Soil-geobotanical assessment of the condition of land plots on the example of the forest fund of MSI "Sokolovskoye Forestry"

N Shogelova[1*] and *S* Sartin[2]

[1]International Educational Corporation, 28 Ryskulbekov str., 050043, Almaty, Republic of Kazakhstan
[2]North Kazakhstan University named after Manash Kozybayev, Petropavlovsk, Republic of Kazakhstan

Abstract. Work has been carried out on the study of forest areas located on the territory of Northern Kazakhstan. The study of the soil was carried out by the method of laying soil sections and semi-sections with a description of the power of horizons. The soil structure was determined by the method of splitting soil samples. The determination of the granulometric composition was carried out by a wet method with a division into the sand, sandy loam, light loam, medium loam, heavy loam, and clay. According to the structure and chemical analysis, the types of soils for each forestry are determined. Based on the results of the study, recommendations were developed for the categories of areas. The areas of plots Suitable for all major forest species and areas with existing forests and forest crops overgrew with self-seeding were also determined. During the reconnaissance route-loop survey of land plots, types of plant associations were identified. A comprehensive ecological and geographical study the forestry was carried out to carry out afforestation work. Mainly, the identification of types of plant associations made it possible to conduct a preliminary assessment on the ground about the quality of the studied sites for the restoration of forests.

1 Introduction

In conditions of increasing demand for forest resources and increasing all-around anthropogenic pressure on forest ecosystems, in order to solve the problems of sustainable development, more and more importance is attached to obtaining prompt and reliable information about the patterns of forest formation and assessing their condition. Therefore, the development of modern methods of coupled quantitative analysis of remote sensing data, data from digital terrain models, data from field complex studies, and other materials that allow increasing the degree of reliability and informativeness of the assessment of the state of the forest canopy is, of course, an urgent task [1,2,3].

* Corresponding author: nazym-shogelova@mail.ru

Forest monitoring is one of the main tasks of the Forest Fund of the Republic of Kazakhstan. However, there is no single legally approved methodology for conducting environmental monitoring of forests on the territory of the Republic of Kazakhstan yet, its development is at the stage of experimental research.

Rational nature management implies the optimal solution to environmental problems facing the territory, which arise as a result of various economic measures that have a direct or indirect impact on the environment. Usually, such impacts are destructive to the vegetation of the developed territory and contribute to anthropogenic dynamic processes. In some cases, this is due to the direct use of plant resources: forest resources, steppe and meadow resources (hayfields and pastures), etc. In other cases, vegetation is affected by man-made and household emissions from industrial enterprises and residential areas. In addition, it is affected by the pyrogenic factor associated with targeted (man-made) burnout, usually used in traditional land use, or non-targeted forest and steppe fires. They are usually of anthropogenic origin and are caused by human activities: tourism, outdoor recreation, accidental use of plant resources, etc. [4,5].

This is largely due to the multifaceted role of vegetation in human life and economic activity. Such a role can be defined as socio-economic, in contrast to the ecological role played by vegetation in geosystems. This is, to some extent, an arbitrary distinction, since all ecological functions of vegetation are usually considered from the point of view of its usefulness or danger to human interests. It is for this reason that it is important and necessary to take them into account in order to achieve rational environmental management in the region [6].

It is advisable to define the specific roles of vegetation in these groups in accordance with specific methods of nature management related to vegetation, such as conservation, protection, resource management, etc. An ecological group is similar in its content definition to a group of ecological functions, but the priority, in this case, is given to the expediency of using a specific function in the economy. The following types of useful ecological functions of vegetation for human economic activity in a particular region are distinguished here: anti-erosion, decongestant, stabilizing permafrost, emergency, anti-landslide, protection of soil and wind, and others. This corresponds to the ecological functions of vegetation performed by it in natural complexes, depending on the general natural and geographical features of the region [7,8]. The complexity of soils and climatic conditions are the main factors when taking into account the cultivation of forest plantations. Therefore, studies devoted to a comprehensive assessment of the soil-geobotanical condition of land plots for the implementation of afforestation works are relevant.

2 Materials and methods

The geomorphological surface of the territory under consideration is represented by the North-Ishim low-wave accumulative plain region with absolute heights of 130-140 m. Geologically, the plain is composed of lacustrine-alluvial medium and heavy, sometimes loess-like loam of Quaternary age, which lie on continental diluvial Neogene deposits.

Characteristic elements of the meso- and microrelief of the terrain are individual high (up to 10 m) manes, inter-mane flat spaces, and steep and hilly elevations with a relative height of 2-4 m. There are also numerous negative forms of relief, represented by saucer-shaped wasteless depressions with an area of 0.2- 20 hectares and hollows, usually occupied by lakes or swamps [9,10].

