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CLASSIFICATION OF SOILS OF NEGORELOYE FORESTRY STATION

Classification of soils is to be done by codes, which indicate the productivity (bonitet), the reference (prospective) tree species, soil evaluation in points and the index shows class of forests (1st – forest of insufficient moisture, 2nd – of excessive moisture). In a forest station there have identified 16 types of soils by codes: from IIIP56_1 to IIIAl14_2. Soil IP77_1 (60,7 %) is prevailing. Soils IIP68_1 and IaP89_1 occupy a much smaller area (13%). In the second class of forests, which account for 12% of the most frequently occurring soils IP77_2 (6.4%) and IIP68_2 (2.7%). The average score of forest stands is 45 and that of soils is 75 points. With an average stand density of 0.72 the stands evaluation is below the maximum by 55 points (100 – 45), due to the group of forests it is lower by 2 (100 – 98), due to site conditions by 23 (98 – 75), due to stand density by 21 (75 – 54) and due to species composition by 9 points. Forest productivity may be increased by 30 points by controlling the species composition and stand density.

Introduction. Soil classification means soil evaluation by relative values (scores).

Soil classification for agricultural purposes in 1984-1985 [1] was based on physical and chemical properties of soils. As a result the soil evaluation was done by scores for each agricultural area of Belarus. This method of agricultural soil classification cannot be applied to forest soils.

Wood species as main assets of forestry production and stand-forming resources have a number of characteristics and specific features that make them different from agricultural soils. Being perennial, wood species develop an enormous overground part and a powerful root system penetrating soil stratum and underlying the ground horizontally and vertically. Besides there are no available detailed data on physical and chemical properties of forest soils of all areas.

Since soil classification is of great practical importance, its application for forestry purposes causes no doubts.

Main part. Methodology of soil classification is thoroughly described in the literature [2]. The scoring of soils largely depends on growing conditions. In forestry practice growing conditions are characterized by a phytocenotic principle, i.e. the forest types and edatopes are defined based on the growing vegetation. An important factor for growing conditions is a growth class of the stands.

Typological structure of forests of Negoreloye forestry station is very diverse. Almost a half of the stands (48%) are of sphagnous forest type. A smaller area (24.2%) is covered by bracken-type forests. Wood-sorrel type occupies 9.4% of the total area, ferny forests cover 4.9%, blueberry forests occupy 3.7%. A minor area is covered by heathy, cowberry, goatweed, long-sphagnous, ledum, sedge, sedge-sphagnous, brookside-grassy, nettle and meadowsweet types. Lichen forest stands are not present here.

Average growth class of the forestry stands equals to I,1 if we consider the growth class degrees in a downward way. Forest stands of growth class I prevail (67.7% of the forested area). Forest stands of growth class II make up 17%, those of growth classes Ia and III make up 11.9 and 1.8% respectively. Other growth classes are inconsiderable. Forest stands of growth class Ib cover the area of 22.4 ha (0.4%), those of growth class Vb occupy 0.6 ha.

The scoring of forests stands is reliant not only on soil fertility. It is heavily influenced by species composition and tree layer density. For this reason benchmark normal forests stands of maximum productivity were used to define the scoring of soils. The productivity was evaluated by the growth class of a forest stand that is an integral index of growing conditions.

When classifying the soils of Negoreloye forestry normal stands of pine, ash and black alder were accepted as benchmark stands (Table). The forested area belongs to forests of group I (greenbelt of Minsk). Therefore, to classify soils we considered total average increment of pine stands (100 years old), ash stands (120 years old) and black alder (60 years old).

To classify soils by scores we used pine stands as a benchmark on those sites where the prevailing or associate species are pine or spruce as well as other species (hard-wooded or soft-wooded broad-leaved). By moisture conditions the soils of these sites are automorphic and semihydromorphic. Peat-boggy soils of transition and upland bogs were also evaluated using pine stands.

Pine growing in hydromorphic peat-boggy soils of lowland bogs is disturbed by excessive moisture during spring snowmelt. Such conditions favour the formation of primary black alder forests (sedge and meadowsweet forest types) accepted as a benchmark. If there is presence of pine or spruce in the black alder stand, the soil is evaluated by pine stands.

Distribution of the forested area of Negoreloye forestry by soil codes

Forest class	Group of stands	Soil code	Area, ha	Per-cent
First (undermoistened forests)	3	$IIIP56_1$	74.9	1.2
	4	$IIP68_1$	790.5	12.7
	5	$IP77_1$	3783.3	60.7
	6	$IaP89_1$	799.4	12.8
		$IbP98_1$	23.1	0.4
		Total	**5471.2**	**87.8**
Second (overmoistened forests)	7	$IaP89_2$	10.9	0.2
		$IP77_2$	398.6	6.4
	8	$IIP68_2$	168.6	2.7
	9	$IIIP56_2$	29.2	0.5
	10	$IVP43_2$	19.1	0.3
	11	$VP31_2$	8.4	0.1
	12	$VaP17_2$	50.9	0.8
		$VbP6_2$	0.6	0.0
	7	$IA71_2$	11.5	0.2
	8	$IIAl18_2$	53.9	0.9
	9	$IIIAl14_2$	5.3	0.1
		Total	**757.0**	**12.2**
		Grand total	**6228.2**	**100**

Ash stands were used to evaluate soils on sites with transitive growing conditions from black alder forests to pine forests if ash is a prevalent species of the stand.

