements possible in earlier times were much more restricted.

By the early 1990s, livestock collectives collapsed with the dismantling of the command economy. The collectives distributed their property in two phases in 1991 and 1992, with a large share of the herds distributed among members (Bruun 1996). New herding households attained an almost unlimited and unprecedented freedom of choice with respect to lifestyle, livestock management, and economic activities (Bruun 1996), with little or no formal regulatory structures to control livestock grazing. This “new freedom” also moved risk from the collective to the individual household. In many areas, and likely all of Mongolia, the lack of strong formal or informal institutions to regulate livestock movement led to declining mobility and increasing out-of-season grazing and trespassing and associated conflicts (Agriteam Canada 1997; Fernandez-Gimenez 1999; Swift and Mearns 1993).

Livestock Numbers

Total animal numbers did not fluctuate greatly as Mongolia moved into collectivization (fig. 2). In fact, animal numbers were somewhat higher in the 1930s and early 1940s compared to collective period (1960s to 1990). This is somewhat surprising because collectivization led to increased inputs, such as veterinary support, greater mechanization in hay production, increased livestock movement, and development of water sources, and because a push for more production accompanied the command economy. However, Mongolian rangelands were apparently close to being “fully stocked” by the 1930s. Sheehy (1996) estimated that there are approximately 60 million sheep forage units available in Mongolia and in 1940 livestock sheep units were about 56 million. Collectivization also introduced changes in the proportion of types of livestock raised in different ecological zones and other management changes that reduced the efficiency of livestock production. For example, during collective times birth rates for private livestock exceeded those for collective livestock (Bedunah and Miller 1995).

After the central government relinquished control over livestock production in the early 1990s, livestock numbers increased rapidly from about 25.2 million head in 1993 to over 33.5 million head in 1999 (Byambatseren 2004; NSO-Mongolia 2004). Livestock numbers reached an all time high in 1999, as calculated as total numbers or on an animal equivalent basis (Sheep Forage Units) (fig. 2 and 3). Numbers of goats increased most dramatically, rising 215 percent from 1990 – 1999 (fig. 2 and 3), resulting in a growing preponderance of goats in Mongolia overall (fig. 4). Horses and cattle numbers also increased dramatically, rising 140 percent and 135 percent, respectively (fig. 2 and 3). It difficult to assess the accuracy of historic

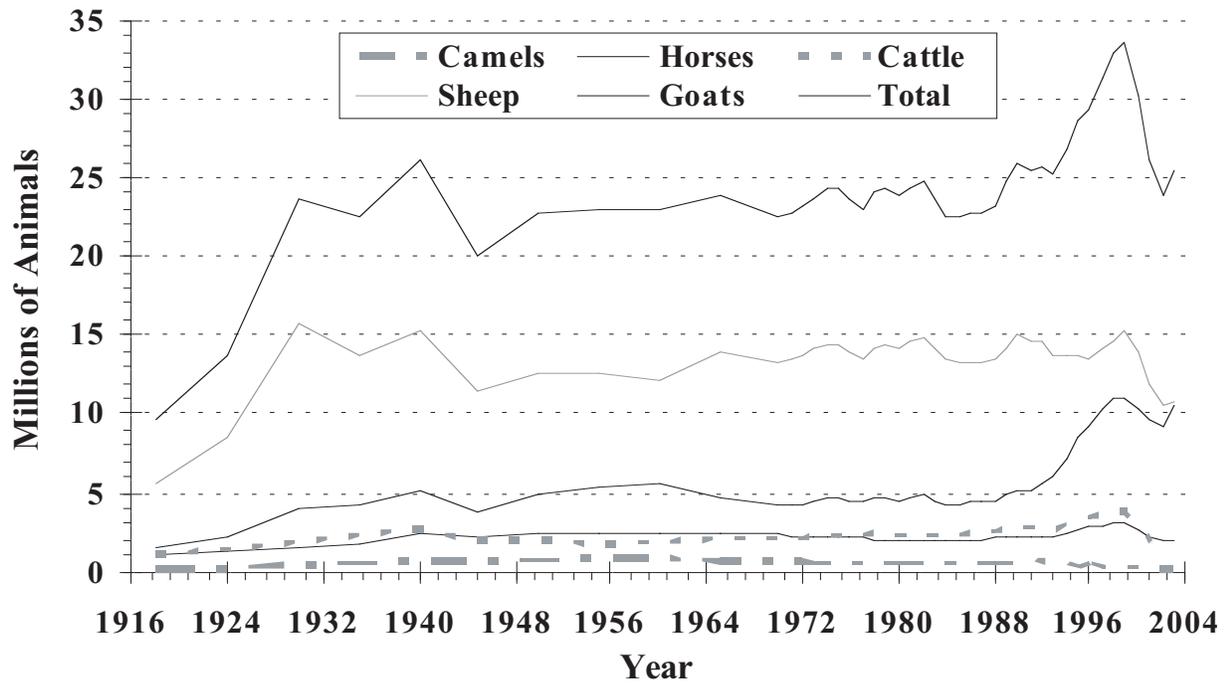


Figure 2—Livestock trends in Mongolia, 1918-2004. Data Source: Mongolian National Statistical Office (Byambatseren 2004; NSO-Mongolia 2004).

