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ECOLOGICAL ASPECTS OF THE ANALYSIS OF THE AGE STRUCTURE OF THE STAND OF THE NATIONAL PARK "BUZULUKSKY BOR"

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ЭКОЛОГИЧЕСКИЕ АСПЕКТЫ АНАЛИЗА ВОЗРАСТНОЙ СТРУКТУРЫ ЛЕСОВ НАЦИОНАЛЬНОГО ПАРКА «БУЗУЛУКСКИЙ БОР»

Abstract. The forests of the steppe Trans-Urals cover a small area and are represented to a greater degree by island forests, birch outlier and inundable poplar forests. However, it is difficult to overestimate their bioecological, habitat forming, soil-fixing, protective and recreational functions. Currently, due to various forest growth conditions and forestry operations, in natural and artificial forest stands, there are processes of shrinking of the stand, epiphytoxics of the stand with harmful insects and fungal diseases, an increase in the proportion of overmature stands, which worsen the general condition of the forest, lead to the development of outbreaks of diseases and create an inflammability. The tree plantations "Buzuluksky Bor National Park" are exposed to periodic droughts, high temperatures in spring and summer, fires in large areas, diseases, as well as continuous logging carried out in the past, which leads to a change in the structure of the stand. The article provides a history of the bor formation, which in the process of its formation was undergone serai change, the influence of various both positive and negative factors, which can be attributed to an anthropogenous factor. An analytical analysis of the changes in the forest fund of the national park "Buzuluksky Bor National Park" because of the use of logging of the main use and the impact of the pyrogenic factor is given. Changes in the area of plantings of individual species by years of forest management are also presented. The optimal age structure is determined, the value of the normative distribution of the areas of plantings for each kind of wood is calculated. Conservation and restoration of forest territories of the steppe zone, in particular "Buzuluksky Bor National Park", the productive capacity of tree plantations, continuing of protective functions, as well as biodiversity and their contribution to global ecological processes are currently the task of prime importance and criterion for sustainable management of forest resources.

Аннотация. Леса степного Зауралья занимают небольшую площадь и представлены в большей степени островными лесами, березовыми колками и пойменными тополевыми лесами. Биоэкологические, средообразующие, почвоукрепляющие, защитные и рекреационные функции этих лесов трудно переоценить. В работе представлен анализ изменения лесного фонда национального парка в результате использования рубок главного пользования и воздействия пирогенного фактора. Даны сведения об изменениях площадей насаждений отдельных пород по годам ведения лесного хозяйства. Была определена оптимальная возрастная структура, рассчитано значение нормативного распределения площадей насаждений по каждой породе древесины. Сохранение и восстановление лесных территорий степной зоны «Национального парка «Бузулукский бор», продуктивной способности древесных насаждений, сохранения защитных функций, а также биоразнообразия и их вклада в глобальные экологические процессы, что является задачей первостепенной важности. В настоящее время в связи с различными лесорастительными условиями и лесохозяйственными работами в естественных и искусственных древостоях происходят процессы усыхания древостоя, эпифитотоксичности древостоя вредными насекомыми и грибными заболеваниями, увеличение доли перестойных насаждений, что ухудшает общее состояние леса, приводят к развитию вспышек болезней и создают пожароопасность. Древесные насаждения «Национальный парк «Бузулукский бор» подвергаются периодическим засухам, высоким температурам весной и летом, пожарам на больших площадях, болезням, а также проводимым в прошлом непрерывным рубкам, что приводит к изменению в конструкции стенда. В статье представлена история формирования бора, который в процессе своего формирования претерпевал серьезные изменения, влияние различных как положительных, так и отрицательных факторов, которые можно отнести к антропогенному фактору.

Keywords: Buzuluksky Bor National Park, dynamics of the forest area, age class of plantings, area of tree species.

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Ключевые слова: национальный парк «Бузулукский бор», динамика площади лесов, возрастной класс насаждений, ареал древесных пород.

