The structure in diameter and sanitary condition of geographical cultures of Scots pine

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Abstract. The study of geographical forest cultures is the scientific basis for forest-seed zoning and selection of tree species. This research identifies the structural features of the diameter of middle-aged stands of different ecotypes of Scots pine (Pinus sylvestris L.) in geographic cultures, as an assessment of its current sanitary state. We studied the stands of 18 forest-steppe and 14 steppe ecotypes. We laid test areas with measuring the diameters of trees with a measuring fork at a height of 1.3 m. Trees with a continuous count were divided into six categories of sanitary status: no signs of weakening, weakened, strongly weakened, shrinking, fresh dead wood and dead wood of past years. Based on the results of continuous recounts, the distribution rows of trees were constructed according to 2- and 4-centimeter-thick steps. In forest-steppe ecotypes, the distribution of trees along 2-and 4-centimeter-thick steps is single-vertex, but with right asymmetry. The distribution of trees of steppe ecotypes over 2-cm steps of thickness is asymmetric and two-peaked. The distribution of trees of steppe ecotypes by 2-cm thickness steps is asymmetric and two-vertex. The average score of the sanitary state of stands of forest-steppe ecotypes is 1.5 (healthy), in steppe – 1.7 (weakened).

1. Introduction

In the theory and practice of taxation and forest management, the diameter of a particular tree at a height of 1.3 m from the soil level and the average diameter of a stand or forest plantation as a whole have long been important and widely used quantitative and dimensional-qualitative indicators. On the test areas and on the plots allocated for logging, the diameter of the trees is usually measured using a special caliper with a graduation of 1, 2 or 4 cm. While organizing large forest areas, the average diameter of forest stands in an allotment is determined by the taxator visually and rounded to 2 cm. The value of the average diameter (Dsr) is the main criterion while determining the age of technical ripeness of forest stands, while determining its productivity according to the tables of the growth course, including its sorting and commodity structure, as well as while harvesting oleoresin in coniferous stands, while cutting drooping birch stands (Betula pendula Roth.), while simulating the growth of plantings and other engineering calculations.

The structure of forest stands by diameter is important while allocating age generations as the part of the dominant tier, while designing and carrying out various forestry measures in different categories of protective forests, such as: cleaning cutting, selective felling in ripe and overgrown plantations of different intensity, while assigning trees to cleaning cutting and companying the wood stock.

Nowadays, in Russia [1] and abroad [2-4], the structure in diameter has been most fully studied in compositionally clean, equally-aged and conditionally uneven-aged forest stands of natural origin of the main forest-forming species.
In recent decades, in relation to stands of Scots pine (*Pinus sylvestris* L.), issues related mainly to its stability and response to climate change, with methods of creation and with various forestry measures have been studied [3-7].

The issues of the structure of *Pinus sylvestris* L. geographical cultures in terms of diameter and the peculiarities of tree differentiation by ranks remain poorly studied. A few domestic works [8,9] or fragmentary information [10] are devoted to this problem, and foreign publications are practically absent [11].

Due to the fact that logging of forest care has not been carried out previously in the studied geographical forest pine cultures, the study of the variability of the tree distribution by thickness steps and intraspecific structural features by the stand diameter of different ecotypes moved to new forest growing conditions for it is of special scientific and practical interest.

Scientific hypothesis: Collections of trees in maturing geographic forest cultures of forest-steppe and steppe ecotypes of Scots pine (*Pinus sylvestris* L.), representing micropopulations of seed progeny moved to the Voronezh region at distances different in latitude and longitude, exhibit hereditary properties inherent in parent plantations within the framework of intraspecific variability. Simultaneously, the stands of seed progeny are transformed at each stage of their ontogenesis during natural selection and adaptation to new soil and climatic conditions of the environment, which differ from the initial ones at the points of seed procurement. The synergy of the influence of various factors and processes dynamic in time is superimposed on the spatial-temporal dynamics of the structure and stability of micropopulations, on the variability of the structure in terms of diameter and sanitary condition.

In this work, in relation to geographic forest crops, the term ecotype is used in the following sense. An ecotype is a stand that includes a set of trees of the same age, which are the seed offspring of a certain maternal population of a species (forest stands) of a known ecological and geographical origin, including closely related individuals or its forms (figure 1).

