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GROWTH AND PRODUCTIVITY OF COMMON OAK EROSION CONTROL STANDS IN NOVGOROD-SIVERSKIY POLISSYA

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The results of researches of peculiarities of growth and dynamics of productivity of erosion control oak stands in Novgorod-Siverskiy Polissya are presented. It's established that oak stands are characterized by a growing type of growth to V age class. Rate of growth in height during this period is characterized by high growth intensity. Productivity of anti-erosion oak stands slightly higher than stock stem wood of oak plantations in Left-Bank Ukraine, which increases by I and I^a site index. The curve of stocks of oak stands is between I and I^a site index of forest stands. At the premature and mature group ages of oak stands the productivity is reduced, although it remains high.

Anti-erosion stand, common oak, growth, height, diameter, productivity, site index, Novgorod-Seversky Polissya.

Anti-erosion stands in loess land of Right Bank of the Desna River at hydrographic fund within Novgorod-Seversky Polissya perform important water-regulating, waterproof, soil formation and other environmental features. This region is highly dissected topography. In terms of loess soils the main valuable species for erosion control vegetation was common oak. Created in the last century oak plantations in ravine and gully systems need their studies and contemporary assessments. It is not known about the features of their growth, condition and performance, depending on site conditions.

The issues of productivity stands of oak were prioritized in researches of P. Lakyda [6-8], P. Pasternak [3], O. Migunova [10] and others. The productivity of forest plantations in the North-East Ukraine by forestry methods investigated R. Sendzyuk [8] O. Bala [6], M. Vedmid, V. Ugarov [4, 11], V. Lavrov [5] and others. Lunachevskyy L.investigated the performance of artificial oak tree stands in Left-Bank Forest-Steppe in terms of fresh maple-lime groves [9]. Comparing the performance of artificial oak tree stands of fresh maple-lime groves and stands of indigenous high-performance researcher notes the low productivity of artificial stands of oak. However,

the author recommends measures to improve forest productivity, namely the reconstruction of low-grade young, even-aged plantations simple rearrangement of complex composition and structure of stands of different ages, using the previous update, improve soil fertility, timely thinning, protection from pests, diseases and fires, the right choice of the main ways of logging, forestry and so on typological basis [9].

The aim of the study was to establish the characteristics of growth and productivity of anti-erosion oak stands in terms of Novgorod-Seversky Polissya.

Methods and materials research. Closing plots and determination of silvicultural characteristics of erosion stands performed in accordance with the applicable regulations and generally accepted in the forest inventory methods [1, 2]. The dynamics of growth and productivity of erosion plantations was developed by modeling using software Microsoft Office Excel.

To establish the dynamics of the studied erosion planting the materials were involved in 14 plots that are laid down in fresh sites, and descriptions of oak plantations of State Enterprises "Novgorod-Seversky Forest Research Station" and "Novgorod-Severskagroforestry", based of forest management in 2006. The soils of erosion control plantings are characterized by different power loam and loamy, law or sometimes heavily washed dark gray soils on loess.

Results. Dynamics of average height, diameter, basal area and the stocks in dependence of age are defined be graphical and analytical methods, and expressed the respective models (Table 1). The value of the reliability of the approximation models is varied within 0,691-0,953, indicating a sufficient accuracy of models describing the dynamics of the studied silvicultural parameters.

Table 1

Models of growth of common oak erosion stands in fresh loam sites

Silvicultural index	Model	Reliability of approximation
Average height, m	$y=-0,0139\ x^2 + 1,589\ x - 23,45$ (1)	0,826
Average diameter, sm	$y=-0,0217\ x^2 + 2,514\ x - 42,75$ (2)	0,864
Total basal area, $m^2 \cdot ha^{-1}$	$y=-0,0315\ x^{1,815}$ (3)	0,953

Stock, $m^3 \cdot ha^{-1}$	$y=-0,3340\ x^2 + 35,87\ x - 687,9$ (4)	0,691

In Fig. 1 it is shown the growth in height of oak tree stands in ravine erosion and gully systems of Novgorod-Seversky Polessya and artificial mixed modal oak forest stands of the Left-Bank Forest-Steppe zone studied P. Lakyda and O. Bala [6]. The growth in height of erosion oak stands is within I^a site index according the site scale of M. Orlov.

