

Rangelands of the Chang Tang Wildlife Reserve in Tibet

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A Tibetan nomad lady bundled up against the wind while herding.

The Chang Tang Wildlife Reserve, in northwestern Tibet, includes one of the last, largely undisturbed rangeland ecosystems in the world and provides habitat for a diverse assemblage of wild ungulate species, several of which are endangered and endemic to the Tibetan Plateau. The southern and westernmost parts of the Reserve also afford grazing for Tibetan pastoralists and their livestock. Geographically isolated, and, until recently, off-limits to Westerners, the Reserve's rangelands and its wildlife have been little studied.

A cooperative wildlife conservation program in the Chang Tang Reserve between the Wildlife Conservation Society and the Tibet Forest Bureau began in 1988 with rangeland surveys and investigations on the distribution and status of wildlife, primarily large ungulates. This paper provides an overview of the rangelands, wildlife and pastoral production systems in the

eastern part of the Chang Tang Reserve based on our research in the fall of 1993 and summer of 1994. We also discuss conservation issues facing the reserve and the implications these have for development, management and conservation.

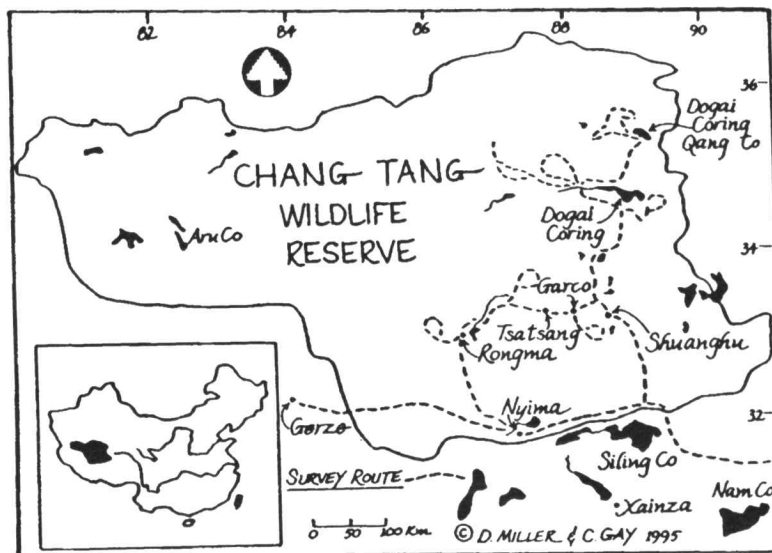
Description and Location

Located in the northwestern part of the Tibetan Autonomous Region (see Map 1), the Chang Tang Reserve encompasses approximately 110,000 square miles, (an area about the size of Arizona), and is the second largest protected area in the world. The Reserve is part of the *chang tang* (Tibetan for "northern plains"), the spa-

cious steppes and mountains that sweep along northern Tibet for almost 800 miles east to west. The *chang tang*, a vast and vigorous landscape comparable in size to the Great Plains of North America, is one of the highest, most remote and least known rangelands of the world. The land is too cold and arid to support forests and agriculture; vegetation is dominated by cold-desert grasslands, with a sparse cover of grasses, sedges, forbs and low shrubs. It is one of the world's last great wilderness areas.

The Chang Tang Wildlife Reserve was established by the Tibetan Autonomous Region government in 1993 to protect Tibet's last, major wildlife populations and the grasslands they depend upon. In the wilderness of the Chang Tang Reserve large herds of Tibetan antelope still follow ancient trails on their annual migration routes to birthing grounds in the far north. Wild yaks, exterminated in most of Tibet, maintain their last stronghold in the mountains of the Reserve, and Tibetan wild ass still roam across the steppes. The reserve retains a grassland

MAP
1



ecosystem largely unaltered by humankind, of broad, rolling steppes broken by hills and snow-capped mountains and large basins often with saline lakes.

There are no major rivers in the reserve; all drainage is internal. However, the headwaters of the Yangtze River are located just outside the reserve in the southeast. Most of the Chang Tang Reserve lies at elevations between 14,500 to 16,500 feet and a number of peaks rise to elevations over 20,000 feet. The Kunlun Mountains and the boundary of the Xinjiang Uygur Autonomous Region define the northern edge of the Reserve. The eastern limit of the Reserve follows the border of Qinghai Province. The "northern road", which crosses Tibet from east to west and continues to Xinjiang, marks part of the southern and western limit.

