Assessment of high conservation value forests in the Tolshmenskoye lease base in the Vologda region

F N Druzhinin¹, M G Dvornikov², E N Pilipko¹*, N A Khoroshun¹ and L V Berseneva¹

¹Vereshchagin Vologda State Dairy Farming Academy, Vologda, Russia
²Professor Zhitkov Federal State Budgetary Russian Research Institute of Game Management and Fur Farming, Kirov, Russia

*E-mail: karlovna@ukr.net

Abstract. The purpose of the research was to identify, research and assess high conservation value forests (HCVF) and representative areas allocated in the lease base of the enterprise. The object of the research is forest areas of special conservation value in the lease base of the logging enterprise LLC Tolshmenskoye. The subject of the research is the quantitative and qualitative characteristics of the high conservation value forests stands. The research was carried out on four stationary objects, which are represented by coniferous stands. The share of conifers in the composition of the stand is from seven to nine units. The researches were based both on the research performed of forest management and reporting documentation of the enterprise, and on the basis of field research materials. The choice of research objects is due to the fact that these plantations perform the function of preserving biological diversity and are excluded from economic activity, which allows for long-term monitoring observations to assess quantitative and qualitative changes in the structure of forest stands and make conclusions about their performance of target functions. The results of the survey showed that the population of trees is characterized by high classes of sanitary assessment. In terms of health, most tree species show no signs of weakening. The number of healthy specimens according to the objects of research and according to the breed composition is quite high (at least 67%). No significant anthropogenic impacts have been identified. The number of undergrowth varied greatly according to the objects of research. The undergrowth is heterogeneous in composition. At the same time, aspen and spruce occupy the dominant position in the emerging tree canopy.

1. Introduction

Forest use violates the integrity of biogeocenoses, fragmenting them and dividing them into clearings. But forest use as a branch of the national economy has become a part of our life, therefore it is important to find ways to preserve such ecological values as biodiversity and ecological functions of forests, not excluding forest use. To this end, an ecological network is being developed with the identification of high conservation value forests (HCVF) in the lease base. Such an ecological network should consist of small protected areas, for example, natural monuments, wildlife sanctuaries, specially protected areas (SPA), forests with restrictions on the types of felling. Such areas should occupy at least 5% of the forested area of the lease. The creation of an ecological framework at the level of the lease base is, first of all.
Russia has already accumulated a fair amount of practical experience in identifying HCVF. A number of research projects have been carried out, the results of which are publicly available; in some regions, maps of HCVF of certain types have been created, methodological recommendations have been developed that allow identifying HCVF in the certification of individual enterprises. Conservation of HCVF is becoming increasingly important in connection with the growing global importance of Russian forests, both in the light of the problem of biodiversity conservation in Eurasia, and in the light of the aggravation of the problem of the global climate. Environmentally responsible forest management ensures that the harvesting of forest products does not threaten biodiversity, does not reduce the productivity of forests, and does not impair the fulfillment of their ecological functions by forests. Socially oriented forest management provides both the local population and society as whole, material and social benefits from forest management in the long term. The guarantee of such forest management is the international forest stewardship certification under the Forest Stewardship Council (FSC) scheme, which is now the world leader in environmentally sensitive markets. In recent years, certification in Russia has been developing especially rapidly, and Russia, along with Canada, is now the world leader in the area of FSC-certified forests [1].

2. Research methods and objects
The researches were carried out in plantations located on the plots located in the lease base of Tolshmenskoye LLC of the Totemsky district of the Vologda region. The selection and laying of permanent test plots was carried out taking into account the requirements of OST 56-69-83 [2] and the methodological instructions of N P Anuchina (1977) [3], V N Sukachev and S V Zonna (1961) [4]. Phytosanitary inspection of pine forests, carried out taking into account Resolutions of the Government of the Russian Federation of 20.05.2017 No. 607 “On the Rules of Sanitary Safety in Forests”.

3. Results and its discussion
The share of forest land in the lease base of Tolshmenskoye LLC is 99.9%, which characterizes this territory as highly wooded. Forested area (approx.96%) is represented mainly by plantations of natural origin. In the forest fund of the leased area, in the course of the author's analysis, HCVF of the fourth type were identified - water protection zones that belong to the first subtype, which is associated with the presence of a significant number of rivers, streams and wetland complexes on the leased area.

