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SOIL-ECOLOGICAL CONDITIONS FOR THE GROWTH OF RARE ENDANGERED PLANT SPECIES IN BALKHASH DISTRICT OF ALMATY REGION

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Abstract. Soil-ecological studies were carried out in Balkhash district of Almaty region on the left bank of the Ili River, where grow the unique turanga trees included into the Red List - Populus pruinosa Schrenk. Since ancient times, turanga has been considered a sacred, tenacious tree, reaching a height of 15-20 meters, it protects plantings from drying out and waterlogging of soil and, in strong winds, it stops the movement of sand, its roots penetrate deeply and retain surface moisture, as well as groundwater. The trees are in extremely critical situation. There are a lot of fallen trees, in some places cut down, broken, uprooted, sick, infected with parasites. The research object was subjected to anthropogenic degradation, pasture digression and desertification. The soil surface is represented by ordinary gray soil, which forms in the foothill desert-steppe zone. Common gray soils are underdeveloped stony-gravelly medium loamy, sandy and sandy loam and form complexes with alluvial, takyr-like, sandy and solonchak soils. The soil-ecological conditions of Ili barberry - Berberis iliensis Popov - were studied in this area. The condition of barberry is satisfactory; in some places there are dried out thinned shrubs. The overgrazing of animals takes place on the territory, which leads to compaction and decrease in soil water-physical properties.

Key words: soil-ecological conditions, turanga, barberry, common gray soil, sandy, saline, alluvial, animal grazing.

INTRODUCTION

The chapter is lacks of specific, measurable goals and research hypotheses questions.

Almaty region borders the following regions of Kazakhstan: Zhambyl region in the west, Karaganda region in the northwest (the water border runs along Balkhash Lake), East Kazakhstan region is located in the northeast, Zhetysu region is located to the north. In the east, the region borders the PRC (XUAR), and in the south, it borders with the Republic of Kyrgyzstan (Chu and Issyk-Kul regions). The region has quite complex geographical characteristics and very diverse terrain. The northern part is a semi-desert plain, slightly inclined towards Balkhash Lake and cut by ancient channels of the Ili River, the most significant of which is Bakanas. The mountain ranges stretch in two separate massifs - in the south and east: the Trans-Ili Alatau and the Dzungar Alatau (Tian Shan Mountain system). mid bed of the Ili River is located at the junction of their descending progressively slopes. The slopes are replete with alluvial cones of its tributaries (Charyn, Chilik, Almatinka, Kurty, etc.).

Balkhash district is located in the northwestern part of Almaty region. It occupies the territory from the Malaysarinsky ridges in the southeast to the southern coast of Balkhash Lake, in the north - part of the Saryesikatyrau desert, in the west and south - the Taukum sands.

The relief is flat. The climate is continental. Winters are cold, and summers are hot and dry. Average temperatures in January are 13-15°C, and

in July, they are 24 °C. The average annual precipitation is 100-150 mm. The largest river is the Ili, River, which is 1001 km long. The Akdala irrigation system is laid along its right bank. There are numerous bacanas- old dry river beds. The Karoi State Nature Reserve with an area of 509 thousand hectares is located on the territory of the district. In geological and geomorphological terms, the southern Balkhash region represents a foothill depression of the western part of the Balkhash-Alakul depression. Such large geomorphological areas represent the region under study as the lower reaches of the Ili River, the southern coast of Balkhash Lake, lower reaches of the Karatal River, takyr-like Akdala-Bakanas plain, sandy plain (desert) of Sary-Esikatyrau and the foothill plains of the elevated Malay-Sary plateau, framing the Ili depression from the south. Thus, in the desert and desert-steppe zones of the Ili-Balkhash region there are very sharp differences in certain parts of the territory.

In the soil surface of the Akdala part of the South Balkhsh depression, zonal light grey soil is observed, and, accordingly, vertical alternation of terrain belts, ordinary grey soil. This is due to the fact that the main distribution zone of zonal light grey soil is the plains of the elevated plateau Bazoi and Karoy, and in the low-mountain massif Malay-Sary, surrounded by these plains, ordinary sandy loam grey soils are common. Therefore, distribution areas of ordinary gray soil, that is typical of the middle and lower parts of the slightly inclined piedmont plain of the desert-steppe subzone (Malay-Sary ridge), are insignificant in an area within the South Balkhash depression. However, this subtype was previously considered as a zonal subtype of the piedmont plains of the Malay-Sary ridges [1, 2].