The climate of the Reserve is harsh with no frost-free season. Daytime temperatures in July and August may reach 75° F, but in most places, even in the height of summer, nighttime temperatures are often below freezing. Winters are extremely cold and windy with temperatures that drop below -40° F. Annual precipitation ranges from about 12 inches in the southeast to less than 4 inches in the northwest, and about 75 percent occurs during the months of July, August, and September, much of it as snow and sleet. Large areas have permafrost 2-3 feet below the surface and these may become quagmires in the summer, making vehicle travel difficult.



Rangelands in the southern part of the Chang Tang Reserve at 14,500 feet used for grazing by Tibetan pastoralists.

Rangelands

We categorized the rangelands of the Reserve into three major vegetation types: alpine steppe, desert steppe, and alpine meadow. The alpine steppe is the dominant type in the southern half of the Reserve and provides the most important grazing land for wild ungulates and livestock. The desert steppe is found in the uninhabited northern part of the reserve and the alpine meadow is located mainly in the southeastern margin of the reserve and along streams elsewhere.

Much of the alpine steppe is dominated by a plant community characterized by a *Stipa*, often known as purple feathergrass for its long, feathery awns. Vegetation cover in these rangelands is usually a meager 10 to 15 percent. Two species of *Stipa* make up 50-60 percent of total vegetation composition. Other Gramineae include blue grasses and sedges, comprising another 15-20 percent of total vegetative composition. Common forbs were a tiny *Potentilla*, a species of *Leontopodium* and legumes of the genera *Oxytropis* and *Astragalus*; making up 10-15 percent of vegetation composition. Low to procumbent shrubs such as *Ceratoides compacta*, *Potentilla* sp., *Myricaria prostrata* and *Ajanía fruticulosa* are also found locally in *Stipa* rangelands.

In the alpine steppe, ungulates such as Tibetan gazelle are selective feeders, concentrating on particular forbs. Tibetan antelope, blue sheep and argali are mixed feeders, consuming both graminoids and forbs while the larger ungulates like wild yak and Tibetan wild ass consume mainly grasses. In winter, herds of wild ass and Tibetan antelope congregate on the extensive *Stipa* rangelands in the southern part of the Reserve.

Table 1. Composition of vegetation (by percentage) of plant communities in the eastern Chang Tang Wildlife Reserve, Tibet. Based on transects with a 0.25 m² circular plot. Fall 1993 survey.

	<i>Stipa</i> Steppe	Mountain Meadows	<i>Carex</i> Steppe
Number of Plots	180	60	40
Average % Bare Ground	84.5	76.4	89.4
Average % Vegetation	13.9	22.1	9.5
Average % Litter	1.6	1.5	1.1
GRAMINOIDS			
Grasses	61.9	29.7	42.8
<i>Carex moorcroftii</i>	3.0	5.3	38.6
<i>Kobresia</i> spp.	12.4	17.5	10.1
FORBS	17.8	35.0	6.4
DWARF SHRUBS	5.7	12.2	2.7

On mountain slopes the alpine steppe flora tends to be more diverse than on the plains. In this type, grasses only make up about 30 percent of total vegetation composition and only about half of it is *Stipa*. Other grasses, such as species of *Elymus*, *Deyeuxia*, *Poa* and *Festuca* are also common, and species of *Kobresia* sedges often amount to 15 percent of total composition. A variety of forbs comprise 40 to 50 percent of total vegetative composition. These alpine grass-meadows provide forage for all species of wild ungulates including blue sheep and Tibetan argali.

In the desert steppe, which extends across the northern part of the reserve, plant communities are often dominated by the sedge, *Carex moorcroftii*, and the shrub *Ceratoides compacta*. This type is found on sandier soils and although *Stipa* grasses are still part of the community they are eclipsed by *Carex moorcroftii*. The forb component in this type is also reduced, often making up only 5 percent of total vegetation composition. Expanses of *Carex* are more common as one travels north in the Reserve. Low sand dunes are sometimes found in these grasslands.

The alpine meadow vegetation type is found in the southeastern portion of the Reserve, which receives more precipitation, and also along rivulets elsewhere. Plant communities here are characterized by a thick turf or sod

layer and vegetation is dominated by sedges of the genus *Kobresia*. These meadows usually have a rich forb component with genera such as *Bistorta*, *Gentiana*, *Pedicularis*. They are normally fed by snow and glacial melt springs. Such riparian areas initiate plant growth earlier than other habitats which depend on summer precipitation for growth.