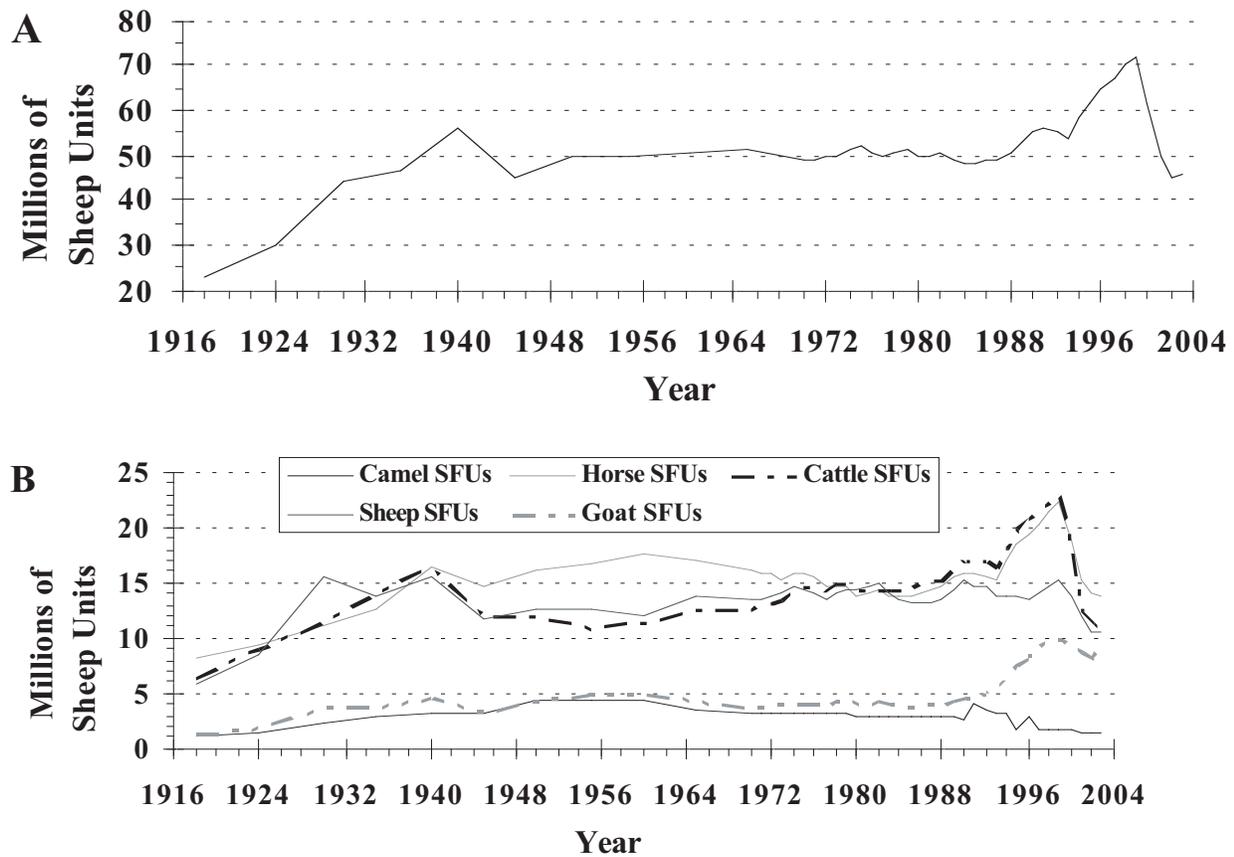
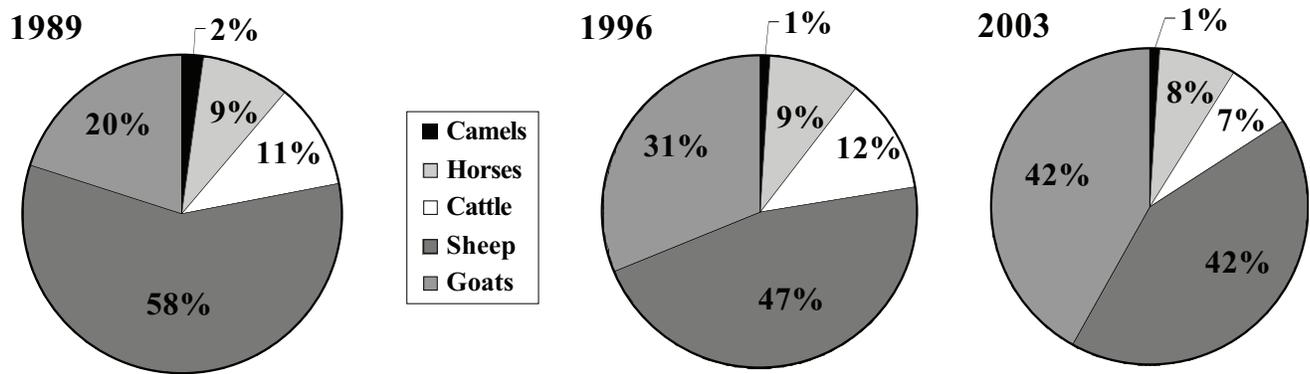


Figure 3—Livestock trends in Mongolia using Sheep Forage Units, 1918-2002. **A.** All species combined. **B.** Each species individually (note that cattle includes yak). Sheep Forage Units (SFUs) seek to standard livestock grazing by placing different species as sheep equivalents. In Mongolia, SFU per type of animal is 5 SFU per camel, 7 SFU per horse, 6 SFU per cow or yak, and 0.9 SFU per goat.



Data Source: Mongolian National Statistical Office (Byambatseren 2004, NSO-Mongolia 2004).

Figure 4—Change in the percentage of each type of livestock in Mongolia, 1989-2003.

livestock numbers, but during the communist era (pre 1992) it is likely that livestock estimates were accurate. During the late 1990s, it became more difficult to evaluate accuracy and Kennett (2000) reported that estimates were often 25 percent lower than actual numbers, as herders under-reported their holdings to reduce taxes paid on livestock.

The increased livestock herds in the 1990s were undoubtedly related to greater numbers of herding families (fig. 5) and increases in numbers of livestock for many herders (fig. 6). The increase in the number of herders possibly resulted

from Mongolia's "culture of pastoralism." Many Mongolians consider pastoralism to be an ideal lifestyle and thus returned to their "roots" as herders because they were now free to do so and because they retained the knowledge of, or at least were not too far removed from, herding and pastoralism. However, for some people herding became a necessity as they lost their jobs and other livelihood opportunities disappeared with the collapse of the command economy. The degree to which these individuals retained herding as part of their past likely influenced their ability to transition into this

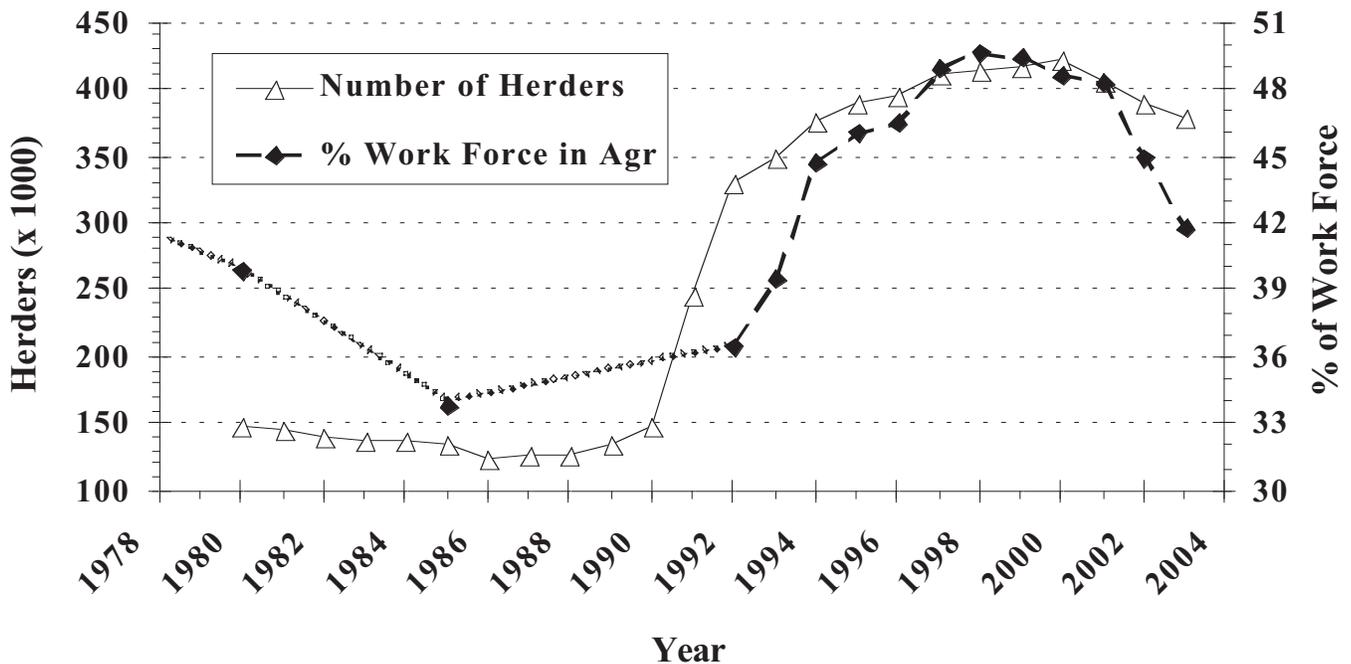


Figure 5—Change in the number of herders in Mongolia and the percentage of the Mongolian workforce engaged in agriculture (the vast majority of whom are herders).