![Figure 1](image1.png)

**Figure 1. Stand of *Pinus sylvestris* L. on temporary test areas No. 4-18 (Kolodez ecotype, Lipetsk region, Russia 51.960160 N, 39.412780 E)**

The aim of the study was to identify the structural features of the diameter of 60-year stands in the geographical forest cultures of forest-steppe and steppe ecotypes growing on the Stupino Field test site in the Voronezh region [12], created in 1969 under the leadership of Professor M M Veresin [10], and assessment of its current sanitary condition.
2. Materials and methods

During the growing seasons of 2018, 2019 and 2020, 18 temporary test areas (RWY) were laid in forest – steppe ecotypes and 14 in steppe ecotypes in the geographical pine crops at the Stupino Field landfill, which has been a natural monument of regional significance since 1998.

The size of each RWY was equal to 0.05 ha (20×25 m) and it was due to the same initial placement of the experiment variants by planting 2-year-old seedlings with an open root system grown at a local forest nursery from 267 seed batches (ecotypes) of different geographical origin. The initial placement of seedlings (0.5×1.5 m) and the density of crops in each variant of the experiment were the same (about 13.3 thousand seedlings per 1 ha).

In total, 1,260 growing pine trees were taken into account and measured on RWY with its distribution into six categories of sanitary condition (I—without signs of weakening, II—weakened, III—severely weakened, IV—shrinking, V—fresh dead wood and VI—dead wood of previous years) in accordance with the scale of current sanitary safety requirements in forests [13].

The average score of the sanitary condition (Bss) of the evaluated stand was calculated [14] according to the formula (1):

\[ B_{ss} = \frac{P_1 \cdot K_1 + P_2 \cdot K_2 + P_3 \cdot K_3 + P_4 \cdot K_4 + P_5 \cdot K_5 + P_6 \cdot K_6}{100} \]

where \( P_i \) is the number of trees or a share of stock of trees of different status categories (I, II, III, IV, etc.), % of the total number of trees or from the total stock of wood; \( K_i \) – numerical index status categories tree (1—no signs of weakening, 2—weakened, 3—severely weakened, 4—drying, 5—fresh dead wood and 6—dead wood of past years).

The average height (Nsr) and average diameter (Dsr) of trees on each RWY and other taxing indicators were determined in the office conditions. Nsr is according to the height curve constructed in the Excel graphic editor based on the materials of measuring 25 trees of the category ‘without signs of weakening’ on each RWY, and Dsr is through the weighted average value of the cross-sectional area at 1.3 m.

The data of continuous tree counts were processed by the methods of variation statistics using the computer programs Statistica-8.2 and Excel-10.

For all RWYs, according to generally accepted taxation methods, the main taxation indicators were determined (average height and diameter, quality class, fullness, stock, average growth, etc.).

At the time of laying RWY series in crops, the safety of trees in forest-steppe ecotypes was 3.5-10.2%, and in steppe ecotypes – 2.5-7.5. Therefore, a small statistical sample was obtained at each RWY when counting growing trees, but the Statistica-8.2 program also allows processing small samples of measurements of tree diameters to obtain the necessary statistical indicators (the average value and its error, the standard deviation and its error, the coefficient of variation, the accuracy coefficient, the reliability of differences, indicators of asymmetry and kurtosis of distribution series with its errors, etc.).

During the previous period of time, only dead trees were periodically removed in the studied cultures (natural decay and trees that died for various reasons). Thus, any influence of logging on the density of geographical pine forest crops, on its sanitary conditions and structure in diameter was completely excluded.

3. Results and discussion

The morpho- and selection-genetic homogeneity of the samples used by us on RWY is due to the initial geographical origin of the harvested seeds in the maternal populations (ecotypes), united in two generalized territorial groups, namely the forest-steppe zone of the European part of the Russian Federation and the steppe zone.

The detailed forestry and taxation characteristics of forest crops in forest-steppe and steppe ecotypes of Scots pine at the Stupino Field landfill according to 32 sample areas are not given here, as it was presented earlier in the works [12,14].
The high reliability of the results obtained is due to the unified method of collecting field materials on all runways and generally accepted methods of its processing (table 1).