Common grey soils are formed in the foothill desert-steppe zone. Common grey soils, underdeveloped, stony-gravelly medium loamy, sandy and sandy loam, form complexes with alluvial, takyr-like, sandy and solonchak soils. In the hilly and ridged areas of the Malay-Sary ridge, ordinary sandy loam grey soil predominates; due to the dissected relief, it is used for pastures and spring-autumn pastures by farms in the Balkhash region. In the Balkhash region, within the hilly and ridged foothills on the lowered floodplain plains of the tributaries of the Karatal River (Bizhe and Koksu) and the Ile River, ordinary grey soils of medium and light loam occur. At the same time, the share of common light loamy grey soils in the structure of the soilsurface of the described territory is insignificant, since they are mainly plowed and occupied by grain crops and perennial grasses [3, 4].

The soils of the South Balkhash depression have undergone significant transformation under the influence of anthropogenic pressure (high grazing loads, rice growing, lack of a scientifically based system of fertilizer application, chemical, water reclamation, etc.) towards their degradation and require the speedy restoration of their natural fertility.

The concentration of soluble salts in soils is 1-2 % or higher, type of salinity is sulfate-chloride and sodium chloride. Further, strip of 2-2.5 km wide is occupied by meadow plump salt marshes, experiencing flooding by the reservoir. Over the past 30-40 years, this strip has not changed significantly, as evidenced by satellite images Landsat-8 and Sentinel-2 (despite the “apocalyptic” forecasts of some researchers. On the surface of these soils there is puffy layer of salts of 2-3 cm, their amount in the upper horizon is 2-4 % or higher. The type of salinity is sodium chloride-sulfate with the participation of soda. The reserves of salts in soil layer of 0-2 m reach 600-700 t/ha. The vegetation here is exclusively halophytic.

The creation of the large Kapchagai reservoir in the Ili intermountain depression for energy, irrigation, recreation and fish farming led to

significant changes in the natural environment on its coast and in the reservoir itself. These are, first of all, flooding and salinization of coastal soils and the formation of new wetlands in the reservoir itself ("Kapchagai delta") [5]. The dynamism of these consequences of the creation of reservoir requires long-term monitoring and forecasting of negative environmental impacts, especially flooding and salinization of the southern coast, in order to most effectively use and protect natural resources [6].

The filling and functioning of the Kapchagai reservoir on the Ili River in southeastern Kazakhstan for 50 years has significantly affected the coast terrains, in particular, reclamation state of soil surface (salinization and flooding of soils, active salt exchange of soils with water masses of the reservoir, use of soils for irrigation, etc.), on dynamics of coastal vegetation as food supply for livestock, on the recreational conditions of the population, development of local fauna and flora of the region [7]. Terrain-ecological assessment of the Ili-Balkhash region is characterized by increased pollution and mineralization of surface and groundwater, decrease in productivity and purification functions of the Ili River delta, degradation of wetlands, and progressive process of anthropogenic desertification.[8]. The lower reaches of the Ili River were particularly affected by adverse impacts, environmental degradation and loss of productivity of irrigated agriculture due to land salinization. In this regard, issues related to the rational use of land and water resources, protection of ground and surface waters from depletion and pollution are very relevant.

MATERIALS AND METHODS

The research object is soil and ecological conditions of growth of the Red List tree –grey leaves poplar or turanga, as well as Ili barberry along the right bank of the Ili River, Balkhash district, Almaty region.

The article uses generally accepted research methods in soil science (total humus according to Tyurin, Gross nitrogen according to Keldal, hydrolyzable nitrogen according to Tyurin and Kononova, Gross phosphorus according to Machigin, mobile phosphorus according to Machigin, Gross potassium according to Machigin, soil reaction by potentiometric method, mobile potassium according to Machigin method in Grabarov modification, total carbonates by gas volume method, the exchange basis of Ca, Mg, K, Na) according to Bobko and Askinazi. granulometric composition according to Kachinsky, soil salinity was determined by the method of soil-water extraction.

RESULTS AND DISCUSSION

General ecological conditions of soil surface of the research object.

According to the object of the study, research was carried out using methods of analysis of soil properties and environmental characterization, analysis of vegetation cover and condition*.*During the study, general ecological conditions of soil surface of the study area were determined. In reserve, where gray leaves poplar (turanga – *Populus pruinosa Schrenk*) grows, there is dense litter on the surface and there are a lot of dried trees projective coverage 100 %. There are a lot of young shoots - *Populus pruinosa Schrenk*. To the northeast of the reserve, there is a shaft that is 1-2 meters high. Along the 20-meter -long rampart of the reserve, there grows Caragana halodendron, which bears fruit. Nobody takes care of the reserve. Many trees are infected, lots of broken trees. Sanitary felling and treatment of trees has not been carried out for a long time. The reserve requires clearing the area from dead wood of old, fallen branches and poplar trunks (figure 1).