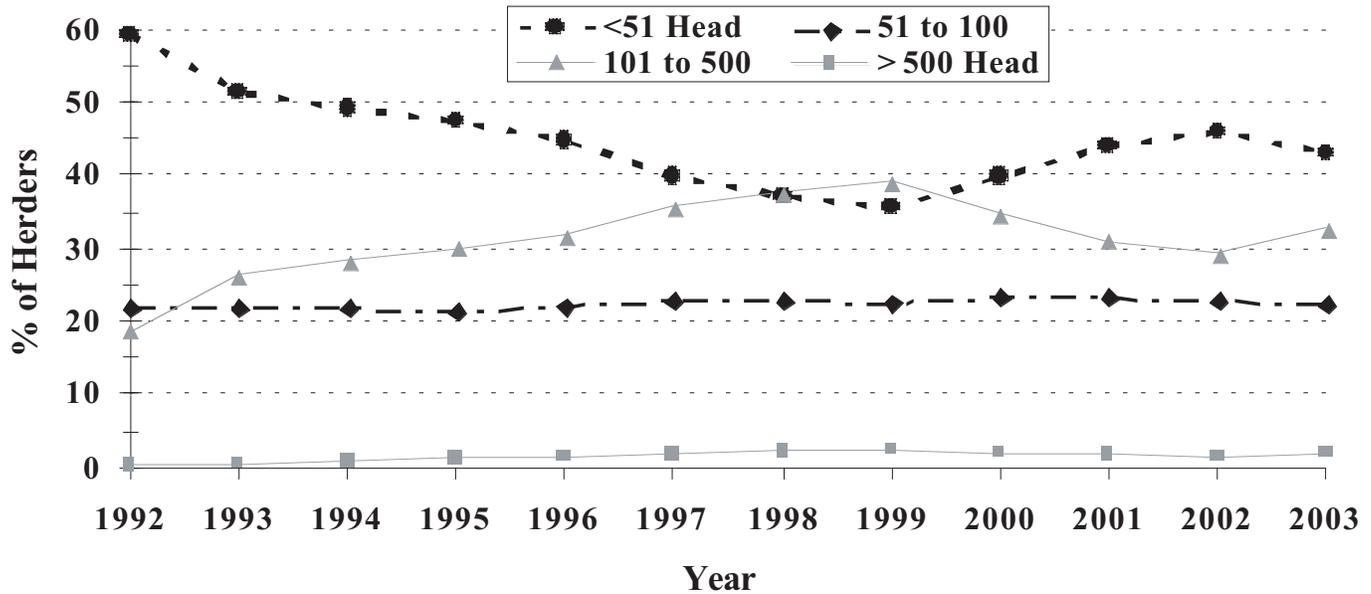


Figure 6—Change in distribution of herd sizes over time in Mongolia. Data Source: Mongolian National Statistical Office (Byambatseren 2004; NSO-Mongolia 2004).

occupation; while most apparently succeeded, others failed and the number of herders decreased each year between 2000 and 2003 (fig. 5). From 1992 to 1999 the number of “small herds” decreased, medium sized herds was generally stable, and large herds increased (fig. 6). Increasing mean herd sizes reflects a general increase in wealth. Despite growing pastoral wealth, a large percentage of herders maintained small herds (< 100 animals), while only a few herders owned very large herds. This disparity in wealth is a recent phenomenon on the rangelands of Mongolia, not seen since the feudal lords controlled livestock wealth.

In the winter of 1999-00, and again in 2000-01, dzuds (a general Mongolian term for various winter conditions during which livestock cannot forage) struck much of Mongolia

causing severe livestock losses (table 2) and a reduction in average herd sizes (fig. 3 and 6). Summer droughts undoubtedly made the impacts of winter dzuds more severe, but determining the extent to which overstocked ranges increased drought severity is difficult to quantify. The large losses of livestock during this period exceeded any since the 1944-45 dzud (table 2). These losses not only impacted pastoral livelihoods, but the national economy; the overall Mongolian economy grew a mere 1 percent in 2001 and 3.9 percent in 2002 (Mearns 2004). The Government of Mongolia (2003, from Mearns 2004) estimated that without the dzud impacts, economic growth from 1999 to 2002 would have been on the order of 8 percent.

Since the mid-1990s, indices of Mongolian herder wealth have increased as the percentage of pastoralists owning jeeps or

Table 2—Livestock losses in Mongolia through drought and dzud over the last 60 years. Source: <http://www.un-mongolia.mn/archives/disaster/>

Years	Type of Disaster	Losses (# of Head)	
		Adult Stock	Young Stock
1944 – 45	Drought + dzud	8,100,000	1,100,000
1954 – 55	Dzud	1,900,000	300,000
1956 – 57	Dzud	1,500,000	900,000
1967 – 68	Drought + dzud	2,700,000	1,700,000
1976 – 77	Dzud	2,000,000	1,600,000
1986 – 87	Dzud	800,000	900,000
1993	Dzud	1,600,000	1,200,000
1996 – 97	Dzud	600,000	500,000
1999 – 00	Drought + dzud	3,000,000	1,200,000
2000 - 01	Drought + dzud	3,400,000	?

trucks, motorcycles, or televisions, and with access to electricity (usually through solar panels or wind mills) continues to rise (fig. 7) (Byambatseren 2004; NSO-Mongolia 2004). However, as with livestock figures, these statistics belie the fact that most herders remain poor. The Mongolian government considers a herd size of about 150 animals as the minimum necessary to maintain a household's livelihood (World Bank 2003). In 2002, about 75 percent of herding families retained herds smaller than this threshold (fig. 6) (World Bank 2003). Of course, many of these families obtain additional income from other sources. Indeed, herding represents supplementary income for many people whose incomes are too low to sustain themselves and their families. Thus, overgrazing increasingly degrades areas around towns and cities (Ferguson 2003).

