ISSN 2518-170X (Online),
ISSN 2224-5278 (Print)

ҚАЗАҚСТАН РЕСПУБЛИКАСЫ
ҰЛТТЫҚ ҒЫЛЫМ АКАДЕМИЯСЫНЫҢ

Х А Б А Р Л А Р Ы

ИЗВЕСТИЯ

НАЦИОНАЛЬНОЙ АКАДЕМИИ НАУК
РЕСПУБЛИКИ КАЗАХСТАН

N E W S

OF THE ACADEMY OF SCIENCES
OF THE REPUBLIC OF KAZAKHSTAN

ГЕОЛОГИЯ ЖӘНЕ ТЕХНИКАЛЫҚ ҒЫЛЫМДАР СЕРИЯСЫ

♦

СЕРИЯ ГЕОЛОГИИ И ТЕХНИЧЕСКИХ НАУК

♦

SERIES OF GEOLOGY AND TECHNICAL SCIENCES

5 (425)

ҚЫРҚҮЙЕК – ҚАЗАН 2017 ж.
СЕНТЯБРЬ – ОКТЯБРЬ 2017 г.
SEPTEMBER – OCTOBER 2017

ЖУРНАЛ 1940 ЖЫЛДАН ШЫҒА БАСТАҒАН
ЖУРНАЛ ИЗДАЕТСЯ С 1940 г.
THE JOURNAL WAS FOUNDED IN 1940.

ЖЫЛЫНА 6 РЕТ ШЫҒАДЫ
ВЫХОДИТ 6 РАЗ В ГОД
PUBLISHED 6 TIMES A YEAR

АЛМАТЫ, ҚР ҰҒА
АЛМАТЫ, НАН РК
ALMATY, NAS RK

«ҚР ҰҒА Хабарлары. Геология мен техникалық ғылымдар сериясы».
ISSN 2518-170X (Online),
ISSN 2224-5278 (Print)
Меншіктенуші: «Қазақстан Республикасының Ұлттық ғылым академиясы» РҚБ (Алматы қ.).
Қазақстан республикасының Мәдениет пен ақпарат министрлігінің Ақпарат және мұрағат комитетінде 30.04.2010 ж. берілген **№10892-Ж** мерзімдік басылым тіркеуіне қойылу туралы куәлік.

Мерзімділігі: жылына 6 рет.
Тиражы: 300 дана.

Редакцияның мекенжайы: 050010, Алматы қ., Шевченко көш., 28, 219 бөл., 220, тел.: 272-13-19, 272-13-18, http://nauka-nanrk.kz /geology-technical.kz

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Редакцияның мекенжайы: Қазақстан, 050010, Алматы қ., Қабанбай батыра көш., 69а.
Қ. И. Сәтбаев атындағы геология ғылымдар институты, 334 бөлме. Тел.: 291-59-38.

Типографияның мекенжайы: «Аруна» ЖК, Алматы қ., Муратбаева көш., 75.

«Известия НАН РК. Серия геологии и технических наук».
ISSN 2518-170X (Online),
ISSN 2224-5278 (Print)
Собственник: Республиканское общественное объединение «Национальная академия наук Республики Казахстан (г. Алматы)
Свидетельство о постановке на учет периодического печатного издания в Комитете информации и архивов Министерства культуры и информации Республики Казахстан **№10892-Ж,** выданное 30.04.2010 г.

Периодичность: 6 раз в год
Тираж: 300 экземпляров

Адрес редакции: 050010, г. Алматы, ул. Шевченко, 28, ком. 219, 220, тел.: 272-13-19, 272-13-18,
http://nauka-nanrk.kz /geology-technical.kz

Адрес редакции: Казахстан, 050010, г. Алматы, ул. Кабанбай батыра, 69а.
Институт геологических наук им. К. И. Сатпаева, комната 334. Тел.: 291-59-38.