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Introduction. The forest stands of the unique steppe forest, which received the status of the "Buzuluksky Bor National Park", were influenced by various positive and negative factors in the process of formation and successional changes, which can include anthropogenic, including pyrogenic [1]. An important management of the Special Protected Natural Areas "Buzuluksky Bor National Park" is to understand how the formation of a unique forest phytocenosis took place, to determine the factors that change its stability and adaptation, and to predict the further development of protected areas.

The purpose of the study is to determine the optimal structure of tree plantations of the "Buzuluksky Bor National Park".

Kovtun S.Y. (2007) notes that the formation of pine forests on the sandy terraces of the Borovka and Samara rivers occurred during the Upper Pleistocene and Holocene epoch (about 10,000 years ago), under aridization of climate [4]. The change of arid and humid climatic periods was reflected in the formation of plant complexes. A number of scientists agree that the decrease in precipitation provoked a decrease in the groundwater level, which subsequently led to an increase in the area of the swept sands. Climatic changes were the primary factors in the formation of the forest landscape, which led to the formation of specific dry (lichen), mossy (fresh, moist), and complex forests [5]. Pyrogenic effects of various geneses led to an intensive increase in non-forested land, which changed the succession of boron. Historically, the formation of boron occurred in the Atlantic humidified period (6000-2500 years BC) and the sub-Atlantic (1500-500 years BC), when there was an increase in the level of groundwater that contributed to the growth of wooded lands. These periods reduced the steppe territories within the forest, and reduced the area of dry cenoses [9; 10]. Subsequent periods

of development of the territory of the "Buzuluksky Bor National Park" occurred during the dry period. After which shifting sand formed dunes, deep sands without layers of sandy loam, gave rise to the formation of a pine complexes.

The history of the study of the forest stand and ecosystem interface in the "Buzuluksky Bor National Park" has more than 200 years; as a result, the scientific community has created an important bibliography revealing the dynamics of boron ecosystems and the patterns of their functioning [7]. The following historical periods of scientific research in the "Buzuluksky Bor National Park" can be distinguished:

First period – 1768-1933. In 1768-1774, by decree of Catherine II, an academic expedition was organized to identify, describe and study natural resources necessary for further economic development of Russia that was. 20 years later, in 1793, a general survey of the forest was carried out by the established Surveying Expedition under the Senate. This decision made it possible to create new jobs .In addition, local population was offered to work as forest wardens, while prohibiting illegal logging. One of the duties was the supervision of the forest management. Since then, this forest area has been given a name – "government-owned place Buzuluksky forest" or "government-owned forest cottage". Survey regulation of district carried out in 1843 laid the foundations for rational forestry in the Buzuluksky forest [7].

On the initiative of Professor G.F. Morozov, a special institution was founded on this territory – the Borovoye Experimental Forestry, which by 1944 stood out as an independent organization of the research direction- the Borovaya Forest Experimental Station of All-Russian Scientific Research Institute of Forestry.

The first ideas about the allocation of this territory as a special one were voiced back in 1927. Professor M.E. Tkachenko, based on the research results of the first scientific expedition, and the recommendations of Academician V.N. Sukachev, prepared a proposal for the creation of the state reserve named as Buzuluksky Bor [9].

The 2nd period – 1933-1948. On the lands of the national park "Buzuluksky Bor", a state reserve was founded, which worked for 15 years. In 1945, a second expedition was organized by Professor V.G. Nesterov, which resulted in the closure of the reserve, and the scientific library and museum were placed at the disposal of the All-Russia Scientific Research Institute of Forestry.

The 3rd period – 1948-1977, when interest in the study of boron by many representatives of the scientific from different fields of science sharply increased. They begin to study and test methods of planting forest cultures; develop technologies for restoring anthropogenic disturbed forest ecosystems. At the same time, due to the lack of the conservation status of boron, active development and oil production continues on the territory of forest stands.

Fourth period – 1977-2007. Committed scientists are beginning to prepare documents for the implementation of the tasks facing specially protected natural areas. A.A. Chibilev (1998) developed a scientific justification for the creation of a National park on all lands of the forest [10].