We suggest that stabilizing and improving the health of the nation's livestock herd is crucial to the long-term stability of the nation, especially given the importance of livestock production to such a large proportion of the population. Mearns (2004) stressed the neglect of the livestock sector in development priorities and thus the decline in agricultural productivity. In the past, Mongolians stressed the need for creating reserve pastures and forage reserves (hay and other supplements) for times of shortages and for providing ways of protecting animals from unfavorable conditions (Minjigdorj 1995). Although the level of hay production that occurred during the highly subsidized Soviet period is impractical today, we argue that historic practices of using reserve pastures and native hay production are necessary to avoid dramatic livestock losses and ensure food security. This requires a more moderate or conservative level of stocking to ensure better animal condition and less pasture degradation. Potential causes of pasture degradation can be complex and are often ultimately attributable to complex institutional changes. However, ultimately animal numbers that are not in balance with forage resources will impact rangelands

and the animals (both livestock and wildlife) that use these grasslands. Ward and Ngairorue (2000) discuss the extremely long-term nature of declining productivity or desertification brought about by heavy grazing in arid habitats. For in-depth discussions of issues and concerns regarding desertification and identification of desertification see Leach and Mearns (1996) and Swift (1996). We believe there is a strong need for research to better understand grazing impacts to ecological systems in Mongolia. For example, the much greater numbers and percentage of goats (fig. 2 and 4) have no doubt impacted shrub communities by increasing browse use. Thus, researchers need to quantify long-term impacts or changes that may negatively impact natural resources.

Mongolian Culture and Conservation

"Mongolians have a deep reverence for their environment and a close symbiotic relationship with the natural world (UNDP 2000: 34)." The roots of Mongolian culture stretch back thousands of years and emanate from animistic beliefs that still strongly influence thoughts and practices in the country, especially among some minority groups (Finch 1996; Germeraad and Enebish 1996). Tibetan style Buddhism arrived in Mongolia in the 1500s and quickly and profoundly affected the culture of the nation (Gilberg and Svantesson 1996). Although ruthlessly repressed by the communist government in the 1930s, the influence of Buddhism remains powerful today and is experiencing a marked resurgence (Bruun and Odgaard 1996). Buddhism teaches love and respect for nature that usually translates into strong support for conservation (Germeraad and Enebish 1996; World Bank 2003).

After a brief period as a Buddhist theocracy, Mongolia became the world's second communist nation in 1921. Yet, even under communism the country's policies maintained support for

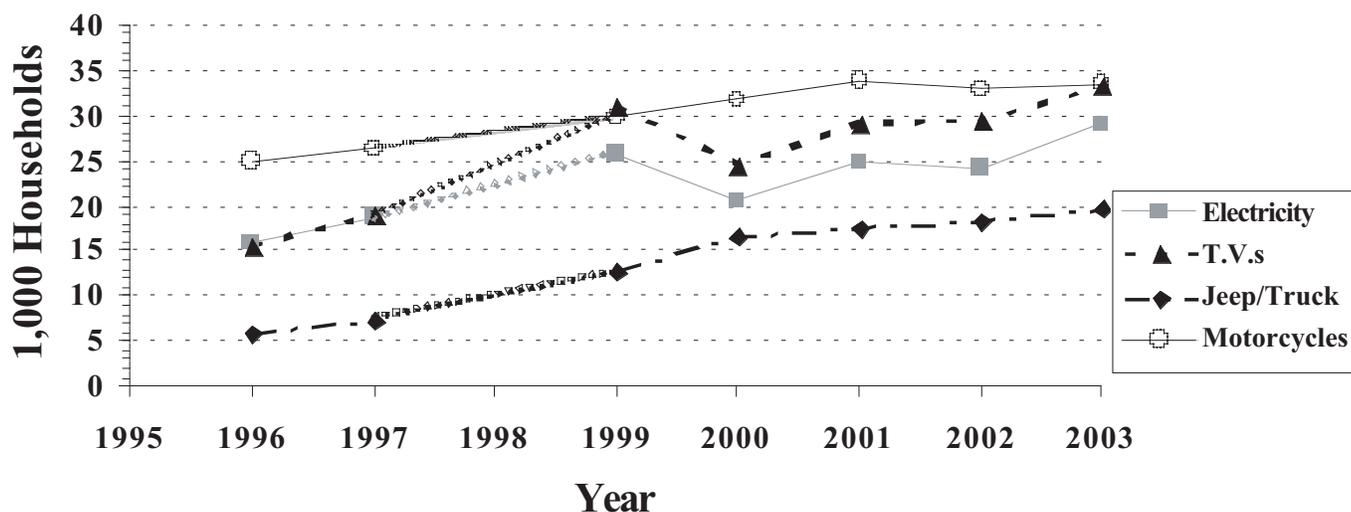


Figure 7—Changes in indices of Mongolian herder wealth over time. Note: no data for 1998. Data Source: Mongolian National Statistical Office (Byambatseren 2004; NSO-Mongolia 2004).

conserving and protecting the wildlife and natural resources of the nation. With the shift from communism to democracy and capitalism in the early 1990s, the government made an initial, strong drive for conservation, reflecting the desires of most of the populace (UNDP 2000). Yet that same shift to a free market economy hastened economic growth and has more recently resulted in policies directed at natural resources exploitation (Ferguson 2003). Given the vast, untapped mineral wealth, rapidly changing policies regarding resource development, and low standard of living affecting most Mongolians, it is perhaps not too surprising that the last few administrations have faced numerous corruption scandals, with several officials convicted and sent to prison. Unfortunately, modern approaches to conservation have not kept pace with this altered political and economic landscape.

Today, most Mongolians still embrace nature conservation, at least in word (UNDP 2000). This attitude appears particularly prevalent in rural areas, including pastoralists. For example, when the government removed a portion of a National Conservation Park in the Gobi, the local people rallied and petitioned for its return (unsuccessfully). Similarly, many pastoralists lobby for the creation of new protected areas (Reading and others 1999). Most protected areas in Mongolia allow grazing by domestic livestock, and even areas that prohibit livestock by law remain largely unmonitored and pastoralists continue to use most of these areas at least periodically. As these parks begin to grapple with issues of grazing management, including restricting livestock numbers and creating zones of livestock exclusion it will be interesting to see how pastoralists react (Reading and others 1999).

A romanticized view of nomadic pastoralism and nature conservation continue to pervade the psyche of most Mongolians (Germeraad and Enebish 1996; Reading and others 1999). Yet, increasing desires to “westernize” and improve standards of living challenge these traditional values. Cultural changes in urban Mongolia appear meteoric to us and are increasingly affecting rural Mongolia as well. Balancing tradition with change affects all nations, of course, but in Mongolia that change comes coupled with the disruptive transition from communism and a command economy to democracy and a free market. And in Mongolia, pastoral nomadism arguably defines their traditional culture more than in most other nations with a relatively large pastoral component. Pastoralism certainly comprises a larger portion of Mongolia’s economy (15.9 percent in 2003) than most other nations (NSO-Mongolia 2004). So, effectively conserving Mongolia’s rangelands would not only help ensure a sustainable rural economy, but also help preserve the nation’s cultural and natural heritage (Reading and others 1999).