Адрес типографии: ИП «Аруна», г. Алматы, ул. Муратбаева, 75

News of the National Academy of Sciences of the Republic of Kazakhstan. Series of geology and technology sciences.
ISSN 2518-170X (Online),
ISSN 2224-5278 (Print)
Owner: RPA "National Academy of Sciences of the Republic of Kazakhstan" (Almaty)
The certificate of registration of a periodic printed publication in the Committee of information and archives of the Ministry of culture and information of the Republic of Kazakhstan N 10892-Ж, issued 30.04.2010

Periodicity: 6 times a year
Circulation: 300 copies

Editorial address: 28, Shevchenko str., of. 219, 220, Almaty, 050010, tel. 272-13-19, 272-13-18,
http://nauka-nanrk.kz/geology-technical.kz

Editorial address: Institute of Geological Sciences named after K.I. Satpayev
69a, Kabanbai batyr str., of. 334, Almaty, 050010, Kazakhstan, tel.: 291-59-38.

Address of printing house: ST "Aruna", 75, Muratbayev str, Almaty

N E W S
OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN
SERIES OF GEOLOGY AND TECHNICAL SCIENCES
ISSN 2224-5278
Volume 5, Number 425 (2017), 181 – 189

UDK 910.3:633.2 (574.1)

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GEOECOLOGICAL ASSESSMENT OF FODDER GROUNDS OF THE PROJECTED STATE NATURE RESERVE "BOKEYORDA" IN WEST KAZAKHSTAN REGION

Abstract. As a result of the study of geoecosystems, an assessment of the state of the forage lands of the projected state nature reserve "Bokeyorda" of the West Kazakhstan region was carried out. Based on the ecosystem analysis and GIS technology, the boundaries of the reserve are defined, zoning of functional sites was carried out and a map of forage lands was compiled. The analysis of the causes of degradation of the reserve's forage lands is performed. Characteristics of the main types of pasture digressions are given.

Key words: projected state nature reserve, steppes, ecosystem, fodder land, digression.

Preservation of the biological diversity of ecological systems, unique natural complexes, objects of the natural reserve fund, cultural and natural heritage of the Republic of Kazakhstan is one of the important tasks of the state at the present stage. In order to preserve and restore biological diversity and natural ecological systems, the Resolution of the Government of the Republic of Kazakhstan approved the "Concept for the Development and Location of Specially Protected Natural Territories of the Republic of Kazakhstan until 2030". It is aimed at preserving biological diversity, preserving the whole diversity of microorganisms, flora and fauna, as well as natural ecological systems, preventing their losses as a result of economic and other activities [1].

Natural areas should be protected from various risks, such as pollution, poisoning of plants, presence of dangerous wild animals, etc. All natural resources, being carriers of energy and information, are tourist-recreational resources. The availability of natural resources is the first condition for location of productive forces in the region. The quantity, quality and combination of resources determine the potential in natural resources of the territory, which is an important factor in the distribution of population and economic activity. The natural resource potential in the sphere of tourist and recreational services has an impact on its market specialization and its place in the territorial division of labor.

At present, intensive anthropogenic impact on the environment is observed in a number of the most economically developed regions of Kazakhstan, including the West Kazakhstan region. In these conditions, the issues of effective management of drylands are of key importance in achieving the goals of sustainable use of natural resources, competitiveness of rural commodity producers, Kazakhstan's accession to the WTO and the list of 50 most competitive countries in the world [2].

Nowadays, the system of specially protected natural areas of the West Kazakhstan region is represented by 3 state nature reserves of national importance and 7 PAs of regional importance, the total area of which is 188.7 thousand hectares or 1% of the total area of the region. At the same time, there are no PAs with a strict regime of protection and with the status of a legal entity [3, 4].

Experimental. In this research of the west of West Kazakhstan region, geographically in the basin of the Small Uzen and Aschyozek rivers, the space of the Volga-Ural interfluve, in the northwestern part of the Caspian lowland within the territory of the Zhanibek, Kaztalov and Bokeyorda regions on the flat and slightly wavy Plain, the vegetation cover for fodder lands was studied with the identification of valuable forage grasses and anthropogenically disturbed ecosystems by conventional methods [5-13]. The area is 690.9 thousand hectares, or about 4.5% of the region's territory (Figure 1). The monitoring sites were bookmarked with the application of their data to the topographic map and the GPS data on the sites were recorded. Fodder land mapping was carried out.

