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«ҚАЗАҚСТАН РЕСПУБЛИКАСЫ
ҰЛТТЫҚ ҒЫЛЫМ АКАДЕМИЯСЫ» РҚБ
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ХАБАРЛАРЫ

ИЗВЕСТИЯ

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STUDY OF THE ECOSYSTEM AND UNIQUE NATURAL OBJECTS OF THE CHINGIRLAU DISTRICT OF THE WEST KAZAKHSTAN REGION USING GIS TECHNOLOGIES

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Abstract. The issue of further improvement of the environmental protection system is relevant in the context of economic development and strengthening the use of natural resources. Rational use of natural resources in market conditions requires adequate application of new scientific and methodological approaches. One of such system-analytical methods of environmental monitoring organizations is the combination of traditional ground-based methods with geoinformation systems (GIS) technologies. The purpose of our study is to study the current state of ecosystems, natural objects based on the ecosystem approach.

Geobotanical, soil, floristic descriptive, comparative, statistical, system analysis, cartographic, complex and ecosystem studies were carried out in the complex using

generally accepted methods. The monitoring sites were laid with their data applied to the topography and GPS data on the sites were recorded.

The studied territory is located in a dry-steppe zone, with a non-washing type of water regime, under dark chestnut soils in combination with various soil combinations, steppe communities differ in significant floral diversity, where xerophilic plant groupings are formed.

Based on the conducted research, the following have been developed: a soil and geobotanical map of the Chingirlau district of the West Kazakhstan region using GIS technologies. 129 types of ecosystems have been identified on the territory of the Chingirlau district, their brief characteristics are given in Table and on the map of ecosystems, which, as a result of their typological grouping, structural and genetic classification, are ordered into a hierarchical systematics.

As a result of our research, a simple and at the same time practically accessible to a wide audience of GIS user's methodology for compiling a digital soil map using the ArcGIS software product has been developed. To make a map, you can use any scanned cartographic basics, photo plans, and, if available, other raster materials. In general, in the studied territories of the Chingirlau district of the West Kazakhstan region, the balance in natural complexes is not disturbed.

Key words: ecosystem, unique natural objects. GIS technologies. digital map, soil and plants

Conflict of interest: *The authors declare that there is no conflict of interest.*

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БАТЫС ҚАЗАҚСТАН ОБЛЫСЫ ШЫҢҒЫРЛАУ АУДАНЫНЫҢ ЭКОЖҮЙЕСІ МЕН ЕРЕКШЕ ТАБИҒИ ОБЪЕКТІЛЕРІН ГАЖ-ТЕХНОЛОГИЯЛАРЫ АРҚЫЛЫ ЗЕРТТЕУ

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Аннотация. Қоршаған ортаны қорғау жүйесін одан әрі жетілдіру мәселесі экономиканың дамуы мен табиғи ресурстарды пайдаланудың артуы жағдайында өзекті болып табылады. Нарық жағдайында табиғи ресурстарды ұтымды пайдалану жаңа ғылыми-әдістемелік тәсілдерді қолдануды талап етеді. Ұйымдардың экологиялық мониторингінің осындай жүйелік-аналитикалық әдістерінің бірі дәстүрлі жерүсті әдістерін географиялық ақпараттық жүйелер (ГАЖ) технологияларымен біріктіру болып табылады. Зерттеу жұмысымыздың мақсаты – экожүйелердің, табиғи объектілердің қазіргі жағдайын экожүйелік тәсіл негізінде зерттеу.

Зерттелетін аумақтағы кешенде жалпы қабылданған әдістерді қолдана отырып, геоботаникалық, топырақтық, флористикалық, сипаттамалық, салыстырмалы-статистикалық, жүйелік-аналитикалық, картографиялық, кешенді және экожүйелік зерттеулер жүргізілді. Бақылау учаскелері олардың деректері картаға түсіріліп, мәліметтер GPS деректері бойынша жазылды. Зерттелетін аумақ құрғақ дала зонасында орналасқан, су режимінің өшпейтін түрі, қара қоңыр топырақтарының әртүрлі топырақ комбинацияларымен кездеседі, ксерофильді өсімдіктер топтары бар далалық қауымдастықтар айтарлықтай флористикалық әртүрлілігімен ерекшеленіп қалыптасып жатыр.

Жүргізілген зерттеулер негізінде ГАЖ технологиялары арқылы Батыс Қазақстан облысы Шыңғырлау ауданының топырақ-геоботаникалық картасы жасалды. Шыңғырлау ауданының аумағында экожүйелердің 129 түрі бар, олардың қысқаша сипаттамасы кестеде және экожүйелер картасында берілген, олардың типологиялық топтастырылуы, құрылымдық-генетикалық жіктелуі нәтижесінде иерархиялық жүйеде орналасқан. Біздің зерттеулеріміздің нәтижесінде қарапайым және сонымен қатар ГАЖ пайдаланушыларының кең ауқымына іс жүзінде қол жетімді ArcGIS бағдарламалық өнімін пайдалана отырып, сандық топырақ картасын құру әдісі әзірленді. Картаны құрастыру үшін, егер бар болса, сканерленген кез келген картографиялық негіздерді, фотопландарды және басқа растрлық материалдарды пайдалануға болады. Жалпы Батыс Қазақстан облысы Шыңғырлау ауданына қарасты зерттелген аумақтардағы табиғи кешендердің тепе-теңдігі бұзылмаған.

Түйін сөздер: экожүйе, бірегей табиғи объектілері, ГАЖ технологиялары, сандық карта, топырақ және өсімдіктер.

Мүдделер қақтығысы*: Авторлар осы мақалада мүдделер қақтығысы жоқ деп мәлімдемейді.*

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ИЗУЧЕНИЕ ЭКОСИСТЕМЫ И УНИКАЛЬНЫХ ПРИРОДНЫХ ОБЪЕКТОВ ЧИНГИРЛАУСКОГО РАЙОНА ЗАПАДНО-КАЗАХСТАНСКОЙ ОБЛАСТИ С ИСПОЛЬЗОВАНИЕМ ГИС-ТЕХНОЛОГИЙ

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Аннотация. Вопрос дальнейшего совершенствования системы охраны окружающей среды является актуальным в условиях экономического развития и рационального использования природных ресурсов. Рациональное использование природных ресурсов в рыночных условиях требует адекватного применения новых научно-методических подходов. Одним из таких системно-аналитических способов организации экологического мониторинга является сочетание традиционных наземных методов с технологиями геоинформационных систем (ГИС). Цель наших исследований – изучение современного состояния экосистем, природных объектов на основе экосистемного подхода.

В комплексе проведены геоботанические, почвенные, флористические описания, сравнительные, статистические, системного анализа,

картографические, комплексные и экосистемные исследования на изучаемой территории с использованием общепринятых методик. Произведена закладка мониторинговых площадок с нанесением их данных на топоснову и зафиксированы GPS-данные по площадкам. Исследуемая территория находится в условиях сухостепной зоны, при непромывном типе водного режима, под темно-каштановыми почвами в сочетании с различными типами почв, степные сообщества отличаются значительными флористическими разнообразиями, где формируются ксерофильные растительные группировки.

На основе проведенных исследований разработаны почвенная и геоботаническая карты Чингирлауского района Западно-Казахстанской области с использованием ГИС-технологий. На территории Чингирлауского района выделено 129 типов экосистем, их краткая характеристика приведена в таблице и на карте экосистем, которые в результате их типологической группировки, структурно-генетической классификации и упорядочены в иерархическую систему.

В результате наших исследований, разработана простая и в то же время практически доступная для широких аудиторий пользователей ГИС методика составления цифровой почвенной карты с помощью программного продукта ArcGIS. Для составления карты можно пользоваться любыми отсканированными картографическими основами, фотопланами, а при наличии и другими растровыми материалами. В целом на исследованных территориях Чингирлауского района Западно-Казахстанской области равновесие в природных комплексах не нарушено.

Ключевые слова: экосистема, уникальные природные объекты, ГИС технологий, цифровая карта, почва и растения.

Конфликт интересов: *авторы заявляют об отсутствии конфликта интересов.*

Introduction

Preservation of biological diversity of ecological systems, unique natural complexes, objects of the nature reserve fund, cultural and natural heritage of the Republic of Kazakhstan is one of the important tasks of the state at the present stage (Salikhov, et al., 2016).