Table 1. Average diameters of pine stand of forest-steppe and steppe ecotypes at an altitude of 1.3 m and its statistical indicators on RWY.

| No.-year RWY | Pine ecotypes (forestry, region) | Statistical indicators |
|--------------|---------------------------------|------------------------|
|              | Forest-steppe ecotypes          |                        |
| 1-18         | Khrenovsky, Voronezh             | 28.9±1.246 5.98±0.882 20.69 4.3 4.3 |
| 2-18         | Bychkovskiy, Voronezh            | 23.0±0.767 5.79±0.542 25.17 2.9 0 |
| 3-20         | Borsky, Voronezh (control)       | 23.0±0.595 4.41±0.420 19.17 2.6 - |
| 4-18         | Kolodezskiy, Lipetsk             | 22.1±0.608 4.83±0.430 21.86 2.8 1.1 |
| 5-20         | Balashovskiy, Lipetsk            | 24.6±0.784 5.60±0.555 22.76 3.2 1.6 |
| 6-18         | Shatalovsky, Belgorod            | 23.7±0.863 6.46±0.611 27.26 3.6 0.3 |
| 7-20         | Urazovsky, Belgorod              | 26.4±0.946 7.14±0.669 27.05 3.6 3.04 |
| 8-18         | Platonovsky, Tambov              | 24.7±1.543 7.56±1.091 30.61 6.2 1.03 |
| 9-18         | B. Stalinisky, Kursk             | 20.7±0.498 4.04±0.352 19.52 2.4 2.9 |
| 10-18        | Krasnoslobodsky, Bryansk         | 23.4±0.743 5.41±0.526 23.12 3.2 0.4 |
| 11-19        | Kashirsky, Moscow                | 23.9±0.594 4.41±0.421 18.45 2.5 1.1 |
| 12-19        | Monastyrsky, Penza               | 25.6±1.019 6.44±0.720 25.16 4.0 2.2 |
| 13-19        | Khatynetskiy, Oryol,             | 27.2±0.901 5.41±0.637 19.89 3.5 3.9 |
| 14-19        | B. Stalinisky, Oryol             | 29.4±0.878 5.04±0.439 17.14 3.0 6.0 |
| 15-20        | Murmansk, Ryazan                 | 24.8±0.598 4.06±0.423 16.37 2.4 2.1 |
| 16-20        | Sovievsky, Cherkassk             | 30.4±1.020 5.49±0.720 18.06 3.4 6.2 |
| 17-20        | Zenkovsky, Poltava               | 26.8±1.063 5.52±0.752 20.60 4.0 3.2 |
| 18-20        | Georgian, Sumy                   | 25.5±1.013 7.44±0.716 29.18 4.0 2.1 |
|              | Steppe ecotypes                  |                        |
| 19-20        | Petrovsky, Saratov               | 25.7±1.030 5.45±0.729 21.21 4.0 2.3 |
| 20-20        | Dyakovsiy, Saratov               | 19.8±0.721 6.62±0.509 33.43 3.6 3.4 |
| 21-20        | Rakhinskiy, Volgograd            | 21.9±1.692 6.77±1.196 30.91 7.7 0.6 |
| 22-20        | Archedinskiy, Volgograd          | 24.8±0.869 5.35±0.614 21.57 3.5 1.7 |
| 23-20        | Peschany, Luhansk                | 30.6±0.843 5.13±0.597 16.76 2.8 7.4 |
| 24-20        | N. Aydarovskiy, Lugansk          | 30.9±1.341 6.70±0.948 21.68 4.3 5.3 |
| 25-20        | Kiryovskiy, Dnepropetrovsk       | 23.4±0.910 5.23±0.644 22.35 3.9 0.4 |
| 26-20        | B. Mikhailovskiy, Dnepropetrovsk | 25.4±0.890 6.23±0.629 24.53 3.5 2.2 |
| 27-19        | Novomoskovskiy, Dnepropetrovsk   | 24.6±1.265 6.33±0.895 25.73 5.1 1.1 |
| 28-20        | Tsuryupinsky, Kherson            | 31.3±1.581 8.06±1.117 25.75 5.1 4.9 |
| 29-20        | Alexandrovskiy, Donetsk          | 29.8±1.019 4.99±0.720 16.74 3.4 5.7 |
| 30-20        | Zhukinsky, Kievskaia             | 27.0±1.497 7.49±1.059 27.74 5.5 2.5 |
| 31-20        | Mezmaysky, Krasnodar Territory   | 24.6±0.907 5.44±0.641 22.11 3.7 1.5 |
| 32-18        | Gufta-Gikhatursky, South Ossetian Autonomous District | 24.9±1.267 7.17±0.896 28.80 5.1 1.4 |