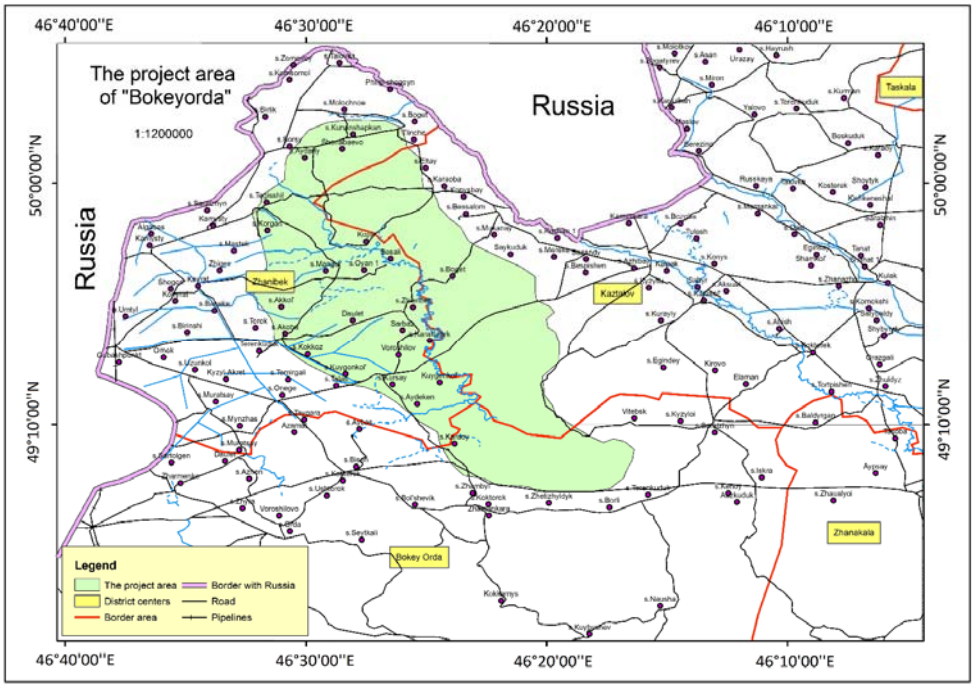

Figure 1 – Map of the projected State Natural Reserve ‘Bokeyorda’ in West Kazakhstan region

Studies were carried out within the framework of the project of the Government of the Republic of Kazakhstan and the Global Environment Facility of the United Nations Development Program "Conservation and Sustainable Management of Steppe Ecosystems" aimed at increasing steppe ecosystems.

Results and discussion. In the flora of the projected territory of the state natural reserve (SNR) "Bokeyorda" we have identified 537 species of vascular plants belonging to 66 families and 265 genera. However, this number does not completely cover the entire species composition of the flora. Only 42.7% of species (537), 54.4% (265) genera and 56.4% (66) families are represented on the territory of the West-Kazakhstan region on the territory of the SNR "Bokeyorda". The most abundant species are the three species: Compositae Biseke, represented by 95 species (17.3%), cereals (Gramineae Juss) - 54 species (9.8%) and mammals (Chenopodiaceae Vent) - 42 species (7.6%). A total of 191 species (35%) [8].

The projected territory of the SNR "Bokeyorda" is located in two natural zones of the steppe (subzone of semi-shrub-turf-steppe desert steppes on light-chestnut soils) and semi-desert (northern sub-zone

of wormwood and perennial-salt semi-deserts on brown soils). In the system of botanical-geographical zoning, the proposed territory is represented by the Euro-Asian steppe and the Afro-Asian desert regions. The steppe is represented by the most arid subzone - the Zawolzhsko-Kazakhstani semi-shrub-turf-grass-deserted steppe, which includes the northern part of the territories, and the desert is the least arid northwestern margin of the Caspian region of the North-Turan steppe desert, to which most of the Caspian lowland belongs [14]. On the projected territory, 7 types of vegetation are widely represented: steppe, desert, forest, shrub, meadow, marsh, submerged-water [15].

