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EUROPEAN BISON (*BISON BONASUS* LINNAEUS, 1758) IN THE BEREZINSKY BIOSPHERE RESERVE AND ADJACENT TERRITORIES

This study examines the results of the reintroduction of the European bison (*Bison bonasus* Linnaeus, 1758) to the Berezinsky Biosphere Reserve from 1974 to 2025. The study focused on the Borisov-Berezinskaya bison micropopulation. Relevant scientific documentation was reviewed. Field observations were conducted from 2010 to 2025 on the territory of the Berezinsky Biosphere Reserve, the hunting grounds “Berezina” and “Lavniki”, the Borisov forestry, the agricultural cooperatives “Zamosh’ye” and “Zembinsky”. For the first time, bisons were brought to the Berezinsky Biosphere Reserve in 1974. The maximum number of animals in a herd was recorded in 2005, when there were 39 individuals. Since then, there has been a steady decline in the population. The main reason for this is inbreeding. Migration of bison from the reserve, division of the herd into smaller groups, and anthropogenic impact aggravated this problem. The last bison of this herd died of natural causes in 2025.

At the end of 2022, the Borisov-Berezinskaya micropopulation was renewed. Fifteen (15) bisons were brought from the Osipovichi Forestry. The territory of the hunting ground “Berezina” (under the Berezinsky Nature Reserve) was chosen for the bison’s introduction. An enclosure was constructed near Brody village for the temporary housing of the animals. In mid-June, the bisonы were released into the wild. By winter, the herd had moved 6 km to the south. Here the bison fed on the agricultural fields. The main herd of 13 bisons was formed. Other bisons stay in small groups or singly. Ehe third year has seen calf-birth.

Key words: European bison; *Bison bonasus*; Berezinsky Biosphere Reserve; hunting ground “Berezina”; metapopulation; micropopulation; binary status; population dynamics.

Fig. 2. Ref.: 9 titles.

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ЕВРОПЕЙСКИЙ ЗУБР (*BISON BONASUS* LINNAEUS, 1758) В БЕРЕЗИНСКОМ БИОСФЕРНОМ ЗАПОВЕДНИКЕ И НА СОПРЕДЕЛЬНЫХ ТЕРРИТОРИЯХ

В данной работе проведено исследование результатов реинтродукции европейского зубра (*Bison bonasus* Linnaeus, 1758) в Березинском биосферном заповеднике на протяжении 1974—2025 годов. Объектом изучения являлась борисовско-березинская микропопуляция зубра. Наблюдения в полевых условиях проводили с 2010 по 2025 год на территории Березинского биосферного заповедника, охотничьего хозяйства «Березина», спортивно-охотничьего хозяйства «Лавники», Борисовского лесхоза, сельскохозяйственных производственных кооперативов «Замошье» и «Зембинский». Впервые зубры были привезены в Березинский биосферный заповедник в 1974 году. Максимальная численность стада зафиксирована в 2005 году — 39 особей. После этого наметилась тенденция к постоянному снижению численности. Основная причина этого — инбридинг, который усугублялся сезонной миграцией зубров с территории заповедника, разделением стада на мелкие группы, антропогенным воздействием. Последний зубр из этого стада погиб по естественной причине в 2025 году.

В конце 2022 года организовано обновление борисовско-березинской микропопуляции. 15 зубров были привезены из Осиповичского опытного лесхоза. Территория охотничьего хозяйства «Березина» (подчиняется Березинскому биосферному заповеднику) была выбрана для вселения зубров. В окрестностях д. Броды был сооружен вольер для временного содержания животных. В середине июня зубры были выпущены на волю. К зиме стадо переместилось на 6 км южнее. Тут зубры кормились на сельскохозяйственных полях. Сформировалось основное стадо из 13 особей. Другие зубры держатся небольшими группами или поодиночке. Третий год фиксируется рождение телят.

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Ключевые слова: европейский зубр; *Bison bonasus*; Березинский биосферный заповедник; охотничье хозяйство «Березина»; метапопуляция; микропопуляция; бинарный статус; динамика численности.
Рис. 2. Библиогр.: 9 назв.