The Governor of the Orenburg Region, V.E. Elagin, by his order in 1997 created a commission It together with the Institute of Steppe of the Ural Branch of the Russian Academy of Sciences developed a project "On the establishment of the Buzuluksky Bor National Park in the Orenburg and

Samara Regions, and received recommendations from the Ministry of Natural Resources of Russia. The result was the decree of the Government of the Russian Federation dated 29.12.2007 No. 1952, on the establishment of the federal state budgetary institution "Buzuluksky Bor National Park" [6; 8].

The 5th period – from 2008 to the present, Buzuluksky forest receives the status of a "National Park". Active conservational, eco-educational, forestry activities are beginning, scientists are actively involved, who continue to investigate and assess the state of the unique forest ecosystem.

At the present stage, the Buzuluksky forest was investigated: Gursky A.A. (2002), Koltunova A.I. (2015), Velmovsky P.V. (2019), Ryabinina Z.N. (2000) and other scientists whose research covers various aspects of unique tree plantations [1; 2; 6; 8].

A significant part of researchers agree that the impact of abiotic and biotic environmental factors has led to the fact that natural succession is practically absent and artificial reforestation prevails.

Anthropogenic development of new lands, including forest lands, led to the development of forest and cultural activities in the Buzuluksky Bor National Park. The areas affected by fire and salvage fellings were actively used in forestry management.

Materials and methods of research. The work used survey, analytical research methods, and archival data of forest management and accounting of the Buzuluksky forest fund for the period from 1948 to 2018, Forestry regulations for 2008 and 2018, and materials of forest management 1948-2018. The forest fund of accounting data was also used. Initially, all data was compiled into work tables according to the established forms. Then the data on the distribution of areas by land categories were summarized in an abbreviated version of Form 1 of the forest fund accounting. The age distribution of the areas and stocks of the main forest-forming species was brought into line with Form 2 of the forest fund accounting. The distribution of areas and stocks of plantings by age groups is reduced to the same ages of decline (logging), which allowed us to compare the data in dynamics from 1948 to 2018.

The studied tree species were: – scotch pine *(Pínus sylvéstris* L.*)*, then pine; petiolate oak *(Quércus róbur* L.*)*, then oak, hanging birch (silver birch) *(Bétula péndula* Roth*)*, then birch; common aspen *(Pópulus trémula* L.*)*, then aspen.

Results and discussion. The gross area of the forestry "Buzuluksky Bor National Park" according to the forest management is 106788, 28 hectares. The territory of the forestry is divided into 12 precinct forest areas: Bogatovskoye – 7754.51 ha; Borovoye-Opytnoye – 10507.20 ha; Borskoye – 10443.69 ha; Derzhavinskoye – 7090.30 ha; Koltubanskoye – 8302.00 ha; Komsomolskoye – 8225.00 ha; Krasno-Zorkinskoye – 8959.50 ha; Partizanskoye – 9256.90 ha; Petrovsky – 6571.00 ha; Skobelevskoye – 9793.98 ha; Chelyuskinskoe – 10093.30 ha; Shirokovskoe – 9790.90 ha.

Officially, 52.0% of the gross area of the forest is located on the territory of the Orenburg region in the Buzuluksky district, which includes Komsomolskoye, Koltubanovskoye, Borovoye-Opytnoye, Shirokovskoye, Partizanskoye, Derzhavinskoye, Chelyuskinskoye forestry. The Samara region includes 48.0% of the gross area of the forest, which includes Bogatovskoye, Bor, Krasno-

Zorkinskoye, Petrovsky, Komsomolsk, Koltuban, Skobelevskoye, Petrovsky forestry (according to the forestry regulations 2018) [5].

The analysis of the forest fund shows that since 1948 there has been a decrease in the gross area of the forest fund of the national Park "Buzuluksky Bor" by 4852 ha, while the land covered with forest vegetation increased by 41355.8 thousand ha (+78.7%).