Preservation and improvement of soil fertility is the main part of the general problem of rational use of land resources, increasing productivity and improving the soil ecology of agricultural landscapes (Salikhov, et al., 2022).

A significant part of the natural steppe spaces on Earth is located in Kazakhstan, which amount to over 120 million hectares. In turn, the steppe ecosystems of Kazakhstan are places of distribution of the unique flora of the steppes, globally endangered species of steppe fauna (Salikhov, 2017a).

The first best-known experience of the global assessment of ecosystem services was conducted by the American economist Robert Costanza in 1997. The results gave a total annual estimate of all the functions of the natural ecosystems of the

globe at an average of 33 trillion US dollars, which was almost twice the GNP created by mankind (18 trillion US dollars per year) (Costanza R., et al., 1997).

Therefore, the problem of preserving the biodiversity of ecosystems is in the focus of attention of scientists and specialists in environmental protection. In Russia, this topic was studied by N.F. Reimers, F.R. Stilmark and V.G. Gorshkov, using the Ae Chatelier principle (Geimere, et al., 1978).

The issue of further improvement of the environmental protection system is relevant in the context of economic development and strengthening the use of natural resources. In order to preserve and restore biological diversity and natural ecological systems, the Decree of the Government of the Republic of Kazakhstan approved the "Concept of development and placement of specially protected natural territories of the Republic of Kazakhstan until 2030", aimed at preserving biological diversity, defined by this concept, is primarily the conservation of biodiversity of the main animal species, globally significant populations of steppes and semi–deserts, to improve the network of interconnected and protected areas in Kazakhstan (On the Concept of development and placement of specially protected natural territories of the Republic of Kazakhstan until 2030, 2000).

Rational use of natural resources in market conditions requires adequate application of new scientific and methodological approaches. One of such system-analytical methods of environmental monitoring organizations is the combination of traditional ground-based methods with geoinformation systems (GIS) technologies based on the widespread use of aerospace images of different resolutions. This approach underlies the agricultural geoinformation systems of developed countries of the world, where the ecosystem is the main subsystem of this information product (Salikhov, et al., 2020).

Therefore, the need for objective and systematic information about the country's environmental resources is constantly growing. The latter dictates the need to create a fundamentally different system of accounting, assessment and monitoring of environmental systems, different from the management of other types of material resources.

Research materials and methods

The purpose of our research is to study the current state of ecosystems, unique natural objects and to develop an ecosystem map of the Chingirlau district of the West Kazakhstan region based on the use of GIS technologies to solve promising tasks of monitoring land resources and the development of agrobioindustry.Materials and methods. Geobotanical, soil, floristic descriptive, comparative, statistical, system analysis, cartographic, complex and ecosystem studies were carried out in the complex using generally accepted methods (Issayeva, et al., 2019; Methodological guidelines for the maintenance of the Chronicle of Nature in specially protected natural areas with the status of a legal entity, 2007; Alekhin, 1983; Gedymin, et al., 1981; Grishina, et al., 1991; Lurie, 2002; Salikhov, et al., 2023; Salikhov, 2017b). The monitoring sites were laid with their data applied to the topography and GPS data on the sites were recorded. The habitats of key plant and animal species were mapped, and the impact of negative factors on biological diversity was assessed.

The fundamental principle for the allocation of valuable sites was an ecosystem campaign based on a comprehensive assessment of the ecological state of the natural components of the studied territory, the dominant biogeocenoses of the natural environment of the steppes using remote sensing data and GIS technology.

The application of the ecosystem approach concept as a methodological basis for the allocation of valuable sites allowed the assessment of the qualitative potential of biodiversity based on the existing correlation between the ecotope (habitat type), vegetation type, etc.

Our field surveys supplement the research data with new factual material. Generally accepted and approved methods of ecosystem research were used during field work.

Results and discussion

Environmental studies based on the geosystem approach and new information technologies have been carried out on the territory of the Chingirlau district of the West Kazakhstan region.

The studied territory is located in a dry-steppe zone, with a non-washing type of water regime, under dark chestnut soils in combination with various soil combinations, steppe communities differ in significant floral diversity, where xerophilic plant groupings are formed.

By the nature of the relief, it represents an almost hollow-flat and slightly undulating plain with a slight slope to the south. This plain is represented in places by depressions, quarrels and ancient channels of temporary watercourses.

The study of plant communities showed that 42.7% of the species (537), 54.4% (265) genera and 56.4% (66) families are represented in the studied territory of the Chingirlau district from the total flora of the West Kazakhstan region. The richest in species are 3 families: composite flowers, represented by 95 (17.3%) species, cereals – 54 (9.8%) species and haze - 42 species (7.6%); a total of 191 (35%) species (Lurie, 2002).

In addition, the vegetation cover of the studied territory is characterized by the complexity of soils, and the spread of halophytic communities, characterized by diversity, where the predominance of zonal soil types is pronounced. Based on the conducted research, the following have been developed: a soil and geobotanical map of the Chingirlau district of the West Kazakhstan region using GIS technologies (Salikhov, et al., 2020; Lurie, 2002; Salikhov, et al., 2023).

129 types of ecosystems have been identified on the territory of the Chingirlau district, their brief characteristics are given in Table 1 and on the map of ecosystems, which, as a result of their typological grouping, structural and genetic classification, are ordered into a hierarchical systematics (Fig. 1 and Fig. 2).

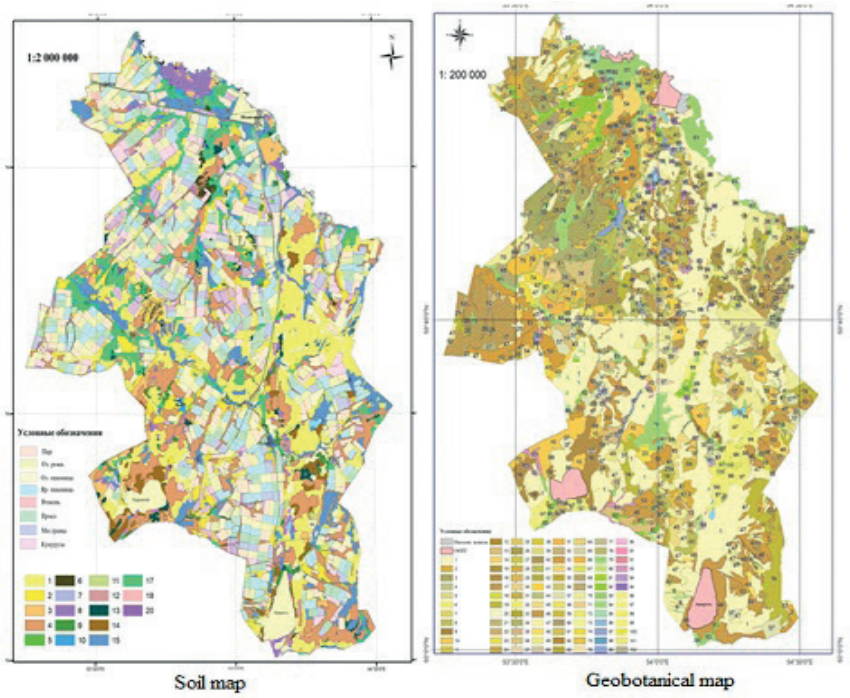

Figure 1 - Soil and plant map of the Chingirlau district of the West Kazakhstan region

