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Present Status of Specially Protected Natural Territories of Mongolia

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Abstract—Using Hovsgol National Park as an example, we have made an assessment of the changes in landscapes occurring from 1992 to 2008, determined the chief causes of them and outlined the principal management tasks regarding specially protected natural territories focusing on minimizing the level of negative effects. We examine the ecological problems faced by the National Park and the associated hazards and suggest recommendations on an optimization of management of the Park with a view to decrease the possible occurrence of challenging ecological hazards.

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Keywords: landscape cover dynamics, Hovsgol National Park, management, satellite information.

INTRODUCTION

Specially protected natural territories (SPNT) constitute the most efficient form of nature conservation. The present-day system of specially protected natural territories of Mongolia, whose categories conform to an international classification, has been in existence for more than two decades [1]. Work on the creation of a network of SPNTs has been carried out by stages since 1990, in accordance with a special Program defining the tasks of improving the state protection of rare animals and plants, their habitats, ecologically important territories as well as of expanding the area of the SPNTs to 15%, 2, 25 and 30% of the country's entire territory by 1995–2000, 2001–2005, 2006–2010 and 2011–2030, respectively. To date, 65 SPNTs have been established, which occupy an area of 22.5 mil. ha, or 14.5% of Mongolia [2, 3]. They include 12 zapovedniks (50.8%), 24 national parks (40.5%), 20 nature reserves (9.1%), and 6 natural monuments (0.8%) (see figure).

A large number of SPNTs of Mongolia boast an international status. The “Uvs nuur” (Natural Heritage), and “Orkhon Valley” (Cultural Heritage) are the World Natural Heritage sites. Hovsgol National Park has been nominated for the inclusion on the list of World Natural Heritage sites. Six SPNTs were recognized as international biosphere reserves: the “Greater Gobi”, “Bogdkhan uul”, “Uvs nuur”, “Mongol daguur” and “Dornod mongol” zapovednik, and “Khustain nuruu” National Park. The list of waterlogged lands of international significance incorporated the «Uvs nuur” and “Mongol daguur” zapovedniks, “Tarkhiin tsagaan nuur” and “Khaar us nuur” National Parks,

the “Ogii nuur” SPNT of local significance as well as five urochishches: Valley of the Gobi Lakes, Buir nuur, Achit nuur, Ganga nuur, and Khurkh-Khuitenii nuuruud Valley.

The objective of this study is to test the interpretation technique for space-acquired high-resolution images of the territory of Hovsgol National Park and to identify the main dynamical tendencies of landscapes on the basis of satellite data for three time intervals: 1992–2000, 2000–2008, and 1992–2008. Analysis of changes in landscape structure takes into consideration the natural components (climate, hydrology, lands, soil, vegetation, etc.) as well as socioeconomic indices (population size, livestock husbandry development, and availability of tourist centers). Based on using satellite information, it was possible to assess the current status of landscape cover in the national park, correlate its changes with socioeconomic conditions as well as to define the best management practices for the national park in the future.

OBJECT AND INVESTIGATIVE TECHNIQUE

Hovsgol National Park was established in 1992. Most of its territory is occupied by Lake Hovsgol. It is one of the most remarkable parts of Mongolia which is with good reason named “Mongolian Switzerland”. The mission of the park is to preserve in a standard state one of the world's largest freshwater lakes. Its territory boasts an impressive recreational potential, specifically for the promotion and development of ecological tourism, and enjoys great popularity.

The park's territory has 3500 inhabitants, with the

population density of 0.41 persons/km². In accordance with the administrative division, the park's territory is under the jurisdiction of several somons of the Hovsgol aimak: Tsagaan Nuur (7.5% of its area), Alag-Erdene (16.3%), Khankh (99.4%), Chandman'-Undur (15.4%), and Renchinlkhumbe (9.0%) [4]. For nature-conservation and recreational purposes, according to the law about SPNTs of Mongolia [5], three protected zones with a different regime were set aside on the park's territory: the zone with the reserved regime – 141.5 ha (or 16.9% of the total area of the park), the recreational zone – 115.0 thou ha (12.4%), and the buffer zone – 647.1 thou ha (77.2%).