We found rangelands in the reserve to be spatially heterogenous ranging from patch to landscape scales in composition, structure and productivity. Although fairly limited in overall plant species richness the rangelands are nevertheless quite diverse and provide habitat for six wild ungulate species and four domestic livestock species as well as a variety of large predators, small mammals and birds. The diversity in the vegetation is often subtle and easily overlooked, yet it is frequently the delicate differences that define movements and foraging behavior of both wildlife and domestic animals.

Wildlife

The Chang Tang supports a unique community of large mammals that includes six wild ungulate species — *chiru* or Tibetan antelope, Tibetan gazelle, Tibetan argali, blue sheep, *kiang* or Tibetan wild ass, and wild yak. All but the blue sheep occur only on the Tibetan Plateau, and all probably evolved in this high and harsh environ-



Tibetan wild ass.

ment. The Chang Tang Reserve now represents the last and best place affording most of these species a future.

We were especially interested to learn how the wild ungulates coexist. With plant species few and vegetation cover sparse, do the species compete for forage with each other and with livestock? The growing season is short, from late May or early June until September, making nutritious green forage only briefly available. To assess the impact of wildlife on the rangelands we had to census animals, plot distribution, and study food habits, the last by collecting droppings for analysis of plant fragments in them.

The *chiru*, more than other species, defines the Chang Tang ecosystem. A few small *chiru* populations are sedentary, but most animals are migratory. *Chirus* spend autumn and winter along the northern margin of the alpine steppe where forage is abundant. They rut there in December. In May, the pregnant females with their female offspring of the previous year migrate north, often in large herds numbering several hundred individuals, along traditional routes for as much as 200 miles to give birth in the high and desolate desert steppe.

Unlike *chirus*, Tibetan gazelles are sedentary. They are usually alone or in small herds, seldom more than a dozen animals. Though still widespread on alpine steppe, on plains as well as on hills, they are highly dependent on rangeland with a variety of forbs. Consequently gazelles congregate in certain localities and are absent from much of the desert steppe in the north.



Tibetan nomad tents which are made out of yak hair and are designed to withstand the strong winds of the Tibetan winter.

Blue sheep are fairly common, with herds sometimes numbering 50 or more animals. They prefer habitat near precipitous terrain, cliffs providing them with refuge from wolves, which limits their distribution. Argalis, large wild sheep, were rare, found only in a few places. Kiang are found mainly in the alpine steppe where they congregate in herds of up to 300 animals in the fall, after the rut. For much of the summer, kiang roam singly or in small herds, usually with fewer than 25 animals.

Wild yaks prefer to be in mountains where they ascend to about 17,700 feet at the limit of vegetation. They are often found on slopes near glaciated peaks where there is fresh water, luxuriant plant growth along rivulets, and terrain that enables them to shift seasonally up and down slopes for the most nutritious forage. Bulls are often alone or in small all-male groups, whereas females with their offspring and any attending bulls are in herds with 10–25 members and occasionally as many as 100–200. Such herds roam widely, making seasonal shifts for 30 miles or more.

These 6 ungulate species overlapped broadly in their use of terrain, although blue sheep, argalis, and wild yaks were usually in mountains. All six fed on only a few plant species, mostly on *Carex moorcroftii* and two kinds of *Stipa* as well as on several forbs, including legumes of the genera *Astragalus* and *Oxytropis*, the cushion plant *Leontopodium pusillum* and the yellow flowered *Potentilla bifurca*. In summer, when forage is abundant and nutritious, competition is less likely than during the long winter when leaves are dormant or dead. We collected fecal samples for analysis in October when temperatures were at times 0° F and below and winds fierce. *Stipa* was at that time the principal feed of all species except gazelle and argali. The coarse and sharp-pointed *Carex moorcroftii* was much grazed by argali, blue sheep and chiru, but not kiang. There were almost no wild yak in our October survey area and we obtained fecal samples the following June farther north after vegetation had begun to green in places. At that time, yaks also ate *Carex*. Even with forbs and shrubs scarce and dry, gazelle, argalis, blue sheep, and to a



A typical nomad family maintains 500 sheep and goats and 20 yaks. Sheepskin clothing is worn throughout the year.

lesser extent chiru, sought out these plants, a selection especially evident for the tiny *Potentilla*. There was some resource partitioning but considerable overlap remained. Diets differed in proportion of plant types they ate, not of plant species eaten.