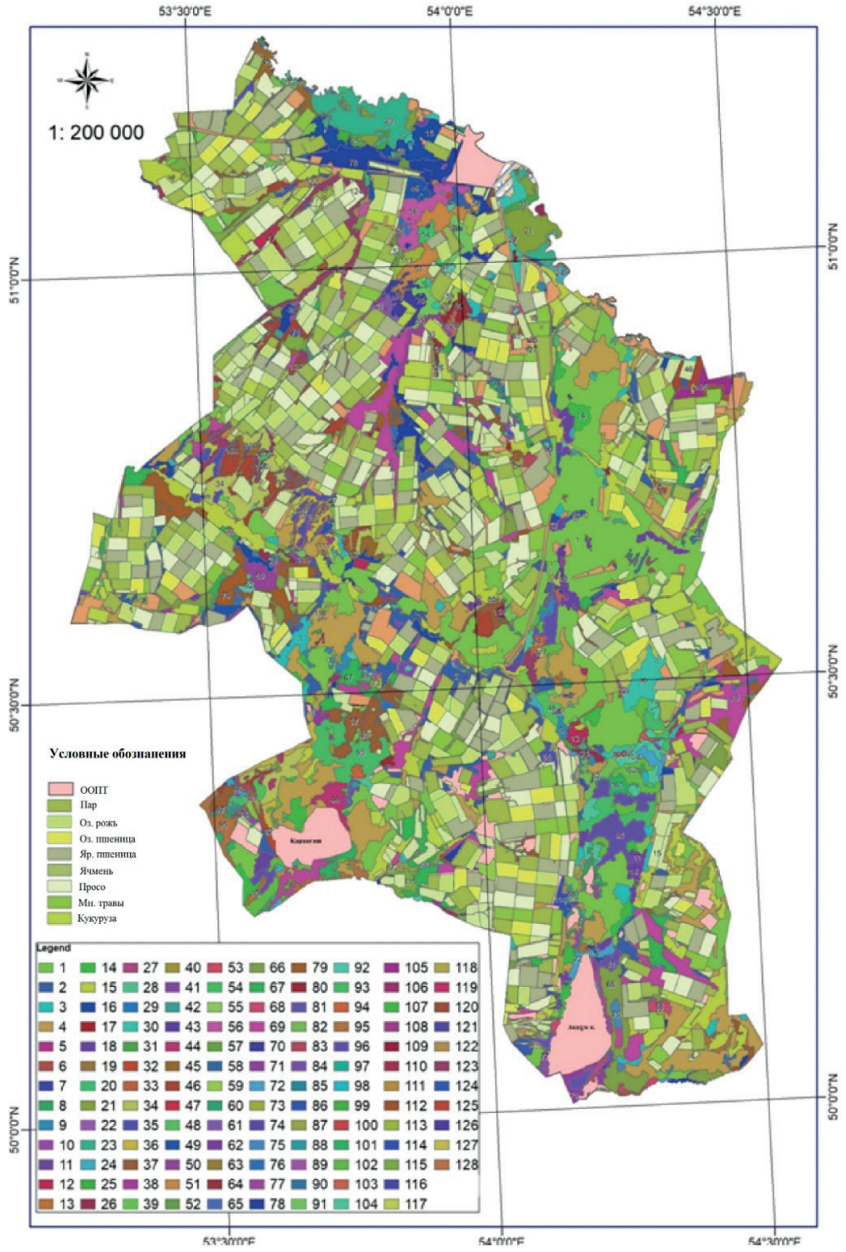

Figure 2 – Map of ecosystems of the Chingirlau district of the West Kazakhstan region

The results of component ecosystem studies, satellite images, GPS-linked field research materials integrated in a single cartographic projection and coordinate system, topographic maps, etc. were used as the initial information for mapping ecosystems of the studied territory.

Table 1 - Ecosystem classification

№	Relief. Title. Soil
1	2
1	Plains and bumpy sands. Varietal-cereal, with a predominance of John's, Lessing's and hairy's grass. Dark chestnut
2	Plains. Grass-grass-wormwood (euphorbia Segirrovskiy, yarrow small-flowered, Russian bedstraw, sandy immortelle, grasshoppers: sandy, hairy, Becker's fescue, brittle wheatgrass, wormwood: Austrian. Dark chestnut
3	Plains and bumpy sands. Granary-cereal with a predominance of comb-shaped granary. Dark chestnut
4	Plains, bumpy sands and depressions. Tyrsovo-cereal with a predominance of tipchak and Becker's oatmeal. Dark chestnut
5	Lowlands and plains. Hayfields with a predominance of swamp. Dark chestnut
6	Lowlands and river valleys. Shrub-grass-mixed grass with a predominance of caragana meadowsweet. Dark chestnut
7	Plains, lowlands and river valleys. Meadow-grass. Dark chestnut
8	Lowlands and river valleys. Cereal-mixed grass with a predominance of wheatgrass and rumps, sometimes of the east. Dark chestnut
9	Plains, lowlands and river valleys. Kovylno-chiyzlakovaya-mixed grass with a predominance of volosnets, vostretsa and chiya. Dark chestnut
10	Plains, lowlands and river valleys. Akmamykty-lebedovaya with kermek and akmamyk. Dark chestnut
11	Plain. Ephemeral, with a predominance of bluegrass, bulbous, volosnets. Dark chestnut
12	Plain. Steppe grass-grass sometimes with wormwood. Dark chestnut
13	Plains and bumpy sands. Tyrsozlakovo-tavolgovaya. Dark chestnut
14	Plains and bumpy sands. Wormwood, with a predominance of green wormwood, Marshal and chagyr. Dark chestnut
15	Plains, lowlands and river valleys. Wormwood, with a predominance of gray wormwood, Lerch and Austrian. Dark chestnut
16	Plains and lowlands. Mixed wormwood, with a predominance of black wormwood (low-flowered) . Dark chestnut
17	Lowlands. Wormwood pasture with a predominance of solyanka and quinoa. Dark chestnut
18	Plains and bumpy sands. Sandy-and-grassy with a predominance of motley grasses and milkweed. Dark chestnut
19	Plains and bumpy sands. Varietal-cereal, with a predominance of John's, Lessing's and hairy's grass. Dark chestnut + slightly salty chestnut
20	Plain. Grass-grass-wormwood (euphorbia Segirrovskiy, yarrow small-flowered, Russian bedstraw, sandy immortelle, grasshoppers: sandy, hairy, Becker's fescue, brittle wheatgrass, wormwood: Austrian. Dark chestnut + meadow chestnut + slightly salty chestnut
21	Plains and bumpy sands. Granary-cereal with a predominance of comb-shaped granary. Dark chestnut + slightly salty chestnut
22	Plains and bumpy sands and lowlands. Tyrsovo-cereal with a predominance of tipchak and Becker's oatmeal. Dark chestnut + slightly salty chestnut
23	Lowlands and river valleys. Cereal-mixed grass with a predominance of wheatgrass and rumps, sometimes of the vostret. Dark chestnut + slightly salty chestnut
24	Plains, lowlands and river valleys. Feather grass-chiyzlakovaya-mixed grass with a predominance of volosnets, vostretsa and chiya. Dark chestnut + slightly salty chestnut

25	Lowlands and river valleys. Akmamykty-lebedovaya with preobladan kermek and akmamyk. Dark chestnut + slightly salty chestnut
26	Plain. Ephemeral, with a predominance of bluegrass, bulbous, volosnets. Dark chestnut + slightly salty chestnut
27	Plain. Steppe grass-cereal sometimes with wormwood. Dark chestnut + slightly salty chestnut
28	Plains and bumpy sands. Tyrsocereal- meadowsweet. Dark chestnut + slightly salty chestnut
29	Plains and bumpy sands. Wormwood, with a predominance of green wormwood, Marshal and chagyr. Dark chestnut + slightly salty chestnut
30	Plains, lowlands and river valleys. Wormwood, with a predominance of gray wormwood, Lerch and Austrian. Dark chestnut + slightly salty chestnut
31	Plains and lowlands. Mixed wormwood, with a predominance of black wormwood (low-flowered) . Dark chestnut + slightly salty chestnut
32	Lowlands. Wormwood pasture with a predominance of solyanka and quinoa. Dark chestnut + slightly salty chestnut
33	Plains and bumpy sands. Sandy-feather and cereal grass with a predominance of motley grasses and milkweed. Dark chestnut + slightly salty chestnut
34	Plains and bumpy sands. Varietal-cereal, with a predominance of John's, Lessing's and hairy's grass. Dark Chestnut + Meadow chestnut
35	Plain. Grass-cereal-wormwood (euphorbia Segirrovskiy, yarrow small-flowered, Russian bedstraw, sandy immortelle, grasshoppers: sandy, hairy, Becker's fescue, brittle wheatgrass, wormwood: Austrian. Dark Chestnut + Meadow chestnut
36	Plains and bumpy sands and lowlands. Granary-cereal with a predominance of comb-shaped granary. Dark Chestnut + Meadow chestnut
37	Plains and bumpy sands and lowlands. Tyrsovo-cereal with a predominance of tipchak and Becker's oatmeal. Dark Chestnut + Meadow chestnut
38	Lowlands and river valleys. Shrub-cereal-mixed grass with a predominance of caragana meadowsweet. Dark Chestnut + Meadow chestnut
39	Lowlands and river valleys. Cereal-mixed grass with a predominance of wheatgrass and rumps, sometimes of the vostret. Dark Chestnut + Meadow chestnut
Table continuation	
1	2
40	Plains, lowlands and river valleys. Feather grass-chiyzlakovaya-mixed grass with a predominance of volosnets, vostretsa and chiya. Dark Chestnut + Meadow chestnut
41	Plain. Ephemeral, with a predominance of bluegrass, bulbous, volosnets. Dark Chestnut + Meadow chestnut
42	Plain. Steppe grass-cereal grass sometimes with wormwood. Dark Chestnut + Meadow chestnut
43	Plains and bumpy sand. Tyrsocereal- meadowsweet. Dark Chestnut + Meadow chestnut
44	Plains and bumpy sands. Wormwood, with a predominance of green wormwood, Marshal and chagyr. Dark Chestnut + Meadow chestnut
45	Plains, lowlands and river valleys. Wormwood, with a predominance of gray wormwood, Lerch and Austrian. Dark Chestnut + Meadow chestnut
46	Plains and lowlands. Wormwood pasture with a predominance of solyanka and quinoa. Dark Chestnut + Meadow chestnut
47	Lowlands. Sandy-feather and cereal grassy with a predominance of motley grasses and milkweed. Dark Chestnut + Meadow chestnut