Introduction. The European bison (*Bison bonasus* Linnaeus, 1758) is the largest mammal and the last representative of wild bulls in Europe. The largest representative of fauna is in the territory of Belarus. It is part of the so-called "Great European Five" that includes: the bison, the moose, the lynx, the wolf and the bear. The European bison has been included in all editions of the Red Data Book of the Republic of Belarus. The bison is also included into the list of the International Union for Conservation of Nature (IUCN), in Annex III of the Berne Convention (protected animal species), in the Red Books of Russia, the Ukraine, Lithuania, Poland [1]. The bison belongs to the species that has adverse trends in the surrounding areas or depends on the implemented protection measures.

Belarus is inhabited by the Belovezhian (lowland) subspecies (*Bison bonasus bonasus* Linnaus, 1758) of the European bison. In 1919, the last representative of this subspecies was killed. The international community has done a lot to revive the bison. At present bisons live only in a small part of the former area. Its natural habitat has undergone significant transformation [2]. The Republic of Belarus has also made a contribution to the conservation of the population. The reintroduction of the bison in its territory began in 1946. Today, there are about 3,000 bisons in Belarus alone [3].

Since 1994, there has been implemented the active program for conservation, distribution and management of the European bison in Belarus. The population of the free-living individual bison, which is territorially separated from other groups, is called a micropopulation. There are currently 11 micropopulations in Belarus. The total of all micropopulations forms a metapopulation. The binary status of the species implies a division of the metapopulation into maintaining and reserve gene pool of individuals. Individuals that represent high breeding value belong to the maintaining gene pool. Individuals of post-reproductive age, exhausted, sick, traumatized are part of the reserve gene pool. Application of the binary status allows to carry out resettlement, selection, elimination of bisons [2].

The Borisov-Berezinskaya micropopulation was established in the territory of the Berezinsky Biosphere Reserve in 1974. Five individuals were brought from the Prioksko-Terrasny Reserve. These bisons were descendants of individuals who were taken in 19th century to the zoo of Prince Pless in Eastern Silesia [2]. However, about 20 years ago the Borisov-Berezinskaya micropopulation went into a stage of depression. In December 2022, 15 bisons were brought in the hunting ground "Berezina" (a structural unit of the Berezinsky Biosphere Reserve) from Osipovichi Forestry.

Materials and methods. The object of research from 2010 to 2025 was the Borisov-Berezinskaya bison micropopulation. The research was conducted on the territory of the Berezinsky Biosphere Reserve, the hunting grounds "Berezina" and "Lavniki", the Borisov forestry, the agricultural cooperatives Zamosh'ye and Zembinsky.

The territorial and biotopical distribution, number, gender and age structure were evaluated in field studies. A survey among the reserve employees, local residents, rangers and hunters was conducted. Studies of archival materials, research work reports, other scientific documentation made it possible to assess the dynamics of the bison population. The main accounting work in field conditions was carried out during winter time by tracking and recording traces of life (tracks, excreta, places of rest and feeding).

Visual observations were made with binoculars, vision tubes, cameras, thermal imagers. The drone was used to search for animals and count numbers. Remote monitoring was conducted using camera traps.

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The Garmin eTrex 20 and Garmin eTrex 22 GPS navigators were used to record the concentration of bisons and their traces of activity. Topographic maps and satellite images of the Internet were used in the analysis of territorial distribution.

Results and discussion. Today in the territory of Belarus there are 2927 bisons living freely — about a quarter of the world's population (data for 2024 references) [3]. Their number is growing every year. They form 11 micropopulations. Micropopulations are territorially isolated from each other, which creates a problem [4]. The holder of the Borisov-Berezinskaya bison micropopulation is the Berezinsky Biosphere Reserve. The study of bisons in the reserve was carried out by P. G. Kozlo [2], M. A. Lavov [5], I. G. Medvedev [6], A. P. Kashtalian [6; 8; 9].

Figure 1 shows the dynamics of the bison population, excluding animals brought in 2022. Five stages can be distinguished in the development of the Borisov-Berezinskaya bison micropopulation.

