

Habitat structure qualitative assessment of hunting resources

*Ol'ga Lyavdanskaya**, *Galiya Bastayeva*, *Aleksandra Koltunova*, *Andrey Kubasov*, and *Mikhail Smirnov*

FSBEI HE Orenburg State Agrarian University, house 18, Chelyuskintsev street, Orenburg, 460014, Russia

Abstract. The article provides analytical data on the integrated use of landscapes for the organization of hunting farms, methods of organizing hunting resources in the conditions of a sharply continental climate of the steppe and forest-steppe landscape of the Orenburg region. The data on the qualitative assessment of hunting resources and the factors affecting its components, the ratio of types of grounds according to the suitability of habitat for hunting animals are analyzed.

1 Introduction

The area of the Orenburg region is about 0.7% of the territory of the Russian Federation, spatially it has an elongated shape with a length from west to east - 755 km and from north to south - 425 km. Features of climatic indicators directly affect the formation of landscapes with a characteristic type of vegetation and associated methods of organizing hunting resources.

The continental climate of the Orenburg region, with hot summers accompanied by dry winds and cold winters with stable snow cover, relatively low precipitation, as well as high annual temperature amplitudes that grow eastward due to the increase in the severity of winters, leave their mark on the formation of natural landscape features [1].

The vegetation period of plants is relatively short, about 180 days. The formation of vegetation cover is the basis for the integrated use of landscapes in the organization of hunting farms and the determining factor in the qualitative assessment of hunting grounds.

On the territory of the Orenburg region, forest-steppe and steppe natural zones are pronounced, where the vegetation cover is relatively homogeneous and is represented mainly by agrocenoses - 88%, incl. arable land - 51%.

The plant world is rich and diverse in terms of species and includes 1613 species of higher plants belonging to 123 families and 551 genera. Most of the plants are 97.6% - representatives of angiosperms, of which 75.6% of plant species are dicotyledonous plants, 22% of plant species are monocots. The most represented families are Asteraceae, Poaceae, Fabaceae, Brassicaceae, Caryophyllaceae, Chenopodiaceae, etc. The leading ecological groups are mesophytes - 34.5% of plant species and xerophytes (drought-resistant plants) - 21.8% of plant species [1].

* Corresponding author: Romashkaoa@rambler.ru

The predominant phytocenotic groups are: meadow - 305, steppe - 215, stony-steppe - 186, meadow-forest - 181 and meadow-steppe - 176.

Planning activities for the rational use and protection of hunting resources is carried out mainly in the territorial socio-economic context, which is characterized by the conditions and factors of population density, the state of the region's economy, the nature and intensity of anthropogenic impact on hunting resources and their habitat, spatially subdivided into hunting lands, specially protected natural territories, territories with restrictions for hunting management [2].

2 Methods

An integrative comprehensive assessment of the main structural units of the habitat of hunting animals included the determination of the structure, composition and area of the elements of the habitat of hunting resources, the implementation of a comprehensive qualitative assessment (grading) of the elements of the habitat of hunting resources in the Orenburg region, and the generalization of the results of the assessment by types of hunting resources.

The cumulative comprehensive qualitative assessment of the structural units of the habitat of game animals was carried out in relation to the following species that have the most important hunting value in the Orenburg region: elk (*Alces Gray*), wild boar (*Sus scrofa* Linnaeus), Siberian roe deer (*Capreolus pygargus* Pallas), European hare (*Lepus europaeus* Pallas), marmot (*Marmota bobak* Statius Müller), black grouse (*Lyrurus tetrix* Linnaeus), gray partridge (*Perdix perdix* Linnaeus).

A qualitative assessment of the territory was given on the basis of an inventory of the composition of the habitat elements and their division into habitable and unsuitable for each species of game animals. Valuation was carried out only in relation to the lands typical for the habitat of a particular type of hunting resources.

The structural units of the habitat identified during the inventory were divided into three categories. Based on the value of the area of each element of the habitat, in the context of the area, the total area categorized was determined, including as a percentage of the total area characteristic for the habitat of a species of game animals. The living conditions of animals were determined not only by the quality of the habitat (feeding, protectiveness, nesting suitability), but also by the influence of other factors, which were conditionally divided into three groups:

1. anthropogenic factors associated with human economic activity that cause anxiety;
2. abiotic factors determined by the natural and climatic conditions of a particular territory;
3. biotic factors associated with the presence of predators, available food, food competitors, foci of pathogens, etc.