Currently the development of ecotourism in Mongolia is concentrated in four SPNTs, and Hovsgol National Park holds the lead. In 1992, it had three active tourist centers occupying an area of 21 ha, with their number increased to 42 (628.21 ha) by the year 2008; as of the summer season of 2010, there were as many as 52 tourist centers (654.4 ha).

Our investigation into the dynamics of landscape cover used digital satellite images acquired by Landsat-TM and Landsat-ETM which were converted to the synthesized scan pattern referenced to the topographic map. The ERDAS IMAGINE software package was employed for a classification of land use units on satellite images. The software used included the ESRI Inc. products: ArcMap GIS desktop package, ERDAS Imagine, IIVIS, and ENVI. The analysis also used the most significant cartographic publications [6–8], and other cartographic and statistical materials.

RESULTS

Change in Landscape Structure

Data from analyzing the satellite images intimate that the larch-Siberian stone pine dark-coniferous and mountain subtaiga forests were replaced to a significant extent by shrub-birch forests with meadow and bog-

meadow associations, while the meadow steppes gave way to shrub birch forests and forbs (see table). There is severe deflation of sands, especially near the mouths of smaller rivers along the lake's left shores, such as the Turag, Toin, Tsagaan Khuzhir, Sevсуул, and Dalbai.

Overall, our investigation shows that the main factors that are responsible for changes in the park's landscape cover are due to global warming (by 60%) and are determined by anthropogenic impacts, including overgrazing and the 40%-excess of the utilization of forest resources.

Changes of Lake Hovsgol

The water surface area of Lake Hovsgol has increased over recent years. This is due to two factors, one of which is global climate change. In the northern part of the area surrounding Hovsgol there are two small centers of contemporary glaciation, and its entire territory is within the zone of permafrost islands. The belt of continuous permafrost occurs in high-mountain regions surrounding the lake. Currently there is taking place an intensification of global processes influencing the dynamics of the largest glaciers, which leads to a water level rise in the lake. The studies show that in the transition zone between the Siberian taiga and the Central desert zone, warming is quite conspicuous. In particular, the yearly mean temperature in the area under consideration is 4.5 °C for the Khatgal meteorostation, and the data for the last 43 years indicate that it has increased by 1.7 °C; more specifically, by 3.1 °C in the winter, by 2.1 °C in the spring, by 1.4 °C in the summer, and by 0.9 °C in the autumn [9].

The other reason behind permafrost thawing comes from severe anthropogenic impacts. The findings attest that in the Dalbai valley with no pasturing, the depth of permafrost thaw is 1.4 m, whereas in the Turaga valley with numerous herds pasturing there, this figure is as high as 4.8m. To date the numbers of animals pasturing

Changes in the landscape area of Hovsgol National Park (total area 8380.7 km²) for the period from 1992 to 2008

Classification of landscape cover	Area, km ²			Change			
	1992	2000	2008	1992–2000		1992–2008	
				km ²	%	km ²	%
Lakes	2746.60	2789.40	2801.50	+42.8	+54.90	+1.6	+2.0
Forests	2268.20	1286.20	1002.30	–982.0	–1265.90	–43.3	–55.8
Forest-steppe	125.90	146.20	144.70	+20.3	+18.80	+16.1	+14.9
Meadows	1289.50	2410.40	1283.60	+1120.9	–5.90	+86.9	–0.5
Meadow steppes	915.95	704.95	1663.25	–211.0	+747.30	–23.0	+81.6
Steppes	191.60	289.20	41.80	+97.6	–149.80	+50.9	–78.2
With no vegetation	837.50	741.90	1406.55	–95.6	+569.05	–11.4	+67.9
Agricultural lands	0.95	1.25	19.50	+0.3	+18.55	+31.6	+1952.6
Sands	4.50	11.20	17.50	+6.7	+13.00	+148.9	+288.9