The area is characterized by the natural and climatic data described below. Forests are represented by massifs of up to 500 hectares and small stakes of birch and aspen, small areas of pine, and shrub willow. The forest cover of the area is high – up to 20%. Birch forests growing in the plakor conditions consist mainly of hanging birch. Steppe cherry is found in the undergrowth, and the grass cover consists of forest, meadow, and meadow-steppe plants. Aspen-birch forests occupy mainly zapadiny. The forest-forming species here are hanging and fluffy birch, and aspen. The undergrowth is poor and represented by rosehip. Willows and sedges usually grow in swampy stakes.

On flat virgin soils, zonal herbaceous vegetation is a rich variety of grass of the meadow, st,eppe and meadow–steppe communities, often with kovylno-tipchak and tipchak-wormwood complexes with a predominance in the latter of tipchak, wormwood, carrot, steppe oats, steppe veronica, and large plantain. According to the depressions, meadow-swamp groupings dominate in treeless areas.

The climate of the zone is characterized by a sharper continentality, compared with the northern forest-steppe. The amounts of annual precipitation range from 270 to 340 mm, including 180-200 mm during the autumn-winter period, and up to 170 mm during the growing season. The frost-free period lasts on average 130 days, the sum of positive temperatures during this period is more than 2400 °.

The soil cover of the area is heterogeneous and closely related to the composition of the soil-forming rocks and the degree of drainage. Gray forest soils are developed under the forests on the plateaus, ordinary and rejuvenated chernozems, in the hollows – malt [11]. Treeless undrained spaces are occupied mainly by meadow-chernozem saline soils and complexes of saline and malt. In numerous swampy depressions, swamp and meadow-swamp rejuvenated soils were formed. Sod-boron soils are formed under pine forests. This forest-growing area belongs to the number of water-supplied with both underground and surface fresh water. For vegetation, the most valuable is groundwater in quaternary sediments at a depth of 0.5-3 m [12,13].

In the intercollegiate open areas of the North Kazakhstan region, ordinary chernozems predominate, which are divided into genera: non-saline, saline, lingual, carbonate, and underdeveloped, as well as into types: powerful (A+ AB more than 80 cm), increased capacity (A+AB within 70-80 cm), medium-sized (A+AB in within 45-70 cm), reduced power (A + AB within 30-45 cm) and low-power (A+ AB less than 30 cm).

On all types of soils, there are salt flats and salt marshes of various shapes, occupying microrelief depressions, the share of which can be up to 30-40% of the total area. They are clearly distinguished by plant associations since there is no herbaceous vegetation on them, the surface is covered with a white layer of salt, and halophytes grow sparsely around them. The complexity of soils and climatic conditions are the main factors when taking into account the cultivation of forest plantations in this zone [14, 15].

2.1 General characteristics of the studied land plots

The surveyed land plots are located in three forest areas: Nalobinsky – 6.6 hectares, Vinogradovsky – 98.5 hectares. Satellite photos of the sites are shown in Figure 1.

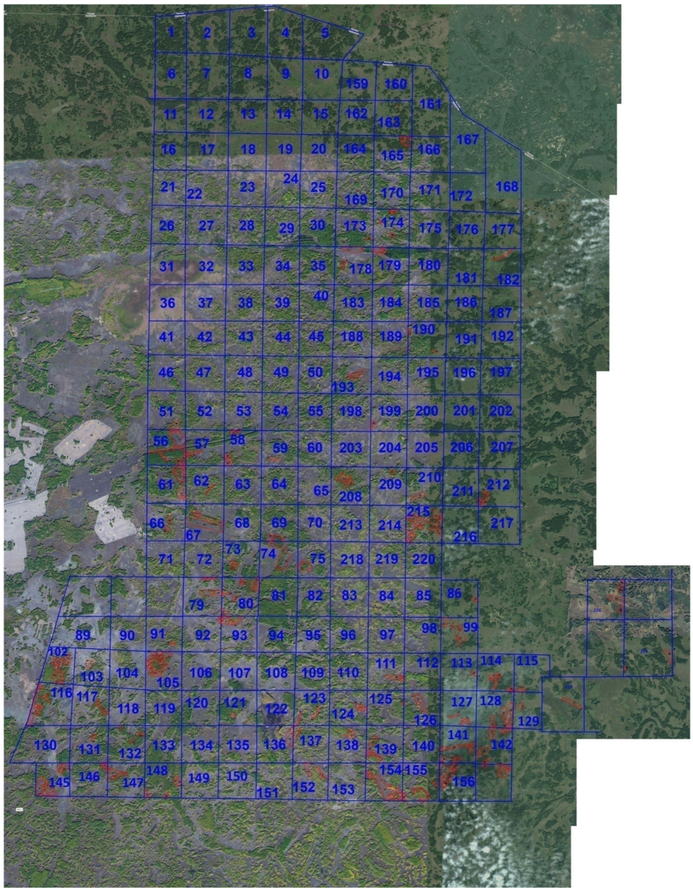


Fig. 1. Satellite image of the investigated land plots in Malinovsky forestry.