In this research, the assessment of the significance of the territory of the " SNR "Bokeyorda", we analyzed not only the presence of the Red Book and rare species, but also the availability of economically valuable and resource species. Also, an assessment was made of the presence of wild relatives of cultivated plants. The flora of the reserve is rich in useful plants. It has been revealed that 70% of the plants registered here (about 378 species) are economically valuable and can be used for dyeing, medicinal, tanning, technical, food, decorative and other purposes. A number of plants possess not one but several useful properties and can be used in a complex manner. Among them, the most extensive group consists of fodder species (104 species, 19%). Valuable forage grasses are various species of polynyas, greens, elm, feather grass, etc. Among the wild-growing species are many plants that have high fodder value. The economic importance of forage grasses is determined by their nutritional value, yield, eating by animals, prevalence.

Fodder plants of the projected area:

1. *Bassia sedoides*
2. *Beckmannia eruciformis L.*
3. *Puccinellia dolicholepis V.*
4. *Puccinellia distans*
5. *Puccinellia tenuissima*
6. *Alyssum desertorum*
7. *Calamagrostis epigejos*
8. *Calamagrostis glauca*
9. *Calamagrostis arundinacea*
10. *Alhagi pseudalbagi D.*
11. *Polygonum aviculare*
12. *Linosyris villosa*
13. *Linosyris vulgaris*
14. *Linosyris tatarica*
15. *Inula Britannica*
16. *Melilotus officinalis*
17. *Sparganium erectum*
18. *Echinochloa crusgalli*
19. *Anabasis salsa*
20. *Agropyron pectinatum*
21. *Agropyron desertorum*
22. *Camphorosma monspeliaca*
23. *Limonium gmelinii*
24. *Trifolium pratense*
25. *Trifolium repens*
26. *Climacoptera brachiate*
27. *Stipa capillata*
28. *Stipa zalesskii*
29. *Stipa lessingiana*
30. *Stipa sareptana*
31. *Leymus ramosus*
32. *Bromus tectorum*
33. *Bromus secalinus*
34. *Bromus inermis*
35. *Kochia prostrata*
36. *Krascheninnikovia ceratoides L.*
37. *Argentina anserine*
38. *Chenopodium album L.*
39. *Atriplex verrucifer*
40. *Atriplex tatarica L.*
41. *Alopecurus pratensis*
42. *Alopecurus arundinaceus*
43. *Psathyrostachys juncea*
44. *Arctium lappa*
45. *Medicago falcate*
46. *Medicago sativa*
47. *Medicago falcata L.*
48. *Glyceria maxima*
49. *Eremopyrum orientale*
50. *Eremopyrum triticeum*
51. *Poa pratensis*
52. *Poa bulbosa*
53. *Poa stepossa*
54. *Poa angustifolia*
55. *Festuca Beckeri*
56. *Festuca valesiaca*
57. *Festuca pratensis*
58. *Carex praecox*
59. *Carex stepnophylla*
60. *Carex melanostachya*
61. *Melica altissima*
62. *Petrosimonia triandra*
63. *Plantago lanceolata*
64. *Agrostis Alba*
65. *Agrostis capillaris*
66. *Agrostis canina*
67. *Artemisia austriaca*
68. *Artemisia terrae-albae*
69. *Artemisia scoparia*
70. *Artemisia lercheana*
71. *Artemisia lessingiana*
72. *Artemisia pauciflora*
73. *Artemisia monogyna*
74. *Artemisia pontica*
75. *Aeluropus littoralis*
76. *Elymus repens*
77. *Potamogeton lucens*
78. *Stuckenia pectinata*
79. *Potamogeton perfoliatus*
80. *Ceratocarpus utriculosus*
81. *Ceratocarpus arenarius*
82. *Typa angustifolia*
83. *Tanacetum achilleifolium*
84. *Halocnemum strobilaceum*
85. *Suaeda physophora*
86. *Suaeda prostrate Pallas*
87. *Juncus Gerardii*
88. *Salicornia europaea*
89. *Glycyrrhiza glabra*
90. *Salsola laricina*
91. *Salsola tamarix*
92. *Butomus umbellatus*
93. *Spiraea crenata L.*
94. *Spiraea hypericifolia L.*
95. *Phleum pretense*
96. *Phleum phleoides*
97. *Koeleria cristata L.*
98. *Phragmites australis*
99. *Achillea millefolium*
100. *Lathyrus pratensis*
101. *Setaria viridis*
102. *Setaria glauca L.*
103. *Onobrychis arenaria*
104. *Onobrychis sibirica*