I stage. 1975—1981 — the period of initial herd growth. One (1) male and 4 females from the Prioksko-Terrasny Reserve to Berezinsky Biosphere Reserve (pl. Uvyazok) were brought at the end of the winter 1974. In autumn, the bisons settled in the woodlands of Borisov forestry and the lands of agricultural cooperatives “Zamosh’ye” and “Zembinsky”. In the same year, two females from the first group were shot by poachers. In 1976, 6 more bisons were brought to the reserve. However, they did not join the first group and scattered far away [5]. There were no new attempts to capture the bisons after that. Thus, The Borisov-Berezinskaya micropopulation developed in complete isolation [6]. Summer habitats were located around elevated places and dry areas of broad-leaved forests among the swampy lowlands. This is pl. Bagun Island (Palik Forestry).

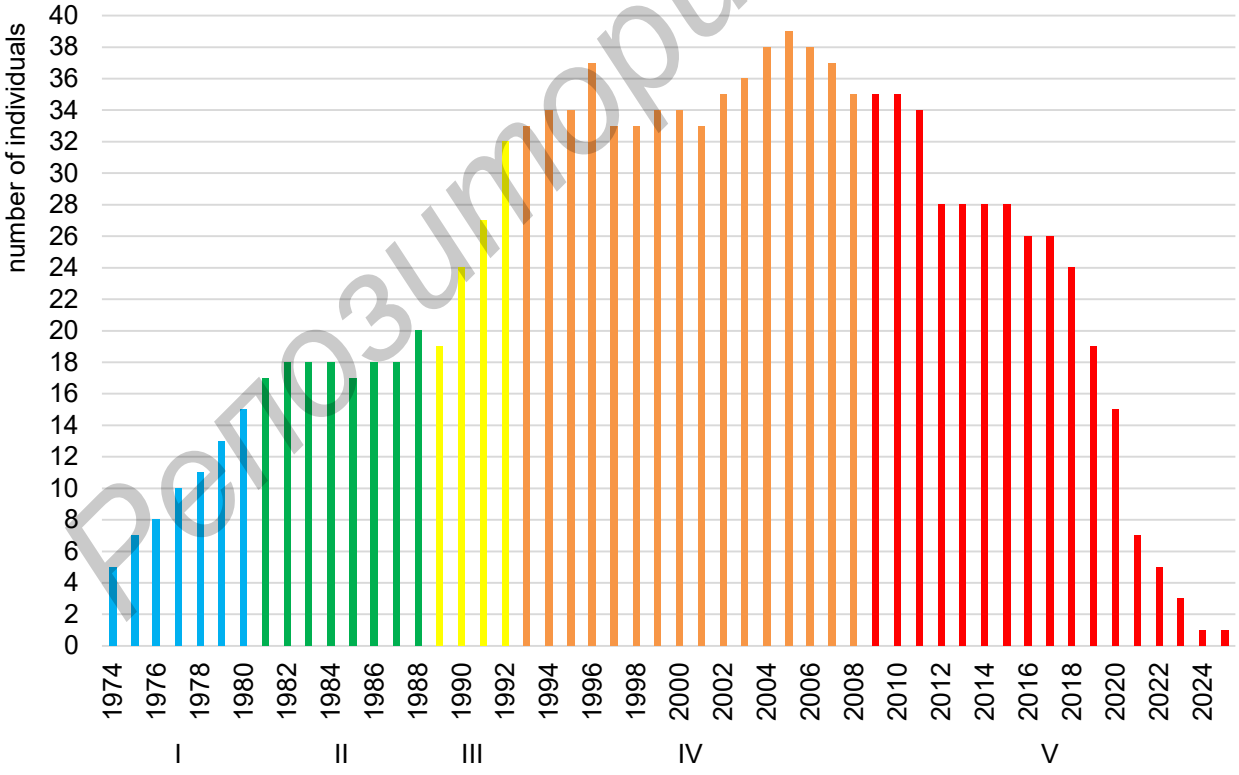

Figure 1. — Population dynamics of bisons that were reintroduced to the Berezinsky Biosphere Reserve in 1974

Рисунок 1. — Динамика численности зубров, завезенных в Березинский биосферный заповедник в 1974 году

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II stage. 1981—1988. In 1982, the Borisov forestry was given responsibility for monitoring and protection of bisons. For this purpose, the ranger posts were introduced. Their responsibilities included the protection and implementation of biotechnological activities during the winter. Bisons tried to avoid meeting people and did not approach farms and villages. During this period, winter forage deteriorated, affecting the overall condition of the herd. The increase in population was insignificant.