on the park's territory have increased dramatically against the year 1992. With the transition to a market economy, some stock raisers have begun to increase their own herds, which has a negative influence on the state of the pasture lands. While 34 800 head of livestock used the territory of the park for grazing in 1992, their numbers have now increased to 63 633, or nearly twice. Overgrazing has caused a degradation of vegetation and soil cover, which promotes permafrost thawing, sandification and desertification. Comparison of areas with and no vegetation revealed that soil temperature is lower in the former case. Specifically, the temperature is lower by 2.2 °C in areas covered with dense vegetation, by 3.6 °C under shrubs and sparse forest, by 4.9 °C under dense forest, and by 6.4 °C in areas with a well-developed moss cover [10]. In the lower part of the northern slope where seasonal permafrost thawing does not penetrate deeply into earth materials or on the shores in places with the disappearing or no moss cover, the permafrost thawing process is more intense [11]. In general, an enhancement in permafrost thawing, no matter what the causes are, results in a water level rise in Hovsgol and in the other nearby lakes (see table).

Fluctuations in climate humidification cause dramatic changes in water ecosystems. Disturbances of an anthropogenic origin have a negative influence on the state of the rivers flowing into the lake. A very commonly occurring kind of such an impact is pollution from loads on pastures, and from yurts located nearby water sources. The water exchange is very low in Lake Hovsgol with its large depth and rocky shores; water temperature is virtually constant, and trace elements are present in minor amounts. Therefore, "self-purification" of the lake lasts for a protracted period, as long as 500 years [12]. For reference, the time of complete replacement of the waters in Lake Baikal (much larger in the volume) by the waters from the rivers emptying into it is 330 years [13, 14].

ORGANIZATION OF MANAGEMENT OF HOVSGOL NATIONAL PARK

Given the noticeable changes in landscape structure within Hovsgol National Park, the issues relating to the protection of the lake as well as of the surrounding terrestrial natural complexes against pollution must be the focus of attention at all times.

A mere declaration of intention to establish the SPNTs is not enough. It is important to give proper attention to management of such a territory. Also, a linkage of the SPNTs with sustainable development of neighboring areas is imperative. In this context, the principal missions of Hovsgol National Park are:

- protection of pristine natural territories for the preservation and conservation of biological diversity, and for maintenance the protected natural complexes and objects in a natural state;

- organization and conduct of scientific research,

- including the keeping of the "Chronicles of Nature";
- conduct of ecological monitoring and educational activity;

- assistance in training scientific personnel and specialists in the field of environmental protection;

- encouraging local residents to participate in environmental protection measures with prospects for presentation of ecological forms of nature management using the park as the base.

The scope and functions of the park listed above suggest that the park's future management can be formulated as follows [4].

1. To refine the zoning arrangement requires taking into account the representativeness of landscapes, and updating, reconciliation and approval of zoning changes, and the expansion and establishment of protected zones based on monitoring results on rare animal species and on the state of landscapes should become the immediate top-priority measures.

2. To optimize the layout of the park's territory, it is imperative that assessments be made of natural and anthropogenic factors affecting the natural complexes of the Hovsgol area, with the relevant investigations repeated on a regular basis, and that a data bank be created and the new management plan be worked out.

3. To ensure regular migrations and reproduction of animals under protection in the park requires the creation of "ecological corridors" between the park and the adjoining SPNTs as well as with territories that are important for their habitat.

4. It is necessary to raise the degree of staff training as well as to improve material and technical equipment of the park.

5. Ecological education and involvement of the local population and administrative bodies in decision-making concerning the park's biodiversity conservation.

6. Considering that illegal mining of minerals is underway, even within the SPNTs, it is necessary to foresee the possible outcome of the existing situation and propose the optimal ways to resolve emerging conflicts.

7. It is important to step up the involvement of local residents in the protection of specially valuable natural sites, including in the protection of forests, rivers, lakes, the flora, and the fauna, with the participation of volunteer inspectors by foreseeing payment of the relevant remuneration to them.

8. To proceed to the implementation of the cooperation agreement between Hovsgol National Park and the adjoining "Tunkinskii" National Park on the Russian side.

The achievement of all the goals formulated above will facilitate optimization of the park's territory management, a strengthening of transboundary collaboration between Mongolia and Russia, and an impressive increase in the flow of tourists both to Hovsgol National Park and to the other SPNTs of Mongolia.

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