

## **Patchwork, Pastoralists, and Perception: Dune Sand as a Valued Resource Among Herders of Inner Mongolia**

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*Scholars have rarely reflected upon dune sand in any context other than that of environmental hazard. Yet recent anthropological research conducted among ethnic Mongol herders in the Keerqin Sandy Lands of Northeast China indicates that native inhabitants exhibit a surprising degree of tolerance, appreciation, and even preference for dune sand at specific spatio-temporal scales. Survey data, gathered primarily through the use of photographic prompts and pile sort exercises during household interviews, reveal that many residents even regard dune sand as the constituent element of a distinctive home environment and cherished way of life. This research underscores the relevance of perception to the policies and practices of human resource management. It also calls into question the authority with which officials and scholars in China and elsewhere indiscriminantly depreciate the various social utilities of dune sand in stock-herding populations.*

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**KEY WORDS:** China; desertification; environmental perception; grasslands; place consciousness.

### **INTRODUCTION**

Ecologists have taken an increasing interest in ecological heterogeneity and environmental patch dynamics (see Pickett and White, 1985; Shorrocks and Swingland, 1990; Kolasa and Pickett, 1991). A "patch" generally refers to the relatively discrete spatial and temporal composition of organisms and/or resources in any physical environment. For example, on arid rangelands, temporal and spatial variability of moisture, temperature, sunshine,

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and soil fertility give rise to uneven distributions of flora and fauna at regional, landscape, and field scales of analysis.

The emphasis on patchiness has precipitated important changes in the way ecologists and a wide range of interdisciplinary scholars tend to think about the structure and function of the natural world. In the words of Bocking (1994, p. 16), "nature is no longer an orderly system in equilibrium; it is instead a patchwork, characterized by pervasive disturbance and instability; constancy has been replaced by change, chaos and nonequilibrium." The old model of ecosystem homeostasis has come under attack, and consequently, many conventional ideas about what constitutes order and disorder in the natural world have drawn greater scrutiny. In particular, grassland ecosystems, once the very inspiration for steady-state climax theory, have been reinterpreted as prime examples of instability and disturbance (see Loucks *et al.*, 1985; Worster, 1990, p. 10).

For the social scientist, these intellectual developments invite a thorough reconsideration of the interplay between patch dynamics and perceptual thresholds within specific socionatural settings. How do pastoral groups in grassland environments perceive and respond to ecological heterogeneity at various scales of analysis? And what difference does it make for specific resource management strategies?

Most pastoral studies have focused on how diverse societies manage and adapt to the variability of certain "key resources" in their production environment, usually defined in terms of forage, water, and mineral salts necessary to sustain herds of grazing animals. Yet there are many other patchy resources that contribute to the viability of pastoral production systems, including solar energy, wind energy, timber, sod, precious minerals, and even dune sand. Although water and grass undoubtedly constitute the most essential of production resources, these others should not be ignored.

### DUNE SAND AND CULTURAL BIAS

Dune sand is one component of the typical heterogenous pastoral environment that merits reconsideration in light of patch ecology. In some semi-arid and arid grassland communities, dune sand actually functions as a resource whose utility and symbolic importance to local inhabitants are too hastily discounted by outside observers. This oversight may be explained in part by the pervasive influence of desertification literature, which usually regards dune sand (in a scale-insensitive manner) as nothing but a menace. From the perspective of Western scientists, sand patches are primarily characterized as blights upon the land—pockets which eventually "radiate out" to form expanding deserts (Nelson, 1990, p. 17).

Although desertified land is not necessarily always portrayed as mere wasteland in these scientific discussions, the notion that sand might be part of a preferred indigenous environment remains quite distant. The following account is fairly representative: "Desertification usually begins as a patch on the landscape where land abuse has become excessive. From that patch, which might be around a watering point or in a cultivated field, land degradation spreads outward if the abuse continues" (Dregne, 1983, p. 7). Other accounts, however, establish a more emotional tone. For example, the United Nations Conference on Desertification (1978, p. 43) asserted, "Desertification breaks out, usually at times of drought stress, in areas of naturally vulnerable land subject to pressures of land use. These degraded patches, like a skin disease, link up to carry the process over extended areas." Some accounts are even more graphic: "Desertification is not about spreading deserts. It is a rash which breaks out in patches wherever the planet's skin is mistreated" (Timberlake, 1985, p. 60).

Curiously, the entire desertification literature treats dune sand almost exclusively in the context of environmental hazard. At the more sensational extremes, dune sand is even indiscriminantly demonized as the sure sign of natural (even moral) disorder (see Sears, 1980; WCED, 1987; Rifkin, 1991). The image of a ticking time-bomb best exemplifies this popular perspective: "In a little less than 200 years at the current rate of desertification there will not be a single, fully productive hectare of land on earth" (UNEP, 1987, p. 17).

