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THE COMPARATIVE ANALYSIS OF A STATE OF SPRUSE STANDS STATE ON THE CONSTANT TEST OF FORESTRY'S

Data on the volume of the current and general attrition at the constant experimental plats in spruce stands in the forestry's during 2004–2013 are analysed. According to the forestry's and the results of own inspections of the constant experimental plats, the comparative analysis of the spruce stands state on constant experimental plats of Tolochin forestry, Cherven forestry, Chausy forestry and Borisov skilled forestry is made. As a result dynamics of state changes in spruce stands at the experimental plats for 2011–2014 and dynamics of dead wood formation in spruce stands is presented. The current assessment of the constant experimental plats condition on the average category of state and according to the current and general attrition is also given. The reasons of difference between our and forestry data on the assessment of a condition of spruce stands on constant trial squares are analysed and discussed. It is established that in a number of the surveyed constant experimental plats of the forestry's there is an overestimate of an assessment of a condition of spruce forest stands that can lead to an inexact assessment of current state of spruce plantings in a number of regions of the republic.

Key words: spruce plantings, dry up, constant trial area, forestry, attrition, category of state.

Introduction. Spruce forests in the Republic of Belarus occupy the area of 750.4 thousand hectares, or 9.5% of all territories covered with forest with a reserve of 180 million м^3. Share of spruce plantations in the forest covered area on the territory of the country gradually decreases from north to south. Spruce forests are widespread on fertile soils of Orsha Elevation and in the northern part of Orsha-Mogilev Plateau [1].

On the territory of Belarus decrease of biological stability and drying of spruce plantations is observed throughout the last 20 years. Modern mass drying of spruce forests had a wave-like character with three expressed drying periods: the first one – 1994–1999, the second one – 2001–2005, the third one – from second half of 2010 until now. At the beginning of 20th century the periods between spruce forests dryings were 30–40 years, in modern conditions the spruce stabilization periods were cut down up to 3–5 years [1].

The phenomenon of spruce stock destruction during the last 20 years does not actually correspond nowadays to the term "periodic mass drying". It has such a prolonged character that it would be more correct to use the term "permanent drying". Permanent character of drying with the presence of periodic "waves" is explained by the pathological processes nature, by combination of factors causing violation or loss of stability of spruce stock on one and the same territory [2].

Mass spruce drying is caused by a complex of causes evoking in the beginning weakening of vital activity and decrease of tree protective functions, and then its death. Thus the principal cause defining the dying intensity of weakened trees and trees without protective function, – is trunk pests for which in such stocks favorable conditions for life activity, breeding and diffusion on vast territories [3] are created thanks to a food supply abundance.

Main part. The research objective is an objective evaluation of the available data of constant plots (CP) of the State Forestry Institutions (SFI) about spruce plantations state to study spruce forests drying dynamics.

In Table 1 there are data of CP about the sizes of current and general falls in percentage from the trunks number [4] in the State Production Forestry Associations (SPFA) during 2004–2013. As it is clear from the table data from 2004 to 2006 there was the fall increase, connected with mass drying, further from 2007 to 2010 the fall size decreased, and after 2011 increased again.

For comparative analysis of spruce plantations state the data of CP in SFI were taken in different regions and geobotanical districts (GDFI "Borisovsky experimental timber enterprise", SFI "Chervensky timber enterprise", SFI "Chaussky timber enterprise", SFI "Tolochinsky timber enterprise").

CP No. 1 is in Borisovsky timber enterprise in allotment 7 of quarters 38 of Borisovsky forestry. Stand structure is mixed with 50% of spruce, age – 70 years. Forest type is a shamrock spruce forest. Quality of locality is I^a, relative completeness is 0.7.

CP No. 2 is in Chervensky timber enterprise in allotment 1 of quarter 150 of Natalievsky forestry. Stand structure is mixed with 80% of spruce, age – 65 years. Forest type is a brake spruce forest. Quality of locality is I, relative completeness is 0.6.

CP No. 3 is in Chaussky timber enterprise in allotment 1 of quarter 20 of Slastenovsky forestry. Stand structure is mixed with 40% of spruce, age – 57 years. Forest type is a shamrock spruce forest. Quality of locality is I, relative completeness is 0.7.

Table 1

Fall formation dynamics on years in spruce plantations of State Production Forestry Associations