The effect of all factors on the species of game animals and birds is extremely unequal and depends on how intensely they manifest themselves [3]. For each species, the main factor is singled out, which sharply worsens the living conditions and causes a decrease in the number, therefore, some factors are the basis for reducing the quality of the area under assessment. A high level of anthropogenic impact can also serve as a basis for reducing the calculated quality of the territory. The evaluation of the elements of the habitat of hunting resources in the Orenburg region was carried out using data on the optimal indicators of the number of game animals per 1000 hectares of land of different gradings. In relation to the specific habitat conditions of hunting resources, the qualitative characteristics of the elements of the habitat were determined in relation to the most significant types of hunting resources. Taking into account the fact that most of the forests of the Orenburg region have sufficient protection (with the exception of artificially created ones), the fodder conditions of the lands

are taken as the basis for their assessment for wild ungulates. At the same time, the natural fodder of the lands is also considered for the winter, the most difficult period in the life of animals.

3 Results

The distribution of animals across the territory of the Orenburg region is closely related to the landscape basis. The main types of animal habitats in the region are steppes, meadows, floodplain and watershed forests, water bodies, as well as various agricultural lands, artificial forest plantations [2].

The total area of the territory of the Orenburg region is 12,370,196 hectares, of which 96.99% of the hectares are attributed to the habitat of hunting resources. Of the total area, the territories allocated for the use of hunting resources - 12,277,054 hectares - of which 11,998,077 hectares are suitable habitat for hunting resources, 278,977 hectares are unsuitable for hunting management (these include territories occupied by settlements, industrial complexes, ruderal territories, territories excluded from hunting use - 93,142 hectares (specially protected natural territories).

Currently, 37,823 hunters are registered, which is 2.1% of the total population of the Orenburg region, with a density of 0.3 people per km².

The fixed hunting grounds include territories transferred for temporary use for the purposes of using hunting resources, organizations and individual entrepreneurs. The total area of such lands in the region is 3,687,700 ha (habitat area is 3,600,956 ha).

Territories not assigned to hunting users belong to the category of public hunting grounds, their total area was 8,589,354 hectares, or 69.44% of the total area of the Orenburg region.

In order to preserve the hunting fauna, hunting resource protection zones are located on the territory of public hunting grounds, which are designed to preserve the reproduction and restoration of certain types of hunting resources and their habitat. The total area of the hunting resource protection zones is 264,772 ha.

The territories excluded from hunting use in the Orenburg region include 4 specially protected natural territories, the total area of which is 93,142 hectares, which have federal and regional status.

On the territory of the Orenburg region, 8 categories and 12 classes of the habitat of hunting resources were identified, of which the most common are meadow-steppe complexes (53.7%) and farmland (34.1%). Also noticeable are small-leaved forests (3.1%), floodplain complexes (4.4%). The share of swamps is insignificant (0.1% of the territory) (Table 1).

Inland water bodies occupy less than 1% of the region's territory.

The share of territories unsuitable for hunting management is only 2.3% of the territory of the region.

Table 1. Habitat structure of hunting resources in the Orenburg region.

Habitat categories of hunting resources	Habitat classes of hunting resources	Square, ha	Share of the total area of the Orenburg region, %
Forests	Coniferous evergreens (coniferous evergreens > 80%)	48501.3	0.4
	Small-leaved (small-leaved species > 80%)	381879.2	3.1
	Broad-leaved (broad-leaved species > 30%)	116482.1	0.94

Habitat categories of hunting resources	Habitat classes of hunting resources	Square, ha	Share of the total area of the Orenburg region, %
	Artificially created	15712.4	0.1
Swamps	Herbal	7431.3	0.1
Meadow-steppe complexes	Meadow-steppe complexes (steppes)	6637870.2	53.7
Farmland	Farmland	4219047.3	34.1
Inland water bodies	Inland water bodies (watercourses, reservoirs, lakes, ponds)	106396.4	0.9
Floodplain complexes	Floodplain complexes dominated by forest (forest > 80%)	188579.1	1.5
	Floodplain complexes with a predominance of herbaceous vegetation (forest and shrubs up to 20%)	361534.4	2.9
Coastal complexes	Coastal complexes of inland water bodies	7782.2	0.1
Unsuitable for hunting	Industrial and ruderal complexes, settlements, etc.	278980.1	2.3
Total for the Orenburg region		12370196.0	100.0

Information on the structure, composition and habitats of game animals and birds in the municipal districts of the Orenburg region shows that forest cover is everywhere small and does not exceed 22%.

In Novoorsky, Orenburgsky, Sakmarsky, Svetlinsky, Sol-Iletsk, Yasnensky districts, the forest area is less than 2% of the total area of the districts. The share of meadow-steppe complexes almost everywhere exceeds 40%, with the exception of Buzuluksky, Ileksky, Oktyabrsky, Sakmarsky, Saraktashsky, Tulgansky districts, where the share of meadow-steppe complexes is less than 40%, but exceeds 30% of the territory [4].