Only rarely have resource management studies in arid zones mentioned any favorable qualities associated with sand. In a significant exception, Tsoar and Zohar (1985) have optimistically conceptualized active dunes around the world as the "largest potential reserves of soil" to feed an overpopulated world. They have argued that various thermal and percolation properties of sand soil create "a favourable substratum" which can support a "denser and more perennial vegetation than heavier soils such as loess." Likewise, Kovda *et al.* (1979, p. 442) reported on the potential of sandy soils to optimally retain and release moisture and nutrients to well adapted plants.

With minimal exception, there has been almost no attention to the functional role of dune sand either among pastoral peoples in general, or among Mongol herders in particular. The flurry of research now coming out of Mongolia tends to stress that perception of critical resources inevitably varies from place to place according to season and local ecological characteristics. Besides the need for a wide variety of forage, other strategic resources that have been explicitly itemized include the following: the distribution of water points, moist depressions, wells, salt licks, tree groves, and windward hillslopes (Szynkiewicz, 1982, pp. 20-23; Mearns, 1991, p. 31,

1993, p. 77). In one brief sentence, Mearns (1993, p. 84) does indicate that sand dunes help provide relative warmth and shelter for certain communities near the Gobi. Nonetheless, to my knowledge no research has yet reflected upon dune sand in the context of a culturally valued environmental patch.

Yet my recent observations and fieldwork experiences among ethnic Mongol herders in the Chinese autonomous region of Inner Mongolia would support that unusual perspective. At certain spatio-temporal scales, dune sand functions not only as hazard but also as a necessary and welcome component of the desert-steppe environment of the Keerqin (Horqin) Sandy Lands. This article will present both anecdotal information and summary data of local perceptions toward dune sand gathered over a period of twelve months in Nasihan township (*sumu*) of Wengniute Banner (*qi*), Chifeng City Prefecture (*shi*).

### RESEARCH SETTING

My host unit for this research was the Shenyang Institute of Applied Ecology, which operates a small weather station and grassland ecosystem research outpost based in the village (*gacca*) of Wulanaodu. The research station has controlled a sizeable portion of enclosed land (about 3000 ha) throughout Nasihan since 1970 in order to conduct experiments in desert fixation and afforestation. For 25 years, a dozen Han scientists from Shenyang have rotated in and out of Wulanaodu village for a month at a time from March through October. Their self-described mission is to study and disseminate information about comprehensive grassland management strategies, to improve the rational use of local resources, and to raise animal husbandry production capacity.

The research station was interested in collaborative research with Western social scientists on the human, historical dimensions of grassland degradation. The context of resource management thus permitted me long-term access to this otherwise restricted and relatively uninvestigated area of China. The unusual juxtaposition between Han scientist and Mongol herder afforded a convenient opportunity to explore differential group perceptions toward local landscape ecology.

I conducted participant-observation and household interviews throughout the entire township, but most of my contact occurred with residents of Wulanaodu village. In 1993, Wulanaodu had a population of 740 people divided among 174 households. The population was 98% ethnic Mongol, and stock-herding of cows, sheep, goats, camels, and horses still accounted for 87% of community income. According to local government statistics, the total village herd in the summer of 1993 consisted of 1829 cattle, 1270 sheep, 4012

goats, 248 horses, 81 donkeys, and 64 camels. The average number of each animal species per active herding household is roughly 11 cows, 8 sheep, 25 goats, 1.5 horses, 0.5 donkeys, and 0.4 camels, although not every household always keeps every species.

Wulanaodu is located in the triangle of land formed between the Xilamulun and Laoha rivers, about 500 km northeast of Beijing. The climate is semi-arid, with mean annual precipitation usually ranging between 300 and 500 mm. The yearly mean rainfall from 1957 to 1990 amounted to only 368.8 mm (WWS, 1990). The rate of evaporation registers between 2000–2500 mm, and the aridity index is 1.3–1.5 (Nan and Wei, 1990, p. 66). There is a strong seasonal pattern to local rainfall, with 71% of mean annual precipitation occurring during the months of June, July, and August. Such uneven spatial and temporal distribution of rainfall is known to contribute significantly to the patchy distribution of vegetation in drought-prone regions, both from season to season and year to year (see Perevolotsky, 1987).

Wulanaodu is located at a cold northern latitude of 44 degrees. The agricultural season is short, with only 130–150 frost-free days per year. The yearly average air temperature registers between 4–6°C. Cold regional temperatures are compounded by extreme winds, which obtain yearly mean speeds of 4.0 m/sec, with the strongest instantaneous wind rate achieving 31 m/sec (Xu, 1990). Sand particles become airborne as wind velocity approaches 5 m/sec, which occurs more than 500 times per year in Wulanaodu (Nan and Wei, 1990, p. 66).