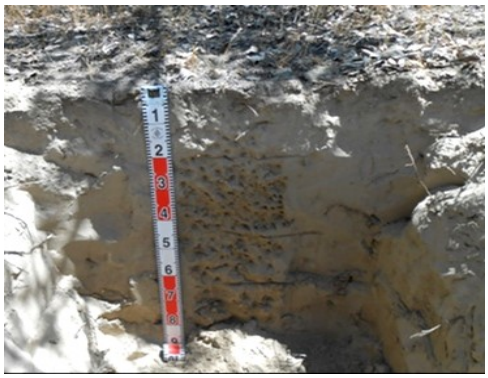
Figure 1– Reserve

In the territory where section 3B was set, the condition of *Populus pruinosa Schrenk* is satisfactory. There are many fallen, dry, broken and diseased trees, the trees are infected with parasites, and there are bare areas without plants. The surface is uneven. On the surface, there is a lot of litter from leaves, small, large dry, broken branches, trees (figure 2).

Figure 2 -General view and soil-ecological conditions of turanga

Section 3 B is laid between the turangas on the dune. Interridge sands are overgrown with turanga, and saxaul is found. On the surface, there is litter from leaves, small and large branches. The grass cover is sparse. The vegetation is noticeably undergoing a process of succession. There is wheatgrass, hedgehog grass, chingil, it is boiling violently from the surface, the lower layer is weak (figure 3). Height 386 meters above sea level. Coordinates: 44° 51' 11.94" 75° 58' 12.31".

Populus pruinosaSchren



Section 3B

Figure 3 - Section 3B

0-2 cm - a fragile turfy root layer, loose, the transition is noticeable.

2-25 cm – light gray slightly with brownish tint, slightly compacted, fresh, lamellar-clumpy-pulverescent, sandy loam, quartz sand with mica flakes, root hairs, living, dead, half-rotten roots, boils violently from HCl, transition noticeable in composition.

25-44 cm - light gray with a yellowish-fawn tint, loose, fresh, structure less, sandy loam, there are root hairs, living, dead, half-rotten roots, shines may be traces of gypsum, boils violently from HCl, the transition is noticeable in composition.

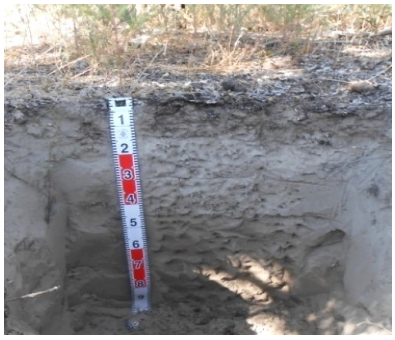
44-65 cm - light gray with brownish-yellowish tint, fresh, loose, structure less, quickly disintegrates, there are root hairs, fresh, decomposed, half-rotten roots, boils from HCl, the transition is noticeable in composition.

65-90 cm - light gray-fawn, fresh, loose, structure less, sandy loam, there are root hairs, fresh, decomposed, half-rotten roots, as well as large decomposed tree roots, boils from HCl, the transition is noticeable in composition.

Figure 4- Populus pruinose Schrenk

Section 4B is laid among old turanga trees, and there are a lot of fallen trees and old, dry branches on the surface (figure 4). Old variegated turanga. The condition of the trees is satisfactory, from shrubs there grow tamarix and chingil, from herbaceous there grow safflowers, the projective cover is 30-50%. On the surface, there is litter from branches, stems, leaves. Height is 382 meters above sea level. Coordinates: 44° 52' 36.78" 75° 53' 29.73" (figure 5).

Populus pruinosa Schrenk



Section 4B

Figure 5 - Section 4B

0-14 cm - dark gray, dry, not compacted at the top, compacted below 10 cm, fragile-lumpy-pulverescent, sandy loam, there are living, small, large, half-rotten roots, many root hairs, boils violently from HCl, noticeable transition by color and composition.

14-30 cm – gray with a yellowish tint, more compacted, fresh, structure less, disintegrates, fragile lumpy-sandy, sandy loam, finely porous, there are crystals of micaceous minerals, there are living, small, large, half-rotten roots, many root hairs, boils vigorously from HCl, transition is noticeable in color and composition.