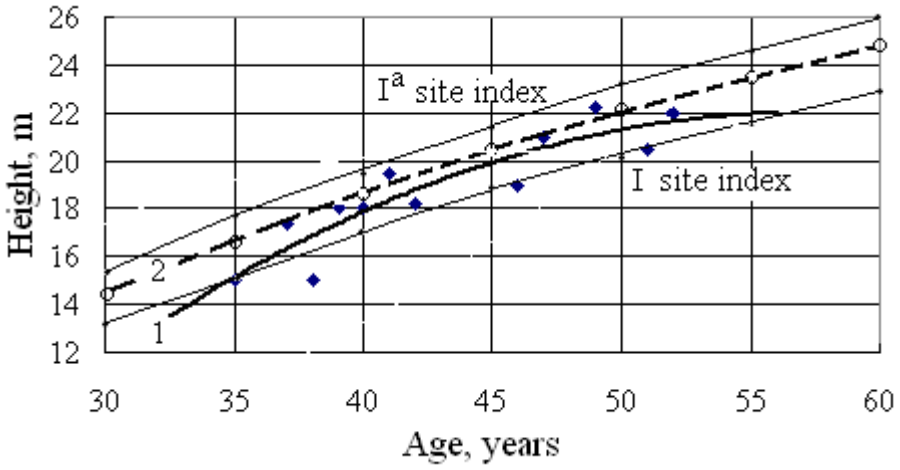

Fig. 1. Dynamics in height of oak stands: 1 – erosion control plantings (survey data), 2 – modal artificial forest stands (as O. Bala); I and I^a site indices – respectively the upper and lower boundary of site scale of M. Orlov

Anti-erosion oak stands are characterized by a growing type of growth to 45 years. Intensity of growth in height during this period is characterized by a high growth rate. Thus, the increment in height over a period of 35 to 40 years is 2.8 m or 18.1 %, 40-45 years - 2.0 m or 11.4 %, 45-50 years - 1.4 m or 6 7% 50-55 years - 0.6 m or 3.4%. After the age of 55 anti-erosion oak stands are characterized by the type of drop growth and height growth curve crosses the line of I site index, that productivity of plantings is reduced. This phenomenon is explained by several factors, namely low initial number of plant material per unit area, because of the wide terraces space (from 2.5 to 5.0 m), slope exposition (oak plantations which grow mostly on the southern slopes) and considerable intensity thinning at a young age.

Dynamics of average diameter of stands in ravine erosion and gully areas is described by the model 2, which is illustrated in Fig. 2.

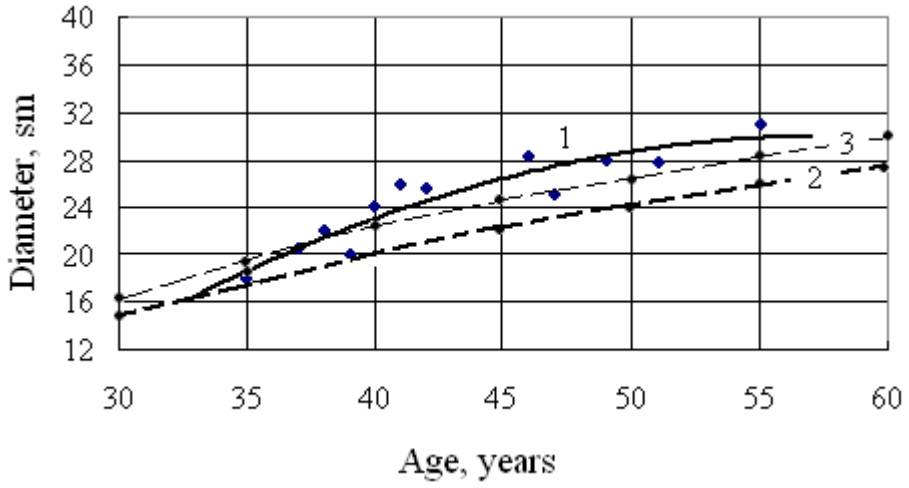

Fig. 2. Dynamics in diameter of oak stands: 1 – erosion control plantings (survey data), 2 and 3 – modal artificial forest stands of I and I^a site indices respectively (as O. Bala)

The average diameter in young stands is increasing sharply from 35 years. In the fourth grade age it is significantly higher than the tabulated values of oak plantations of I^a class site index established be O. Bala [6]. Such an intense increment in diameter of oak erosion stands caused by low density planting locations and placing smaller initial number of seedlings. After 40 years, the growth rate of the average diameter is accelerated and he crosses the line of I^b class site index. However, since 55 years the curve of the average diameter of the studied oak forests becomes decreasing in УІ age class and again intersects the curve of class I^b site index, going down. It shows the influence of the above factors on growth and productivity erosion oak stands.