The lands of the Buzuluksky forest covered with forest vegetation have changed since the first forest management, depending on the ratio of the areas of logging of the main use and the areas covered by fires. Thus, in 1959-1977, the average annual volume of logging of old growth and over-mature forest was 148 thous. m^3, and in 1990-2018, only 35 thous. m^3.

The area of land covered by fires was about 1.5 thousand hectares. Conflagration type of fire were observed in 1831 on an area of 24 thous. ha, in 1879 – on an area of 18 thous. ha and in 1926 – on an area of 6 thous. ha. As a result of catastrophic fires in 1921, 1926 and 1931, the forest management of 1936 marked the smallest percentage of forested land – 65% of the gross area (tabl. 1).

Table 1

Dynamics of forest fund distribution by forest and non-forest lands

Indicators of land characteristics	1948		1958		1989		2002		2008		2018	
	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
1. Gross land area of the forest fund	111640	100	110710	100	111232	100	111118	100	106788	100	106788	100
2. Лесные земли – всего	76520	68.5	81170	73.3	93150	83.7	96104	86.5	94851	88.8	96639.5	90,5
2.1. Covered with forest vegetation – total	52539	47.1	61986	56.0	86190	77,5	94133	84.7	93272	87.3	93894.8	87.9
2.1.1. Including planted forest	–	–	5384	4.9	2128	1.9	392	0.4	25061	23.5	–	–
2.2. Not covered with forest vegetation – total	23981	21.5	19184	17.3	6960	6.3	1971	1.8	1579	1.5	2744.7	2.6
including: non-closed forest crops	–	–	5384	4.9	2128	1.9	392	0.4	–	–	–	–
wood glades, wastelands	19386	17.4	10368	9.4	3008	2.7	1209	1.1	–	–	2058.7	1.9
3. Non-forest lands – total	11139	10.0	10356	9.4	11122	10.0	13043	11.7	11937.28	11.2	10148.9	9.5

One of the priority areas of economic activity of forestry in Buzuluksky forest has always been reforestation, as a result of which the area of forest land increased from 76.52 thous. ha in 1948 to 96.66 thous. ha in 2018, or by +26.3% [3; 4]. The territory of standing forest increased from 5.34 thous. ha in 1958 to 25.0 thous. ha in 2008. The positive dynamics of the decrease in the areas of forest areas with artificial reforestation, the taxation indicators of which do not meet regulatory requirements and unforested cutting areas was noted. Non-forest lands decreased by 990.1 ha during the study period and in 2018 amounted to 9.5% of the gross area forest fund.

Table 2 shows the ratio of the main forest-forming species depending on the year of accounting. In particular, according to the forest management in 2018, the ratio of species was: birch – 8.8%, aspen – 10.2%, oak – 16.2%, pine – 50.8%.

Table 2

Dynamics of tree plantings areas

Species of wood			Pine tree	Oak	Aspen	Birch	Oth. species of wood	Grand total:
Accounting years	1948	ha	30.5	15.7	13.5	6.9	10	76.6
		%	39.8	20.5	17.6	9	13.1	100
	1958	ha	41.5	19.5	17.5	8.9	29	116.4
		%	35.7	16.8	15	7.6	24.9	100
	1968	ha	46.6	19.3	12.7	8.6	20.9	108.1
		%	40.6	16.8	11.1	7.5	24	100
	1979	ha	40.6	16.8	11.1	7.5	24	100
		%	46.1	16.7	10.9	7.4	17.6	98.7
	1989	ha	52	17.9	11.3	8.5	16.5	106.2
		%	49	16.9	10.6	8	15.5	100
	2002	ha	50.2	16.4	10.7	8.7	14	100
		%	50.2	16.4	10.7	8.7	14	100
	2008	ha	51.3	16.6	10.5	8.9	14.2	101.5
		%	50.5	16.4	10.3	8.8	14	100
	2018	ha	52.6	16.8	10.6	9.1	14.5	103.6
		%	50.8	16.2	10.2	8.8	14	100
Dynamics of 2018-1948.±		ha	22.1	1.1	-2.9	2.2	4.5	27
		%	72.5	7	-21.5	31.9	45	35.2