The study of the soil was carried out by the method of laying soil sections and semi-layers with a description of the thickness of the horizons in centimeters, color, structure, addition, borehole, soil density, the presence of soil neoplasms, and inclusions. The depth of the soil sections is up to the soil–forming rock.

To unify the definition of soil color, a triangle of colors was used by S.A. Zakharov. The soil structure was determined by the method of splitting soil samples. The composition of the soil was determined by field studies on the resistance of knife indentation throughout the depth of the soil pit with a division into loose, compacted, and dense. The borehole of the soil was determined by the size of the pores and the width of the inter structural cracks with a division into finely porous (pore diameter less than 1 mm), porous (more than 1 mm), thinly cracked (with a crack width less than 3 mm) and fractured (more than 3 mm). The porosity was taken on the basis of determining the mechanical composition of the soil according to the reference data of V.V. Dobrovolsky. For clay – 44-50%, coarse sand, gravel – 36-42%, and - 35-40%. The determination of the granulometric composition was carried out by a wet method with a division into the sand, sandy loam, light loam, medium loam, heavy loam, and clay.

Chemical analysis of soil samples was carried out in the certified laboratory of the Department of Land Cadaster and Technical Inspection of Real estate – a branch of the non-profit joint stock company "State Corporation "Government for Citizens" in the North Kazakhstan region in accordance with the requirements of GOST 26423-85, GOST 26428-85, GOST 26950-86, GOST 17.1.4.01-84.

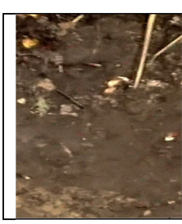
Vegetation was studied by the method of laying accounting sites with a size of 1 m2 according to the mechanical principle with the determination of plant species and abundance on them according to the Drude scale. Soil sections were laid in areas with a typical over-ground cover after a reconnaissance route-loop survey of the territory. The uniformity of soils within the soil contours is confirmed by the laying of digs in approximate boundaries determined by plant associations.

2.2 Description of land plots based on the materials of field and laboratory studies of soil section No.1

The plot is an area with a significant slope toward the lake. Felling of a birch stake, renewal is weak. The amount of self-seeding is small. The total coverage of grassy vegetation is 100%. The average height of the herbage is 45 cm. Meadow bluegrass dominates (40%), ground vine (30%), field aspen (5%), elmberry (5%), bedstraw (5%), yarrow (5%), silky wormwood (5%), common tansy (5%). To characterize the soil profile of the site, Table 1 provides a description of section No. 1.

According to the chemical analysis of soil samples, it was found that the humus content is low: in horizon A – 2.7%. The absorption capacity is average: in horizon A 22.56% and decreases with depth to 14.24% in horizon AB, and 9.12% in horizon B. In the composition of the absorbed bases, the amount of exchangeable sodium is: in horizon A – 0.71%, in horizon AB – 1.19%, and in horizon B – 2.96%, which characterizes the soil as non-saline. The number of dissolved salts in horizon A is 0.0303%, increasing with depth to 0.0437% in horizon AB and 0.2116% in horizon B. According to the degree of salinity and the presence of salts in the entire soil profile, the soil is unsalted. There are no soluble carbonates. Bicarbonates are present in the entire soil profile in low amounts: 0.0085%, 0.0183%, and 0.0238%, respectively. The amount of chlorides in the upper horizons is low: in horizons A and AB – 0.0096%, and the average in horizon B – 0.0394%. The number of soluble sulfates is extremely low and amounts to 0.0024%, 0.0024%, and 0.0816%, respectively. The amount of magnesium ions toxic to wood species is low: 0.18 mg-eq/100 g in horizon A and AB, 0.26 mg-eq/100 g in horizon B. Calcium dominates in the composition of aqueous extract cations in horizons A and AB, and sodium dominates in horizon B. The soil is slightly acidic in the upper horizon and alkaline in the underlying ones. The pH increases with depth. According to the structure and chemical analysis, the type of soil on this site can be defined as ordinary chernozem. The soil is Suitable for all major tree species.

Table 1. Description of the structure of the soil of the site according to the field study of soil section No.1.