The growth class of benchmark forest stands comply with the growth class of prevailing species. If hard-wooded broadleaved species were present in the stand, the soil was evaluated by pine stands by a higher growth class. For instance, there is a wood-sorrel oak forest of growth class I on the site. In this case the soil is evaluated by a pine stand of growth class Ia as wood-sorrel pine forests are usually of this growth class [3].

Soil classification is usually coded, the codes represent productivity (growth class) of the benchmark forest stand, wood species, the scoring of soils while the indexes show the forest types.

For instance, quarter 159 unit 15 is covered by heathy birch forest of 10B composition and of growth class III. The soil code of this site is $IIIP56_1$, i.e. the soil was benchmarked by a pine stand of growth class III, soil evaluation being 56 scores. Quarter 24 unit 7 is covered by long-sphagnous pine stand of 5P5B composition of the same productivity (growth class III). As the same benchmark stand was used to evaluate the soil, the soil code is the same ($IIIP56_1$). However, heathy birch forest belongs to undermoistened forests, so this specific feature of water-air sooil regime is indexed as 1; reduced productivity of long-sphagnous pine forest which is attributed to excessive moisture is indexed as 2.

Quarter 79 unit 14 is occupied by wood-sorrel oak forest of a complex species composition (5O1A2S1B1As) of growth class I. The soil code of this site is $IaP89_1$. Quarter 82 unit 18 is covered by meadowsweet black alder forest of 9Bal1B composition of growth class II. Therefore the soil code of this site is $IIAl18_2$.

The table represents the soil codes in the ascending order from pine forests of growth class III scored as 56 to black alder forests of the same growth class scored only 14.

In the forestry we identified 16 soil types by codes that differ in moisture conditions, benchmark wood species and productivity. Undermoistened soils (forest types – heathy, cowberry, sphagnous, bracken, goatwood and wood-sorrel) make up 88%, while overmoistened ones make up 12% of the forested area. Out of these soils of the first forest type scored 77 prevail (60.7%). The soils of this forest type scored 68 and 89 cover a considerably smaller area (13% each).

Soils scored 77 (6.4%) and 68 (2.7%) are most common for the second forest type.

Soil codes are a rather fixed characteristic of soil-ground conditions. The scoring of soils can fluctuate with anthropogenic impact on granulometric soil composition and hydrological situation when earth excavating, draining, water diverting, etc.

The carried out study made it possible to state that the average scoring of the Negoreloye forest stands is 45 and is determined by growing conditions. The average soils scoring turned out to be 75. Since the most productive forest stands (their density being equal to 1) were used for soil evaluation, the average soil scoring was determined only by growing conditions. The average density of the Negoreloye forest stands is 0.72. Such density would result in the scoring of benchmark forest stands being 54 ($75 \cdot 0.72$). Therefore, the scoring of Negoreloye forest stands is 55 scores inferior to the maximum (100–45), the determining factors being group of forests – 2 scores (100 – 98), growing conditions – 23 scores (98–75), density – 21 scores (75–54) and species composition – 9 scores.

Based on the made analysis we can conclude that on Negoreloye forestry station forest productivity can be increased by 30 scores or by 30%, of which species composition control makes up 9 scores, increasing stands density – 21 scores. Growing conditions modification (irrigation for the first forest type and draining for the second forest type) is at present not advisable to increase productivity of forest phytocenoses.

Conclusion. The soil scoring on individual sites reflects natural fertility. Classification of forest stands and soils is a basis for elaborating measures of increasing forest productivity and rational forest lands utilization. It is indispensable for reforestation, forest growing, main felling operations and improvement cutting to create productive and sustainable forests, to estimate costs of land transfer, to plan forestry production and forest inventory, to evaluate forest transformation under anthropogenic impact on soil-ground conditions as well as to allocate economic forest areas.

References

1. Оценка плодородия почв Белоруссии / Н. И. Смеян [и др.]. Минск: Ураджай, 1989. 359 с.

2. Русаленко А. И. Леса Беларуси: экология, структура, продуктивность. Минск: БГТУ, 2012. 348 с.

3. Юркевич И. Д. Выделение типов леса при лесоустроительных работах. Минск: Наука и техника, 1980. 120 с.

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