Studies from 1948 to 2018 reflect the change in the percentage of areas covered by forest plantations. They reflect the positive dynamics of the species composition, which is expressed in an increase in the area of birch plantations – by 2.2 thous. ha (+31.9), oak by 1.1 thous. ha (+7.0%), pine by 22.1 thous. ha (+11%). The area covered by aspen during the study period decreased by 2.9 thous. ha (-21.5%) from 13.5 thous. ha to 10.6 thous. ha. The area under other species increased from 10 thous. ha in 1948 to 14 thous. ha in 2018, the increase was +4.5 thous. ha (+45%). The gross area of plantings for the time period 1948-2018 increased by 27 thous. ha (+35.2%).

The age structure of the stand (tabl. 3) indicates that the average age of tree species has changed, for example, the average age of pine plantations has increased and amounted to 92 years by 2018 (+18 years). This indicates the aging of plantings in the ecosystem, bringing it closer to the category of overgrown forest. This dynamics is noted for all the studied tree species, the class of bonity and the average completeness of the stand changed slightly during the study period.

According to the volume of wood for 1 ha, the first most important wood species is pine. There is a positive trend in the accumulation of its reserves, from 298 m^3/ha in 1948 to 551 m^3/ha in 2018. The second most important wood species is oak. The dynamics of volume and age varies from 137 m^3/ha at 35 years in 1948 and up to 284 m^3/ha at 78 years in 2018. At the same time, the capacity class decreased slightly (by – 0.4), but the completeness increased by +0.2.

The third forest forming species is aspen. The average age of its plantings increased from 34 to 72 years, the capacity class increased by 0.5 and the reserve by 149 m^3/ha. The fourth forest forming species is birch. Its plantings increased the age by 15 years, the area by 65% and were generally stable in productivity in comparison with other breeds.

Table 3

Dynamics of average taxation indicators of the stand

Species	Years of accounting	Age, years	Capacity class	Comple-teness	Stock for 1ha, m3		Stock change	
					Mature and overmature tree	Forested	Average, m3/ha	Total, thousand/m3
Pine	1948	74	1.2	0.56	298	211	2.7	79.5
	1958	86	1.2	0.69	357	242	3	102
	1968	69	1.2	0.67	366	225	3.5	141
	1979	71	1.2	0.63	398	249	4.2	194.4
	1989	78	1.3	0.65	390	255	3.7	176
	2002	89	1.2	0.7	435	340	4.4	210.9
	2008	90	1.2	0.74	487	423	5.1	244
	2018	92	1.2	0.78	551	468	5.7	279
Dynamics 2018-1948±		+18	–	+0.2	+253	+257	+3.0	+200
Oak	1948	35	2.9	0.57	137	81	2.3	36.1
	1958	41	3.2	0.66	151	98	2.4	38.7
	1968	47	3.1	0.68	150	122	2.7	44.9
	1979	56	3.1	0.67	160	141	2.7	44.6
	1989	66	3.1	0.65	192	168	2.6	42.5
	2002	70	2.0	0.68	224	227	2.8	42.9
	2008	73	2.0	0.7	255	271	3.1	43.3
	2018	78	2.5	0.73	284	328	3.2	44.5
Dynamics 2018-1948±		+43	+0.4	+0.2	+147	+247	+0.9	+8.4
Aspen	1948	34	2.0	0.69	191	110	3.6	48.3
	1958	35	2.2	0.74	180	130	3.7	53.8
	1968	35	1.5	0.76	196	147	4.2	46.2
	1979	39	1.9	0.75	233	160	4.3	47
	1989	48	1.8	0.76	243	195	4.2	43.8
	2002	57	1.7	0.77	258	228	3.8	38.6
	2008	65	1.6	0.77	271	259	3.5	33.2
	2018	72	1.5	0.78	284	259	3.1	28.3
Dynamics 2018-1948.±		+38	+0.5	+0.1	+93	+149	-0.5	-20
Birch	1948	33	2.1	0.59	147	90	2.6	18.4
	1958	38	2.1	0.69	145	113	3.1	22.4
	1968	42	1.9	0.66	158	130	3.2	24.4
	1979	49	1.7	0.67	200	151	3.3	24.6
	1989	56	1.9	0.67	195	174	3.1	24
	2002	65	1.7	0.68	216	195	3.0	19.7
	2008	56	1.9	0.67	195	172	3.1	24.1
	2018	48	2.1	0.66	172	155	3.2	28.5
Dynamics 2018-1948.±		+15	0	+0.1	+25	+65	+0.6	+10.1