48	Plains and bumpy sands. Sandy-feather and cereal grassy with a predominance of motley grasses and milkweed. Dark Chestnut + Meadow chestnut
49	Plains and bumpy sands. Varietal-cereal, with a predominance of John's, Lessing's and hairy's grass. Dark chestnut + meadow chestnut + salt chestnut corky
50	Plain. Grass-cereal-wormwood (euphorbia Segirrovskiy, yarrow small-flowered, Russian bedstraw, sandy immortelle, grasshoppers: sandy, hairy, Becker's fescue, brittle wheatgrass, wormwood: Austrian. Dark chestnut + meadow chestnut + salt chestnut corky
51	Plains and bumpy sands and lowlands. Tyrsovo-cereal with a predominance of tipchak and Becker's oatmeal. Dark chestnut + meadow chestnut + salt chestnut corky
52	Lowlands and river valleys. Shrub-cereal-mixed grass with a predominance of caragana meadowsweet. Dark chestnut + meadow chestnut + salt chestnut corky
53	Lowlands and river valleys. Cereal-mixed grass with a predominance of wheatgrass and rumps, sometimes of the vostret. Dark chestnut + meadow chestnut + salt chestnut corky
54	Plains and bumpy sands. Tyrsocereal- meadowsweet. Dark chestnut + meadow chestnut + salt chestnut corky
55	Plains, lowlands and river valleys. Wormwood, with a predominance of gray wormwood, Lerch and Austrian. Dark chestnut + meadow chestnut + salt chestnut corky
56	Plains and lowlands. Mixed wormwood, with a predominance of black wormwood (low-flowered) . Dark chestnut + meadow chestnut + salt chestnut corky
57	Lowlands. Wormwood pasture with a predominance of solyanka and quinoa. Dark chestnut + meadow chestnut + salt chestnut corky
59	Plain. Grass-cereal grassy-wormwood (euphorbia Segirrovskiy, yarrow small-flowered, Russian bedstraw, sandy immortelle, grasshoppers: sandy, hairy, Becker's fescue, brittle wheatgrass, wormwood: Austrian. Dark chestnut + meadow chestnut + salt chestnut corky
60	Plains and bumpy sands. Granary-cereal with a predominance of comb-shaped granary. Dark chestnut + meadow chestnut + salt chestnut corky
61	Plains and bumpy sands and lowlands. Thyrsa -cereal with a predominance of tipchak and Becker's oatmeal. Dark chestnut + meadow chestnut + salt chestnut corky
62	Lowlands and river valleys. Cereal-mixed grass with a predominance of wheatgrass and rumps, sometimes of the vostret. Dark chestnut + meadow chestnut + salt chestnut corky
63	Plains and bumpy sands. Tyrsocereal- meadowsweet. Dark chestnut + meadow chestnut + salt chestnut corky
64	Plains and lowlands. Mixed wormwood, with a predominance of black wormwood (low-flowered) . Dark chestnut + meadow chestnut + salt chestnut corky
65	Lowlands. Wormwood pasture with a predominance of solyanka and quinoa. Dark chestnut + meadow chestnut + salt chestnut corky
66	Plains and bumpy sands. Varietal-cereal, with a predominance of John 's Feather Grass, Lessing's and hairy's grass. Dark chestnut + corky chestnut solonets
67	Plain. Grass-cereal grass-wormwood (euphorbia Segirrovskiy, yarrow small-flowered, Russian bedstraw, sandy immortelle, grasshoppers: sandy, hairy, Becker's fescue, brittle wheatgrass, wormwood: Austrian. Dark chestnut + corky chestnut solonets
68	Plains and bumpy sands. Granary-cereal with a predominance of comb-shaped granary. Dark chestnut + corky chestnut solonets. Dark chestnut + corky chestnut solonets
69	Plains and bumpy sands and lowlands. Tyrsovo-cereal with a predominance of tipchak and Becker's oatmeal. Dark chestnut + corky chestnut solonets
70	Lowlands and river valleys. Shrub-grass-mixed grass with a predominance of caragana meadowsweet. Dark chestnut + corky chestnut solonets
71	Lowlands and river valleys. Cereal-mixed grass with a predominance of wheatgrass and rumps, sometimes of the vostret. Dark chestnut + corky chestnut solonets

72	Lowlands and river valleys. Feather-chiyzlakovaya-mixed grass with a predominance of volosnets, vostretsa and chiya. Dark chestnut + corky chestnut solonets
73	Lowlands and river valleys. Akmamykty-lebedovaya with a predominance of kermek and akmamyk. Dark chestnut + corky chestnut solonets
74	Plain. Ephemeral, with a predominance of bluegrass, bulbous, volosnets. Dark chestnut + corky chestnut solonets
75	Plain. Steppe grass- cereal grass sometimes with wormwood. Dark chestnut + corky chestnut solonets
76	Plains and bumpy sands. Tyrsocereal- meadowsweet. Dark chestnut + corky chestnut solonets
Table continuation	
1	2
77	Plains and bumpy sands. Wormwood, with a predominance of green wormwood, Marshal and chagyr. Dark chestnut + corky chestnut solonets
78	Plains, lowlands and river valleys. Wormwood, with a predominance of gray wormwood, Lerch and Austrian. Dark chestnut + corky chestnut solonets
79	Plains and lowlands. Mixed wormwood, with a predominance of black wormwood (low-flowered). Dark chestnut + corky chestnut solonets
80	Lowlands. Wormwood pasture with a predominance of solyanka and quinoa. Dark chestnut + corky chestnut solonets
81	Plains and bumpy sands. Sandy-and-grassy with a predominance of motley grasses and milkweed. Dark chestnut + corky chestnut solonets
82	Plains and bumpy sands. Varietal-cereal, with a predominance of John's, Lessing's and hairy's grass. Dark chestnut + solonets
83	Plain. Grass- cereal grass-wormwood (euphorbia Segirrovskiy, yarrow small-flowered, Russian bedstraw, sandy immortelle, grasshoppers: sandy, hairy, Becker's fescue, brittle wheatgrass, wormwood: Austrian. Dark chestnut + solonets
84	Plains, bumpy sands and lowlands. Tyrsovo-cereal with a predominance of tipchak and Becker's oatmeal. Dark chestnut + solonets
85	Lowlands and river valleys. Shrub-grass-mixed grass with a predominance of caragana meadowsweet. Dark chestnut + solonets
86	Lowlands and river valleys. Cereal-mixed grass with a predominance of wheatgrass and rumps, sometimes of the vostrets. Dark chestnut + solonets
87	Plains, lowlands and river valleys. Feather-chiycereal-mixed grass with a predominance of volosnets, vostretsa and chiya. Dark chestnut + solonets
88	Lowlands and river valleys. Akmamykty-lebedovaya with a predominance of kermek and akmamyk. Dark chestnut + solonets
89	Plains and bumpy sands. Tyrsocereal- meadowsweet. Dark chestnut + solonets
90	Plains, lowlands and river valleys. Wormwood, with a predominance of gray wormwood, Lerch and Austrian. Dark chestnut + solonets
91	Plains and lowlands. Mixed wormwood, with a predominance of black wormwood (low-flowered). Dark chestnut + solonets
92	Lowlands. Wormwood pasture with a predominance of solyanka and quinoa. Dark chestnut + solonets
93	Plains and bumpy sands. Varietal-cereal, with a predominance of John's feather grass, Lessing's and hairy's grass. Dark chestnut + flat sands fixed