III stage. 1988—1992. In areas of winter herding, restrictions were imposed on certain types of economic activities. Protection measures were improved, regular feeding in the winter period was established. This led to a short-term increase in the bison population.

IV stage. 1992—2008. From 1996 to 2004, there was a series of administrative and territorial changes that had a negative impact on the bison micropopulation. In addition, from 1994—1995 and 2001—2002 the management of the reserve organized hunting on eight bisons (not on reserve territory). The increased anthropogenic impact led to a decline in the herd's quantitative growth. The number of bisons did not exceed 39 individuals [6].

V stage. 2008—2025 is a period of depressed micropopulation numbers. During this time period, it was reliably recorded that only two calves were born in 2008 and 2012. In 2017, out of 26 individuals there were 3 males and 23 females. Accounting work on the bison herd was difficult for a number of reasons. Camera traps were used for monitoring [7]. The herd split into groups — from 10 to 2 individuals, some males were by themselves. Observations showed a steady decline in herd numbers. In the last five years, only one female has been observed. However, in June 2025, her remains were found near Vishnevaya village. The bisons deaths during the observation period from 2010 to 2025 were of natural causes, the facts of poaching were not identified.

As a result, there are currently no descendants of the bison from the Prioksko-Terrasny Reserve (Pless bisons) in Belarus. The status and dynamics of the Borisov-Berezinskaya micropopulation were regularly discussed at meetings devoted to the problems of bisons conservation. This micropopulation of bisons had a number of problems, some of which existed in the early stages' resettlement.

There is little genetic diversity in the entire world population. Inbreeding is the cause of negative mutations that lead to the phenotype change and suppressed the immune system. This ultimately led to reduced animal viability. As a result of inbreeding, the micropopulation has reached the stage of depression. This is one of the reasons for the absence of calves at later stages. Micropopulations are territorially isolated from each other in Belarus [4]. This makes it difficult for the species to exchange naturally [8; 9].

From the end of autumn to spring, bisons moved away from the reserve by 20—25 km in a south-west direction. This made it difficult to control, protect and provide winter feeding to the bison herd.

There is almost no anthropogenic impact in the summer habitats. On the contrary, in the places of their winter habitat the active economic activity was carried out by Borisov forestry, the hunting ground "Lavniki", agricultural cooperatives "Zamosh'ye" and "Zembinsky". In contrast to the reserve, these organizations were not interested in the protection of bisons. Increased economic activity in the summer led to the bisons return of the reserve [6].

Today, Belarus is in a kind of isolation with regard to the preservation of the bisons. The closest partner — Russia — has refused to maintain the pure-blood line of Belovezhian bisons. Contacts with the countries of the European Union were cut off, especially with Poland. This situation will have a negative impact on the genetic diversity of the Belarusian population.

The need for renewal of the Borisov-Berezinskaya micropopulation of bisons has been discussed for many years. In 2010 the possibility to purchase bisons in Western Europe and Belovezhskaya Pushcha (Belarus) was explored. But these options had not been implemented. Only in 2022, the Berezinsky Biosphere Reserve bought 15 bisons from Osipovichi Forestry. Before that, scientists of the State Scientific and Production Association "Scientific and Practical Center for Bioresources of the National Academy of Sciences of Belarus" made a proposal based on the

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studies in favor of bison resettlement. The report described the following aspects: appropriateness of housing, environmental conditions, feeding base, recommendations for loading, upkeeping, care, release, protection and subsequent breeding of bisons, the optimal number of bisons in one area, etc. The place for accommodation was chosen in the hunting ground "Berezina". A corral shelter for rewarming of bisons was built in the vicinity of Brody village. The enclosure allows bisons to adapt to a new living conditions. There were three main reasons why this territory was chosen for bisons habitat. First, the hunting ground "Berezina" is a structural subdivision of the the Berezinsky Biosphere Reserve, therefore the habitat of bisons remain within the boundaries of the land of one land user. Second, the close location of the territory of the proposed settlement for the bisons from reserve. This simplifies bison monitoring and protection. Third, in the territory of hunting grounds there are opportunities to carry out biotechnical activities.