30-45 cm - light gray with a yellowish tint, slightly compacted, fresh structure less, sandy loam, there are living, small, large, half-rotten roots, many root hairs, boils violently from HCl, the transition is noticeable in color, composition and distribution of roots.

45-100 cm – yellowish-brownish-gray, loose, moist, structure less, disintegrated, fine sand, shiny minerals, root hairs are rare. At a depth of 42 cm there is a buried, half-rotten tree trunk, slightly boiling from HCl.

Figure 6 – *Berberis iliensis Popov*

Section 5B is laid on the saucer-shaped relief of the floodplain, in more elevated part between barberries, there are many fallen trees, mixed forest, barberry, turanga, elk, tamarix. There is a dense tugai forest, meadow vegetation (figure 7, 8): Achnatherum, wormwood, zygophyllum). Height 397 m above sea level. Coordinates: 44° 45' 59.85" 76° 20' 06.94". There are shells on the surface.

Berberis iliensisPopov

Section 5B

Figure 7 - Section 5B

0-13 cm - gray with dark tint, slightly turfed, slightly compacted, fresh, dry on the surface, fragile-lumpy-grainy-powdery, light sandy loam, fine pores, there are snails, rooty, there are live, small, large, half -rotten roots and root residues, many root hairs, boils violently from HCl, the transition is noticeable in composition.

13-27 cm - light gray with yellowish tint, dry in some places, fresh, more dense, fragile-lumpy-powdery-pulverescent, light sandy loam, finely porous, shiny quartz particles, living, small, large, half-rotten roots and root residues are found, many root hairs, the horizon is marked by density, boils violently from HCl, the transition is noticeable in composition.

27-50 cm - gray-fawn with a brownish tint, fresh, less compacted, structure less, thin pores, quartz sparkles are noted, living, small, large, half-rotten roots and root remains are found, many root hairs, the horizon is marked by density, boils vigorously from HCl, the transition is noticeable in composition and humidity.

50-75 cm - brown-fawn, compacted, fresh, fragile-lumpy-powdery-pulverescent, sandy loam, porous, larvae of May beetles are found, there is accumulation of quartz sparkles, boils violently from HCl, the transition is noticeable in composition.

75-100 cm - gray-fawn with a brownish tint, fresh, slightly compacted, loose in some places, the structure is fragile and breaks up into fractions, there is abundance of quartz crystals, matte efflorescence of salts is observed throughout the horizon.

The area where *Berberis iliensis Popov* grows is subject to degradation and is littered with household waste. Dung beetle larvaewere found under a barberry bush (figure 8).

Figure 8 – Dung beetle larva

Section 16 B was laid on a coastal floodplain terrace with isolated plants from the right bank of the Ili River to the mountains there are tree and shrub species. Along the shore of Iliriver, in some places, rosehip, barberry, willow, and oleasterbushes grow. The section was laid 200 meters from the river to the southwest under a barberry bush, parfolia, thistle, wormwood grow in patches and islands, most of the territory is overgrown with wormwood. Projective cover 45 %. On the surface, there is litter from leaves, branches, plant debris, shells. Height 450 m.a.s.l. Coordinates: 44°08'56.70" 76° 57'39.90".(figure 9)

Барбарис илийский – *Berberis iliensis Popov*

Section 16B

Figure 9 - Section 16B

0-18 cm - gray, light gray, loose, dry, lumpy-pulverescent, porous, lumps are difficult to break up, intertwined with root hairs, boils violently from HCl, the transition is noticeable in composition.

18-40 cm – gray, with a dark tint, fresh, dense, porous, lumpy-grainy-pulverescent, abundance of root hairs and roots, fresh, half-rotten and decomposed roots, carbonate formations in the form of grains, mycelium, veins, coating, brown iron formations, there are nests of insects, boils violently from HCl, the transition is noticeable in composition.

40-50 cm – gray-yellow with brown coating, dark spots, fresh, slightly moistened, dense, weak-lumpy, sandy loam, carbonate new formations in the form of grains, mycelium, veins, coating, brown iron formations, there are insect nests, boils violently from HCl, transition is noticeable in color.

50-62 cm – variegated, gray-yellow with brownish tint, with dark brown spots, moist, dense, lamellar-lumpy, layered-plate -scaly, sandy loam, porous, decomposed root remains, carbonate formations are found along the profile in the form of grains, mycelium, veins, coating, boils violently from HCl, transition is noticeable in composition.