	Horizon A0 From 0 to 3 cm	Steppe felt and forest litter
	Horizon A from 3 to 27 cm	Dark gray. Permeated with the roots of herbaceous plants. Finely lumpy. Loose. Fresh. Medium loam. pH 6.6. The transition to the next horizon is clearly noticeable.

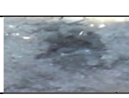
	Horizon AB from 27 to 71 cm	Brown with very much blurred gray tongues. Compacted. Finely lumpy. Fresh. Medium loam. pH 7.4. The transition to the next horizon is gradual.
	Horizon B from 71-185 cm	Brown. Wet. Large-lumpy. Medium loam. pH 7.9. Boils violently under the influence of hydrochloric acid.

2.3 Description of land plots based on the materials of field and laboratory studies of soil section No.2

The site is an area with a noticeable slope towards the south. Heavily overgrown with cherries. The amount of self-seeding of birch and aspen is large, but it is unevenly distributed on the site. The total coverage of grassy vegetation is 100%. The average height of the herbage is 45 cm. Meadow bluegrass (35%), meadow fescue (35%), Marshal's carrot (5%), field aspen (5%), elmberry (5%), tuber-bearing zopnik (5%), yarrow (5%), silky wormwood (3%), small plantain (2%). To characterize the soil profile of the site, Table 2 provides a description of section No. 2.

According to the chemical analysis of soil samples, it was found that the humus content is high: in horizon A – 5.2%. Absorption capacity in horizon A is 29.6%, 22.71% in horizon AB, and 16.4% in horizon B. In the composition of absorbed bases, the amount of exchangeable sodium is low: 0.14% in horizon A, 0.26% in horizon AB, and 0.43% in horizon B, which characterizes the soil as non-saline. The amount of dissolved salts is low: in horizon A 0.0295%, in horizon AB 0.0395%, and in horizon B 0.0845%. According to the degree of salinity and the presence of salts in the entire studied soil profile, the soil is unsalted. There are no soluble carbonates. The amount of hydrocarbonates is low: 0.0125% in horizon A, 0.0171% in horizon AB, and 0.0296% in horizon B. The amount of chlorides in all horizons is low: 0.0065% in horizons A and AB, and 0.0096% in horizon B. The number of soluble sulfates is insignificant: 0.0024% in horizon A, 0.0029% in horizon B, and 0.0061% in horizon B. The amount of magnesium ions toxic to wood species is low: 0.08 mg-eq/100 g in horizon A, 0.18 mg-eq/100 g in horizon AB, 0.2 mg-eq/100 g in horizon B. Calcium dominates in the composition of the cations of the aqueous extract. The soil is alkaline throughout the soil profile, and the pH increases with depth. According to the structure and chemical analysis, the type of soil on this site can be defined as ordinary chernozem. The soil is Suitable for all major tree species.

Table 2. Description of the structure of the soil of the site according to the field study of soil section No.2.

	Horizon A0 From 0 to 3 cm	Steppe felt and forest litter

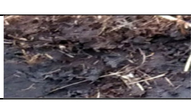
	Horizon A from 3 to 50 cm	Black color. There are numerous roots of herbaceous plants. Finely lumpy granular. Loose. Dry. Medium loam. pH 7.3. The transition to the next horizon is gradual.
	Horizon AB from 50 to 121 cm	Brown with strongly blurred dark tongues. Compacted. Finely lumpy. Dry. Medium loam. pH 7,7. The transition to the next horizon is gradual.
	Horizon B from 121-188 cm	Brown. Fresh. Compacted. Finely lumpy. Medium loam. pH 8.3. Boils moderately under the influence of hydrochloric acid.

2.4 Description of land plots based on the materials of field and laboratory studies of soil section No.3

The section is laid out in allocation 40 of block 154. The vegetation is grass meadow associations. There are pine crops on the site that have suffered greatly from overeating by wild animals. The trees are alive, but the formation of the trunk is disrupted. The total coverage of grassy vegetation is 100% The average height of the herbage is 50 cm. Meadow bluegrass dominates (50%), meadow fescue (35%), green strawberry (10%), yarrow (3%), elmberry (2%). To characterize the soil profile of the site, Table 3 provides a description of section No. 3.