Local vegetation is a transitional variety from forest to steppe. A remnant forest of pine and oak still exists some 20 km from the research station. The regional terrain is characterized by low mountains and rolling hills, with extensive aeolian dune distribution that alternates with low wetlands. Wulanaodu village has a total area of 88.61 km<sup>2</sup> with less than 10% occupied by woodlands, ponds, and arable fields. According to the publications of the research scientists, Wulanaodu has four major types of sand soil (Wang *et al.*, 1984; Xu, 1990). The first is mobile-dune sand soil, which accounts for roughly 15% of total land area. The second consists of semi-fixed and fixed dunes, which together account for another 15% of land area. The third is grassland sand soil, accounting for about 27% of land area. The fourth is alkalized meadow sand soil, accounting for about 14% of land area.

Moving dunes have vegetative cover in the range of 0–30%, and may exhibit fragmented clumps of species such as *Agriophyllum arenarium*. Local dunes are about 10 m in height, though the tallest may reach 20 m (Cao *et al.*, 1984, p. 2). At the crown, dune height fluctuates from 0.4–1.0 m per year, although under extreme conditions they might vary by as much as 80 cm a day. The dunes advance at a rate of 2–3 m every year, although more

recent observations indicate an accelerated rate of 5-10 m per year (Nan *et al.*, 1993). Semi-fixed dunes have vegetative cover in the range of 30-70%, with shrub and willow species such as *Artemisia halodendron* and *Salix flavida*. Fixed dunes are characterized by at least 70% vegetative cover, with some humus (0.3%) and subsurface moisture present in the porous soil. Typical plant communities include *Caragana microphylla*, *Hedysarum fruticosum*, *Ephedra distachya*, and *Betula microphylla*, while the dominant grasses include *Pennisetum flaccidum* and *Agropyron cristatum*. Herbage communities distributed on the low grasslands and meadow areas include *Cleistogenes squarrosa*, *Aneurolepidium chinense*, and *Iris ensata*.

A brief introduction to the contemporary social landscape is equally relevant to this discussion. Since national leaders initiated decollectivization in the early 1980s, the central government has declared its interest in promoting household commercial livestock production. Policy initiatives attempt to turn an extensive system of open-range grazing into an intensive production regime based upon enclosed pastures, irrigated fodder crops, stall feeding, and machinery. In Nasihan township, production brigades distributed livestock to independent households in 1981, and land use rights in 1984. Private land tenure was a radically new and unfamiliar institution for herding households who have traditionally viewed the range as a common property resource. In short, the household enclosure policies have disrupted earlier economic and social norms, and have not been very popular with the majority of ethnic Mongol residents who sense the passing of a cherished way of life (see Williams, 1996a,b).

### RESEARCH STRATEGY AND METHOD

Culturally informed perceptions of dune sand in Wulanaodu manifest themselves in subtle ways. Initially, the most salient group discrepancies emerged when I began to contrast the language of the Han scientists with comments elicited from local residents. For example, the director of the research station would sometimes explain their mission to the region by using the slogan: "we must change yellow (*huang*) into green (*lu*)." With this phrase, he meant that it was necessary to turn sand into vegetation. The slogan conveys a pun because the Chinese phoneme "huang" can mean both "yellow" and "wasteland." From his ethnic and professional perspective, the patchwork of dune sand in the local environment is both aesthetically unpleasing and agriculturally useless. It is best converted into fields of intensive fodder cultivation and tree farming.

In contrast, local Mongols use the same term "huang" with more positive connotations. Quite the opposite of wasteland, they speak of "huang" as yellow-tinted "living sand" and contrast it with white "dead sand."<sup>2</sup> They

perceive that sand which appears yellow can sustain vegetation, while sand which appears white will not (though it too has a special utility, as I discuss later). This simple contrast taught me in the early stages of fieldwork that native residents, unlike their Han visitors, look rather favorably upon the conspicuous sand of their environment. They consider it "good sand" (*hau shazi*) because it is "alive" (*huo*) with potential.

I became intrigued with exploring the possibility for more distinctive perceptual thresholds. I decided to use photographic prompts as a means to standardize and quantify resident responses to questions about landscape preference. In collaboration with a few local informants, I photographed diverse landscape scenes and then selected 12 photos that represented a broad spectrum of variation. Some photos portrayed reserve hay meadows with dense grass growth, others portrayed images from unenclosed range with only moderate vegetation, while others portrayed images dominated by sand. My plan was to ask respondents to arrange the photos in rank order according to their own perceptions of immediate land quality for the purposes of livestock grazing. After that, I would ask them to refer to the photos to answer other questions pertaining to qualities of resilience and aesthetics. By way of comparison, I also arranged to interview the regular staff members among the Han scientific community at the research station.

There are significant methodological problems associated with the use of photographs, but in my field setting the benefits far outweighed the liabilities. In such a remote and impoverished field setting, my presence was initially intimidating to many residents. Most of them had never even met a foreigner, so the idea of hosting one in their own homes was too overwhelming without the aid of some mechanism to break the ice. The photographs not only captured their immediate interest, but also firmly established their role as expert, and helped them to overcome a fearful disposition. Furthermore, I am convinced the photographs provided a medium that allowed all of us to get beyond the initial problem of finding precise terminology to explore and discuss the meaningful features of their physical environment.