62-75 cm - variegated, gray-brown bluish coating, dark brown spots, dense, damp, structure less, traces of various root pores, carbonate new formations in the form of grains, mycelium, veins, coating, many root hairs and roots, fresh and decomposed roots, brown spot is given by decomposed roots, boils violently from HCl, transition is noticeable in composition, redox process in floodplain terrace is clearly visible.

75-93 cm - gray-fawn with brownish-gray tint, dense, damp, lumpy-lamellar, loam, carbonate coating, there are large roots, decomposed root hairs, dark passage of animals, boils violently from HCl, transition is noticeable in composition and color.

93-120 cm - gray-fawn with yellowish tint, damp, loose, structure less, root hairs are rare, boils violently with HCl.

Results of laboratory and analytical studies

Table 1 gives the results of granulometric composition of soils on the bank of the Ili River, where grow the turanga trees included into the Red List and rare species, endemic *Berberis iliensis Popov*, with shrinking range and population, which is also have been listed in the Red Book since 1981.

Table 1 - Granulometric composition of soils on the coast of the Ili River in the Balkhash region

Soil Sections	Depth, cm	A.C.H % H2O	Fraction content in % on absolute dry soil						
			Fraction sizes in mm						
			Sand		Dust			Silt	Sum of 3 fractions <0.01
			1,0-0,25	0,25-0,05	0,05-0,01	0,01-0,005	0,005-0,001	<0,001	
2023									
Balkhash district									
P-3B	0-25	0,36	0,28	92,89	2,81	1,61	2,007	0,40	4,01
	25-44	0,28	0,14	95,85	1,60	1,60	0,401	0,40	2,41
	44-65	0,38	0,06	81,87	10,44	3,21	2,811	1,61	7,63
	65-90	0,16	0,24	90,95	5,21	2,40	0,801	0,40	3,61
P 4B	0-14	1,04	7,64	74,98	8,49	1,62	4,446	2,83	8,9
	14-30	0,52	1,27	77,42	12,47	4,02	3,217	1,61	8,85
	30-45	0,32	1,99	94,00	0,80	0,80	0,401	2,01	3,21
	45-100	0,24	19,83	73,36	2,41	2,01	0,802	1,60	4,41
P 5B	0-13	0,84	5,12	75,11	7,66	2,82	5,244	4,03	12,10
	13-27	0,40	8,84	77,11	8,43	0,80	2,811	2,01	5,62
	27-50	0,34	4,92	80,63	10,84	2,01	1,204	0,40	3,61
	50-75	0,24	2,17	85,81	8,02	1,20	2,005	0,80	4,01
	75-100	0,44	3,88	76,44	10,04	4,82	3,214	1,61	9,64
P-16B	0-18	1,24	3,06	71,43	2,43	2,43	2,835	17,82	23,09
	18-40	1,44	1,66	60,19	0,81	14,21	6,494	16,64	37,34
	40-50	0,46	2,19	46,78	15,27	1,61	17,681	16,48	35,77
	50-62	0,12	1,38	66,18	13,22	2,00	1,201	16,02	19,22
	62-75	0,12	2,54	61,01	8,01	14,02	4,005	10,41	28,43
	75-93	0,16	0,84	54,69	27,64	5,61	1,603	9,62	16,83
	93-102	0,08	2,78	75,20	5,20	1,20	8,006	7,61	16,81

The results showed that almost all soils of the presented sections, by the amount of physical clay <0.01 mm, are sands, sandy loams, and light loams. By the content of fine sand, it should be said that the sand fraction predominates, which reaches up to 95 %.

Table 2 gives the results of concentration of humus, nutrients, pH and carbonate concentration in the soils of the Ili River coast. In sections 4B and 5B, humus concentration is typical for the upper horizons of ordinary gray soils, and, respectively, the amount of gross and mobile forms of nutrients. The soil environment is alkaline and highly alkaline, and also carbonate. The soil of section 3B is more depleted, since it is mainly sand in granulometric composition.