The areas and stock volume by age groups were distributed taking into account the exploitability age adopted by forest management. In order to compare mature and overmature plantings for all accounting periods, the plantings were assigned to the age corresponding to the age of exploitability established by the rules of forest management: for pine – 121, oak – 71, birch – 61, aspen – 51 and more years. The analysis shows a wide range of distribution of plantings by age classes (tabl. 4). The indicators vary significantly, and the areas of mature and overmature pine plantations increased to 36.9% by 2018 against 20.1% in 1948.

The analysis of age-related changes in oak plantations shows significant changes since 1948, when the area of plantations was 6.8% in the I age class, and by 2018 it dropped to 0.9%. An increase in the area of plantings is noted in the VII and subsequent oak age classes from 7.0% in 1948 to 78.5% by 2018.

Table 4

Distribution of plantings by structural classes, (%)

Sesies	Years of accounting	Age class										
		I	II	III	IV	V	VI	VII	VIII	IX	X and more	VII and higher
Pine	1948	20.5	7.1	7.3	7.0	11.5	26.5	15.8	4.1	0.2	–	20.1
	1958	23.6	5.0	7.3	8.3	5.8	24.8	23	2.2	–	–	25.2
	1968	31.4	9.0	6.4	9.3	5.4	11.4	22.4	4.2	0.5	–	27.1
	1979	19	26.7	5.3	7.2	7.3	6.6	17.6	9.7	0.6	–	27.9
	1989	9.8	32.6	8.8	5.8	8.8	4.8	10.4	16.8	2.0	0.2	29.4
	2002	2.7	16.8	27.1	5.8	6.8	8.3	7.9	12.6	11.6	0.4	32.5
	2008	2.0	15.6	32.1	16.8	10.9	12.8	8.2	10.1	14.6	2.3	34.1
	2018	1.5	14.1	21.7	28.4	12.3	9.3	9.6	8.3	17.9	3.4	36.9
	S.d.	**14.3**	**14.3**	**14.3**	**14.3**	**14.3**	**14.3**	**14.3**	**–**	**–**	**–**	**14.3**
Oak	1948	6.8	10.7	24.7	26.8	12.3	8.4	3.3	2.5	2.3	2.2	7.0
	1958	3.7	7.7	11.7	32.3	20.6	11.8	7.6	4.6	–	–	4.6
	1968	1.1	4.1	9.5	15.7	25.8	25.7	13	3.4	1.1	0.6	5.1
	1979	0.7	2.1	4	10.7	17.7	28.3	23	10.3	2.2	1	13.5
	1989	0.1	1.8	2.9	5.4	9.6	20.4	26.9	21.4	8.6	2.9	32.9
	2002	0.1	0.4	1.9	3.8	3.8	6.9	13.9	31.0	27.8	10.1	82.8
	2008	0.2	0.5	2.2	4.1	4.2	7.1	12.4	28.2	25.3	14.2	80.3
	2018	0.9	1.2	2.6	4.9	4.8	8.9	13.6	24.5	21.2	18.6	78.5
	S.d.	**12.5**	**12.5**	**12.5**	**12.5**	**12.5**	**12.5**	**12.5**	**12.5**	**–**	**–**	**12.5**
Aspen	1948	9.6	19.3	23.2	25	14.6	5.2	2.1	0.8	0.2	–	8.3
	1958	5.1	12.5	18.2	25.6	24.1	11.8	2.6	0.1	–	–	14.5
	1968	10.4	7.9	16.6	20	28.2	13.5	3	0.4	–	–	16.9
	1979	11.4	12.6	9.7	16.1	21	23	7.5	1.3	0.1	–	29.2
	1989	2.8	8.5	15.1	10.5	17.1	22.8	17.1	4.8	0.8	0.5	46
	2002	1.9	1.9	7.7	12.5	10.6	20.2	22.1	19.2	2.9	0.5	44.7
	2008	2.2	2.2	6.8	11.8	8.7	18.9	24.5	23.1	3.1	1.9	46.1
	2018	1.9	1.9	5.7	10.2	7.3	17.4	28.7	26.9	4.4	2.8	48.3
	S.d.	**16.6**	**16.7**	**16.7**	**16.7**	**16.7**	**16.2**	**–**	**–**	**–**	**–**	**16.6**
Birch	1948	4.4	26	18.5	16.2	15.1	10.7	5.8	2.5	0.8	–	9.1
	1958	1.2	7.5	23.9	24.8	21.9	23.4	6.4	0.9	–	–	7.3
	1968	1.1	2.8	8	36.4	25.5	28	3.6	1.7	0.1	–	5.4
	1979	2.6	3.5	4	13.6	39.7	23.3	9.1	3.6	0.6	–	7.3
	1989	1.6	3	4.4	4.1	19.3	37.7	21.5	6.7	1.7	–	29.9
	2002	1.2	2.4	3.7	3.7	6.1	10.9	35.4	28.2	7.3	1.1	71.8
	2008	0.9	2.2	4.3	4.2	7.2	8.9	37.2	32.1	8.4	–	74.2
	2018	2.4	3.8	3.8	3.5	7.9	5.4	38.6	36.2	9.6	–	78.7
	S.d.	**14.3**	**14.3**	**14.3**	**14.3**	**14.3**	**14.3**	**14.3**	**–**	**–**	**–**	**14.3**