The absorption capacity in the AB horizon is low - 12.8 mg-eq per 100 g of soil. As part of the absorbed bases, the amount of exchangeable sodium in the AB horizon is 0.23%, which characterizes the soil as non–saline. According to the chemical analysis of soil samples, it was found that the humus content is reduced: in horizon A – 2.9%. There are no soluble carbonates. The amount of hydrocarbonates is low: 0.0104% in horizon A and 0.0128% in horizon AB. The amount of chlorides is low and amounts to 0.067% in horizons A and AB. The number of sulfates is also low: 0.048% in horizons A and AB. The amount of magnesium ions toxic to wood species is low: 0.2 mg-eq/100 g in the horizon A and AB. The soil on the studied profile is slightly acidic. The pH does not change with depth. The sum of salts in horizon A is 0.0296% and in horizon AB 0.0328%. By the number of salts, the soil profile is uninhabited. According to the structure and chemical analysis, the soil type is ordinary low–humus chernozem. Suitable for all major tree species.

Table 3. Description of the structure of the soil of the site according to the field study of soil section No.3.

	Horizon A0 from 0 to 5 cm	Dry grass (steppe felt).

	Horizon A from 4 to 45 cm	Gray. Ubiquitous inclusions of grass roots, the number of which decreases towards the bottom. Loose. Dry. Finely lumpy. Sandy loam. pH 6.9. The transition to the next horizon is gradual. A rodent burrow is marked in the section.
	Horizon AB from 45 to 100 cm	Brown with very much blurred gray tongues. Finely lumpy. Dry from top to bottom fresh. Loose. Light loam. pH 6.9.

2.5 Description of land plots based on the materials of field and laboratory studies of soil section No.4

The cut is laid out in the allocation of the 5th quarter of 31. Vegetation is a rich variety of grass associations. The total coverage of grassy vegetation is 100%. The average height of the herbage is 40 cm. The ground vine dominates (40%), creeping wheatgrass (35%), green strawberries (10%), field aspen (6%), bedstraw (4%), elmberry (3%), common wormwood (2%). To characterize the soil profile of the site, Table 4 provides a description of section No. 4.

The absorption capacity in the AB horizon is low - 16.64 mg-eq per 100 g of soil. As part of the absorbed bases, the amount of exchangeable sodium in the AB horizon is 0.12%, which characterizes the soil as non–saline. According to the chemical analysis of soil samples, it was found that the humus content is reduced: in horizon A – 3.7%. There are no soluble carbonates. The amount of hydrocarbonates is low: 0.0177% in horizon A, and 0.0146% in horizon B. The amount of chlorides is low and amounts to 0.068% in horizons A and B. The number of sulfates is also low: 0.047% in horizons A and B. The amount of magnesium ions toxic to wood species is low: 0.3 mg-eq/100 g in horizon A, 0.28 mg-eq/100 g in horizon B. The soil on the studied profile is neutral in the upper horizon and slightly acidic in layer B. With depth, the pH decreases. The sum of salts in horizon A is 0.0382%, in horizon B is 0.035%. By the number of salts, the soil profile is unsalted. According to the structure and chemical analysis, the soil type is ordinary chernozem. Suitable for all major tree species.

Table 4. Description of the structure of the soil of the site according to the field study of soil section No.4.

	Horizon A0 from 0 to 1 cm	Dry grass (steppe felt).

	Horizon A from 1 to 20 cm	Gray. Ubiquitous inclusions of grassroots, the number of which decreases towards the bottom. Loose. Dry. Finely lumpy. Sandy loam. pH 7.0. The transition to the next horizon is gradual.
	The horizon is from 20 to 95 cm	Brown. Finely lumpy. Dry. Loose. Sandy loam. pH 6.9.

2.6 Description of land plots based on the materials of field and laboratory studies of soil section No.5

The cut is laid in blocks 78 and 72. In such areas, cereal-wormwood associations are noted, which is an indicator of salinity. The site is a clearing between the stakes. The total coverage is 100%. Herbage height is within 30 cm. It is dominated by the sprawling limpet (45%), Austrian wormwood (30%), and tipchak (10%). In micro–depressions - the ground-based vane (10%). Scattered wormwood Sivers (3%), under the forest - meadowsweet (2%). According to the chemical analysis of soil samples, it was found that the humus content is low: in the horizon A – 2.7%. The absorption capacity is low: in horizon A 22.61 mg-eq per 100 g of soil, in horizon AB 19.02 mg-eq per 100 g of soil, in horizon B 15.88 mg-eq per 100 g of soil. As part of the absorbed bases, the amount of exchangeable sodium in horizon A is 3.02%, in AB – 12.09%, in horizon B – 30.55%, which characterizes the soil as a medium-salt salt. The amount of dissolved salts in horizon A is low at 0.0643%, then increases in horizon AB to 0.3185% and in horizon B to 0.4446%. According to the degree of salinity and the presence of salts, the soil is slightly saline. There are no soluble carbonates. The amount of hydrocarbonates is low and increases with depth: 0.0377% in horizon A, 0.0549% in horizon AB, and 0.058% in horizon B. The amount of chlorides is average and increases with depth: 0.0109%, 0.0117%, and 0.0149%, respectively. The number of sulfates is insignificant in the upper horizon: 0.0048%. Then it sharply increases in the AB horizon to 0.1944%, and in the B horizon to 0.2236%, but still does not exceed the maximum permissible value (0.3%). The amount of magnesium ions toxic to wood species is low: 0.22 mg-eq/100 g in horizon A, 0.24 mg-eq/100 g in horizon AB, and 0.28 mg-eq/100 g in horizon B. The composition of the cations of the aqueous extract is dominated by calcium sodium. The soil is alkaline throughout the soil profile, and the pH increases with depth. According to the structure and chemical analysis, the soil type is solonets medium-solonets. UnSuitable for the main tree species of the region.