94	Plain. Grass-cereal grass-wormwood (euphorbia Segirrovskiy, yarrow small-flowered, Russian bedstraw, sandy immortelle, grasshoppers: sandy, hairy, Becker's fescue, brittle wheatgrass, wormwood: Austrian. Dark chestnut + flat sands fixed
95	Plains and bumpy sands. Breadbasket - cereal with a predominance of comb-shaped granary. Dark chestnut + flat sands fixed
96	Plains,bumpy sands and lowlands. Tyrsovo-cereal with a predominance of tipchak and Becker's oatmeal. Dark chestnut + flat sands fixed
97	Lowlands and river valleys. Cereal-mixed grass with a predominance of wheatgrass and rumps, sometimes of the vostrets. Dark chestnut + flat sands fixed
98	Plains, lowlands and river valleys. Feather-chiycereal-mixed grass with a predominance of volosnets, vostretsa and chiya. Dark chestnut + flat sands fixed
99	Lowlands and river valleys. Ephemeral, with a predominance of bluegrass, bulbous, volosnets. Dark chestnut + flat sands fixed
100	Plain. Steppe grass-cereal grass sometimes with wormwood. Dark chestnut + flat sands fixed
101	Plains and bumpy sands. Tyrsocereal- meadowsweet. Dark chestnut + flat sands fixed
102	Plains and bumpy sands. Wormwood, with a predominance of green wormwood, Marshal and chagyr. Dark chestnut + flat sands fixed
103	Plains, lowlands and river valleys. Wormwood, with a predominance of gray wormwood, Lerch and Austrian. Dark chestnut + flat sands fixed
104	Plains and bumpy sands. Sandy-and-grassy with a predominance of motley grasses and milkweed. Dark chestnut + flat sands fixed
105	Plains and bumpy sands. Varietal-cereal, with a predominance of John's feather grass, Lessing's and hairy's grass. Chestnut + clay outcrops
106	Plain. Grass-cereal grass-wormwood (euphorbia Segirrovskiy, yarrow small-flowered, Russian bedstraw, sandy immortelle, grasshoppers: sandy, hairy, Becker's fescue, brittle wheatgrass, wormwood: Austrian. Chestnut + clay outcrops
107	Plains and bumpy sands. Breadbasket-cereal with a predominance of comb-shaped breadbasket. Chestnut + clay outcrops
108	Plains and bumpy sands. Tyrsocereal- meadowsweet. Chestnut + clay outcrops
109	Plains and bumpy sands. Varietal-cereal, with a predominance of John's feather grass, Lessing's and hairy's grass. Chestnut + dense rock outcrops
110	Plain. Grass-cereal grass-wormwood (euphorbia Segirrovskiy, yarrow small-flowered, Russian bedstraw, sandy immortelle, grasshoppers: sandy, hairy, Becker's fescue, brittle wheatgrass, wormwood: Austrian. Chestnut + dense rock outcrops
111	Plains and bumpy sands. Breadbasket-cereal with a predominance of comb-shaped breadbasket. Chestnut + dense rock outcrops
112	Plains, lowlands and river valleys. Wormwood, with a predominance of gray wormwood, Lerch and Austrian. Chestnut + dense rock outcrops
113	Plains and bumpy sands. Varietal-cereal, with a predominance of John's feather grass, Lessing's and hairy's grass. Meadow chestnut
114	Plain. Grass-cereal grass-wormwood (euphorbia Segirrovskiy, yarrow small-flowered, Russian bedstraw, sandy immortelle, grasshoppers: sandy, hairy, Becker's fescue, brittle wheatgrass, wormwood: Austrian. Meadow chestnut
Table continuation	
1	2
115	Plains,bumpy sands and lowlands. Tyrsovo-cereal with a predominance of tipchak and Becker's oatmeal. Meadow chestnut

116	Lowlands and river valleys. Shrub- cereal grass-mixed grass with a predominance of caragana meadowsweet. Meadow chestnut
117	Lowlands and river valleys. Cereal-mixed grass with a predominance of wheatgrass and rumps, sometimes of the vostrets. Meadow chestnut
118	Lowlands and river valleys. Akmamykty-lebedovaya with predominance of kermek and akmamyk. Meadow chestnut
119	Plain. Ephemeral, with a predominance of bluegrass, bulbous, volosnets. Meadow chestnut
120	Plain. Steppe grass-cereal grass sometimes with wormwood. Meadow chestnut
121	Plains and bumpy sands. Tyrsocereal- meadowsweet. Meadow chestnut
122	Plains, lowlands and river valleys. Wormwood, with a predominance of gray wormwood, Lerch and Austrian. Meadow chestnut
123	Plains and lowlands. Mixed wormwood, with a predominance of black wormwood (low-flowered). Meadow chestnut
124	Lowlands. Wormwood pasture with a predominance of solyanka and quinoa. Meadow chestnut
125	Plains,bumpy sands and lowlands. Thyrsa-cereal with a predominance of tipchak and Becker's oatmeal. Meadow chestnut
126	Plains, lowlands and river valleys. Varietal-cereal, with a predominance of John's feather grass, Lessing's and hairy's grass. Meadow chestnut
127	Plains, lowlands and river valleys. Feather-chiycereal-mixed grass with a predominance of volosnets, vostretsa and chiya. Meadow chestnut
128	Plains and lowlands. Mixed wormwood, with a predominance of black wormwood (low-flowered). Meadow chestnut
129	Lowlands. Sandy-feather and cereal grassy with a predominance of motley grasses and milkweed. Meadow chestnut

Rare natural complexes and unique natural objects, which serve as a refuge for many species of plants and animals, have been preserved in the studied territory. Peculiar natural complexes and unique natural objects, as well as rich recreational potential make it possible to allocate a large number of natural heritage sites within the territory of the district. The following natural complexes and unique natural objects are found on the surveyed territories:

1. Accuma tract (Landscape reserve). It has the status of regional significance. It is located in the extreme south of the Chingirlau district and covers an area of 7.5 thousand hectares. The nature reserve includes the Accuma sand massif, Kindykty, Segizsay and Karatal tracts. The Karatal tract is located on the territory of the Karatyubinsky district. The sandy massif is located near the confluence of the rivers Kuagash and Karasu (Petrenko, et al., 2001).

Accumulations in landscape terms are the ancient delta sandy plain of the Kaldygaity River, which in the Quaternary period was full-flowing and flowing into the ancient sea, deposited its delta. The relief of the sandy massif is dominated by bumpy sands, with hollows of blowing. The central part of the massif is occupied by loose dune-bumpy sands almost devoid of vegetation, only in places in separate hollows of blowing there are tree and shrub thickets. The margins of the bumpy sands are anchored by herbaceous, shrubby and woody vegetation dominated by sandy wormwood, Colchian sedge, Cossack juniper, meadowsweet and other

psammophytes. Birch, aspen, willow, sand mounds are occupied by broom, juzgun and karagana grow in the hollows of the vyduvaniya. The valley of the Kaldygaity river is occupied by meadow-grass-tree-shrub plant communities on meadow-swamp, meadow-swamp, meadow-chestnut alluvial soils. Plant groupings are arranged here in strips: reed-shrubby ones are replaced on the terrace by plots of grass-grass meadows and thickets of birch and aspen.

The Kindykty and Karatal tracts are woodlands. Located in swampy depressions of the estuary type. They are the refuge of many rare plant species, including dremlik, belozor, pellia, drepanocladus, primrose, mnium and others found only here. In the western part of the reserve, in the ravines of Sezizsai, bayrachny birch-aspen fishing lines with various grass and shrub associations grow. The territory of the reserve has a significant biological diversity, 243 plant species are registered here, of which 56 species are listed in the Red Book of Kazakhstan and recommended for inclusion in the list of rare and endangered species of the region (Petrenko, et al., 1998).

The animal world of Accumulators is distinguished by a mixture of forest. meadow and steppe species. It is home to about 100 species, including 60 species of birds, 20 species of mammals, 7 species of reptiles and fish, and 3 species of terrestrial and aquatic (Debelo, et al., 1999). On the territory of the reserve there are areas of the giant blind, listed in the Red Book of Kazakhstan.