The new constitution and variety of new laws passed since 1991 codify the strong conservation values of most Mongolians. The constitution guarantees every citizen the right to a healthy environment. In keeping with this mandate, the Mongolian parliament, or Ikh Khural, passed a number of new environmental laws since the early 1990s (Wingard and Odgerel 2001). While these laws and subsequent regulations represent an important first step, their effectiveness is limited

by a serious lack of implementation and enforcement (for example see Amgalanbaatar and others 2002). Similarly, as we noted above, Mongolia has rapidly expanded its protected areas network in recent years, but that expansion has not enjoyed a commiserate increase in the capacity of the Mongolian Protected Areas Bureau to manage the new reserves (Johnstad and Reading 2003; Reading and others 1999). To help address this short-coming, several international aid organizations (such as the United Nations Development Programme, German Technical Advisory Cooperation or GTZ, the Ministry for International Cooperation of the Netherlands, the U.S. Agency for International Development or USAID); non-governmental conservation and environmental organizations (such as the World Wide Fund for Nature-Mongolia, Mongolian Association for the Conservation of Nature and Environment, Denver Zoological Foundation, Philadelphia Academy of Natural Sciences, International Crane Foundation, Wildlife Conservation Society); and universities (for example University of Montana, Columbia University, Colorado State University) have developed and begun implementing programs to train protected areas staff, develop management plans, involved local people, and provide much needed funding (Johnstad and Reading 2003).

The end of communism also led to a rapid increase in the number of non-governmental organizations (NGOs) focused on the environment and nature conservation, and by 2003 there were several environmental NGOs registered with the government (Anonymous 2003). Indeed, Mongolian conservationists recognized the need to increase the effectiveness of the growing number of small environmental NGOs by creating an umbrella organization, the Union of Mongolian Environmental, Nongovernmental Organizations (UMENGO) in 2000 (Mooza 2003). NGOs are becoming increasingly involved in conservation initiatives, but lack of resources and professional capacity limit the effectiveness of most of them (Anonymous 2003). Still, the overall capacity of Mongolian environmental NGOs grows yearly and enthusiasm among members remains high, boding well for the future (Mooza 2003).

Threats & Challenges to Rangeland Conservation

Mongolia’s rangelands persist largely unfragmented and only minimally degraded (UNDP 2000). Still, threats and challenges to maintaining this situation are growing, primarily in the form of increased natural resources exploitation, growing conflicts between pastoralism and conservation, and a lack of conservation capacity to address these issues.

Natural Resources Exploitation

Mongolia harbors vast reserves of many natural resources that have largely gone untapped until recently. The country’s mineral wealth includes vast deposits of gold, copper, uranium, fluor spar, and molybdenum (MNE 2001; Sanders 1996). Additionally important minerals include iron, silver, tin, tungsten, zinc, lead, phosphates, and nickel (MNE 2001). Vast coal deposits and

more modest oil and gas reserves also exist throughout large portions of the nation. Since the transition to a free market economy, mining activity has increased dramatically (Brooke 2003; Ferguson 2003; UNDP 2000). For example, gold production increased by over 11 times (1,100 percent) from 1993 to 2000 as the number of mines increased to 150 (MNE 2001). In addition, numerous wildcat mines illegally excavate gold throughout the country. By 2004, companies already licensed 29.9 percent of Mongolia's territory for exploration and mining and over 6,000 significant deposits of 80 minerals have been found (Mineral Resources Authority of Mongolia 2004).

Because minerals represent 15 to 20 percent of the nation's GNP and 57 percent of its exports (MNE 2001; Mongolian National Mining Association 2004), the mining industry exerts tremendous influence on environmental management in Mongolia. As the Mineral Resources Authority of Mongolia (2004: 6) states, "[Mining] opportunities are facilitated by a supportive government attitude and alluring foreign investment business environment." Although mining companies are required to prepare Environmental Impact Assessments, undertake reclamation activities, and place 50 percent of their environmental protection budget in a government account prior to beginning work (Wingard and Odgerel 2001), the Mongolian Ministry for Nature and Environment states that "none of these laws are enforced" (MNE 2001: 17). As mining continues in the absence of law enforcement, companies have simply ignored environmental mitigation and restoration requirements (Brooke 2003; Ferguson 2003).

Pressure for increased mining activity continues to mount and Farrington (2005) suggests the largest threat to the protected-area system from mining has come from within the government itself. In June 2002, the Ministry of Nature and the Environment proposed deprotecting 434,000 ha of land in 10 protected areas and at the same time, the Mineral Resources Authority of Mongolia proposed deprotecting an additional 1.5 million ha of land in 8 protected areas (Farrington 2005). These motions were later rejected by the Mongolian parliament, but a new proposal in December 2003 proposed deprotecting 3.1 million ha or approximately 15% of Mongolia's protected-areas system, in four different protected areas so that the areas could be opened to mining (Brooke 2003; Farrington 2005). The Mongolian conservation community has strenuously opposed such actions, as have most local people (Anonymous 2004; Brooke 2003; Johnstad and Reading 2003). Nevertheless, the precedent was set in the early 1990s when the government deprotected a portion of Three Beauties of the Gobi National Conservation Park to permit the establishment of a gold mine. In addition to resource extraction, talks are underway to deprotect portions of border parks to allow the construction of transportation corridors (rail lines and paved roads) to facilitate the exportation of natural resources to Russia and especially China (Anonymous 2004; Birdlife International 2003).

Despite the increasing extraction of minerals from Mongolia, the nation's refining industry has not developed (Wingard and Odgerel 2001). As a result, a source of economic development

is being lost. Similarly, mining and taxation laws generous to extractors permit companies to exploit natural resources, while paying modest taxes and royalties to the government (Anonymous 2004; Brooke 2003). For example under the Minerals Law of Mongolia, passed in 1997 and amended in 2001, exploration fees are US\$0.05/ha for the 1st year, US\$0.10/ha for the second and third years, and then rises to US\$1.50/ha by the seventh year (Ariuna and Mashbat 2002). Mining fees are US\$5.00/ha for years 1 to 3, US\$7.50/ha for years 4 to 5, and US\$10.00/ha thereafter (Ariuna and Mashbat 2002). There are no customs fees or limits on repatriated money earned from mining (Wingard and Odgerel 2001). Mining royalties are set at 2.5 percent for all minerals, except gold (7.5 percent) (Ariuna and Mashbat 2002). In addition, the government is not required to approve business or operational plans; foreigners can work for extraction companies; and firms can export raw materials (Mineral Resources Authority of Mongolia 2004). Given this situation, the benefits to Mongolia seem meager.