The fodder land in the territory of the SNR "Bokeyorda" can be divided into the following groups depending on habitat conditions (soils, landforms) and species composition: steppe pastures with prevalence of the feather grass over the plains, steppe pastures with prevalence of feather grasses (*Stipa capillata* and *Stipa sareptana*) along plains and valleys, steppe and deserted pastures with predominance of *Agropyron* (*pectinatum* and *desertorum*) along plains and valleys, steppe and deserted pastures with predominance of *Festuca valesiaca* over plains and valleys, meadow-steppe meadow pastures with predominance of the *Spiraea hypericifolia L.* along the valleys, meadow grasses-cerealspastures along the river valleys, meadow pastures with the predominance of soft-stemmed grasses (*Elymus repens*) along the valleys and river valleys, sagebrush pastures with predominance of wormwood (*Artemisia austriacaon*) on the plains, mixed-pasture pastures with a predominance of wormwood on bitterly saline habitats and juicy-solyankovye pastures in solonchaks leaved grasses (Figure 2).

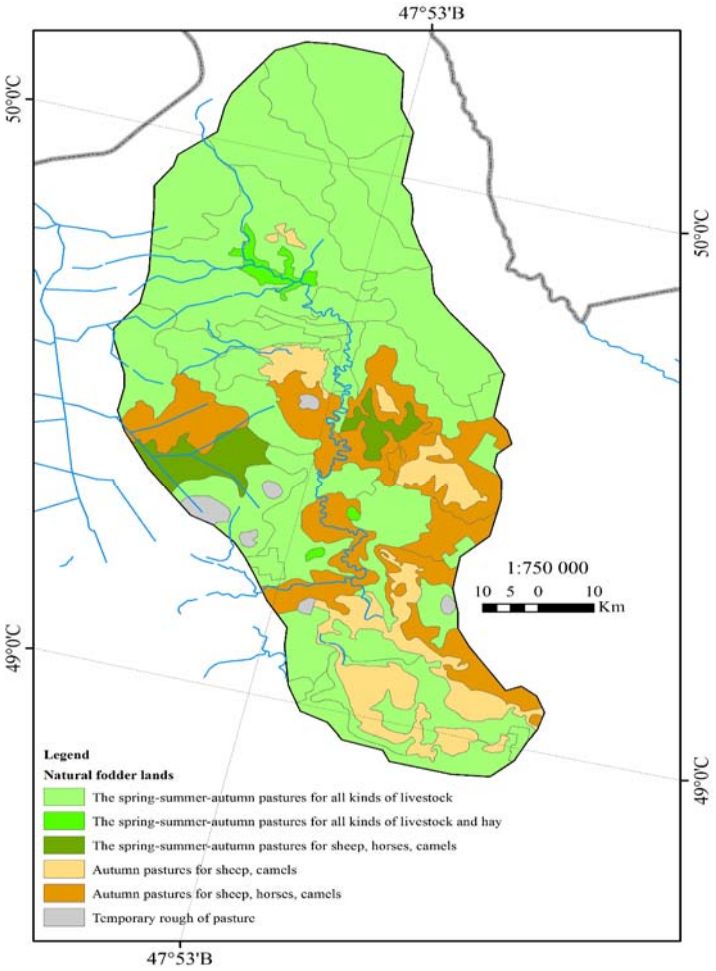

Figure 2 – Map of natural fodder land for animal species of the projected state SNR “Bokeyorda”

The most common steppe pastures on the plain are: *Festuca valesiaca-Gramíneae*, *Festuca valesiaca*-wormwood, *Agropyron Gramíneae*. The maximum mass of cereals is given in the summer. The yield of pastures in some areas varies from 2 to 6 centners/ha. Turf grasses are characterized by high nutritional value and good eating during the entire pasture season. Cereal pastures are used as spring-summer-autumn pastures. On the solonetzes there are *Artemisia pauciflora* and *Tanacetum achilleifolium* pastures, the herbage of which is a good addition to the cereal forage in the autumn period. The yield of *Artemisia pauciflora* pastures reaches 2-4 c/ha, and *Tanacetum achilleifolium* pastures of 1-2 c/ha. The *Elymus repens* pastures of the projected area are characterized by yields ranging from 20 to 40 c/ha. In the solonchak common *Chenopodium album L., Anabasis salsa, Suaeda* pastures. The yield of the *Chenopodium album L.-Anabasis salsa* pastures ranges from 1.5 to 5 c/ha.