*Abbreviations: M±m – average diameter and its error, cm; σ±m – standard deviation and its error, cm; C – coefficient of variation,%; P – accuracy; t – significance of differences.

The local Bor ecotype from the Voronezh Region served as a control in the comparative assessment of forestry and taxation indicators of stands on 32 runways, the maternal population, in whose plantation seeds were harvested in 1956, is located on the territory of the nearby Usman Bor Forest area, near which the Stupino Field landfill is located.
It was previously established [12,14] that the coefficients of variation of tree diameters at a height of 1.3 m in seed progeny of forest-steppe ecotypes varied from 20.83 to 30.36%, and in steppe ecotypes-from 21.95 to 25.04%.

Generalized information about the nature of the distribution of growing pine trees on RWY in forest-steppe and steppe ecotypes by 2- and 4-centimeter thickness steps is given in table 2.

**Table 2.** The distribution of the trees (%) of *Pinus sylvestris* L. in forest-steppe and steppe ecotypes by different thickness levels.

| Steps, cm | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 |
|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Total, %  | 0.4| 2.5| 5.7| 8.5|11.6|13.5|14.7|11.2|10.8| 7.0| 4.7| 3.0| 2.5| 1.5| 0.7| 1.1| 0.5| 0.1|
| Steps, cm | 12 | 16 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 36 | 40 | 42 | 44 | 46 |
| Total, %  | 1.5| 10.9|22.5|28.5|18.9| 9.5| 5.1| 2.3| 0.8|

The number of trees (%) in the cultures of steppe ecotypes:

| Steps, cm | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 | 46 | 48 | 50 | 52 |
|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Total, %  | 1.1| 5.7| 7.4|10.8| 9.9| 11 | 12 |10.8| 8.3| 5.7| 5.7| 4.6| 2.5| 0.9| 0.9| 0.9| 0.2| 0.2| 0.0| 0.2|
| Steps, cm | 12 | 16 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 | 36 | 38 | 40 | 42 | 44 |
| Total, %  | 1.8| 9.7|21.4|21.4|19.5|12.9| 8.0| 3.7| 1.1| 0.2| 0.2|

Among the studied 18 forest-steppe ecotypes of pine, the best in terms of productivity is Urazovsky (583 m³/ha) from the Belgorod region, Balashovsky (522 m³/ha) and Kolodezsky (487 m³/ha) from the Lipetsk Region, and in terms of sanitary condition it is Kolodezsky (state score 1.2) from the Lipetsk Region, Shatalovsky (1.3) from the Belgorod Region and B. Stalinsky (1.3) from the Oryol region.

The worst productivity among the forest-steppe ecotypes of pine is Zenkovsky (253 m³/ha) from the Poltava region and Platonovsky (263 m³/ha) from the Tambov region, and in terms of sanitary condition it is Khrenovskaya (state score 2.2) and Borsky (1.8) from the Voronezh region, Platonovsky (1.8) from the Tambov region and Murmansk (1.8) from the Ryazan region.

Among the 14 studied steppe ecotypes of pine, the best in terms of productivity is Peschany (491 m³/ha) from the Luhansk region and B-Mikhailovsky from the Dnipropetrovsk region, and in terms of sanitary condition it is Peschany (state score 1.2) from the Luhansk region, Petrovsky (1.3) from the Saratov region and Kirov (1.3) from the Dnipropetrovsk region.

The worst productivity among the steppe pine ecotypes is Rakhinsky (79 m³/ha) from the Volgograd region, Novomoskovsky (211 m³/ha) from the Dnipropetrovsk region and Gufta-Gihatursky (212 m³/ha) from South Ossetia, and in terms of sanitary condition it is Rakhinsky (state score 2.6) from the Volgograd region, Dyakovsky (2.6) from the Saratov region and Zhukinsky (2.5) from the Kiev region.