Table 2 – Concentration of humus, CO_2, pH and nutrients

Sampling location	Depth, cm.	Humus, %	Total Nitrogen, %	Hydrolyzednitrogen, mg/kg	CO_2 %	Phosphorus		Potassium		pH
						Gross, %	Mobile, mg/kg	Gross, %	Mobile, mg/kg	
Balkhash district										
P - 3B	0-25	0,41	0,056	16,8	4,35	0,1	20	1,812	290	9,38
	25-44	0,47	0,056	25,2	4,12	0,092	3	2	290	9,49
	44-65		0,056	36,4	4,48	0,092	2	2	290	9,35
	65-90		0,028	22,4	4,81	0,092	1	2,062	280	9,09
P - 4B	0-14	2,48	0,196	106,4	3,57	0,184	168	1,812	1000	8,76
	14-30	0,30	0,056	58,8	4,55	0,1	23	2	1020	9,24
	30-45	0,07	0,028	19,6	3,8	0,08	5	1,875	930	9,36
	45-100		0,014	16,8	2,34	0,06	5	1,75	320	9,29
P - 5B	0-13	1,26	0,14	75,6	5,23	0,132	13	1,687	370	8,87
	13-27	0,17	0,042	19,6	4,38	0,1	5	1,75	80	9,4
	27-50	0,34	0,042	19,6	4,42	0,04	3	1,687	20	9,11
	50-75		0,07	16,8	4,38	0,048	2	1,875	10	9,19
	75-100		0,028	14	4,87	0,04	2	1,812	10	8,9
P 16B	0-18	2,07	0,112	84	5,2	0,18	36	2,375	950	8,41
	18-40	1,1	0,098	58,8	5,23	0,144	10	2,187	280	8,67
	40-50	0,52	0,042	39,2	6,62	0,144	5	1,625	100	9,07
	50-62		0,042	33,6	6,69	0,144	5	2	60	9,06
	62-75		0,07	25,2	6,5	0,144	3	2,25	40	9,01
	75-93		0,042	19,6	5,52	0,136	0.	1,625	30	8,9
	93-120		0,042	8,4	4,19	0,128	0	2	10	9,07

The content of absorbed bases in table 3 corresponds to concentration of humus, carbonates and alkalinity of soil environment, also soils are mainly saline from slightly to highly saline, soil of section 3B is not saline, although sodium cations are present in absorbed composition, which indicates salinity. The soils have low values by the amount of absorbed bases, which are typical for light soils of semi-deserts and deserts.

Table 3 - Content of absorbed bases

Sampling place	Depth, cm	Absorbed bases, mg/eq				
		Ca^{++}	Mg^{++}	Na^{+}	K^{+}	The sum
Balkhash district						
P - 3B	0-25	0,49	4,46	0,36	0,23	5,53
	25-44	0,99	1,98	0,36	0,23	3,55
	44-65	0,49	1,98	0,36	0,21	3,04
	65-90	1,98	2,97	0,36	0,21	5,52
P - 4B	0-14	9,9	7,43	0,69	0,36	18,37
	14-30	3,96	3,47	0,17	0,34	7,94
	30-45	0,99	3,96	0,78	0,04	5,77
	45-100	0,49	1,98	0,45	0,05	2,96
P - 5B	0-13	13,37	6,44	0,07	0,16	20,04
	13-27	2,48	4,95	0,67	0,25	8,35
	27-50	1,98	2,97	0,11	0,25	5,31
	50-75	1,49	2,48	0,09	0,25	4,31
	75-100	2,48	2,48	0,07	0,25	5,28
P - 16B	0-18	9,9	7,43	0,46	0,58	18,37
	18-40	22,28	2,48	1,58	0,16	26,5
	40-50	4,95	14,85	0,74	0,27	20,81
	50-62	7,43	14,85	1,13	0,31	23,72
	62-75	9,9	17,33	0	0,31	27,53
	75-93	2,97	9,41	0,46	0,31	13,15
	93-120	1,49	3,47	0,14	0,31	5,4

The content of water-soluble salts in soil indicates qualitative and quantitative soil salinity (table 4). Thus, soils of sections 4B, 5B and 16B are saline to varying degrees. The soil of section 3B is non-saline. The soil of sections 16B and 4B is highly saline. The amount of dry residue ranges from 1 up to 2 %. The salinity is chloride-sulfate in anions and calcium-sodium composition in cations; soda salinity is also noted. The soils are solonetzic and, according to morphological description of the profile, were characterized by increased density.