The harsh and high steppes of the Chang Tang probably had a relatively low density of wildlife even in the past. Natural mortality is high. In October 1993 we noted that only about half of the chiru females had an offspring at heel and the following June only one female in three had a surviving young. Over half of the young had died in their first year of life, probably weakened by snow and wind shortly after birth and some killed by predators. Among the predators, snow leopard are rare, confined to a few rocky ranges, and lynx are uncommon. However, wolves remain widespread, even though much persecuted by herdsman. Once we observed a lone wolf pursue a chiru herd and after a long chase pull down a female.

Small mammals, especially marmot and pikas are also important wolf prey. Pika colonies are ubiquitous. Unlike marmots, pikas do not hibernate and they thus are the year-round basic food of many predators from upland hawks and saker falcons to Tibetan sand foxes and brown bears; even wolves subsist on them when larger prey is

unavailable. The wild ungulates have evolved to survive blizzards and predators but not the additional stress of unrestrained hunting by people.

Pastoralists and Livestock Production in the Reserve

Although most of the Reserve is uninhabited, a belt of rangelands in the southern part supports pastoralists and their livestock who for centuries have managed to exist there, despite living in one of the world's harshest environments and at altitudes as high as any other people on earth. Today's northernmost grazing areas around the villages of Tsatsang, Garco and Shuanghu, however, were settled less than a quarter century ago by pastoralists who were moved north from the administrative center of Xainza. Today, there are about 3,500 nomad families and their livestock that depend upon grazing lands in the Reserve for a livelihood. The average size of a nomad family in the Reserve is a little over five members, making a total population of about 19,000 people. These nomads maintain an estimated 1.5 million head of livestock in the Reserve.

Domestic yaks, which are descended from wild yaks, provide milk, meat, fiber, and dung and are also used as

pack animals. Although yaks characterize Tibetan pastoralism, sheep and goats are economically more important in the reserve. Sheep are milked for a few months in the summer and are also an important source of meat for nomads. Each nomad family will slaughter about 40 sheep every fall for its own consumption. Tibetan goats produce fine cashmere wool, which has increased greatly in value in recent years. Goats are also milked, giving more milk for a longer period than sheep.

Sheep are the most common domestic animal and comprise about 60 percent of the total livestock population, goats make up 30 percent, yaks about 8 percent and horses only 2 percent. Although the number of livestock per family varies considerably depending on range conditions, climate and an individual's animal husbandry skills, many herders interviewed in the south-central part of the Reserve maintained an average of 500 sheep and goats and 20 yaks. In the eastern edge of the Reserve, where rangelands are dominated by *Kobresia* sedge meadows and are more productive than the arid *Stipa* grasslands, the number of sheep and especially yaks maintained by nomads increases.

The survival of Tibetan nomads today indicates that many of the strategies of

animal husbandry and grazing management developed centuries ago are well adapted responses to environmental conditions found on the harsh Tibetan steppes. The fact that most nomads continue to live, and live well, is proof of the rationality for many traditional Tibetan nomadic pastoral practices as a means to convert forage from cold, arid rangelands into valuable animal products.

Management Issues

The steppes of the Reserve are one of the few rangelands in the world that have been little affected by man and his livestock. Yet, little is known about the nutritional status of forage species at different seasons, plant compositions and productivity in various habitats, and extent of monthly overlap in food habits between the various livestock and wildlife species. Much more information is also needed about current livestock herding and marketing practices. Without such data the impact of, for instance, kiang on the winter range is difficult to evaluate.

Pastoralists in some areas complain that kiang compete with their livestock for winter forage. Certain village cooperatives or *xiangs* have therefore requested that the government reduce the kiang population. Livestock and

kiang indeed subsist mainly on *Stipa* during winter, and some competition for forage no doubt occurs, but there is little evidence of rangeland deterioration yet. So far, problems between livestock and wildlife are more perceived than real. Livestock numbers have not reached a level where it has degraded rangelands, except in the vicinity of a few villages; the rangelands remain in good condition. And there are now few wild ungulates.

Rangelands on alpine steppe that belonged almost exclusively to wildlife as recently as the 1960s are now settled, at least seasonally, to their northern limit. Beyond, good grazing is sporadic, mere islands in the arid desert steppe. Yet the government has plans to expand pastoralism north into this uninhabited terrain, into this area so marginal for livestock that previous attempts to settle there failed. In the 1970s, herders were moved to one northern site. They left within a year because of water scarcity and remoteness, but not until they had killed many wild yaks, judging by the litter of skulls we found. Starting in the 1990s, a few herders began to enter the Dogai Coring area illegally from Qinghai Province. Patches with good grazing in these inhospitable uplands are critical to the survival of wildlife. With the alpine steppe now essentially usurped by pastoralists, the northern part of the reserve represents the last real refuge for wildlife and especially for the wild yak, wolf, and bear.