In the future, there is a project to increase the area of the reserve at the expense of the nearby territories of the Bayanas tract and reorganize it into a landscape reserve of republican significance.

2. Karaagash tract (State reproductive hunting farm). Organized in 1971. The area of the hunting farm is 17.7 thousand hectares. The hunting farm occupies the territory of sandy massifs in the upper reaches of the Buldurty River. It includes the Karaagash tract, and part of the Bigula sandy massif, within the northern part of the sandy plain of the Pre-Syrtov ledge. Dry-steppe bumpy, fixed and loose sands were formed here. They are found among dark chestnut and chestnut zonal soils and represent ancient week formations processed by the wind (Petrenko, et al., 1998). To the south of the sandy massif there is an estuary-type depression, irrigated by springs with woody and shrubby vegetation. On the left bank of the Buldurty River, dune-bumpy sands have been preserved, forming a kind of group of tracts (Fig. 3).

The relief of the sandy massif is dominated by mounds with hollows of blowing. The relative height of individual mounds reaches 8 meters or more. Along the outskirts, the relief is hollow-hilly, with small inter-hilly depressions. In the center, the mounds are higher, have scanty vegetation cover, in places the mounds and their slopes are occupied by thickets of willow and caragana covered with sand. In the hollows of the blowing, Colchian sedge grows, and in deeper places there are birch-shrub associations and thickets of reeds. Closer to the outskirts, the sands become more fixed - srednebugristye. The mounds are occupied by Cossack juniper and leafless juzgun. The hollows of the blowing are occupied by forest spikes

overgrown with aspen, birch, rosemary-leaved willow, buckthorn. The vegetation cover on the outskirts of the sandy massif becomes thicker, the projective cover is on average 30% and is represented by sand-wormwood-psammophytic communities, in the species composition of which sandy wormwood, giant volsenets, milkweed, chondrilla, sedge, desert granary, etc. predominate.

In the estuary-type lowlands there is a forest area, which consists of birch-aspen woody vegetation, in the undergrowth - from shrub communities (willow, rosehip, honeysuckle, buckthorn, etc.), and the subspecies - from a meadow grass association.

The various grasses are represented by the following species: labaznik, krovohlebka, cypress, perlovnik, krestovnik, osot, bedstraw tenacious, sedge and reed grow in the swampy areas. 138 plant species have been recorded on the territory of the farm, among which northern forest species dominate and 15% are inhabitants of the sands and adjacent steppe areas.

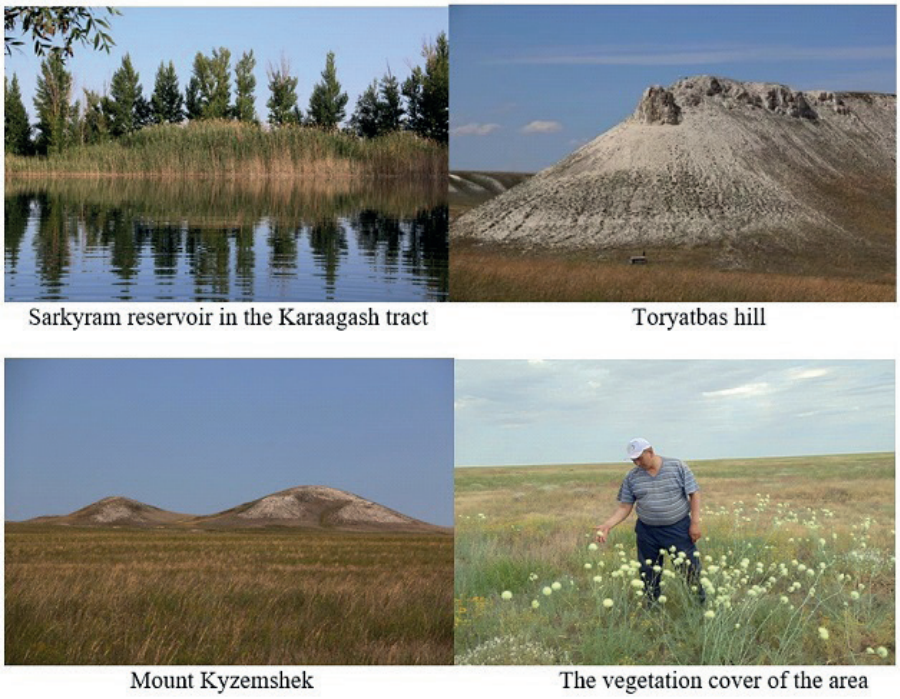

Figure 3 - Natural complexes and unique natural objects of the area

The fauna of the farm, due to its relatively small area, is not rich. About 20 species of mammals, about 50 steppes and dendrophilous bird species, 6 species of reptiles, as well as 5-6 species of fish have been recorded on the territory of the farm. Among the animals are rare and endangered species – the giant blind man, the belladonna crane, the steppe eagle, the eagle owl, the flutter, bustard, etc., listed in

the Red Book of Kazakhstan and recommended for inclusion in the list of rare and endangered species of the fauna of the region.

The rich landscape and biological diversity of the hunting economy dictates the need to organize a state integrated nature reserve here.

3. Sorkol tract (meadow-salt marsh complex). On the gently sloping shores of the steppe lake, a kind of meadow vegetation was formed with marsh whiteflower and long-stemmed primrose. These plant species grow in moist places, and their main habitat is in the northern forest areas. In our region, both of these plant species have been recorded in only two places, so it is extremely important to preserve their habitats. The lake is located 3.5 km northeast of the village of Sorkol of the same name. The area is about 750 ra, the territory of Almaznensky rural district. The type of monument is botanical.

4. Kindykty tract. The tract is located in a vast depression, where spring hollow waters drain and atmospheric precipitation is filtered from adjacent sandy areas. The tract consists of three groves separated from each other by meadows, the area of which is from 3 to 5 hectares. Peat-bog soils with a hummocky surface are formed here. The vegetation cover is represented by sedge, swamp fern, there are individual specimens of aspen and vetla. In the undergrowth - viburnum, brittle joster, hawthorn, rosehip. Trees and shrubs are entwined with hops. The forest areas are surrounded by meadow grass associations and separated by thickets of willows, the width of which varies from 20 to 30 meters or more. Ash willow dominates among the shrubs, it is mixed with blackthorn, razmarinolistnaya willow, krastnotal, etc. Of the herbaceous plants, there are marsh podmerennik, high zyuznik, etc.

The Kindykty tract is located near the abandoned Kindykty village north of the Uralsk-Aktobe highway. The area is about 100 hectares, the territory of Almaznensky rural district. The type of monument is botanical (forest).

5. Thickets of Cossack juniper in the Accuma tract. Cossack juniper is found in the sandy masives of the left bank of the Ural River. This creeping tree belongs to the cypress family and is an excellent sand anchor. Its huge star-like thickets and fluffy, well-tamed shoots, like caps, tightly cover the tops and slopes of the dunes, reliably protecting them from weathering. Juniper thickets cover the western and southern parts of the Accuma sandy massif closer to the floodplain of the Kuagash River. The area is about 25 hectares, the territory of the Chingirlau forestry. The type of monument is botanical.

6. Thickets of Cossack juniper in the Karaagash tract. This is the second sandy massif in the West Kazakhstan region, where this relict species is found. Thickets of Cossack juniper grow in the western part of the sandy massif and create a kind of "cap" on the mounds. The diameter of the trees reaches 30-35 meters or more. The plant has a rare biological feature: its branches are creeping and rooting, which is very important for securing the sands from scattering. Cossack juniper covers the western edge of the Karaagash sandy massif. Its area is 75 hectares, the territory of the Chingirlau forestry. The type of monument is botanical.

7. Forest cottage Karaagash. On the slopes of the gently anchored sands adjacent to the birch forest, a community of high damask and sandy cumin has formed, which perfectly coexist with each other. The habitat of these plants is different, but a plant community of mixed habitat has been formed on this site, which provides a clear example of the coexistence of plants of sandy massifs (cimin) and swampy or wooded places (devyasil). Both plants are medicinal, which are used for various diseases. The site is located 3 km northeast of the village of Aksuat. The area is about 5 hectares, the territory of the Chingirlau forestry. The type of monument is botanical.

