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EVOLUTION OF COMPONENT STRUCTURE OF FOREST STANDS IN CONDITIONS OF MODERN FORESTRY ACTIVITIES

Evolution of forest stands component structure in the comparable limits has been determined. This had been done on the example of four different forest areas of different specializations for the period 1946–2008 years. There have been discovered an increase in the proportion of bedrock stands, high-density stands as well as of higher class forest stands and reduction in the proportion of stands with undergrowth of specified species and low density stands.

Introduction. Belarus makes a significant contribution to the conservation of forest cover in Europe. Processes of reforestation and afforestation in the country prevail over the process of deforestation. This is particularly important in the view of ongoing decline in forest cover of the planet [1]. Changes in the qualitative composition of forests are mostly resulted from various management activities that had been carried out on a large scale in the second half of the XX century.

The purpose of this work was to determine trends of changes in component structure of forest stands in terms of forest management for a long period of time (about six decades).

Objects and research techniques. As objects of study there have been selected forest stands in comparable boundaries of four forestries (Ivye industrial, Tumilovichy experimental, Negoreloe forestry experimental station, Minsk Forest and Park). Duration of economic impact is in the period of 1946–2008 years.

Forest stands of 3155 investigated survey plots were combined into 12 ranked structural component groups each having a rating from “1” to “12”. Rating has been established on the basis of pairwise comparative numerical score as algebraic from three (+1, –1, 0) components: degree of density, forest stand composition, undergrowth composition. According to the class, forest stands with a rating of “9–12” is referred to a higher class stands, with a rating of “5–8” – to a middle class and “1–4” – to a lower class.

Main part. Over half of a century 34.5% of the investigated forest stands have been affected by economic influence. According to forest density the greatest attention had been paid to low (40.9%) and middle density stands (38.9% of their original area). These efforts resulted in significant improvement of forest density and species composition. Based on the initial set of forest stands with an average rating “8.08” there have been formed a new set of forest stands which has different component structure ($t_{st} = 16.67$) with an average rating “9.19” (table).

The proportion of forested land with indigenous formations has been occurred. Forest stands with a specified composition have been increased from 87.4 to 88.2%. Accordingly, there was a re-

duction of stands with non-specified composition – from 12.6 to 11.8%.

The amount of stands with undergrowth of specified species had been reduced from 46.2% to 29.6%.

The proportion of low-density forest stands division (0.3–0.5) stands had fallen from 25.7 to 6.7%, proportion of middle density stands practically remained the same (0.6–0.7). Increase in the proportion of high density stands has doubled (from 20.1 to 40.9%) – 0.8–1.0.

In general, 18.9% of stands being studied kept the original component structure. 51.1% of studied stands has improved their rating and 30.0% worsen it.

During the analyzed period, the share of stands with higher grade rose from 63.7 to 82.3% with significant reducing of stands with lower grade (from 18.7 to 10.0%) and average grade (from 17.6 to 7.7%). Nevertheless, the share of stands with medium and especially low grade is still high.

In the analysis of component s transformation of structural groups of forest stands according to their grade one can note their safety in 85.3% (1715 sites). Stratum rated as “6–8” and “1–4” retained its original condition by 12.3 and 11.5%, respectively.

Most plants (88.4%) with a rating of “1–4” improved their condition: 77.9% of stratum being estimated in current term as plantings with higher grade, and 10.5% of the stands – as those of with middle grade.

In stands having average grade rating of the original number of stratum has increased by 75.9%, 11.9% of stratum moved to the stands of lower-grade.

During current period of time 14.7% stratum with higher grade are characterized as low (9.1%) and average (5.6%) grades. Most represented in the initial period of observation were middle density stands – 54.2%.

Low-density stands occupied 25.7% of the territory and high density – 20.0%.

Analysis of stands transformation according dense groups shows the highest safety of groups with average density (55.6%) and high density (42.7%). Preservation of stands with thickness of 0.3–0.5 was only 6.5% of the initial amount, the rest of them are transformed into groups with average (45.2%) and high (48.3%) density.

Dynamics of stratums according to component structure of stands being investigated, art.