The future of the rangelands and the wildlife in the reserve as well as the traditional life of the pastoralists will depend on innovative management programs. Any such policies and programs need to address the basic issue of coexistence between livestock and wildlife and they need to be designed with the goal of maintaining the reserve as a viable and undamaged ecosystem. They must also be flexible enough to address specific local problems. For example, kiang are perceived to be serious competitors of livestock in a few localities but not the reserve as a whole. How can such issues be resolved?

Commercial hunting for yak meat and chiru wool is a major problem. Unregulated hunting in the last few



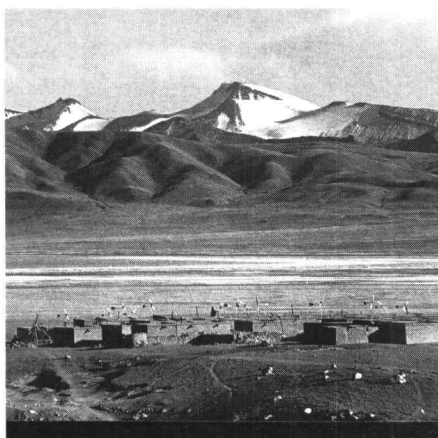
Young nomad boy taking care of the family's flock of goats. The goats are tied up for milking.

decades has ravaged wild yak and chiru populations in the more accessible, southern parts of the Reserve. Reserve staff are still poorly equipped and trained to control this illegal hunting.

The Tibet government is concerned about wildlife conservation, especially for the kiang, chiru, and wild yak which are fully protected. The reserve is viewed as a multiple-use area where the needs and aspirations of the local people must be considered. Fortunately there is time to develop a plan that will permit the great wild herds, the livestock, and the people to coexist. To achieve this goal, several actions are needed: (i) illegal commercial hunting must be controlled; (ii) any future oil drilling and gold mining must be strictly regulated and monitored to avoid excessive damage to the environment; (iii) the uninhabited northern areas of the reserve should be wholly reserved for wildlife and all human access prohibited except by special permit; (iv) the building of fences that hinder the free movement of wildlife should be prohibited; (v) since livestock is in a reserve whose explicit purpose is to protect wildlife, there will have to be limits placed on the number of livestock allowed, at least in some areas at certain seasons, such as chiru breeding grounds; (vi) the reserve should be made a UNESCO Biosphere Reserve to promote greater international awareness and cooperation; and (vii) major research should be conducted *before* rangelands are damaged.

Conclusions

The fact that grand herds of wildlife and a prosperous pastoral culture remain on the rangelands of the southern part of the Chang Tang Wildlife Reserve bears witness to the remarkable diversity and resilience of this unique ecosystem. These rangelands, however, are coming under increasing pressure from an expanding human population and rapidly increasing development yet, properly managed, they could continue to provide critical habitat for wildlife as well as grazing land for sustainable livestock production.



The Tibetan settlement of Garco at 16,000 feet. One of the most northern inhabited areas of the Reserve.

Strategies for range management, wildlife conservation, and pastoral development in the Chang Tang Wildlife Reserve should foremost aim to maintain the condition of the rangelands and protect biodiversity. To achieve this goal it will be necessary to develop strategies for sustainable livestock production that take into account the needs of wild ungulates and other wildlife as well as the aspirations of the local people. Developing such strategies requires a much better understanding of ecosystem dynamics, more information on the status, distribution and ecology of wildlife, increased knowledge of pastoral production practices, more thorough analysis of the issues and opportunities facing pastoralists, and modifications in policies and current approaches to management of the rangelands. These actions are crucial for saving the wildlife and their habitat and for ensuring sustainable pastoral development in the face of growing threats from modernization.

The remarkable steppes of the Chang Tang Wildlife Reserve will experience a great and tragic barrenness if the rangelands are degraded. Unique wildlife populations will be severely threatened and equally unique pastoral cultures will be transformed beyond recognition. With imaginative planning and cooperation of the pastoralists, the Chang Tang can be managed in the kind of ecological harmony that is the basis of Tibetan Buddhism.

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