One of the main suppliers of bisons in Belarus is Osipovichi Forestry. It was the best option. As a result, 15 bisons were purchased and delivered to the location: 4 young females, 7 adult females, 2 young males, 2 adult males. The delivery was carried out as soon as the bison was caught. On the feeding lot for the bisons hay, oats, corn silage, as well as salt and vitamin-mineral supplements were placed until April. Permanent access to water was provided by a meliorative channel. The release of animals from the enclosure was carried out in mid-June 2023.

By autumn of 2023, the main group of 13 bisons had moved to agricultural lands in the vicinity of Mazhnitsa village. Here they fed in the fields with green rapeseed. The remaining bisons stayed held in the vicinity of Voilovo village. In April, bisons returned to the resettlement area and during the summer period lived in the vicinity of Voilovo and Brody villages. For the winter season 2024-2025 bisons moved along the same route again to the rapeseed fields in the vicinity of Mazhnitsa village. Monitoring of the herd showed that between 2023 and 2025 six calves were born. Thus, the total herd number by the end of 2025 is 20 individuals.

Comparison of the dynamics of the Borisov-Berezinskaya micropopulation with other micropopulations in the territory of Belarus allows to define conditions that ensure their sustainable development [2]:

- the number of bisons should be at least 15—20 individuals;
- the optimal number for different age groups of bisons and male to female ratios;
- preliminary study of the environmental conditions of the intended habitat;
- conducting biotechnological activities;
- prevention of various diseases.

In the settlement of bisons in 2022 these conditions were taken into account. As a result, new bisons seasonal migration is about 6—7 km. Pless bisons made seasonal migrations of 20—25 km (Figure 2).

Conclusion. The Borisov-Berezinskaya bison micropopulation in 2024 passed its 50-year mark. Today, the line of the Pless bison in Belarus has disappeared. All bisons originate from Belovezhskaya Pushcha. This impoverishes genetic diversity. The isolation of micropopulations increases the negative consequences of inbreeding. For the Borisov-Berezinskaya micropopulation, the poorly chosen places of residence, seasonal long-distance migration, the division of the herd into small groups and the anthropogenic impact have aggravated this problem.

At present, the micropopulation is estimated to have about 20 individuals — 11 females and 3 males. The gender of the offspring will be determined during further observations. There is a tendency for the herd to grow.

In the renewal of the Borisov-Berezinskaya micropopulation in 2022, the main problems were taken into account. The new herd has already formed summer and winter habitats, seasonal migration routes. There is a continuous birth of offsprings a third year in a row. Implementation of high-level protection, monitoring and biotechnology activities will ensure the sustainable development of micro-populations.