Conflicts Between Pastoralism and Conservation

Pastoralists remain among the staunchest supporters of conservation initiatives in Mongolia, including the creation of new protected areas, yet their knowledge of the meaning of terms like "biodiversity" and of Mongolian environmental laws and conservation activities remains low (Anonymous 2003). Still, conflicts between pastoralism and conservation do arise and require attention. For example, Agriteam Canada (1997) raised concerns over additional constraints placed on herders by the establishment of large protected areas. They reported that in Khustain Nuruu Nature Reserve, established for the reintroduction of Przewalskii horse, a reduction in total area available for herders in Altanbulag *sum* created conflicts associated with a loss of traditional winter and spring camps. Establishment of the Gobi B Ecological Reserve also reportedly reduced winter grazing areas for local herders (Agriteam Canada 2003). We found no information on conflicts associated with removing domestic livestock from protected areas established before the 1990s; however, O'Gara (1988), in describing the success of the Khokh Serkhi Strictly Protected Area for conserving wildlife, reported that within five years of its establishment in 1977, all pastoralists and their livestock had been removed. We do not know how the removal of pastoralists was achieved or the impacts on those pastoralists, but we assume that displacement of pastoralists did impact their lives. A more recent study reported that the creation of Gobi Gurvan Saikhan National Park was a positive influence on some communities of pastoralists living in the park, largely because of planning and support by GTZ (Bedunah and Schmidt 2004). Bedunah and Schmidt (2004) reported that the pastoral issues identified in Gobi Gurvan Saikhan National Park were not associated with the park, but were issues faced by the entire country associated with the lack of land-use controls for addressing livestock grazing. This situation has arisen during the transition from the command economy to free-market system because of a lack of institutional

controls and thus a deterioration to more or less free access of grazing lands (see Fernandez-Gimenez 1999; Mearns 2004).

Just after the transition to democracy, Sheehy (1996) suggested that most of the grazing land in Mongolia remained in good or excellent condition, and that degraded pastures responded favorably to reduced grazing pressure. At the time range scientists considered only about 11 million ha, or 7 percent of Mongolia's land area, of pasture land as degraded. However, livestock numbers rose markedly during the 1990s (fig. 2 and 3), resulting in greater degradation and increased desertification, especially in the more marginal desert steppe and desert regions (Amgalanbaatar and others 2002). By 2001, government officials reported that over 70 percent of total pastureland was degraded and 7 percent was heavily degraded (MNE 2001; UNDP 2000); although, a recent World Bank report (2003) disputes these figures as likely being too high and not based on valid studies.

The increased degradation of pasturelands in Mongolia, whatever the current level, has been attributed to global climate change, vehicular damage, and especially over-grazing of relatively fragile rangelands (MNE 2001; UNDP 2000). Over-grazing resulted from an increase in the national livestock herd, drought, and poor management of livestock (for example reduced livestock movement by many pastoralists) associated with a loss of land use controls or institutional development for ensuring sustainable grazing management. The rapid increase in livestock, from 24.7 million in 1989 to about 33.6 million in 1999 (Byambatseren 2004, NSO-Mongolia 2004) (fig. 2), has been attributed to 1) reduced livestock prices that encouraged herders to maintain live animals rather than selling them for slaughter and 2) an increasing number of pastoralists as many urban residents turned to pastoralism as a way of life following the collapse of communism and a loss of other livelihood opportunities (MNE 2001; Sheehy 1996; UNDP 2000; World Bank 2003). Following two severe winters coupled with large expanses of drastically over-grazed pastures, the national herd size dropped dramatically to 23.9 million head by 2002 (Byambatseren 2004) (fig. 2). Persistent droughts undoubtedly exacerbated overgrazing in some areas, but herders did not reduce animal numbers to balance animals with forage resource when conditions called for such actions. Reportedly, over 7 million head of livestock died (World Bank 2003). Of course, wildlife also suffered from these impacts. At our argali research site in Ikh Nartiin Chuluu Nature Reserve, we witnessed the starvation deaths of dozens of argali and ibex as little forage remained following heavy livestock grazing.

The increased numbers of nomadic herders and livestock also meant increased displacement of wildlife from traditional pastures. For example, in western Mongolia, pastoralists are pushing higher and further into the mountains, increasing the stress on the ever more fragmented and declining argali populations that remain (Amgalanbaatar and Reading 2000; Amgalanbaatar and others 2002; Mallon and others 1997; Schuerholz 2001). We also recently discovered that domestic guard dogs predate on argali sheep (Reading and others 2003). Indeed, domestic dogs represent one of the major sources of mortality for argali at our study site.

Pastoralists also displace wildlife by poaching (Pratt and others 2004). Although the extent of poaching remains largely unstudied (but see Zahler and others 2004), we have observed poachers throughout Mongolia at all times of the year while conducting our research, suggesting that it represents a significant source of mortality for ungulates. Pratt and others (2004) examined reasons for rising poaching in Mongolia. Much of the increase occurs because of the rising market value of game animals in Asian markets and for meat, coupled with declining standard of living many people are facing during this difficult transition to a market economy. Pastoralists also readily admit to poaching wolves and snow leopards out of concern for livestock depredation. Although both species are faring relatively well in Mongolia, they remain heavily persecuted. Mongolian pastoralists do not actively herd or guard large livestock species, such as horses, cows, yaks, and camels. Instead, they permit these animals to roam relatively freely until required for slaughter, to provide products (for example milk, wool), or to serve as beasts of burden. As such, many depredations undoubtedly go undetected. Alternatively, many pastoralists blame large carnivores, especially wolves, for most large livestock losses that occur, despite the fact that disease, malnutrition, and other factors (theft and poisonous plants) probably represent the majority of missing animals.

An additional cause of mortality to wildlife, and a continued threat, is indiscriminate use of rodenticides. For example, the Mongolia Agricultural Ministry initiated massive Brandt's voles (*Microtus brandtii*) poisoning programs because of the perception that the voles compete with livestock. The poisons, zinc phosphate and bromadiolone, were applied to grains and broadcast across vast expanses of steppe (Birdlife International 2003; Natsagdorj and Batbayar 2002). The pesticides kill far more than voles and other rodents, however, and massive die-offs of several species of birds, small mammal carnivores, and even livestock have been reported (Birdlife International 2003; Natsagdorj and Batbayar 2002; Zahler and others 2004). Ironically, the reason for the increased vole populations is likely associated with overgrazing and the subsequent shorter vegetation. Short vegetation enables voles populations to expand due to increased ability to detect predators (Natsagdorj and Batbayar 2002; Birdlife International 2003). The loss of vole predators will exacerbate the problem by facilitating future population irruptions at shorter time intervals (because there are fewer predators, whose slower population growth means they require more time to recover from the mass poisoning campaigns), to help stem the growth of vole populations.

Despite the generally high level of support that most pastoralists express for conservation, conflicts do arise with some conservation initiatives. Perhaps the most of important of these are the loss of traditional grazing rights and restricted rangeland access that come with the establishment of new protected areas. This source of conflict has the potential to increase dramatically, as protected areas become increasingly better and more actively managed. Although most protected areas permit some level of continued grazing by domestic animals, most also include or permit establishing special zones where grazing is restricted or prohibited for the benefit of wildlife (Wingard and

Odgerel 2001). In addition, many protected areas will require more active grazing management to sustain the unique plant and animal communities they were established to protect. As park managers remove pastoralists from protected areas, limit the number of livestock they graze, or restrict the seasonality of grazing, the potential for conflict rises.

Lack of Conservation Capacity

Arguably the greatest challenge to successfully conserving Mongolia's rangelands is the lack of conservation capacity that currently exists in the nation. A joint government-independent assessment found that Mongolia lacked adequate conservation capacity to conduct effective conservation actions (Anonymous 2003). Luckily, however, this challenge is probably the most easily addressed. The national assessment of conservation capacity found that problems stemmed primarily from too few staff, inadequate or inappropriate professional training of staff, lack of experience among conservation professionals, and insufficient resources, both for field and office work (Anonymous 2003).