Name of component structures of forest stands	Rating	Total amount of forest stands	
		Base period	Current term
Low density forest stand (0.3–0.5), composition of forest stand and undergrowth of non-specified species	1	60	18
Low density forest stand(0.3–0.5), composition of forest stand comprises non-specified species, undergrowth – specified ones	2	6	4
Middle density forest stand (0.6–0.7), composition of forest stand and undergrowth of non-specified species	3	177	153
Low density forest stand (0.3–0.5), composition of forest stand comprises specified species, without undergrowth or comprising non-specified ones	4	346	142
High density forest stand (0.8–1.0), composition of forest stand and undergrowth of non-specified species	5	76	108
Low density forest stand (0.3–0.5), composition of forest stand and undergrowth of specified species	6	400	47
Middle density forest stand (0.6–0.7), composition of forest stand comprises non-specified species, undergrowth – specified ones	7	54	63
High density forest stand (0.8–1.0), composition of forest stand comprises non-specified species, undergrowth – specified ones	8	25	25
Middle density forest stand (0.6–0.7), composition of forest stand comprises specified species, without undergrowth or comprising non-specified ones	9	643	942
Middle density forest stand (0.6–0.7), composition of forest stand and undergrowth of specified species	10	835	495
High density forest stand (0.8–1.0), composition of forest stand comprises specified species, without undergrowth or comprising non-specified ones	11	394	859
High density forest stand (0.8–1.0), composition of forest stand and undergrowth of specified species	12	139	299
Total number of stratums		3155	
Average rating of forest stands		8.08	9.19

Today, 36.6% (626 stratums) of middle density stands being estimated as high density stands.

Stands thinning occurred in 15.6% (493) of stratums: 132 middle density stands moved to low-density stands; 361 high density stands – into low- (26) and middle density stands (335).

As stated earlier, there is a reduction of stands with undergrowth of specified species (from 46.2 to 29.6%). Preservation of specified undergrowth is observed in 32.5% (474) of stands. Forest stands with undergrowth of non-specified species or without undergrowth retain its original state, namely 72.9% (1237) stands.

Areas with non-specified composition of the stand retained their status within 4.0–11.8% of the initial amount of strata surveyed.

Not everywhere in stands with specified composition there have been formed specified undergrowth: 113 stratums (8.2%) were transformed into the stands with non-specified composition.

Most representative in the baseline period (46.8% of the area of wooded land) were stands rated as “9” – these are middle density (0.6–0.7) specified stands with undergrowth of non-specified species or without it (20.4%) and stands rated as “10” – these are middle density stands

with stand and undergrowth of specified species (26.5%).

After 60-year period stands rated as “9” (29.9%) and “11” (27.2%) dominated. 10.0–12.0% of these stands are formed on the stratums with the original non-specified composition of stand, 22.6–29.7% – of specified low-density, 41.6–48.4% – higher grade stands.

Effectiveness of forest enterprises is different. Negoreloye forestry experimental stations and Minsk Forest and Park forestry raised the rating structure slightly (respectively from “8.84” to “9.05” and from “8.70” to “8.91”). Stands rating in Tumilovichy forestry experimental station increased from “8.16” to “8.64” and in Ivie production station – from “7.17” to “9.9”.

In terms of forestries being studied there is no specific character of changes in stand grades. In all forestries during the analyzed period, the proportion of stands with higher grade has increased: by 14% – in Minsk Forest and Park forestry, by 87% – in Ivie production forestry. The proportion of low grade stands has decreased: by 4% – in Tumilovichy forestry, 80% – in the Ivie forestry. Proportion of average grade stands has also decreased except for Negoreloye forestry experimental

station, where the proportion of these stands has increased by 64%.

In Negoreloe forestry experimental station there have been an increase of strata with low density forest stands – from 27.0% to 42.0% while reduction of high density ones – from 14.0% to 6.0%.

Minsk Forest and Park forestry differs in increasing strata with middle density stands from 59.0 to 77.1% with reduction of high density and low density stands.

During the past 57-year period, forest management of Ivie forestry has takebserious efforts to improve density of stands. The number of strata with high density has risen in 3.7 times, and those ones with low density has fallen in 28.4 times.

Conclusion. During the analyzed period, the proportion of high grade strata has increased (63.7% – its original state, 82.3% – current) with

significant reduction of low grade stands (from 18.7 to 10.0%) and average grade (from 17.65 to 7.7%). Nevertheless, the proportion of average and low density stands is still high (7.7 and 10.0%, respectively). Insufficient attention is paid to undergrowth of specified species – plants share with undergrowth of specified species has decreased from 46.2 to 29.6%. Significant reduction one can observe in the proportion of low-density strata – from 25.7 to 6.7%, almost remained unchanged middle density stands. The number of high density strata has doubled (from 20.1 to 40.9%).

References

1. Глобальная оценка лесных ресурсов 2010 года // Документ ФАО по лесному хозяйству. Основной отчет. – Рим, 2011. – 344 с.

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