The largest area of meadow-steppe complexes is typical for Dombarovsky, Pervomaisky and Yasnensky districts, where it exceeds 70% of the territory. Agricultural land also occupies significant areas - more than 30% in most areas of the Orenburg region. The share of swamps is insignificant. Floodplain complexes are distributed quite unevenly, in the Ileksky, Sakmarsky, Saraktashsky, Tashli regions their share exceeds 10%, and in the Abdulinsky, Adamovsky, Akbulaksky regions - less than 1%.

An analysis of the distribution of forest complexes is of great importance for assessing the quality of hunting grounds, carrying out appraisal and planning biotechnical measures that will ultimately lead to the optimization of the territorial organization of hunting grounds [5].

When carrying out a comprehensive qualitative assessment of the elements of the habitat of the main types of hunting resources, the biological characteristics of the species of game animals, which are influenced by many features, including forage preferences, were also taken into account [6,7].

Table 2. Results of a comprehensive qualitative assessment of habitat elements.

Type of hunting animal	Area, species habitat, ha	Good grounds		Average grounds		Bad grounds		Bonitet	Est. number, heads
	ha	ha	%	ha	%	ha	%		
elk	1096976	188579	17.2	859896	78.4	48501	4.4	3	2426
Siberian roe deer	1956424	188579	9.6	1703705	87.1	64140	3.3	3	18291
boar	1323142	305061	23.1	579918	43.8	438163	33.1	3	9069
hare	11437957	859522	7.5	10374642	90.7	203793	1.8	2	164548
marmot	7059775	3318935	47.0	3318935	47.0	421905	6.0	3	69401
black grouse	1940786	190940	9.8	1584863	81.7	164983	8.5	3	18117
gray partridge	7915229	1476667	18.7	5172848	65.4	1265714	16.0	2	593642

The southernmost border of the elk range passes through the territory of the Orenburg region and its distribution is confined mainly to the forested floodplains of the Ural, Sakmar, Samara rivers and areas where there are fairly large forests, among which there are Severny, Buguruslansky, Ponomarevsky, Sharlyksky, Tulgansky, Saraktashsky, so like moose are typical dendrophages. On the territory of a significant number of municipal districts of the Orenburg region, due to the lack of large forest areas, the number of elk is single, and where forest vegetation is represented mainly by forest belts and other artificially created plantations, the habitat of elk is not registered according to winter route accounting.

The Siberian roe deer is a typical representative of the fauna of the steppe and forest-steppe subzones and lives on the territory of all municipal districts, with the exception of three southeastern ones - Dombarovsky, Yasnensky, Svetlinsky, where there is practically no tree and shrub vegetation that serves them as natural shafts. The key habitats of the Siberian roe deer in the Orenburg region are floodplain forests and shrubs, massifs of small-leaved and broad-leaved forests. Unlike other species of wild ungulates, such as elk and red deer, roe deer spend a significant part of their time in open biotopes - forest glades, the outskirts of agricultural fields. In winter, permanent habitation of roe deer is recorded in reed beds, weeds, unharvested sunflower and corn fields. However, completely open landscapes are used by roe deer temporarily or seasonally, so they were only partially assessed during a comprehensive qualitative assessment.

The distribution of the wild boar is confined mainly to floodplain, broad-leaved and small-leaved forests. Quite often, wild boars live in reed thickets; in search of food, they regularly visit the outskirts of agricultural fields and forest clearings. The wild boar constantly lives on the territory of all municipal districts of the region. The greatest number and population density of the species of hunting resources is typical for areas where there are floodplain complexes and massifs of broad-leaved forests that are significant in area. The factors negatively affecting the livelihoods and distribution of the wild boar in the Orenburg region include high snow cover (more than 40 cm), which is especially typical for the northern and northwestern regions of the Orenburg region. Dense crusts, which, as a rule, form in late winter and early spring, severely restrict access to food and hinder the movement of animals.

The hare as a typical inhabitant of the steppes and forest-steppes, one of the most common hunting resources. Typical habitats of the brown hare are steppes, forest belts, and agricultural lands. The quality of the hare's habitat is determined by several parameters. The capacity of the habitat is significantly increased by the moderate folding of the relief (beams,

ravines) and the presence of forest belts, which create excellent protective and brooding conditions for the brown hare.

However, the brown hare is negatively affected by many different limiting factors. Many hares die during the chemicalization of agricultural land (fertilization, pollination of crops), haymaking. During the breeding season, the survival of young animals is extremely negatively affected by frosts and prolonged cold rains. In addition, hares often become victims of terrestrial and feathered predators.

The Baibak marmot is also a typical inhabitant of the steppe and forest-steppe belt, lives in most areas of the Orenburg region, the largest number and density of settlements is observed in the eastern and southeastern regions of the region: Belyaevsky, Kuvandyksky, Adamovsky, Yasnensky and Svetlinsky. The number and distribution of the marmot is influenced by many biotic, abiotic and anthropogenic factors, the key of which are: the availability of succulent forb vegetation throughout the entire period of ground activity; the presence of a sufficient layer of fine-earth soil (at least 2 m deep), which makes it possible to build deep wintering burrows with the necessary microclimatic conditions during hibernation; the possibility of visual-sound communication between individual animals of the family and within the colony.