Poor environmental monitoring and law enforcement well illustrate the lack of conservation capacity in Mongolia. Currently, monitoring and law enforcement are almost nonexistent. The government itself readily admits this problem (MNE 2001). Lack of monitoring and enforcement stems from several factors, including lack of resources to monitor, lack of political will to prosecute, corruption, lack of adequate training, and the vast size of the nation (especially, relative to available resources) (Anonymous 2003).

Mongolia remains a very poor nation (NSO-Mongolia 2004). The nation's sparse resources mean that environmental monitoring usually receives inadequate funding. Mongolia invests only US\$2 per km² in protected area management, well below the global mean of US\$893 per km² or even the mean among developing nations of US\$125 per km² (Anonymous 2003). A mere 194 rangers patrol the nation's 20.7 million ha of protected areas and only 1 ranger per *sum* patrols the rest of the nation (Anonymous 2003). And although every *sum* (like a county) employs an environmental ranger, most lack the resources necessary to permit the ranger to actually leave the *sum* center to monitor natural resources exploitation activities, patrol against poaching, and collect data on the state of the environment. To a lesser extent, the same is true for rangers of protected areas (*sums* are actually responsible for managing Nature Reserves, but most go unmanaged). As such, most natural resources exploitation occurs without any governmental oversight, especially for small operations (Anonymous 2003). Natural resources exploitation will likely continue unless political will to counter this exploitation is generated.

Similarly, most rangers possess little to no equipment or training (Anonymous 2003). Some rangers have benefited from limited training and equipment provisioning by international aid organizations, conservation organizations, and universities. Yet, generally such equipment and training remain insufficient, especially relative to the size of the enforcement task. Even when rangers are able to monitor their territories, they must

confront poachers unarmed; they lack the means to determine whether or not mining activities are negatively impacting the environment; they generally do not have the capacity to collect evidence for effective prosecution; etc. As such, even when monitoring occurs, it is usually ineffective (Anonymous 2003). As a result, most pastoralists, resources extractors, and others are able to operate with little regard to the law or their impacts to the environment.

Lack of conservation capacity is not restricted to government agencies. Mongolian environmental NGOs face many of the same constraints as the nation's agencies. Of the 120 environmental NGOs, only 37 actively engage in activities; most remain simply organizations on paper (Anonymous 2003). Even the 37 most active environmental NGOs struggle—80 percent of these lack stable finances, 60 percent have no permanent office space, and 25 percent are without paid staff (Anonymous 2003). Only 20 environmental NGOs employ >1 staff members and only 4 employ >10 (Anonymous 2003). Finally, most environmental NGOs suffer from the same lack of resources and training as do the government agencies, seriously constraining their effectiveness.

Improving Prospects for Conservation

Opportunities for successful conservation of Mongolia's rangelands in a manner that sustains both the pastoralist traditions of the nation and the wildlife of the steppes remain within our grasp. Yes, Mongolia is changing rapidly and threats are growing; but, Mongolian pastoralists are among the greatest allies of conservationists in that country. Better cooperation and integration of government agencies, Mongolian environmental NGOs, international donor and conservation NGOs, and local people arguably offers the best path toward more holistic and sustainable conservation of Mongolian rangelands.

Strengthening Protected Area Management

Mongolia's protected area system is currently under attack from natural resources extraction interests (Johnstad and Reading 2003). The government largely supports the industry's initiatives, and many people believe that some change is likely. Not only does natural resource extraction threaten wildlife and scenic values, but it also may threaten customary grazing lands. We suggest that those opposed to the deprotection process need to engage those favoring the process in a constructive dialog to ensure wildlife and cultural values are considered and valued.

Although establishing new protected areas or expanding existing ones may be difficult given efforts to reduce the current system, many areas deserve protection to preserve important wildlife habitats and should be pursued. For example, some of the crucial breeding grounds of Mongolian gazelle remain unprotected and thus subject to development or degradation. As the wildlife of Mongolia is increasingly better studied,

additionally vital habitats undoubtedly will be discovered and delineated. Biologists should work quickly to determine where these areas lie and conservationists should then move rapidly to protect them. In addition, most protected areas remain too small and isolated to protect viable populations of dependent wildlife species (Johnstad and Reading 2003). Conservationists should determine the size and location of habitats required to conserve focal species. In many cases, protecting some form of linkage (for example corridors or small “stepping stone” reserves) may be easier and more effective than expanding reserves.

Finally, but perhaps most importantly, the capacity of Mongolia’s protected areas agency requires serious improvement. A report issued by the Mongolian government and independent evaluators recommends improving conservation capacity through increased training; more and better equipment; better fund raising; improved and more frequent collaboration and cooperation with Mongolian and international environmental NGOs and donors; and better public awareness and education program, including training and empowering local people to assist with conservation through grassroots community groups (Anonymous 2003). Such recommendations hold outside of protected areas as well. Conservationists should work with local people to determine areas that remain vital to wildlife, but cause minimal conflict with pastoralists. Community-based management then should be developed to manage these areas (Johnstad and Reading 2003). Such community-based systems may provide a method of improving management at lower costs, while simultaneously reducing conflict.

Tourism

Many conservationists advocate nature-based tourism as an alternative to natural resources exploitation. In Mongolia, such eco-tourism is unlikely to provide benefits to offset losses from foregoing exploitation. Although generally increasing, few tourists visit Mongolia each year. Officially, 50,835 tourists visited Mongolia in 2002 (Byambatseren 2004). Because of the Severe Avian Respiratory Syndrome (SARS) scare, tourism dropped to 21,890 visitors in 2003; although some portion of the 180,558 people that visited Mongolia for “private purposes” were probably also tourists. (NSO-Mongolia 2004). Of tourists that visited Mongolia in 2003, 78.9 percent came from East Asia and the Pacific and 17.6 percent came from Europe (NSO-Mongolia 2004). In addition, the majority of these tourists likely came for cultural-based tourism, not ecotourism. Although cultural tourism in Mongolia requires conservation of rangelands, a small proportion of the nation’s territory can accommodate the vast majority of that tourism. Therefore, while locally important, tourism will likely not facilitate efforts to conserve Mongolia’s rangelands.

Still, nature-based tourism in Mongolia potentially represents a much larger source of additional revenue for conservation than is currently being realized. Protected areas in Mongolia generated about 30 percent of their budget from tourism (primarily), international aid, and collection of fines, which could be much higher if all fines issued were collected (Anonymous 2003).

Ecotourism is increasing in Mongolia (Johnstad and Reading 2003). Further increasing ecotourism and associated revenue requires additional capacity building in this sector as well, including improved infrastructure (accommodations, travel, etc.); better trained, more knowledgeable guides; and more aggressive marketing. Most high end ecotourism to date has focused on fishing and trophy hunting, but we believe could be expanded, especially if improvements in law enforcement led to more and better wildlife viewing opportunities. However, tourism comes with its own ecological and socioeconomic impacts that largely remain unaddressed in Mongolia (Johnstad and Reading 2003). As such, conservationists must strengthen their capacity to develop and manage ecotourism in a socially and ecologically sustainable manner.