SPFA	Fall, %, on years																			
	2004		2005		2006		2007		2008		2009		2010		2011		2012		2013	
	cur.	gen.	cur.	gen.	cur.	gen.	cur.	gen.	cur.	gen.	cur.	gen.	cur.	gen.	cur.	gen.	cur.	gen.	cur.	gen.
Brestskoe	12.3	18.1	19.0	26.7	18.9	30.8	19.8	30.2	15.7	28.7	14.7	28.5	13.1	26.6	14.7	28.9	14.7	31.3	12.4	24.0
Vitebskoe	10.9	13.2	7.5	11.3	9.1	14.2	7.0	12.6	8.4	15.3	9.8	17.6	8.1	16.4	11.7	21.2	13.0	24.8	8.0	18.2
Gomel-skoe	–	–	–	–	14.4	16.6	6.8	9.6	2.7	7.7	1.7	9.0	5.0	12.4	11.2	21.2	17.8	26.3	12.7	19.8
Grodnen-skoe	11.7	15.3	11.4	17.8	7.5	12.9	4.0	13.9	6.8	16.9	4.9	17.3	2.9	15.8	1.8	12.5	5.0	16.5	8.7	19.6
Minskoe	7.0	10.8	7.7	14.7	4.4	12.2	5.1	12.8	6.0	13.4	6.2	13.7	5.5	14.0	6.6	15.5	7.9	16.0	7.1	13.8
Mogilev-skoe	5.0	6.8	5.8	11.1	3.7	10.7	3.4	11.5	3.7	12.3	3.8	12.1	3.7	12.4	4.4	14.0	10.9	19.5	7.9	19.7
Avera-geon Forestry	7.8	10.7	8.6	13.6	9.7	16.2	7.7	15.1	7.2	15.7	6.9	16.4	6.4	16.3	8.4	18.9	11.6	22.4	9.5	19.2

CP No. 4 is in Tolochinsky timber enterprise in allotment 3 of quarter 208 of Tolochinsky forestry. Stand structure is mixed with 10% of spruce, age – 61 years. Forest type is a shamrock spruce forest. Quality of locality is I^a, relative completeness is 0.7.

To determine the plantations state it was done a continuous counting of trees on CP according to thickness degrees and categories of their forest-pathological state. Materials of counting and state assessment of spruce plantations on constant plots of SFI for the last four years were also analyzed. The weight average category of the stand state for each inspection period was determined. Dynamics of change of a state of fir groves is presented to Table 2 on CP for 2011–2014.

It is possible to see in the table that the spruce plantations state becomes worse with the course of time. Data comparative analysis of Borisovsky, Chervensky and Tolochinsky timber enterprises and of our inspections results indicates the difference in the state assessment. According to our data the state weight average category on the plots is lower, than according to SFI, and therefore, the stands state is worse, than it is fixed by timber enterprises. Results similarity can be seen only in Chaussky timber enterprise.

Fall formation dynamics in spruce stock according to SFI data and our inspections is shown in Table 3. It is clear from the table that volumes of current and general falls increases.

At that the formed fall is populated and used to a large degree by xylophages. It is possible to note that the fall volume, fixed in SFI, do not correlate with stand state change.

Table 2

State change dynamics of spruce forests on the constant plots on years

CP number	State weight average category on years			
	2011	2012	2013	2014
Data of SFI				
1 – Borisovsky experimental timber enterprise	I,74	I,75	I,76	I,84
2 – Chervensky timber enterprise	I,19	I,47	Absence of data	III,66
3 – Chaussky timber enterprise	II,95	III,48	III,75	III,78
4 – Tolochinsky timber enterprise	II,44	II,10	II,29	II,29
Results of our inspections				
1 – Borisovsky experimental timber enterprise	I,74	I,75	I,77	I,85
2 – Chervensky timber enterprise	I,19	I,47	Absence of data	IV,12
3 – Chaussky timber enterprise	II,95	III,48	III,77	III,79
4 – Tolochinsky timber enterprise	II,44	II,35	II,50	II,53

Table 3

Fall formation dynamics in spruce forests on the constant plots

CP number	Fall, %, on years							
	2011		2012		2013		2014	
	current	general	current	general	current	general	current	general
SFI data								
1 – Borisovsky experimental timber enterprise	0.8	8.5	–	8.5	–	8.5	1.7	10.2
2 – Chervensky timber enterprise	–	–	0.9	4.8	Absence of data		42.3	55.8
3 – Chaussky timber enterprise	12.9	22.4	17.7	28.6	15.0	36.6	13.6	36.1
4 – Tolochinsky timber enterprise	6.7	16.0	2.0	12.0	3.6	13.8	2.9	10.7
Results of our inspections								
1 – Borisovsky experimental timber enterprise	0.8	8.5	–	8.5	–	8.5	–	5.4
2 – Chervensky timber enterprise	–	–	1.0	4.8	Absence of data		11.5	51.0
3 – Chaussky timber enterprise	12.9	22.4	17.7	28.6	15.4	36.6	14.1	36.7
4 – Tolochinsky timber enterprise	6.7	16.0	5.7	12.1	6.9	13.8	7.8	14.7

Conclusion. Difference of SFI data and our data according to the spruce forests assessment state on the constant plots is possible to explain by several causes.

1. Illogical assessment of the state category of the same trees on years (for example, at first III, in a year II, then again III).

2. Leaving trees of state category V (dead wood of current years) over a period of several years in the same category (though it should be changed into VI).

3. Assignment of numbers of the cleaned trees (dead wood of past years or windfall) to other trees, but already in I–II categories, thus it can happen beyond sighting devices of CP. In this connection there is an inexplicable reduction of current and general falls on CP according to SPFA data.

4. On CP there is removal of dead and windfall trees with numbers, which are in the records and have numbers and categories of state.

It is necessary to note that only in SFI "Chaussky timber enterprise" there are no mentioned discrepancies and inspections results match. Thus, on a number of constant plots inspected by us there is a state overestimate of spruce stocks, and that can lead to an inexact assessment of the current state of spruce forests in a number of republic regions.

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