3 Results and discussion

The territory of the North Kazakhstan region has a wide variety of soil types, which forces their analysis to identify favorable areas for planting crops. A comprehensive ecological and geographical study of forestry was carried out to carry out afforestation work. The results of the forestry research formed the basis for the work of an improved methodology for organizing and conducting forest monitoring. Moreover, this approach makes it possible to identify changes in the state of the land and assess these changes. Also, based on the results, it is possible to make a forecast and develop a number of recommendations for the prevention and elimination of the consequences of negative processes.

The surveyed land plots are located in the West Siberian lowland within the boundaries of the southern forest-steppe zone within the North Kazakhstan region of transitional typical forest-steppe (massive) aspen and birch forests. They are located on both banks of the Ishim River.

The implementation in practice of an integrated approach to restoring and increasing the total area of forest lands significantly increases the efficiency of the work carried out, but at the same time imposes restrictions on planting in certain areas of regulated crops. For example, in modern forest management, birch and pine are chosen as the main crops for sowing. However, in the studies conducted, on approximately 30% of the areas, soil analysis showed the need for primary planting of elm (or other rocks that contribute to soil salinization), while earlier attempts to plant the main crops led to financial losses. The development of the method of integrated ecological and geographical research in the future can significantly increase the efficiency of forest management work in general and minimize losses associated with environmental influences.

The developed recommendations based on the results of the study are given in Table 5.

Table 5. By land plots of Nalobinsky and Vinogradovsky forestry

Area Category	Quarter	Select	Area, ha	Research results and recommendations
cutting down	20	55	1,2	Cutting, abundantly overgrown with cherries. There is self-seeding of aspen and birch. Ordinary chernozem. Suitable for all major tree species.
clearing	21	60	0,6	A clearing between pine and birch crops. Ordinary chernozem. Suitable for all major tree species.
cutting down	95	44	2,4	Deforestation and renewal are weak. The amount of self-seeding is small. Ordinary chernozem. Suitable for all major tree species.
cutting down	95	50	2,0	Deforestation and renewal are weak. The amount of self-seeding is small. Ordinary chernozem. Suitable for all major tree species.
wasteland	98	4	0,4	Overgrown with self-seeding cherry and apple trees. It is difficult to access, as it is located inside a heavily overgrown self-seeding apple tree forest.
cutting down	27	77	1,6	The cutting down of the overripe forest is about 10 years old, so the resumption is weak. A birch woodland has been formed. Ordinary chernozem. Suitable for all major tree species.
wasteland	30	16	1,0	Lost forest crops. Solonets are medium-saline. UnSuitable for growing forest crops.
cutting down	30	54	2,5	Overgrown with birch, aspen, and in places talnik.
cutting down	30	69	3,6	Overgrown with birch, aspen, and in places talnik.
wasteland	31	5	2,8	Lost forest crops. Most likely, they were killed by cattle, since they are near the village. Ordinary chernozem. Suitable for all major tree