### PREFERENCE FOR LANDSCAPE DIVERSITY

During the survey, resident herders consistently indicated that they placed a high value upon landscape diversity. Height and density of grass was seldom their only consideration in evaluating rangeland preferences, as it was when I queried personnel at the research station. The presence

<sup>2</sup>Their notion of "living sand" basically corresponds with soil types 2-4 as discussed earlier (including semi-fixed and fixed dunes, grassland sand soil, and alkalized meadow soil), whereas "dead sand" corresponds with soil type 1 (aeolian mobile dune soil).

of trees, hill slopes, and even patches of sand were all deemed important components of a desirable grazing environment. To Mongol herders, the relative value of a given pasture will always depend upon the season of use. Traditionally, for example, a suitable winter pasture could do without water, but absolutely required a good wind-break. Suitable spring pastures required position on the southern slopes of a hill, where snow melts and grass grows the quickest. Summer pastures required access to water, grass, and soda licks, while autumn pastures primarily required particular grasses that promote lactation and fat buildup (Szynciewkicz, 1982, p. 22).

Landscape diversity also conditions the quality of grazing within each season. Especially in the summer when an abundant variety of grass is necessary to assure thick fleece growth, ecological heterogeneity of forage is critical. Fernandez-Gimenez (1995, p. 10) recently reported that landscape diversity (both between and within seasons) is consistently valued among herders all across Mongolia. My interviews confirm persistence of these attitudes among contemporary Mongol herders in China, despite government efforts to sedentarize the population over the last four decades.

#### SAND AS RESILIENT AND AESTHETIC

Resident herders were surprisingly optimistic about the presence of dune sand and the resiliency of the land. Many members of the community, including some of the most educated and elite, expressed the opinion that even landscapes totally dominated by moving dunes can be restored to "full productivity" (*huifu shengchan nengli*) within a mere three years. To be specific, during the survey I asked 130 household managers to estimate the number of years required before the least desirable landscape represented in the photos could recover to the same approximate level of productivity as the most desirable landscape, once enclosed and left fallow. The photos under comparison necessarily varied, depending upon each respondent's prior selection of "best" and "worst" grazing landscapes. One photo was fairly consistently chosen as "worst" (106 out of 130 valid cases), while four different photos competed closely for the position considered "best" (together comprising 112 out of 130 valid cases). All four of the most popular candidates for "best" landscape photo depicted a stable terrain almost fully covered by green vegetation. In the majority of cases, the respondents were comparing Fig. 1 (best) against Fig. 2 (worst).<sup>3</sup>

<sup>3</sup>To provide an initial frame of reference, I should briefly describe the different landscapes from my own subjective perspective. Fig. 1 (the "best") reveals a dense and unbroken field of tall grasses and shrubs that are edible to livestock. The abundant forage suggests the land is utilized as a reserve meadow for collective hay production. Fig. 2 (the "worst") reveals a shallow pond that has formed on terrain dominated by mobile sand dunes. Withered shrub roots gnawed by passing livestock provide the only sign of vegetation.



Fig. 1. The "best" landscape.

Among all resident respondents, only two said that the worst landscape would never recover to the level of best, and three others said that it would take more than 15 years. The response with the greatest frequency, however, was "three years" (33 out of 130). The average estimate for all village respondents was 5.9 years. In contrast, five out of eight available respondents among the Han scientists at the research station said that the same sand covered landscape would require more than fifteen years to restore a stable vegetation cover. The average estimate of recovery time from the Han scientists was 14 years, or nearly two and a half times longer than native perceptions. According to the published research of the scientists, enclosed dune sand only begins to show marked increase in above-ground biomass after at least seven years fallow (Kou and Xue, 1990, pp. 6-7). The senior director of the station argued that their experimental plots had not fully recovered even after 25 years of protection.<sup>4</sup>