The distribution of black grouse is confined mainly to birch forests, which explains the mosaic nature of its range in the region. The best lands for black grouse are massifs of birch forests, glades adjacent to them and plots of agricultural land, therefore, areas in which birch forests are completely absent or their share is insignificant are not assessed for black grouse. Factors negatively affecting the livelihoods and distribution of the black grouse also include the general low forest cover of the region, chemicalization of agricultural land, freezing rains and thaws in winter, and the formation of crusts. During the period of incubation of clutches and rearing of young animals, frosts and prolonged cold rains have an extremely negative effect. In addition, grouse clutches are often ruined by feathered and terrestrial predators, including wild boar, and the grouse themselves become their victims.

The gray partridge is found in all areas of the Orenburg region, but the largest number and density is observed in the western part of the region. The best lands for the gray partridge are areas of steppes with rare shrub and tall vegetation, the outskirts of agricultural land. The capacity of the habitat for this type of hunting resource is significantly increased by forest belts and sparse plantings of trees and shrubs. crust formation. During the period of incubation of clutches and rearing of young animals, frosts and prolonged cold rains have an extremely negative effect. In addition, gray partridge clutches are often devastated by feathered and terrestrial predators, and the chicks themselves become their victims.

4 Conclusion

The hunting grounds of the Orenburg region are quite mosaic in composition and structure, the presence of forests with a wide edge line that increases the quality, goes in a decreasing parallel with a high level of anthropogenic pressure, a low level of biotechnical measures, poaching, and the development of spontaneous recreational activities.

Closer interaction between hunting and forestry will allow organizing work and increasing the responsibility of workers for the state of the forest and the reproduction of fauna, the precise organization of biotechnical measures and the protection of wildlife [8,9].

Hunters and game managers should also take care, first of all, of saving and increasing the productivity of hunting grounds, of identifying and preserving valuable populations and sustainable forest biogeocenoses and cultural landscapes. With constant and sufficient funding for conservation biotechnical measures, the optimal densities of the main species of game animals and birds can be kept at a stable level for quite a long time.

Only in this case will conditions be created for the subsequent increase in the number of hunting species, the establishment of ecological balance and the sustainable use of hunting resources.

The natural productivity of hunting grounds varies and depends on a combination of natural, economic and other factors [10]. The main indicator of the use of the hunting fund in the economy is the value of the gross hunting and other products obtained from 1000 hectares of hunting grounds. Increasing the productivity of these lands, more rational use of them can be achieved through a complex of forestry, biotechnical and hunting activities.

References

1. A. A. Chibilev, *Natural heritage of the Orenburg region* (Orenburg: Orenburg book publishing house, 1996)
2. D.O. Yampolskaya, S.Yu. Chernikov, E3S Web Conf., **311** 06007 (2021)
3. Yu.S. Cherepantseva, E.M. Ruzaeva, E3S Web Conf., **311** 03002 (2021)
4. Yu.A. Gulyanov, A.A. Chibilyov (jr.), A.A. Chibilyov, S.V. Levykin, *Izvestiya Rossiiskoi Akademii Nauk. Seriya Geograficheskaya* **86(1)** 28-40 (2022) <https://doi.org/10.31857/S258755662201006X>
5. N. Egorov, G. Kovrov, M. Solomonov, E3S Web Conf., **295** 01010 (2021) <https://doi.org/10.1051/e3sconf/202129501010>
6. A. A. Chibilev, V. P. Petrishchev, P. A. Kosykh, *Izvestiya of the Russian Geographical Society* **153(1)** 59-68 (2021) <https://doi.org/10.31857/S0869607121010031>
7. R. G. Kalyakina, G. T. Bastaeva, O. A. Lyavdanskaya et al., *Journal of Physics: Conference Series* **1655** 012022 (2020) <https://doi.org/10.1088/1742-6596/1655/1/012022>
8. V. A. Simonenkova, V. S. Simonenkov, A. Y. Kulagin, *Journal of Physics: Conference Series* **2049** 012077 (2021) <https://doi.org/10.1088/1742-6596/2049/1/012077>
9. M. Gulyukin, V. V. Belimenko, A. A. Shabeykin, A. E. Droshnev, A. I. Laishevtsev, *IOP Conference Series: Earth and Environmental Science* **421** 042013 (2020) <https://doi.org/10.1088/1755-1315/421/4/042013>
10. Federal Law "On hunting and on the conservation of hunting resources and on amendments to certain legislative acts of the Russian Federation" dated July 24, 2009 N 209-FZ. <https://www.consultant.ru> (accessed 17.02.2023)