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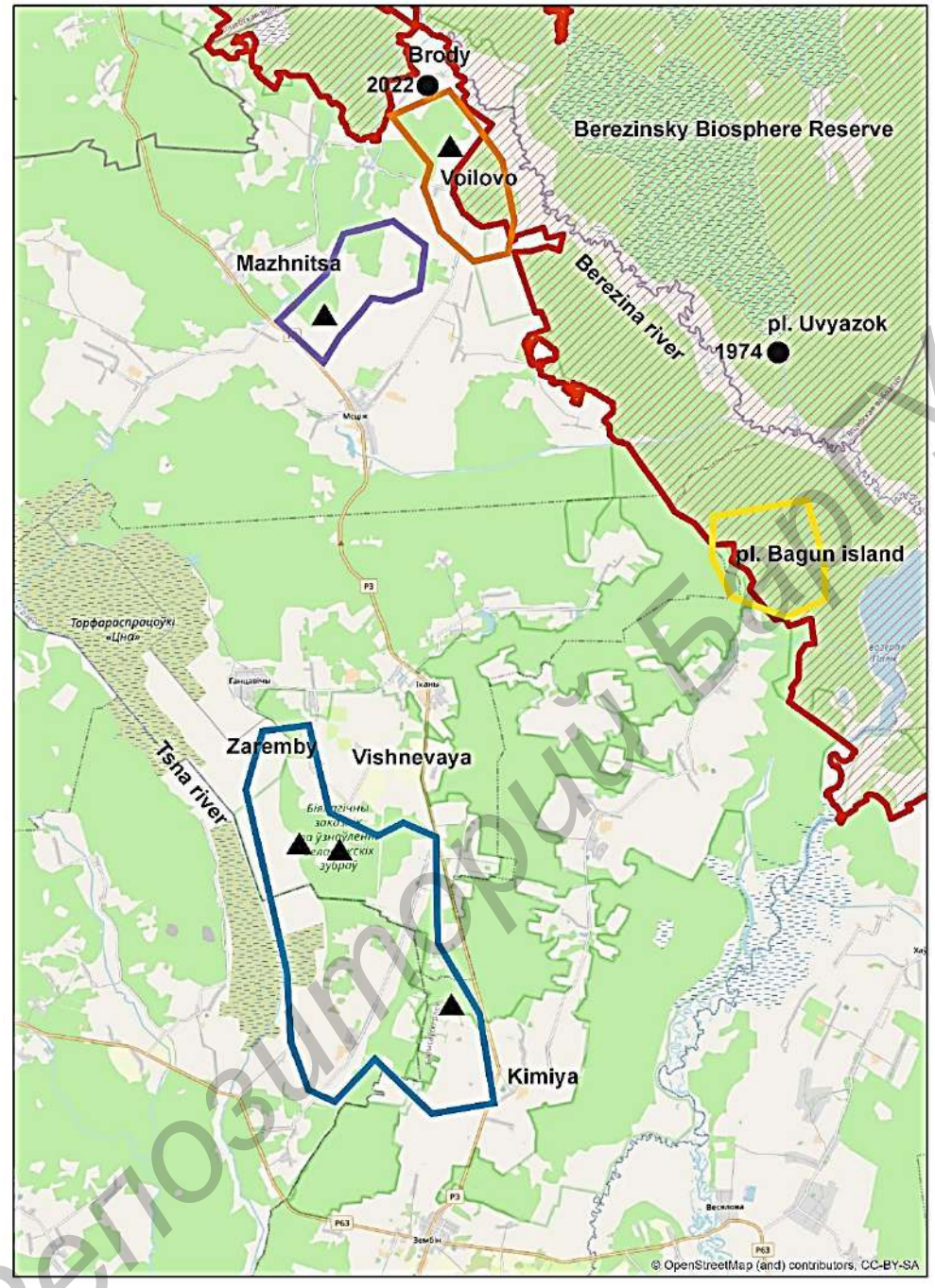

Figure 2. — Territorial and seasonal distribution of the Borisov-Berezinskaya bison micropopulation: red contour — the border of the Berezinsky Biosphere Reserve; ▲ **—** feeding grounds; **1974● —** place of bison settlement in 1974; **yellow** — their summer concentration area; **blue** — their winter concentration area; **2022● —** place of bison settlement in 2022; **orange —** their summer concentration area; **violet —** their winter concentration area

Рисунок 2. — Территориальное и сезонное распределение зубров борисовско-березинской микропопуляции: красный контур — граница Березинского биосферного заповедника; ▲ **—** подкормочные площадки; **1974● —** место вселения зубров в 1974 году; **желтый контур —** места их летнего обитания; **синий контур —** места их зимнего обитания; **2022● —** место вселения зубров в 2022 году; **оранжевый контур —** места их летнего обитания; **фиолетовый контур —** места их зимнего обитания

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To minimize the level of inbreeding in the future it is necessary to import from other micropopulations in Belarus — for example, the Agricultural Production Cooperative "Ozery Grodno district" or the National Park "Belovezhskaya Pushcha".

The history of bison reintroduction, including that in the Berezinsky Biosphere Reserve, shows how difficult it is to return a species to a habitat that had undergone severe transformation or had been completely destroyed. For the sustainable development of the bison population, it is necessary to solve the problems inherent to this species in a timely manner.

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