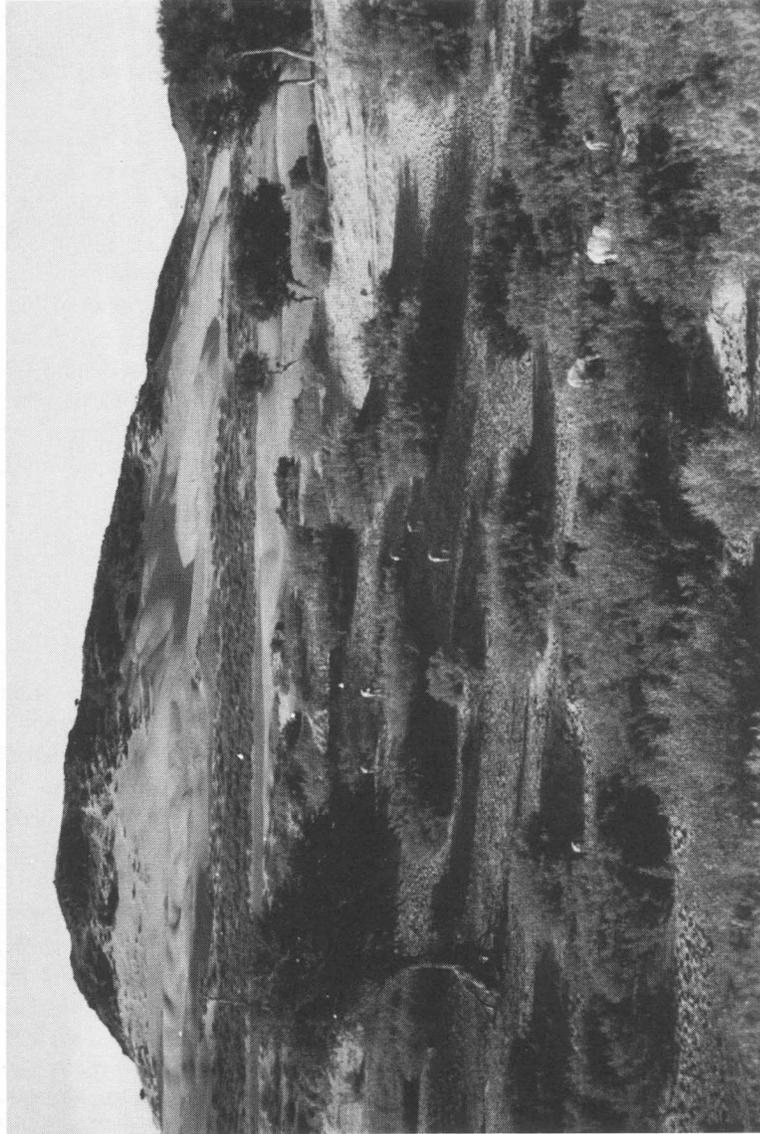
<sup>4</sup>It is relevant to note that some high profile research conducted in China on the fringes of the Taklimakan Desert, along the Hexi Corridor, and in Turpan have reported significant gains in vegetative cover (from 60 to 85 percent) on enclosed sandy lands within three years time. Those experiments, however, involved intensive labor and capital inputs, as well as winter irrigation (see DDR, 1982, p. 16). The land was not simply enclosed and fallowed, as in the hypothetical scenario that I used to query my respondents.



Fig. 2. The "worst" landscape.

These contrasting responses indicate that local residents have distinctive perceptual thresholds with regard to both the resiliency of the land and the minimal appearance of a landscape that is worthy of the term "full productivity." I had the opportunity to advance follow-up questions during most household interviews, and so I was able to discern that most respondents did not literally believe that the worst plot of land would necessarily replicate the best in 3 years time. (For example, they admitted the grass species might not be the same, and the vegetative cover might not achieve the same parentage.) Rather, their responses indicate that their notion of fully productive land is highly tolerant to the presence of sand. Consistent with their value of landscape diversity, a pasture characterized by sufficient patchiness of multiple resources will qualify in their minds as "productive land." The restored pasture would be comparable in use value, regardless of whether it was technically comparable in all aspects of physical appearance. This interpretation of the data helps to explain why so many residents express annoyance that the research station continues to hold so much land in reserve, even after it has laid fallow more than two decades. The Han scientists perceive that the land has still not recovered, but Mongol herders perceive only a capricious hoarding of community resources.

Besides the optimistic attitudes toward land resiliency, the survey also revealed a surprising tolerance for dune sand at a landscape scale. Al-



**Fig. 3.** Diverse steppe terrain.

though the top four ranked photos (by total village response) all exhibited a relatively lush ground cover of vegetation, many individuals actually favored sand-conspicuous landscapes with a higher ranking. For example, in 25 cases (19%), respondents ranked Fig. 3 superior to Fig. 4. The same photograph was even preferred over Fig. 1 (shown earlier) in 19 cases. I was especially surprised when 23 respondents (18%) ranked Fig. 5 superior to Fig. 4. Figure 5 was also preferred over Fig. 1 in 12 cases.<sup>5</sup>

Whereas Han Chinese are culturally inclined to view a patchy desert-steppe environment as barren and desolate (see Meserve, 1982), a surprising number of Mongol herders tend to view it not only as "alive," but also as aesthetically pleasing. For example, when asked to select the photo that depicted the most beautiful landscape, 37 out of 126 respondents (29%) selected a photo that was not among the top four ranked in terms of productivity. Instead of selecting among the most "green" landscapes, significant numbers of the population selected photos in which exposed sand soil or dune sand was again a conspicuous feature of the terrain. Even when sand-conspicuous terrain was not chosen as the most beautiful landscape, respondents typically did not dismiss them out of hand as did the Han, nor did they display any overt revulsion.