On the dates of laying RWY (2018, 2019 and 2020), the trees preserved on it had the same biological age, equal to 59, 60 or 61 years. Due to the fact that all of it grow in almost the same conditions (A2-B2), the established features of the structure and the limits of diameter variation in the absence of logging of forest care (clarification, clearing and thinning) can be explained only by the intensity of natural selection processes over the past 60 years, as well as the nature of intraspecific and individual variability of pine, due mainly to the belonging of trees to the corresponding geographical forest-steppe or steppe ecotypes.

In 2018, 2019 and 2020 on each RWY, with its same area, there were different numbers of trees that were 59 years old, 60 years old and 61 years old. Therefore, for the purpose of comparability of the results obtained, it is expressed as a percentage of its total number.
For clarity, the nature of the distribution of trees by 2-and 4-centimeter thickness steps on the entire set of sample areas is shown separately for forest-steppe and steppe ecotypes of pine in figures 2 and 3.

Figure 2. The nature of the distribution of pine trees by 2-centimeter thickness steps in forest-steppe (a) and steppe ecotypes (b).

Figure 3. The nature of the distribution of pine trees by 4-centimeter thickness steps in forest-steppe (a) and steppe ecotypes (b).

The coefficient of asymmetry (obliquity of the distribution series) in the curve of the generalized distribution series of pine trees in the stands of forest-steppe ecotypes is 0.684±0.085, and in the cultures of steppe ecotypes – 0.486±0.117.

The indicators of the kurtosis (steepness of the distribution series) of the mentioned curves are respectively 0.926±0.171 and 1.487±0.235, which indicates the presence of significant deviations from the normal distribution.
The predominant part of trees in forest-steppe (79.4%) and steppe (75.2%) ecotypes is concentrated in four central 4-centimeter-thick stages (20, 24, 28 and 32 cm) with minor differences in its number.

The amplitude of the range of fluctuations between the values of the minimum and maximum diameters in forest-steppe ecotypes is narrower (from 16.0 to 34.4 cm), and in steppe ecotypes it is wider (from 13.0 to 35.5 cm). The absolute value of the minimum diameters of trees growing on different RWY in the cultures of forest-steppe ecotypes is 49.3-74.4 % of the Dsr., and the fluctuations in the values of the maximum diameters from the Dsr. are 137.3-188.9 %. In the cultures of steppe ecotypes, it is 51.1-70.5% and 129.9-208.3 % of the Dsr.

In the studied geographical pine cultures, only dry-hardy trees (V and VI categories of sanitary condition) were removed periodically (about once every 5 years) throughout its life. On RWY in the stands of seed progeny of steppe and forest-steppe ecotypes during its life, the amount of natural fall was different, as evidenced by the different number of trees growing (taken into account) on it in the corresponding thickness steps (table 3).

### Table 3. The distribution of growing pine trees of forest-steppe and steppe ecotypes by thickness levels and categories of sanitary condition.

| Status categories | The distribution of trees of different categories of sanitary condition (%) by thickness steps: |
|-------------------|--------------------------------------------------|
|                   | 12 | 16 | 20 | 24 | 28 | 32 | 36 | 40 | 44 | 48 | 52 | Total, % |
|--------------------|----|----|----|----|----|----|----|----|----|----|----|----------|
| Forest-steppe ecotypes (RWY No. 1-18) | I  | 1.2 | 9.0 | 22.2 | 29.9 | 20.4 | 9.4 | 5.2 | 2.1 | 0.7 | - | - | 100 |
|                   | II | 2.4 | 22.0 | 25.6 | 19.5 | 8.5 | 9.8 | 4.9 | 2.4 | - | - | 100 |
|                   | III | 6.3 | 43.8 | 25.0 | 12.5 | 6.3 | 6.3 | - | - | - | - | - | 100 |
|                   | IV | - | - | - | - | - | 100 | - | - | - | - | - | 100 |
|                   | Total | 1.5 | 10.9 | 22.5 | 28.5 | 18.9 | 9.5 | 5.1 | 2.3 | 0.8 | - | - | 100 |
| Steppe ecotypes (RWY No. 19-32) | I  | 1.7 | 8.1 | 19.8 | 21.8 | 20.1 | 14.0 | 8.4 | 4.2 | 1.4 | 0.3 | 0.3 | 100 |
|                   | II | - | 10.9 | 36.4 | 16.4 | 18.2 | 9.1 | 7.3 | 1.8 | - | - | - | 100 |
|                   | III | 14.3 | 7.1 | 21.4 | 35.7 | 14.3 | 7.1 | - | - | - | - | - | 100 |
|                   | IV | - | 66.7 | - | 16.7 | - | - | 16.7 | - | - | - | - | 100 |
|                   | Total | 1.8 | 9.2 | 21.7 | 21.5 | 19.4 | 12.9 | 8.1 | 3.7 | 1.2 | 0.2 | 0.2 | 100 |