Table 4 - Content of water-soluble salts

Sampling location	Depth, cm	Total salts, %	Alkalinity		Cl', %	SO_4'', %	Ca^{++}, %	Mg^{++}, %	Na^{+}, %	K^{+}, %
			Total in HCO_3, %	From normal carbonates to CO_3, %						
Balkhash district										
P 3B	0-25	0,05	0,032	0,002	0,003	0,00	0,004	0,003	0,002	0,005
	25-44	0,05	0,032	0,005	0,001	0,00	0,002	0,003	0,002	0,006
	44-65	0,06	0,029	0,002	0,001	0,01	0,004	0,002	0,003	0,007
	65-90	0,09	0,029	0,002	0,003	0,03	0,006	0,008	0,003	0,007
P 4B	0-14	0,54	0,044	0,002	0,045	0,27	0,038	0,012	0,074	0,057
	14-30	0,46	0,039	0,005	0,023	0,24	0,025	0,008	0,067	0,055
	30-45	0,40	0,027	0,002	0,022	0,21	0,015	0,007	0,065	0,049
	45-100	0,17	0,020	0,000	0,013	0,08	0,008	0,006	0,029	0,010
P 5B	0-13	0,97	0,032	0,000	0,088	0,55	0,082	0,029	0,177	0,011
	13-27	0,17	0,027	0,000	0,019	0,07	0,008	0,006	0,036	0,001
	27-50	0,20	0,020	0,000	0,018	0,11	0,019	0,008	0,032	0,001
	50-75	0,12	0,020	0,002	0,015	0,05	0,008	0,007	0,019	0,001
	75-100	0,16	0,017	0,000	0,027	0,07	0,010	0,009	0,028	0,001
P 16B	0-18	0,77	0,037	0	0,164	0,312	0,07	0,021	0,121	0,046
	18-40	1,84	0,02	0	0,329	0,923	0,218	0,073	0,267	0,013
	40-50	1,23	0,02	0	0,387	0,424	0,046	0,063	0,288	0,002
	50-62	1,49	0,017	0	0,406	0,589	0,046	0,078	0,35	0,002
	62-75	1,88	0,015	0	0,516	0,769	0,093	0,135	0,346	0,002
	75-93	0,76	0,02	0	0,168	0,344	0,046	0,056	0,12	0,002
	93-120	0,19	0,02	0	0,031	0,085	0,007	0,016	0,029	0,002

CONCLUSION

The conclusions effectively summarizes key findings on the impact of human activities on soil and ecological systems in the Balkans, highlighting issues such as degradation and overgrazing. It presents practical recommendations to mitigate these effects, emphasizing the need for increased control, penalties for violations, sanitary cleanups and targeted phytological research. However, it could be strengthened by offering more detailed strategies, linking findings to broader environmental implications, suggesting specific future research directions, providing quantitative data on degradation and the potential impact of recommendations, and considering stakeholder engagement.

During the study, general soil-ecological disturbances of soil surface were identified, i.e. anthropogenic, pasture digression, degradation, and erosion processes. There are many human-made grazing trails; tourists and vacationers make a more destructive impact on soil, leaving behind household garbage and broken grey leaves of poplar trees. In the

reserve, where poplar (*Populus pruinosa Schrenk*) grows, there is dense litter on the surface and lots of dried-out, broken trees. Many trees are infected. Sanitary felling and treatment of trees have not been carried out for a long time. The reserve requires clearing of the area from dead wood, old fallen branches, and poplar trunks. Overgrazing is observed. Under the influence of grazing, the physical properties of soils change significantly. The soil and ecological conditions of the habitat of the endemic *Berberis iliensis Popov* are also severely degraded; in some places, there are bare areas with sparse specimens of this endemic. Overgrazing of animals is observed on the site; the consequence of overgrazing is soil compaction, which occurs under the influence of animal hooves. In some areas, initial succession processes are noticeable. It is necessary to monitor the state of ecosystems under grazing pressure, and the soil surface is a leading factor in their stability - an essential element of monitoring the state of the natural environment. The territory is subject to not only natural degradation but to a greater extent, anthropogenic disturbances occur. The coastal areas of the Ili River are littered with bottles, various containers for food and drinks (tin cans, plastic bags, paper and cardboard packaging materials), bricks, places of fires with unburned logs, firebrands and all kinds of garbage after picnics.

The soil surface has low fertility, there are primarily light sandy loams and sands, as laboratory analytical data have shown, they are poorly supplied with nutrients and are highly saline. The salinity is chloride-sulfate, calcium-sodium. Significant areas are bare due to pasture digression. In some places, the process of dune formation is underway due to wandering sands, unsupported by trees and shrubs.

Economically, these soils are unproductive, with the exception of small areas of meadow-floodplain soils, which, in case of grazing regulation, can be good hayfields with the restoration of the coastal ecosystem and ecosystem of the Ili River itself.

Recommendation:

-increased control and supervision is necessary on the part of the forestry department over compliance with the rules and laws of staying of people in the recreation area;

- strengthen penalties for violations and environmental pollution;

- carry out sanitary felling and cleaning of the reserve on the territory of the Balkhash region;

-phytological research and measures to improve the Red List plants are necessary.