### ECONOMIC UTILITY OF SAND PATCHES

Many herders also appreciate sand for utilitarian reasons. First, residents assert that sand provides a good habitat for livestock. It keeps them dry and hygienic, with a yielding terrain that is neither too abrasive nor slippery. Second, residents say that dune sand helps to regulate livestock body temperature, keeping the herds warm in the winter and cool in the summer. A poor conductor of heat, sand is valued less for thermal properties than for shelter provided by the dunes. Mobile dunes and the jagged terrain formed by widespread erosion help to protect animals from excessive exposure to both wind and sun. They can find refuge on the leeward side of any mound, or wallow among the deeper topographical depressions. This land structure provides an absolutely critical asset for stabilizing microhabitat temperatures in a region that has so few tree-stands and otherwise offers such little protection.

<sup>5</sup>Again, I should divulge my own subjective interpretations of these photos. Figure 3 reveals a diverse steppe terrain that includes Caragana shrub, elm trees with exposed roots, diffuse and light grass cover, and the pervasive presence of wind-blown sand. The composition suggests the area is utilized as public range. Figure 4 reveals a dense and homogenous field of tall grass, undoubtedly utilized as a reserve hayfield. Figure 5 reveals a sand-covered terrain dotted with Caragana shrubs and elm trees, whose foliage has been heavily browsed by passing livestock.

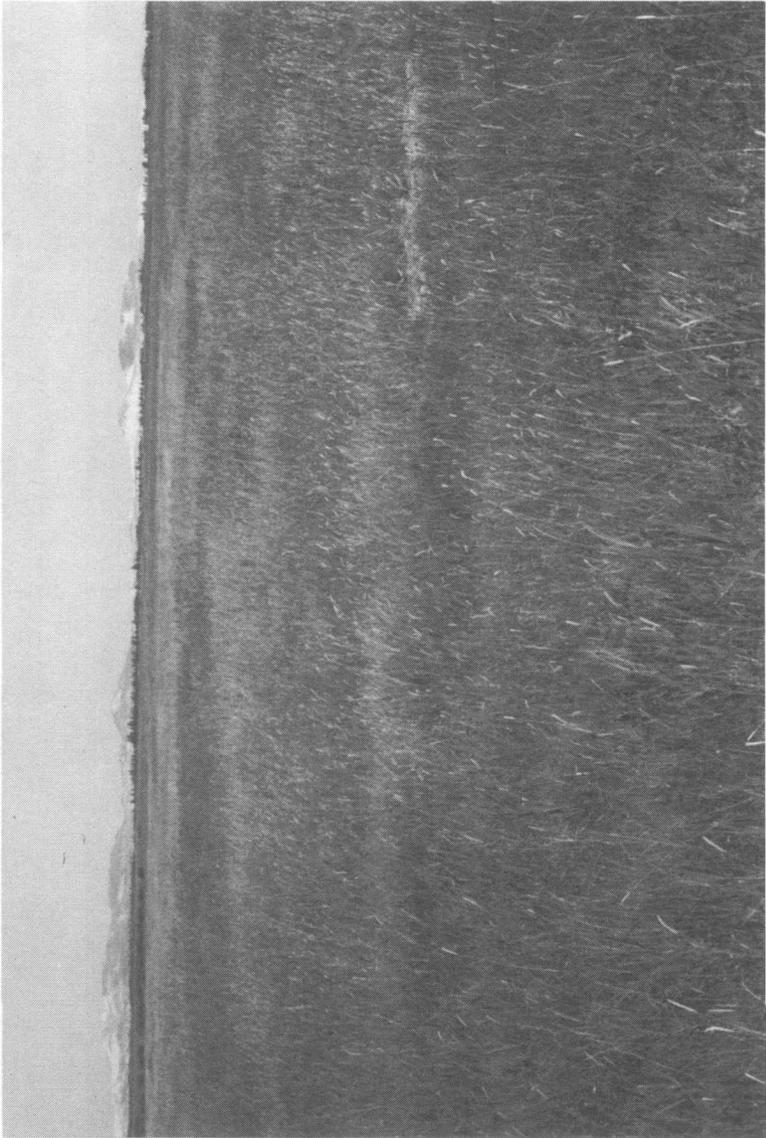


Fig. 4. Reserve hayfield.



Fig. 5. Heavily browsed terrain.

Third (and most intriguing), residents perceive and utilize sand as a factor of animal husbandry production in its own right. Goat herders of northern China have long engaged in a practice that is known locally as "*can shazi*" (adding sand). When they shear goats in late April to collect the fine short hairs from which cashmere is produced, local herders universally grind sand into the shocks of hair. They do this to inflate the weight of their produce and thereby increase their market earnings. They have developed a method that efficiently binds sand to hair so that even after the shocks dry out, the sand will not separate. In fact, it remains remarkably inconspicuous. The buyers are not oblivious to the practice—they assume a certain percentage of adulteration and factor that into their purchasing price. The supplier's challenge is to compact more sand into each shock than the buyer expects. Herders who are most skilled at this practice typically buy up shocks from their neighbors and restuff them with sand before selling again to profit from the narrow margins of their "value added." The sand that is most prized for this purpose is the fine white sand that has no humus. Thus, even when sand is considered "dead" it is not altogether barren in this economy.