A serious problem in the current economy of the studied area is the failure to comply with the principles of distribution of pasture load - the result of lack of professionality in the organization and conduct of livestock grazing.

Additionally, overgrazing of livestock takes place directly near the settlements of Saralzhyn, Karaoba, Tegisshil, Borsy, Akoba.

The studied area is characterized by the irrational use and excessive exploitation of pastures. The reasons for this are, firstly, lack of pasture in agricultural units and, secondly, insecurity of many pastures by watering sites, due to which the areas lying closer to ponds, wells and other sources of water are systematically overgrazed. The same overgrazing explains the appearance of sites under different associations, characteristic for the stage of failure, confined to the remains of abandoned settlements, to old camps, broken down wells and abandoned wintering grounds. The type of such malfunctions varies depending on habitat conditions and composition of animals, to a lesser extent on the original association, since often the same types of failures can occur in the place of different plant groups. This similarity of the final results of digression at different initial stages indicates that at its extreme stages a completely new, qualitatively different situation is created, which has a decisive influence on the formation of the vegetation of such sites, regardless of the initial floral and other differences. During the field research on the territory of the SNR "Bokeyorda" using the data of V.V. Ivanov [16], six types of faults were identified: black wormwood-saltwort disruptions (*Artemisia pauciflora-salsola*), ephemeral-mortuaries disruptions (*Cremoporum-ephemerae), c*hagyr disruptions (*Artemisia arenaria* and its companions), distal-sagebrush failures (*Artemisia procera*). Lerhopolyno-ephemeral disruptions. *(Artemisia Lerchiana). ephemeral-ebelekovye disruptions* (*Ceratocarpus arenarius*).

Black wormwood-saltwort disruptions (*Artemisia pauciflora-salsola*). Predominantly, sheep grazing is responsible for the emergence of quite frequent in the zone of complex steppes of black wormwood-saltwort (*Artemista-salsola*) malfunctions developing from the previously existing black sagebrush (*Artemista-gramineal*) and grassy-blackgrass groupings. From conventional chernopolynnyh associations they are distinguished by an extremely depressed state of wormwood oliganthous (*Artemisia pauciflora*) and her faithful companion kamforosmy Marseilles (*Camphorosma monspeliacum*) and wide distribution of annual species of thistles (*Salsola*), among which there are anabasis leafless (*Anabasis aphylla*) and sometimes saiga grass (*Frankenia hirsute*), which indicates an increased solonchakiness of the site. Ordinary bug is also pierced (*Lepidium perfoliatum*) and *Descurainia Sophia*, but their role is small.

Ephemeral-mortuaries disruptions (*Cremoporum-ephemerae).* With the activity of sheep, the formation of ephemeral-mortem (*Cremoporum-ephemerae*) faults is formed, formed by almost pure accumulations of annual herrings (*Eremopyrum triticeum, E. orientale*), among which are associations of ephemerals formed mainly by various species of cruciferous (*Brassicaceae*). Here are common bug-leaf

Figure 3 – Ephemeral-mortuaries disruptions near to the Tatken wintering in Zhanibek district

piercing (*Lepidium perfoliatum*), *Descurainia Sophia*, *Alyssum desertorum,* chorispora delicate (*Chorispora tenella*), to which sometimes the consanguineous primate (*Ceratocephalus orthoceras*), the small moth (*Myosurus minimus*), large (*Androsace maxima*) and ephemeroids: small geese (*Gagea minima*) and Bilbifer sparaxis (*sparaxis*) and undersized specimens of ebelek: the sandstone (*Ceratocarpus erenaruis*). In the spring, up to the middle of May, the projective coverage of such groupings reaches 70-80% and they can give up to 4-5 c/ha of dry mass, which does not really matter, since all the named plants are not eaten by animals. The duration of existence of ephemeral associations, apparently, is quite large. We had to meet similar sites of 8-10-year-old age near Samey, Shopan-Kuduk and in a number of other places. Their origin from the grass areas of the steppe is confirmed by the remains of the Fesluca sulcata, Koeleria gracilis and Potentilla argentea that persist in them in some places.