S.d. – Standart distribution of plantings areas (%)

The area of aspen plantings in the I age class was 9.6% in 1948, and by 2018 it had decreased to 1.9%, however, the area of its overmature plantings has doubled over 70 years.

A similar distribution of the area of plantings by age classes is observed in birch plantings; in particular, in the I age class in 1948, they were 4.4%, and by 2018 they had decreased to 2.4%. In the VII age class, their area in 1948 was 9.1%, and by 2018 it reached 78.7%.

There are several reasons to explain the trends in the accumulation of forested land by species in comparison with 1948. This was probably influenced by the prohibitions of reforestation logging introduced since 1978, and therefore their small volume prevented the renewal of the age structure of plantations. The second reason may be severe droughts observed in 1998, 2009, 2010, 2012, 2015. The Orenburg region can be considered their epicenter, where there are all types of droughts: early spring, autumn-summer, summer-autumn, combined and stable. This factor is of great importance for the stability of birch and oak plantations.

Conclusion. The complex age structure of the forest fund, the ratio of the areas of forest stands of different ages form the features of the functioning of the forest biocenosis, as well as determine the prospects for forest management, will allow identifying criteria for assessing the health and sustainability of forests at present and in the future. The age structure of the forest fund of the National Park “Buzuluksky Bor” according to the above tree species is not optimal from the point of view of forest management.

Forestry activities of the National Park “Buzuluksky Bor” should be focused on the normative distribution of plantings, which will lead to the alignment of the age structure. The article presents the values of the normative distribution of the areas of plantings (%) for the main tree species of the Buzuluk forest, taking into account the age class. The normative distribution of pine, oak, birch plantings, taking into account the age class, does not change, aspen plantings change slightly. The obtained values show an equalized structure of tree species, which is aimed at the formation of sustainable forest management and reforestation, reducing the accumulation of over-standing plantings. The above normative distribution of the stand is justified by the peculiarities of the economic activity of the national park, which does not provide for logging of the main use. In our opinion, the optimization of the age structure of the stand is possible to a greater extent with the reasonable use of logging for main use, which will minimize negative factors such as inflammability, an increase in the number of harmful insects and fungal diseases.

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