While assessing the sanitary condition of trees in different thickness levels, it turned out that trees of the categories ‘without signs of weakening’, ‘weakened’ and ‘severely weakened’ are presented in thin, medium and thick thickness levels. However, the proportion of trees of the category ‘without signs of weakening’ is greater in thick steps.

On RWY, in the cultures of forest-steppe ecotypes, there are no trees of the III and IV categories of sanitary condition in steps 36 cm and thicker, and in steppe ecotypes it is found in small numbers.

Table 3 clearly shows the following trend, characteristic of both forest-steppe and steppe pine ecotypes: in less thin thickness steps, the proportion of trees of the worst condition increases, which indicates the continuation of the process of natural selection in middle-aged geographical pine cultures.

In the total aggregate of 60-year-old forest crops, the share of trees belonging to the categories of fresh dead wood and dead wood of previous years on RWY is not large and amounts to 4.4 and 5.3% in the forest-steppe ecotypes, and 5.2 and 8.0% in the steppe ecotypes.

For clarity, the generalized distribution of pine trees of forest-steppe (RWY No. 1-18) and steppe (RWY No. 14-32) ecotypes by six categories of sanitary condition and by thickness levels is shown in figures 4 and 5.
Figures 4 and 5 show that there is no clearly defined pattern in the distribution of pine trees of forest-steppe and steppe ecotypes by state categories and thickness levels, and this generalizing conclusion partially coincides with the previously obtained results of other researchers [15,16]. Consequently, the current structure of pine crops in diameter in forest-steppe and steppe ecotypes is due only to the variability of growth and development of these ecotypes.

4. Conclusion
The growing stands of seed progeny of forest-steppe and steppe ecotypes of Scots pine (Pinus sylvestris L.) on RWY differ both in sanitary condition and in the nature of the distribution of growing trees by thickness steps due to intraspecific and population variability.

The amplitude of fluctuations in the diameters of pine trees in steppe ecotypes is wider than in forest-steppe ecotypes. The sanitary condition of trees on RWY varies from 1.2 to 2.6 points.
The distribution of trees by 2-centimeter thickness steps in forest-steppe ecotypes has a single-vertex character with a right asymmetry. In the steppe ecotypes of pine, a two-vertex character was revealed in the distribution of trees, where the first and lower peak in height falls on a smaller step (20 cm) than the average diameter, and the second and higher peak falls on the central step of thickness (28 cm) includes trees which thickness is close to the average diameter.

The distribution of trees by 4-centimeter thickness steps in the cultures of forest-steppe and steppe ecotypes has a single-vertex character with right-sided asymmetry (the coefficients of asymmetry are 0.684±0.085 and 0.486±0.117), and the kurtosis indicators are 0.926±0.171 and 1.487±0.235.

The distribution of Scots pine trees in middle-aged geographical forest cultures by 2- and 4-centimeter thickness steps is asymmetric and differs from the normal distribution. It is due to the intraspecific variability of the geographical ecotypes of pine, as well as the processes of natural selection in it and evolutionary adaptation to new soil and climatic conditions compared to the original seed harvesting sites.

The cumulative average score of the sanitary condition of stands of seed progeny of forest-steppe ecotypes is 1.5 (assessment – healthy), in steppe – 1.7 (assessment – weakened).

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