				species.
cutting down	40	58	1,5	The northern part is overgrown with dense self-seeding of birch and aspen (0.5 ha). In the rest of the site, the self-seeding of birch and aspen grows sparsely, which makes it possible to lay forest crops. Ordinary chernozem. Suitable for all major tree species.
cutting down	45	21	3,4	Ordinary chernozem. Suitable for all major tree species. There is self-seeding of birch, aspen, and hawthorn.
cutting down	51	3	0,5	A well-formed birch forest. Partially passed by a grassroots fire, but the trees were preserved.
cutting down	51	5	1,0	The clearing passed by the fire. Actively overgrown with birch, aspen, and willow. There are about 3-5% saline languages. In the rest of the territory - ordinary chernozem. Suitable for all major tree species.
cutting down	51	118	0,9	Actively overgrown with aspen and birch. Ordinary chernozem. Suitable for all major tree species.
glades	61	48	15,0	Partially overgrown with birch (□1.5 ha). The ungrown areas are the middle salt flats. In places in the ruts, there is even efflorescence on the surface, characteristic of salt marshes. UnSuitable for growing forest crops.
glades	63	63	2,8	The site is heavily moistened. In the center is a small swamp overgrown with aspen and willow. Around it is also actively overgrown with aspen curtins with single birches. There is a lot of sparse self-seeding of willow and aspen in the ungrown areas (□1.4 ha). Ordinary chernozem. Suitable for all major tree species.
wasteland	73	11	2,1	Overgrown with self-seeding birch, which formed a birch woodland with separate small clearings. The passage of equipment to ungrown areas is problematic. Ordinary chernozem. Suitable for all major tree species.
glades	73	15	1,3	The clearing is heavily overgrown mainly with self-seeding birch, in places aspen and willow curtins. There are small ungrown areas, the passage of equipment to which is problematic. Ordinary chernozem. Suitable for all major tree species.
glades	73	16	1,4	Most of the allotment is represented by forest crops of birch and maple. In the southeastern part, there is a clearing with an area of 0.1 hectares free of forest crops, on which there are many self-seeding birches, maple, and even pine. Ordinary chernozem. Suitable for all major tree species.
glades	73	17	1,1	There is a dimple nearby. Overgrown almost completely mainly with aspen with a small admixture of birch. In the center of the allotment, a small, not yet overgrown clearing with an area of about 0.1 hectares has been preserved. Ordinary chernozem. Suitable for all

				major tree species.
glades	78	10	2,1	Lost forest crops. Ordinary chernozem. Suitable for all major tree species.
glades	78	16	1,8	Ordinary chernozem. Suitable for all major tree species. A lot of self-seeding birch.
glades	78	72	3,0	The southern and eastern part of the clearing is almost completely overgrown (□1.5 ha). In the center and in the north, there are thickets of micropropagation, including self-seeding pine trees. All elevations of the microrelief that are not overgrown with forest are solonets of the middle solonets. UnSuitable for growing forest crops.
glades	78	78	2,3	It is actively overgrown in the southern part (□1.5 ha). In the northern part, there are dead birch crops. Single trees have been preserved. There is a lot of aspen self-seeding in the furrows. Ordinary chernozem. Suitable for all major tree species.
glades	79	2	2,5	Overgrown with maple, birch, and yellow acacia. Only the regularly plowed mineralized strip is not overgrown.
glades	79	63	1,6	Pine crops are about 40 years old.
cutting down	90	8	0,4	Part of the allotment is a ripe forest. Part - cutting with a good natural renewal.
cutting down	90	12	1,2	Cutting with a good natural renewal.
cutting down	90	40	3,4	Part of the allotment is a ripe forest. Part - cutting with a good natural renewal.
cutting down	103	11	3,5	Overgrown with dense aspen.
cutting down	113	71	1,2	Cutting down. Pine crops severely damaged by grazing. Reconstruction works make sense only when fencing off the site to prevent grazing. Ordinary low-humus chernozem. Suitable for all major tree species.
cutting down	114	6	0,9	Cutting down. Birch crops are severely damaged by grazing. Reconstruction works make sense only when fencing off the site to prevent grazing. Ordinary low-humus chernozem. Suitable for all major tree species.
cutting down	114	20	0,6	Cutting down. Birch crops are severely damaged by grazing. Reconstruction works make sense only when fencing off the site to prevent grazing. Ordinary low-humus chernozem. Suitable for all major tree species.
cutting down	114	22	2,4	Cutting down. Birch crops are severely damaged by grazing. Reconstruction works make sense only when fencing off the site to prevent grazing. Ordinary low-humus chernozem. Suitable for all major tree species.
cutting down	122	19	1,2	There are furrows from forest crops. It is located in a swamp basin, swampy, birch gets wet, and aspen and willow are sown.
cutting down	122	24	2,5	Cutting down. Renewal is weak, there is a little self-seeding of birch. Ordinary chernozem.