When it comes to adulteration, the various marketing structures that have operated in pastoral regions for centuries have all failed to provide consistent negative feedback linkages between consumer and producer. Under these circumstances, sand and the overall dusty environment have distinct economic value. As Longworth and Williamson (1993, p. 312) recently noted:

If farmers were penalized for incorporating dust in the wool, they would have an incentive to avoid dusty environments. At present, the marketing arrangements encourage wool-growing households to consider dust as one of the "inputs" in the production of wool. Indeed, one could envisage a "dust production function" from which an optimal input of dust could be determined and, by implication, an optimal amount of pasture destruction to provide the dust needed to "produce" the wool.

Actually, the potential margin of profit derived from a "dust production function" is greatest among communities that specialize in goat husbandry and cashmere production, rather than among sheep herders who produce the heavier commodity of wool. At 1994 spring prices, a kilogram of sand embedded within a sack of cashmere would earn 200 yuan from outside traders, whereas the same kilogram buried in wool would only earn 10 yuan (\$1 exchanged for 8 yuan). This helps explain why residents increasingly specialize in goat husbandry as the range increasingly erodes.

Based upon an educated estimate that each kilogram of marketed cashmere contains between 20–25 grams of sand, and each kilogram of wool contains perhaps 5 g, a rough extrapolation based upon the goat and sheep population in the village would indicate that Wulanaodu herders must have sold about 1160 km of sand in 1993. If that ratio of sand to

fleece were to be consistently applied to all of Inner Mongolia, approximately 3490–3594 tons of sand would have been marketed in the single year of 1990.<sup>6</sup>

Despite the speculative nature of these estimates, it is clear that up to some hypothetical saturation point, sand is a resource and a desirable feature of the regional landscape. Further, residents could not actually market so much sand if it were not so ubiquitous in the environment. In fact, a good part of the saturation occurs entirely without human effort. Residents undoubtedly have more sand surface than they need or want, but pockets of “desertified” areas do make positive contributions to local production, and may in fact be necessary to sustain the viability of the economic system as a whole.

Fourth, I should also point out that dune sand has more utilitarian value even within the home than is generally assumed. One obvious example is that sand soil functions as an important building material. It provides the core ingredient of mudbrick for house construction, and serves a great variety of miscellaneous purposes as well (such as wall plaster). Mongol herders also value sand as a material for purification. Humphrey *et al.* (1993, p. 53) reported that contaminated water may be approved for consumption through the exercise of religious rituals that involve sprinkling it with sand. In Wulanaodu, Mongol women use sand in the cradle and in the swaddling clothes of newborn infants. When I saw this, I assumed the function was to collect daily excretions for convenient disposal, but perhaps the practice also involves certain purification rituals that remain undisclosed.

### SYMBOLIC UTILITY OF SAND

Dune sand also functions to some degree as a symbol of ethnic and/or livelihood identity. For example, during household interviews, I asked people to explain why Mongols tend to live in areas characterized by sand. No respondent ever challenged the premise of the question. Most of them answered by reference to human and animal population growth. Others made veiled references to the biases of the national political economy, Han colonialism, and historical experiences of ethnic exploitation. I was surprised, however, when some respondents specifically asserted that their ancestors

<sup>6</sup>This range was derived using the figures provided by Longworth and Williamson (1993, p. 31), who reported a total of 2076 tons of cashmere, 2292 tons of goat wool, and 59,203 tons of sheep wool produced and sold in Inner Mongolia for the year 1990. At 5% adulteration in wool, that amount would yield about 3075 tons of sand. At 20–25% adulteration in cashmere, that amount would yield between 415 and 519 tons of sand. The estimate from wool was then added to the high and low estimates from cashmere to produce the final range reported.

had pursued the sand as a preferred environment. From this point of view, residents have not suddenly found themselves living in a desert-steppe environment today merely because they overgrazed the range, but because the utility of the diverse landscape had long ago beckoned herdsmen to settle in the area. Conditions on the range have since deteriorated, they concede, but the land was selected through a deliberate historical process.

At least some herders use sand to think about their collective identity in another sense. They perceive a symbolic connection between the overgrazed landscapes of home and their own social marginality within the national political economy. Just as the land is perceived to possess great diversity and potential, some people tend to see themselves as an untapped national resource that is neglected, but worthy of investment. This connection suddenly occurred to me one day during an interview with a surprisingly outspoken young man. I asked him to estimate the recovery time of the "worst" landscape photo and he responded by asking me how long the Communists had been in power. He then made the point that the land could recover in just a few years, "if it only had a little help." But since there were no meaningful institutional supports to promote soil conservation in marginal territories, the land has still not recovered, even after four decades. This sentiment was expressed in other ways as well. I heard the term "colonization" used frequently in reference to central government policies and campaigns that promoted Han in-migration and the exploitation of regional resources. Thus, direct connections do exist in the mind of many residents between local land degradation processes and the larger social realities of the Chinese state. Dune sand is by no means always regarded in positive terms, but whether residents perceive it negatively or positively, it consistently reminds them of their own ethnic differentiation.