A comparative analysis of indices of growth and productivity of erosion oak plantations with artificial modal oak stands of the Left-Bank Forest-Steppe zone of Ukraine, studied P. Lakyda and O. Bala [6], has clear advantages and is characterized by objectivity, since comparable planting approximately equal density.

Dynamics of stocks of oak forest described by model 4 and illustrated in Fig. 3.

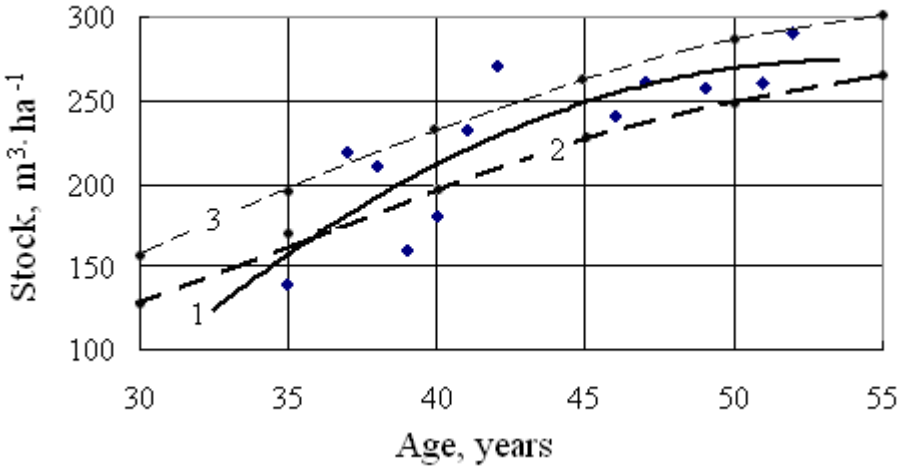

Fig. 3. Dynamics of stocks of oak stands: 1 – erosion control plantings (survey data), 2 and 3 – modal artificial forest stands of I and I^a site indices respectively (as O. Bala)

With regard to the dynamics of stocks of erosion oak stands in terms of fresh site loam, their performance is slightly higher than stock stem wood piece oak forest stands of Left Bank, which increases by I^a class of site index. In general curve of dynamics of stocks studied oak stands is between I^a and I^b class of site index of artificial forest stands. Stock line is coping of curve diameters and since V class age it crosses the line of I^a class of site index. So at the pre-mature and mature age the productivity of oak erosion stands is reduced.

Thus the stock of studied oak stands at age 50 is 270 $m^3 \cdot ha^{-1}$ and artificial oak stands of I^a and I^b classes of site indices –249 and 284 $m^3 \cdot ha^{-1}$. Consequently, the productivity of erosion control plantings in V class age, growing in site D_2, higher than artificial oak of I^a class site index by 8.4 %, and lower the stocks of artificial forest stands at 5.2%. Thus the productivity of oak forests of ravine and gully systems in Novgorod-Seversky Polissya increases to III-IV grade age, and since medieval group is reduced, although it remains high.

Conclusions

The soils of erosion control plantings are characterized by different power loam and loamy, law or sometimes heavily washed dark gray soils on loess.

Anti-erosion oak stands are characterized by a growing type of growth to 45 years. Intensity of growth in height during this period is characterized by a high growth

rate. Thus, the increment in height over a period of 35 to 40 years is 2.8 m or 18.1 %, 40-45 years - 2.0 m or 11.4 %, 45-50 years - 1.4 m or 6 7% 50-55 years - 0.6 m or 3.4%. After the age of 55 anti-erosion oak stands are characterized by the type of drop growth and height growth curve crosses the line of I site index, that productivity of plantings is reduced.

Productivity of oak stands slightly higher than stock stem wood piece oak forest stands of Left Bank, which increases by I^a class site index. General dynamics of stocks of studied oak stands is between I^a and I^b classes site indices of artificial forest stands. Since V age class the line of stocks crosses the boundary of class site index. So at the pre-mature and mature ages of the productivity of erosion oak stands is reduced, although it remains high.

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