Chagyr disruptions (*Artemisia arenaria* and its companions). In the southern part of the projected area, chagory failures formed by eating animals, formed by wormwood sand (*Artemisia arenaria*) and its companions – *Asperula Danilevskiana, Eremosparton aphyllum*, chondrilla Sitnikovida (*Chondrilla juncea*), Siberian tourne (*Tournetortia sibirica*), giant sturgeon (*Elymus giganteus*), camel thorns (*Alhagi pseudoalhagi*), and common (*Peganum harmala*). Unsuitable for haying, or for bleeding, chagyrs are either not used at all, or serve for fuel preparation, which dooms them to further dispelling. Such chagyrs represent, in the vast majority of cases, one of the stages of pasqual digression; when providing rest, they are extremely slow (for 10-25 years), but are steadily transformed into wormwood-cereal "sandy steppe" [13].

Distal-sagebrush failures (*Artemisia procera*). In the estuaries and often in the floodplain meadows, also under the influence of cattle, there are chili-sagebrush scotoprobes represented by large bushes of the *Artemisia procera*, with which the common cocklethorn (*Xanthium strumarium*), the large burdock (*Arctium lappa*), Occasionally licorice naked (*Glycyrrhiza glabra*), and on sandy soils – a fossil felted (*Petasites tomentosus*) and a camel Marshall (*Corispermum marschallii*). The same tapes with a chisel wormwood stretch along the cattle trail paths along the shores of lakes and rivers, for example along the Aszyozeku. The duration of their existence is measured by ten or more years, but they are resistant only to the appearance of sheep, beginning to gnaw leaves of wormwood and turning these groupings into a highly sparse weed (ruderal) malfunction (rudus).

Figure 4 – Tall wormwood disruptions near to Ushtan wintering in Zhanibek district

Lerhopolyno-ephemeral disruptions. Lherhopolyno-ephemeral *(Artemisia Lerchiana)* scotopoies, which are caused by grazing of various types of livestock from the communities of cereals *(Gramineae)* and Lerholyna-cereal associations, are also frequent. Among the rare and largely oppressed wormwood of Lerch (*Artemisia Lercheana*) and the same rod (*Kochia prostrata*), here in the spring, the *Roa bulbosa, Carex praecox* and the species *Eremopyrum*, thanks to which such pastures still retain some fodder value until mid-June.

Ephemeral-ebelekovye disruptions. One of the most common types of disruptions should be called the Ebelian (from *Ceratocarpus arenarius*), formation of which can be caused by animals. Abelian failures are characteristic of more or less cohesive light chestnut soils, developing both from cereal and Lerholyna-cereal communities. Ebelek is eaten by all kinds of livestock, why he himself on such sites is represented by extremely short, small plants, which still form an almost continuous grayish carpet. In addition to the Ebeleks *(Ceratocarpus)*, *Camphorosma monspeliacum*, *Lepidium perfoliatum* and *Alyssum desertorum*, which are not eaten by cattle, are common here. Very rare are the underdeveloped, severely depressed *Kochia prostrata* and single specimens of *Roa bulbosa*. *Descurainia sophia*, *Chorispora tenella* are also common here, to which *Ceratocephalus orthoceras* (*Myosurus minimus*), *Androsace maxima* and ephemeroids (*Gagea minima* and *S. bulbifera*) sometimes attach in notable numbers. It is eaten only in the first half of summer, when the yield of such a malfunction is about 1.0-1.5 c/ha.

Conclusions. The assessment presented in this work is schematic; more accurate results can be obtained by taking into account a detailed ration of livestock and productivity of forage lands in the region.

In order to increase the productivity of hayfields and pastures and to prevent their degradation, it is necessary to follow recommendations for their rational use. The rational use of fodder lands includes pasture rotation systems with proper grazing organization, optimum timing of the beginning and end of grazing, proper distribution of pasture areas between different livestock species, maintenance of a moderate load and provision of conditions for good growth, renewal of forage grasses and accumulation of nutrients. Since there is a favorable condition for the level of load of livestock in the pasture, it is possible to further increase its livestock in all landscape areas of the region.