Lattimore (1941) and more contemporary sources refer to the popular legend of "singing sands" that exists among herding communities in regions of Inner Mongolia. Under favorable atmospheric conditions, dune sand emits a loud and distinctive humming sound whenever pedestrians set off a ripple of disturbance. This natural phenomenon provides another vehicle by which sand functions to preserve memories of traditional Mongol culture and thereby sustain a collective identity. For example, some communities explain the eerie sound by reference to an ancient lamasery buried under the dunes. The spirits blow their trumpets and ring their bells everytime somebody marches over the hill, "to let the people know that they are there" (Serruys, 1980, p. 102). In a somewhat analogous fashion, the presence of dune sand serves contemporary Mongol herders as a tangible marker of ethnic and lifestyle difference that reminds the surrounding Han Chinese of their enduring presence.

To summarize, local herders recognize dune sand (at both a regional and landscape scale) as the enabling ecological parameter that guarantees the survival of extensive land use systems and sustains the viability of traditional pastoral lifestyles. In this sense, residents legitimately consider dune sand to be the constituent element of a preferred home environment and familiar way of life. Sometimes the people seem to appreciate this reality, sometimes they seem to resent it.

### CONCLUSIONS

The world still has much to learn about desert environments and their various inhabitants. Popular perceptions of both are continually qualified in scholarly literature (see Allan and Warren, 1993; Thomas and Middleton, 1994; Tiffen *et al.*, 1994). In part the relatively immature knowledge base derives from problems of inaccessibility and discomfort associated with these regions. It is also perpetuated at times, however, by the unexamined cultural assumptions of scholars who conduct research in unfamiliar settings. El-Baz (1984, p. 1) has suggested that experiential blinders have hampered scientific understanding of arid lands ever since earth science first developed in Europe—"the only continent without a desert." Quite separate from the issues of ethnocentrism, this research suggests that an important tension also exists between scientific and indigenous constructions of ecological knowledge.

Despite the pessimism of desertification literature, sand does function as both hazard and resource in pastoral areas of Inner Mongolia. Furthermore, residents express positive attitudes toward dune sand within the context of specific patchwork scales. This is not to argue that most residents are satisfied with the state of their environment today. They have more sand surface than they want, especially at the field scale where a national rangeland enclosure policy is gradually destroying the traditional patch matrix of grass and sand with devastating effect for some households. Nonetheless, native tolerance (even preference) for sand is much higher than usually assumed. Considering the distinctive economic and cultural perspectives of contemporary Mongol herders, it is not surprising that they do not all share the same stark view of their environment as the visiting Han research scientists, the Chinese state in general, or for that matter, the broad international network of desertification scholars (see Williams, 1997).

Certainly, more discriminating information about dune sand in dryland areas is required to devise the most appropriate strategies for interpreting and dealing with acute land management problems. The challenge to account more fairly for local perceptions would require officials and scholars in China to reconsider much of their standard rhetoric about desertification

in the northern grasslands, which is routinely packaged in misleading statements like the following:

Sand-drift, known as the ferocious "yellow dragon" to local inhabitants, has always stood in the way of the people's livelihood and national construction . . . . The conquest of the yellow dragon has long been the need and desire of those who have lived in its path. (Hsiao, 1960, p. 24)

Over the years before liberation in 1949, the people living in China's desert areas were oppressed and exploited. As their natural resources were wasted and plundered, they were forced to retreat before the advance of wind-driven sands. Since the founding of the People's Republic of China . . . comprehensive measures were developed in a cooperative spirit, with scientific and technical personnel working closely with the farmers. (DDR, 1982, p. 4)

In the past, the desert was regarded as nothing more than a devil jeopardizing the quality of life of human beings. Now, however, we are devoted to creating an industry [of fruit, grain, and fisheries] based on the sand. (Jiang, 1994, p. 20)

Such politically motivated caricatures of an unfamiliar pastoral environment do not promote institutional understanding of serious development issues.

In a pioneering study of environmental perception, Heathcote (1980) asserted that socially constructed perspectives are a "significant component" of the interrelationships between the physical environment and human activity systems that accelerate desertification processes at village and global scales. He observed that local residents often seem to be less concerned about soil erosion than officials who live in distant areas, and reported that ignorance, fatalistic attitudes, and apathy help explain local behaviors (pp. 126-131). Rather than assume the existence of dysfunctional attitudes among the natives, however, this study suggests that local attitudes towards hazards and resources cannot always be so neatly separated, especially when specific spatio-temporal scales of reference have not been specified. While local residents might be inclined to underestimate the hazard, it is equally true that nonlocal institutions might be inclined to underestimate the resource. Officials and scholars need to recognize that local land management practices may result less from ignorance or carelessness than from longstanding cultural perceptions that dune sand (in certain proportions) is non-threatening, and even affirming of traditional life orientations.

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