8. Bigula Sands. On the northern fixed part of the Bigula sandy massif in the form of "islands" there are significant areas of grass steppes. In these steppes, feathery feather grass mainly prevails. During the flowering period and the beginning of fruiting of this feather grass, the steppe acquires a silvery hue. The steppe, illuminated by the sun, seems to be covered with a thin layer of freshly fallen snow. From the wind, the silvery feathers of the feather grass sway like waves, and the steppe seems like a sea. This is a variant of the feather-grass pisammophytic steppes. A fragment of these steppe areas should be allocated 3 km north of the abandoned village of Karakala. The area is 25 hectares. The type of monument is landscape-botanical.

9. Segizsay tract (birch-aspen stakes). The western slope of the valley of the river Kuagash is dissected by eight deep gullies, which are part of the named tract. The length of the beams ranges from about 3 to 5 kilometers or more, the width is up to 200 m, and their depth from the mouth to the mouth gradually deepens, and reaches 10 m. In seven of them, birch-aspen bayrach forests have been preserved from the mouth to the sources. Lower places are occupied by birch with sedge in the herbage. Higher up the slopes, aspen prevails with an abundant shrub layer of meadowsweet, low badamsh, joster, broom, steppe cherry, honeysuckle, bird cherry. In the upper reaches, with a decrease in the depth of the beams to 3-4 m, the trees disappear. Instead of them, thickets of steppe shrubs with a powerfully developed meadow-steppe herbage appear. Closer to the mouth along the bottoms of the beams, birch thickets develop better and reach 9-10 m in height, and 12-14 cm in diameter. Along with birch trees, shrubs are also found, these are rosehip, Caspian willow, blackberry, etc. Of the herbaceous plants, sedge groupings with a combination of horsetail and licorice dominate. Previously, a forest apple tree was marked here.

The slopes of the beams are occupied by grass-grass steppes with polynopesan-milkweed plant communities on fixed sands. In places, there are meadowsweet-broom thickets. On the inter-girder upland areas, feather-grass-milkweed associations with an admixture of psammophytic plants on fixed sandy soils predominate.

Bayrachny forests suffer from forest fires and deforestation almost every year. Despite such a severe anthropogenic impact, the renewal of birch and aspen is

satisfactory. The tract is located 0.5 km south of Lebedevka village on the right bank of the Kuagash River, one of the sources of the Kaldygaity River. The area of 800 hectares, the territory of Almaznensky rural district. The type of monument is landscape-botanical.

10. Kuagash tract (birch-aspen stakes). Tree and shrub thickets in the floodplain of the Kuagash River are distributed by belts. Near the riverbed there are willows with thickets of reeds, the height of which is more than 2 meters. Then there is a small strip of grass meadows, alternating with birch and aspen. Of the herbaceous plants, blackberries and horsetail alternately dominate. Shrubby thickets are represented here by the usual rosehip, towolga, viburnum and buckthorn. Closer to the sands, the floodplain forest is thinning, only individual birches come close to the dunes. The local population collects blackberry fruits, which usually bear fruit abundantly in these places. The coastal forests are located on the left bank of the Kuagash River opposite the Lebedevka village and border the Accuma sandy massif on the western side. The area is about 300 hectares, the territory of the Chingirlau forestry. The type of monument is landscape-botanical.

11. Steppe section "Shybyndy". The mountain with the local name "Shybyndy" is located in the extreme east of the region. The absolute height of 273 m is the highest point of the West Kazakhstan region. The terrain is composed of Cretaceous rocks and is a continuation of the ridges of the Poduralsky plateau. Preserved grassland steppes on dark chestnut carbonate soils cover the relatively gentle slopes of the watershed massif separating the Shyngyrlau River and the Shybyndy River. On the northern slopes of the massif and inter-elevated shrubs are found: karagana, laxative joster, rosehip, etc. Flocks of pink starlings feeding on locusts were observed in the vicinity of the hill.

The Shybyndinsky feather steppe site is located 11 km away. north of the abandoned village of Otradnoye. The area is about 400 hectares. the territory of the Akshat rural district. The type of monument is landscape-botanical.

12. Upper Utva steppe. It is located in the subzone of the kovyl steppes (Fig. 3). The terrain of the site is flat, eroded by small beams. To the south of the site is the source of the Shyngyrlau river, the channel of which is in the form of a narrow steep ravine, first directed in a southerly direction, and then acquires a north-westerly direction. The vegetation cover of the upland areas consists of grass-type-grass-grass associations on dark chestnut carbonate soils. In depressions and gullies, vegetation is represented by grass-shrub communities on meadow-chestnut soils, where thickets of common carrot, common mallow and other plants predominate, Tatar honeysuckle from shrubs, and single specimens of wild apple trees are also found.

According to V.V. Ivanov, the Upper Utva grass steppe is dominated by Lessing grass, feathery and hairy grass (Ivanov, 1958). On this site at the time of visits, due to the wet summer, the feather beds were in a satisfactory condition, where the projective coverage is on average 80-90%. As a result of steppe fires, sod

is completely absent. The total area with surrounding plots is about 3 thousand hectares.

The Verkhne-Utvinsky steppe site was allocated in 1998 by the staff of the Steppe Institute of the Ural Branch of the Russian Academy of Sciences (Chibilev, 1999). It is proposed to organize a specially protected object here to preserve areas of virgin Tipchak-kovyl steppes. The steppe site is located 7-8 km northwest of the village of Otradnoye. The area of 400 hectares, the territory of the Akshat rural district. The type of monument is landscape-botanical.

13. Upper Utva chalk mountains. They are located within the Poduralsky plateau (Fig. 3). Absolute heights are 200-250 meters. The surface of the hill is composed of Upper Cretaceous deposits, in which fossilized remains of marine animals are found. The terrain is steep-hilly with chalk remnants.

The soil and vegetation cover is represented by tipchak-kovylny steppes on dark chestnut normal soils, in places there are kovylno-tipchak communities on dark chestnut strongly saline soils. In depressions and gullies, vegetation consists of variegated shrub associations on meadow-chestnut soils. Cretaceous endemics with rare and endangered species grow on Cretaceous outcrops.

In order to preserve biological and landscape diversity and as a geomorphological object, the chalk hills at the source of the Shyngyrlau River are included in the list of natural objects of national and international significance by the decree of the Government of the Republic of Kazakhstan (On approval of the list of geological, geomorphological and hydrogeological objects of the state natural reserve fund of republican and international significance, the Rules for their limited economic use in specially protected natural areas, as well as the list of subsoil areas of special environmental, scientific, cultural and other value classified as specially protected natural areas of republican significance, 2010).

The area of the chalk hills is about 50-70 hectares; they are located within the territory of the Akshat rural district. The type of monument is landscape-geomorphological.

14. Chalk mountains in the upper reaches of the Kaldygaity river. The chalk hills are located in the southeastern part of the Chingirlau district within the Poduralsky plateau. The terrain is steep-hilly with low chalk outcrops with absolute heights of 190-200 m. The slopes are cut by ravines and gullies, among which the Kaldygaity River originates. In some places there are chalk hills with relative heights of up to 20 m or more.

The soil and vegetation cover is dominated by tipchak-grass communities on dark chestnut sandy loam soils, with a projective coverage of up to 70-80%. Calcifytic vegetation is widespread on the Cretaceous outcrops, among which there are Cretaceous endemics and Rare species of flora.

In order to preserve biological and landscape diversity, and as a geomorphological object, the chalk hills at the source of the Shyngyrlau River are included in the list of natural objects of national and international significance by the decree of the

Government of the Republic of Kazakhstan (On approval of the list of geological, geomorphological and hydrogeological objects of the state natural reserve fund of republican and international significance, the Rules for their limited economic use in specially protected natural areas, as well as the list of subsoil areas of special environmental, scientific, cultural and other value classified as specially protected natural areas of republican significance, 2010).

The area of the chalk hills is about 50-70 hectares; they are located within the territory of the Almaznensky rural district. The type of monument is landscape-geomorphological.

15. Chalk mountains in the upper reaches of the Buldurty river. The sites with chalk elevations are located on the southwestern slope of the Poduralsky plateau at the junction with the Pre-Syrtic ledge. The relief is undulating and hilly with small chalk hills with absolute heights of 100-150 m. The relative height of the chalk hills is 3-5 m; they are covered with semi-fixed sands. The Karaagash sands are closely adjacent to the chalk hills. In places, springs with clean fresh waters beat from the chalk strata, which give rise to the Buldurty River.

The soil and vegetation cover is represented by feather-tip associations on chestnut sandy loam soil. In lower, more humid places, there are grass-grass plant communities with a projective coverage of up to 100%.