				Suitable for all major tree species.
cutting down	122	26	9,6	Burnt pine crops on birch felling. Ordinary chernozem. Suitable for all major tree species.
cutting down	122	27	0,3	Burnt pine crops on birch felling. Ordinary chernozem. Suitable for all major tree species.
cutting down	122	28	0,5	Burnt pine crops on birch felling. Ordinary chernozem. Suitable for all major tree species.
cutting down	122	29	2,9	There are furrows from forest crops cut across the drain, which is why water stagnation occurred in them. The discharge is in the channel of the drain, swampy, birch gets wet, and aspen and willow are sown.
cutting down	122	31	0,4	There are furrows from forest crops. It is located in a swamp basin, swampy, birch gets wet, and aspen and willow are sown.
cutting down	127	7	2,5	Cutting down. The resumption is unsatisfactory. Ordinary chernozem. Suitable for all major tree species.
cutting down	127	8	0,5	Cutting down. The resumption is unsatisfactory. Ordinary chernozem. Suitable for all major tree species.
gar	132	40	2,2	Burnt pine crops. Separate biogroups have been preserved. The south and north of the site are densely overgrown with self-seeding birch and aspen. The central part is a clearing (1.2 hectares), where it is possible to carry out reconstruction work. Ordinary low-humus chernozem. Suitable for all major tree species.
gar	132	47	1,3	Burnt pine crops, a big drop off. Ordinary low-humus chernozem. Suitable for all major tree species.
cutting down	153	54	3,2	Cutting down in strips. By cutting down the pine culture. Good survival rate. Heavily eaten by wild animals. Ordinary chernozem. Suitable for all major tree species.
cutting down	154	40	2,0	Pine cultures. Heavily eaten by wild animals. Ordinary low-humus chernozem. Suitable for all major tree species.

4 Conclusions

During the reconnaissance route-loop survey of the land plots of the Alabinsky forestry, 1 type of plant association was identified, however, considering the great distance between the sites, 2 soil sections were laid to determine soil differences. In addition, one plot (block 98 allocated 4) is completely overgrown with self-seeding of cherry and apple trees. It is difficult to access, as it is located inside a heavily overgrown self-seeding apple tree forest. During the reconnaissance route-loop survey of the land plots of the Vinogradovsky forestry, 3 types of plant associations were identified. In the clearings between the forests and in some open spaces, lowered relative to the surrounding areas, there is a high herbage with a predominance of meadow grass of various types of grass. At the same time, wormwood – indicators of salinity - are absent-mindedly present in single quantities.

There are also areas with a rich variety of grasses on sandy loam and light loam, usually with a lower height of the grass.

1. Cereal-wormwood associations are singly noted, which is an indicator of salinity.

2. The sections are laid on all three types of plant associations. The analogy of soil morphology was confirmed by digging on other sites.

Thus, from the surveyed area:

1. 6.6 hectares were surveyed in Nalobinsk forestry:
- the area Suitable for all major forest species is 6.2 hectares,
- the area with existing forests/forest crops / overgrown with self-seeding is 0.4 hectares;
2. 98.5 hectares were surveyed in Vinogradovsky forestry:
- the area unSuitable for the main forest species is 16 hectares,
- the area Suitable for all main forest species is 45.7 hectares,
- the area with existing forests/forest crops / overgrown with self-seeding is 36.8 hectares.

References

1. F. E. Kozy`baeva, G.B. Bejseeva, G.A. Saparov, N. Zh. Azhikina, Zh. Sarkulova (2017)
2. A. Belov, L.P. Sokolova, J. Geography and Natural Resources, **30** (2), 119-125 (2009)
3. Z. Chen, N. Chen, W. Du, J. Gong, Computers & Geosciences **116**, 42 (2018)
4. M. Rubtsov, J. Lesovedenie, **2**, 3-9 (1984)
5. P. Soudek, P. Petřík, M. Vágner, R. Tykva, V. Plojhar, Š Petrová, T. Vaněk, European Journal of Soil Biology **43**, 251-261 (2007)
6. A. Belov, L.P. Sokolova, J. Geografiya i prirod. resursy, **2**, 29-40 (2008)
7. B. Tavus, S. Kocaman, C. Gokceoglu, Remote Sensing and Spatial Information Sciences ISPRS Archives **43**, 3 (2021)
8. G. Dobrovolskiy, *Структурно функциональная роль почв в биосфере* (GEOS, Moscow, 1999)
9. V. Sochava, *An Introduction to the Theory of Geosystems* (Nauka, Novosibirsk, 1978)
10. N. Shogelova, S. Sartin, T. Zveryachenko, Eastern-European Journal of Enterprise Technologies, **2**, 30-41 (2022)
11. E. Kulieva, Почвоведение и агрохимия, **3,** 52-56 (2014)
12. N. Kazangapova, Conference proceedings «Лесная наука Казахстана: достижения, проблемы и перспективы развития», 178 (2017)
13. E. Ananev, J. Agrarnyiy vestnik Urala, **8** (162), 4-9 (2017)
14. A. Alekseev, A. Nikiforov, A. Vagizov, A. Mihaylova, Conference Proceedings *Lesa Rossii: politika, promyishlennost, nauka, obrazovanie,* **1,** 224 **(**SPBGLTU, Spb, 2016)