The work was carried out based on the materials of the program section: “Study the composition and properties of soil surface in the study areas of Almaty region”, Institute of Botany and Phytointroduction, State Targeted ST Program “Cadastral assessment of the current ecological state of flora and vegetation of Almaty region as scientific basis for effective management of resource potential”.

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ТҮЙІН

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АЛМАТЫ ОБЛЫСЫНЫҢ БАЛҚАШ АУДАНЫНДА СИРЕК КЕЗДЕСЕТІН ЖОЙЫЛЫП КЕТУ ҚАУПІ ТӨНГЕН ӨСІМДІК ТҮРЛЕРІНІҢ ӨСУІНІҢ ТОПЫРАҚ-ЭКОЛОГИЯЛЫҚ ЖАҒДАЙЛАРЫ

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Топырақ-экологиялық зерттеулер Алматы облысының Балқаш ауданында Іле өзенінің сол жағалауында жүргізілді, онда тораңғы терегінің бірегей Қызыл кітапқа енген ағаштары - Populus pruinosa Schrenk өседі. Ежелгі заманнан бері тораңғы терегі қасиетті, берік ағаш болып саналады, биіктігі 15-20 метрге жетеді, ол екпелерді топырақтың кебуінен және *батпақтануынан қорғайды* және қатты желден құмдардың қозғалысын тоқтатады, оның тамырлары терең еніп, беткі ылғалды, сонымен қатар жер асты суларын сақтайды. Ағаштар өте маңызды. Құлаған, кейбір жерлерде кесілген, сынған, тамырымен жұлынған, ауру, паразиттер әсер еткен ағаштар көп. Зерттеу нысаны антропогендік деградацияға, жайылымдық дигрессияға және шөлейттенуге ұшыраған. Топырақ жамылғысы тау бөктеріндегі шөлді-дала аймағында пайда болған қарапайым боз топырақтардан тұрады. Тасты-құмтасты орташа құмбалшықты, құмды және құмайтты кәдімгі боз топырақтар жайылмалық, тақыр тәрізді, құмды және сортаң топырақтармен кешендер түзеді. Осы аумақта Іле бөріқарақатының - Berberis iliensis Popov топырақ экологиялық жағдайы зерттелді. Бөрі қарақаттың жағдайы қанағаттандырарлық, кей жерлерде кеуіп кеткен, сиреген бұталар кездеседі. Аумақта мал қарқынды жайылады, оның өзі топырақтың тығыздалуына және су-физикалық қасиетінің төмендеуіне әкеледі.

Түйінді сөздер: топырақ-экологиялық жағдайлар, тораңғы терегі, бөріқарақат, кәдімгі боз топырақ, құмды, сортаңдар, жайылмалық, малдың жайылуы.

РЕЗЮМЕ

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ПОЧВЕННО-ЭКОЛОГИЧЕСКИЕ УСЛОВИЯ ПРОИЗРАСТАНИЯ РЕДКИХ ИСЧЕЗАЮЩИХ ВИДОВ РАСТЕНИЙ В БАЛХАШСКОМ РАЙОНЕ АЛМАТИНСКОЙ ОБЛАСТИ

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Почвенно-экологические исследования проводились в Балхашском районе Алматинской области по левому берегу реки Или, где произрастают уникальные краснокнижные деревья туранги- Populus pruinosa Schrenk. С древних времен туранга считалась священным, живучим деревом, достигая высоты 15-20 метров она защищает посадки от пересыхания и переувлажнения почвы и при сильных ветрах останавливает движение песков, корни ее проникают глубоко и удерживают не только поверхностную влагу, но и грунтовые воды. Деревья находятся в крайне критическом положении. Очень много выпавших деревьев, местами вырубленные, сломанные, выкорчеванные, больные, пораженные паразитами. Объект исследования подвергся антропогенной деградации, пастбищной дигрессии и опустыниванию. Почвенный покров представлен сероземом обыкновенным формирующимся в предгорной пустынно-степной зоне. Серозёмы обыкновенные малоразвитые каменисто-щебнистые среднесуглинистые, песчаные и супесчаные формируют комплексы с аллювиальными, такыровидными, песчаными и солончаковыми почвами. На данной территории были исследованы почвенно-экологические условия барбариса илийского - Berberis iliensis Popov. Состояние барбариса удовлетворительное, местами встречаются высохшие изреженные кустарники. На территории идет усиленный выпас животных, что приводит к уплотнению и снижению водно-физических свойств почвы.

Ключевые слова: почвенно-экологические условия, туранга, барбарис, серозем обыкновенный, песчаные, солончаки, аллювиальные, выпас животных.

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