Grazing Reform

Perhaps the greatest opportunity for improving rangeland conservation in Mongolia lies with grazing reform. Currently, the absence of any functioning formal structure for managing rangelands precludes effective conservation. Instead, grazing management lies in the hands of thousands of independent, semi-nomadic pastoralists, often with differing skill levels and goals. After several years of livestock declines and continually degrading rangelands, most pastoralists and government officials realize that a problem exists and livestock controls are necessary. Most are open to, if not actively searching for, solutions. Schmidt (this proceedings) suggests that community organizations of herders is improving this situation and indeed, the process has begun with a conflict-laden land reform process currently underway.

Obviously, to succeed, any grazing reform requires the involvement of pastoralists during its development and implementation from the beginning. Yet, we also believe that wildlife biologists and conservationists should be included in discussions directed at grazing and rangeland management reform in Mongolia. Thus far, these interests have been excluded from active involvement in the grazing reform process. We believe it is crucial. In the U.S., public lands are to be managed for multiple-use. In Mongolia, there is appreciation of land for watersheds, aesthetic, and biodiversity values, as well as a lack of monitoring and management for ensuring these values. In fact, there seems to be a prevalent attitude by many Mongolians that livestock are a part of the natural system and thus are unlikely to degrade or negatively impact other values.

How best to manage grasslands to protect and conserve biodiversity and cultural diversity will depend on a number of variables. However, it seems logical that where grazing is practiced best management practices (BMPs) and resource management plans should be developed for the particular area. In some ways it may seem unnecessary to recommend BMPs for Mongolian herders who have a long history of herding; however, with the changes in the 20th Century and a generation of “new herders” we strongly believe that development agencies should help Mongolia develop an extension service that can develop and demonstrate grazing practices that will protect biodiversity and conserve rangelands under the changing social

and economic conditions impacting pastoralists. The BMPs could be developed in a general way for regions, but for each particular protected area the BMPs should be based on the goals of that protected area. For example, in protected areas where argali are the major species of concern and their primary use is during the winter, park plans should reduce livestock grazing, especially sheep and goat grazing because of the high dietary overlap on argali winter range. Restrictions would vary, but in this example it may be best to completely restrict livestock grazing with the knowledge that some transient horse, camel, yak and cattle grazing will likely occur as these animals are not herded. Resource management plans would provide the means for herders and park officials to develop plans cooperatively and to understand each other's objectives. Multiple-use planning with communities of pastoralists using protected areas, based on grazing association use of public lands in the U.S. may provide a model to meet a number of resource objectives in many of the protected areas used by pastoralists.

Wildlife Management

Mongolia lacks a wildlife management agency. All wildlife outside of protected areas remains largely unmonitored and almost completely unmanaged (other than limited monitoring by *sum* rangers). Yet, obviously, most of Mongolia's wildlife persists outside of protected areas, suggesting the need to expand management throughout the nation. We suggest that wildlife species could be managed as indicators of rangeland health and well-managed pastures should support large populations of native wildlife, especially ungulates.

A wildlife management agency, perhaps based on a Western wildlife agency could be created and funded via institution of a permit hunting system. Additional funds could be garnered from tourism taxes. Game species, including non-trophy species such as marmots, require active management if populations are to remain viable (Zahler and others 2004). Given the prevalence of hunting in Mongolia, such a program should generate substantial revenues.

Integrated Solutions and Conflict Reduction

Finally, our ability to develop sustainable pastoralism and nature conservation on Mongolia's steppe will require that we develop integrated solutions and avoid unproductive conflict. This, in turn, depends on effectively employing interdisciplinary approaches and working with the full complement of stakeholders. We firmly believe that sustainable pastoralism and conservation of Mongolian rangelands are fundamentally linked. As such, both should proceed in tandem. Conservationists should work closely with herders to develop management plans that consider and address both issues. In the case of protected areas, protected areas staff should involve herders at levels of the planning and implementing processes (Pimbert and Pretty 1995). Outside of protected areas, herders may well be the ones to initiate range management changes. It is less

clear which government agencies and officials should work in unprotected landscapes. The Ministries of Agriculture, Mining, and Nature and Environment all can appropriately participate, as can local aimag and sum governments. In some cases (e.g., border areas), the Defense Ministry may also be included.

Herders must recognize that legislation requires government officials to follow certain regulations and officials should make herders aware of pertinent laws and recognize the constraints that herders face in trying to make a living on Mongolia's rangelands. Even with increased understanding and respect, conflicts will inevitably arise. Not all conflict is bad, as well-managed conflict can lead to better ideas, creativity, and innovation. Community-based approaches to conservation offer a variety of methods to help local people and conservationists avoid and manage conflict (Ghimire and Pimbert 1997; Western and Wright 1994). An in-depth discussion of such approaches goes beyond the scope of this paper. We support such initiatives; however, we stress that they must go well beyond traditional sustainable development approaches that often have focused on development while giving short shrift to conservation (Brandon and others 1998a; Frazier 1997). Similarly, a variety of environmental dispute resolution methods exist to help avoid and manage conflict (Wollondeck and others 1994; Wondolleck and Yaffee 2000). Such methods should be employed before conflicts become intractable and the people involved become so distrustful they are unable to work together.

Conclusions

Proper management of Mongolia's rangelands is critical for ensuring a productive livestock industry, maintaining livelihood options of pastoral cultures using these rangelands, and supporting the natural diversity of flora and fauna. Vast expanses of rangelands extend unfragmented and largely unaltered by crop agriculture or industry throughout the nation. In general, rangelands retain their natural potential although degradation caused by livestock grazing is a critical problem, especially near towns and watercourses. Few introduced exotics have established and much of the historic flora and fauna survive, often in relatively large, apparently healthy populations. Yet, since the end of communism and command-control economy in the early 1990s, Mongolia has been changing rapidly. Several challenges have emerged and now face conservationists interested in preserving sustainable pastoralism and wildlife populations on the steppe. We propose developing a variety of interdisciplinary approaches that link conservation biology, range management, and the social sciences to address these threats and increase the chances for effective rangeland management that is sustainable and enjoys enduring public support. This requires a concerted effort by state and local government as well as support at the local or user level. The international conservation community is committed to helping Mongolia, but success in conservation requires acceptance by and planning with those most dependent on the rangelands. Others have stressed that livestock overgrazing has been greatly exacerbated by a loss of institutional capacity (loss of control

by government or community control), a loss of historic norms in cooperation and management, etc. Protected areas that restrict livestock grazing may have some future, detrimental impacts on individual households; however, in general grazing in protected areas should allow modest additional development with pastoralists by combining efforts to preserve flora and fauna and pastoral cultures. We propose that protected areas work with pastoral communities to develop conservation plans, including grazing management plans, monitoring, and BMPs, that permit adaptive management of grazing lands. This requires that the government agencies enter into cooperative agreements with each other (for example, the Ministries of Agriculture and Nature & Environment) and with local people to ensure the conservation of Mongolian rangelands and native species, as well as sustainable pastoralism for local people grazing those lands.

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