In order to preserve biological and landscape diversity and as a geomorphological object, the chalk hills at the source of the Shyngyrlau River are included in the list of natural objects of national and international significance by the decree of the Government of the Republic of Kazakhstan (On approval of the list of geological, geomorphological and hydrogeological objects of the state natural reserve fund of republican and international significance, the Rules for their limited economic use in specially protected natural areas, as well as the list of subsoil areas of special environmental, scientific, cultural and other value classified as specially protected natural areas of republican significance, 2010).

The area of the chalk hills is about 20-30 hectares; they are located within the territory of the Karaagash rural district. The type of monument is landscape-geomorphological.

16. The mountains of Kyzemshek. Isolated tent outliers were formed under the influence of water and wind erosion (Fig. 3). The name of the tract is given by the shape of the outliers, resembling a maiden's breast from a distance. The absolute height of the remains is about 200 m; the relative height is 25-30 meters. The slopes of the mountains are cut by gullies, almost vertically going from top to bottom. This is the result of the activity of modern water erosion processes that destroy the slopes of the outliers. Cretaceous endemics grow on the slopes of hills and on their surfaces. The soil and vegetation cover is dominated by tipchak-kovyl communities on chestnut carbonate soils with an admixture of white-wormwood groupings. The hills are located on the right bank of the Shyngyrlau River, 2 km from the village of Kyzemshek. The area is about 20 hectares, the territory of the Karagash rural district. The type of monument is landscape-geomorphological.

17. Almaztau Mountain. It is located in the extreme east of the district, at the junction with the Aktobe region within the Ural plateau. The mountain stands out from afar in the form of a cretaceous remnant, the slopes of which are more gentle, cut by decays. The surface is composed of Upper Cretaceous deposits, there are outcrops of writing chalk, marl, etc. The absolute height is 230 meters. Relative height - reaches 25-30 m. In the vicinity and on the slopes of the mountain, the soil and vegetation cover is dominated by grass and grass-grass steppes on chestnut soils. The lowered areas and decays are occupied by grass-shrub communities on meadow-chestnut soils. The vegetation of the Cretaceous outcrops is represented by calcefites, among which there are rare and endangered species.

In order to preserve biological and landscape diversity and as a geomorphological object, the Almaztau chalk hill is included in the list of natural objects of national and international significance by the decree of the Government of the Republic of Kazakhstan (On approval of the list of geological, geomorphological and hydrogeological objects of the state natural reserve fund of republican and international significance, the Rules for their limited economic use in specially protected natural areas, as well as the list of subsoil areas of special environmental, scientific, cultural and other value classified as specially protected natural areas of republican significance, 2010).

The area of the chalk hill is about 10 hectares; it is located within the territory of the Almaznensky rural district. The type of monument is landscape-geomorphological.

18. Toryatbasy Mountain. The Cretaceous outlier belongs to the system of the southwestern spurs of the Poduralsky plateau and its slopes close to the valley of the Shyngyrlau River (Fig. 3). The surface is composed of Upper Cretaceous sediments, in which fossilized remains of marine animals of the Cretaceous period are found. The absolute height of the mountain is 211 m. Submitted by A.Z. Petrenko on this mountain in the decays along the gentle slopes of the mountain, thickets of small-flowered honeysuckle were found. This is the only location of this species in Western Kazakhstan. Toryatbasy is a refuge for endemic and endangered plant species, and also has aesthetic value. The mountain is located 5 km north of the village of Marxism. In order to preserve biological and landscape diversity, it is proposed to include the city of Toryatbasy in the structure of the organized Mirgorod State landscape-biosphere desert-steppe Reserve. The area of the protected object is 10 hectares; it is located within the territory of Aktau rural district. The type of monument is landscape-geomorphological.

19. Pine crops in the Accuma tract. Pine plantations were planted in the northern part of the Accuma sandy massif in the late 80s and early 90s of the last century. Currently, they have taken root well, and settled in the hollows of blowing, which create a natural stand of trees. The height of the stand is low, on average reaches up to 2 meters or more. Self-seeding of pine is observed, as evidenced by young shoots. The area of pine plantations is 10-15 ha on the territory of the Chingirlau forestry. The type of monument is forest-cultural.

20. Forest plantations in the valley of the river Kuagash. In the 50s of the last century, an ordinary bird cherry was planted on a small section of the valley of the Kuagash River. It has taken root well and settled along the left bank of the Kuagash River, forming natural thickets with a length of almost 1 km, the width of the thickets ranges from 10 to 25 m, the tree bears fruit perfectly. The thickets of bird cherry are located on the left bank of the Kuagash River, slightly above the village of Lebedevka. The area is about 2 hectares, the territory of the Chingirlau forestry. The type of monument is forest-cultural.

21. The spring of Sarkyram. Powerful spring pure fresh waters gush from the chalk layer of the Pre-Syrtovy ledge and are the sources of the Buldurty River (Fig. 3). Flowing down, spring waters are collected in an artificial lake with a diameter of about 50 m. From the Cretaceous rocks, the color of the water in the lake becomes turquoise-blue. Flowing out of the artificial lake, the Buldurty River originates. The spring is located 5 km northeast of the village of Aksuat. The area of 0.25 hectares, the territory of the Chingirlau forestry Type of monument - hydrological.

22. The origins of the Shyngyrlau river. Prolonged processing of the slopes of the Cretaceous Poduralsky plateau by water erosion led to the exposure of aquifers and the formation of springs. Often springs are the sources of rivers and streams. Water erosion contributed to the formation of a canyon-like relief at the source of the Shyngyrlau River. Under the influence of anthropogenic pressure, this unique piece of nature may change or disappear. Therefore, environmentalists raise the question of the need to give it the status of a specially protected object. The springs are located 1 km north of the village of Otradnoye. The area is about 1 ha, the territory of the Akshat rural district. The type of monument is hydrological.

23. Lake Sulukol. It is located in the southwestern part of the Poduralsky plateau, near the village of Sulukol. The lake has an elongated shape, with a diameter of about 3 km. The northern and western shores are composed of chalk deposits, and the southern and eastern shores of the lake are closely approached by a bumpy-sandy massif. The shores are cut by small ravines, which are filled with meltwater in the spring, and dry up by midsummer. The length of the coastline is approximately more than 10 km; the depth ranges up to 2.5 m. The lake water is fresh, transparent, the bottom is muddy.

The shallow coastal part is occupied by thickets of reeds, reeds, cattails, as well as aquatic and marsh plants. Such as umbrella susak, curly rdest, etc. The vegetation of the shores is mainly represented by psammophytic and steppe species.

The ornithological fauna of Lake Sulukol was described by the scientist (Zarudny, 1888), who visited the lake at the end of May 1881. According to his observation, up to a thousand different species of birds swam on the lake. Currently, the lake is rich in various species of birds. At the time of the visit, hundreds of individuals of swans, terns, cormorants, gulls and other bird species were noted. The lake area is about 900 hectares, the territory of the Akshat rural district. The type of monument is hydrological.

Conclusions

Based on the conducted research, the following conclusions can be drawn:

- to improve the quality of generalized maps (district, regional and others), it is necessary to create objective automated methods for generalizing maps in a digital environment;

- as a result of our research, a simple and at the same time practically accessible to a wide audience of GIS users methodology for compiling a digital soil map using the ArcGIS software product has been developed. To make a map, you can use any scanned cartographic basics, photo plans, and, if available, other raster materials.

- the territory has preserved rare natural complexes in the steppe expanses, which serve as a refuge for many species of plants and animals. The territory is significant as a natural forage land since the plants growing on pastures are diverse in their forage properties and seasonality of use, these plant communities allow for high nutritional value feed almost throughout the year.

- environmental protection measures carried out in the study area are scattered, because the existing services are each engaged in their own functions.

- at the same time, excellent steppe and meadow natural complexes are increasingly used by humans for economic purposes, serve for grazing livestock, a place for harvesting wood, berries and mushrooms, hay, and are used for recreation.

- the work will continue to determine the importance of ecosystems for biodiversity conservation based on the distribution of key animal and plant species across ecosystems with the compilation of maps of the environmental significance of ecosystems, integral environmental significance and the degree of disturbance of ecosystems depending on anthropogenic activity and its impact on natural complexes.

In general, in the studied territories of the Chingirlau district of the West Kazakhstan region, the balance in natural complexes is not disturbed.

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