Due to the decrease in the number of vulnerable endangered plant species and increase in the anthropogenic pressure on their habitats it is necessary to prohibit a cutting down of forests, cattle grazing, plowing of steppes, collection of flowers, seeds and bulbs. In addition, it is necessary to optimize pasture use and haymaking taking into account conservation of biodiversity of wild plants and to change pastures and hayfields.

Based on the results of the assessment of the ecological state, it is recommended to develop a system of measures to improve the use of pasture territories. Since there is a favorable condition for the level of load of livestock in the pasture, it is possible to further increase its livestock in all landscape areas of the region. To preserve the biodiversity of the steppes used for grazing, it is advisable to alternate regimes of adjustable grazing in the paddock system.

Taking into account the fact that currently in the West Kazakhstan region there are no specially protected natural areas with strict protection regime, the organization of a new environmental institution will allow us not only to ensure preservation and restoration of the steppe biodiversity of the region, but also to improve social and economic conditions through creation of additional work places, development of ecological tourism, etc. To a large extent this will be facilitated by the creation of a large State Nature Reserve "Bokeyorda" and an integrated state nature reserve in the west of the West Kazakhstan region.

Acknowledgements. *Research was carried out in the framework of the project of the Government of Kazakhstan and the Global Environment Facility, United Nations Development Programme 'Conservation and sustainable management of steppe ecosystems', which is aimed at increasing the steppe ecosystems. Contract No 62761.*

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БАТЫС ҚАЗАҚСТАН ОБЛЫСЫНДА ЖОБАЛАНҒАН «БӨКЕЙОРДА» МЕМЛЕКЕТТІК ТАБИҒИ РЕЗЕРВАТ АУМАҒЫНДАҒЫ МАЛ АЗЫҒЫНА АРНАЛҒАН ЖЕРЛЕРІН ГЕОЭКОЛОГИЯЛЫҚ ТҰРҒЫДАН БАҒАЛАУ

Аннотация. Ғылыми зерттеу жүргізу нәтижесінде Батыс Қазақстан облысында жобаланған «Бөкей-орда» мемлекеттік табиғи резерват мал азығына арналған жерлердің қазіргі кездегі геоэкожүйелерін бағалау жүргізілді. Экожүйелік талдау және ГАЖ технологиясы негізінде функционалдық учаскелер мен резерваттың шекаралары анықталып, мал азығына арналған жерлердің картасы жасалынды. Резерваттың мал азығына арналған жерлердің тозу себептері талданды. Жайылымның дигрессияға ұшыраған жерлерінің негізгі түрлері сипатталған.

Түйін сөздер: жобаланған мемлекеттік табиғи резерват, дала аймағы, экожүйе, мал азығына арналған жерлер, дигрессия.

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ГЕОЭКОЛОГИЧЕСКАЯ ОЦЕНКА КОРМОВЫХ УГОДИЙ НА ТЕРРИТОРИИ ПРОЕКТИРУЕМОГО ГОСУДАРСТВЕННОГО ПРИРОДНОГО РЕЗЕРВАТА «БОКЕЙОРДА» ЗАПАДНО-КАЗАХСТАНСКОЙ ОБЛАСТИ

Аннотация. В результате исследовании геоэкосистем проведена оценка состояния кормовых угодий проектируемого государственного природного резервата «Бокейорда» Западно-Казахстанской области. На основе экосистемного анализа и ГИС-технологии определены границы резервата, проведено зонирование функциональных участков и составлена карта кормовых угодий. Выполнен анализ причин деградации кормовых угодий резервата. Дана характеристика основных типов пастбищных дигрессий.

Ключевые слова: проектируемый государственный природный резерват, степи, экосистема, кормовые угодья, дигрессия.

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www:nauka-nanrk.kz

ISSN 2518-170X (Online), ISSN 2224-5278 (Print)

http://geolog-technical.kz/index.php/kz/

Верстка *Д. Н. Калкабековой*

Подписано в печать 16.10.2017.
Формат 70x881/8. Бумага офсетная. Печать – ризограф.
18,9 п.л. Тираж 300. Заказ 5.

Национальная академия наук РК
050010, Алматы, ул. Шевченко 28, т. 272-13-19, 272-13-18