Based on the analysis of the current regulatory legal acts of the project documentation: the forest plan of the Vologda region, the forestry regulations for the Totemsky district [5], the Forest Development Project of Tolshmenskoye LLC [6], taxation descriptions of forest areas, cartographic materials, on the territory of the lease base of Tolshmenskoye LLC at the first stage, stands were identified that potentially have high conservation values. Based on the results of the analysis of the existing system of specially protected natural territories (SPNA), specially protected areas (OZU) and the general situation of biodiversity conservation in the Vologda region, on the territory of the lease base of Tolshmenskoye LLC, located in the Totemsky district, 3895.0 ha forests of high conservation value, which is 29% of the total area of the enterprise lease. The preservation of such forests has not only ecological but also social significance.

4. The vital state of forest stands
The results of our survey showed that high classes of sanitary assessment (table 1) characterize the set of trees.

| № etc.pl. | Breed | Distribution of trees by classes of sanitary assessment, % | Average class of phytosanitary assessment |
|-----------|-------|----------------------------------------------------------|---------------------------------|
|           |       | I   II  III  IV  V  VI  VII windfall, windbreak          |                                 |
| 1         | E     | 53   28  5   8   6   -   -   I.9                         |                                 |

Table 1. Assessment of the sanitary state of plantings.
S 84 8 - 1 7 - - - I.4  
B 88 6 - - 6 - - - I.3  
S 27 63 3 4 3 - - - I.9  
E - 9 38 49 4 - - - III.5  
S 40 46 10 2 2 - - - I.8  
E 2 26 47 21 4 - - - III.0  
S - 28 36 17 19 - - - III.2  
E 13 34 28 16 9 - - - II.8  
B - 13 74 13 - - - - III.3  
S 2 42 40 16 - - - - II.7  
E 26 58 10 6 - 1 - - - I.7  
S 4 30 39 15 12 - - - - III.0  
E 13 34 28 16 9 - - - II.7  
B 4 17 68 11 - - - - II.8

I - no signs of weakening;  
II - weakened;  
III - severely weakened;  
IV - drying up;  
V - fresh dead wood;  
VI - dead wood of past years

5. Damage to stand components

Simultaneously with the phytosanitary assessment, signs (types) and causes of damage were established. The most common was the mechanical impact caused by intraspecific competition. In total, 10 types of damage were identified (table 2).

| № et c. pl. | Breed | Proportion of plants without damage, % | Distribution of trees by types of damage, % | Percentage of damaged copie, % |
|-------------|-------|--------------------------------------|---------------------------------------------|-------------------------------|
| 1 E         | S     | 97 - 1 - 2 - - - - - - - - - - - - |                                                            |
| 1 B         |       | 100 - - - - - - - - - - - - - - - - |                                                            |
| 2 E         | S     | 95 - 3 - 2 - - - - - - - - - - - - |                                                            |
| 2 S         |       | 67 - 2 - - 2 9 9 2 - - - - - - - - |                                                            |
| 3 E         | S     | 84 - - 4 - - 6 - 2 4 - - - - - - - - |                                                            |
| 3 S         |       | 97 - - - 3 - - - - - - - - - - - - |                                                            |
| 4 E         | S     | 88 - - 3 3 1 2 - 3 - - - - - - - - |                                                            |
| 4 S         |       | 73 1 - 7 - 3 6 10 - - - - - - - - - |                                                            |

Table 2. Damage to trees on test plots.
Among the surveyed tree species, according to the objects of research, the drooping birch is characterized by the minimum damageability. She occupies a co-dominant and subordinate canopy, which to a certain extent influenced her life state.

Scots pine is the most susceptible to damage of all species. This was especially pronounced in the 3rd and 4th test plots, where the proportion of damaged plants reached 33%. In the composition of the stand, there are a small number of specimens with a one-sided crown, multi-peaked, etc. Individual dead trees were also recorded in all forest areas.

In general, in the course of monitoring observations, it was found that woody plants in the investigated area have a fairly high resistance.

6. Assessment of the natural forest formation process

In taiga forests there is a constant process of natural regeneration. A complex of climatic, biotic and abiotic factors determines the intensity of this process. An abundance of seeds does not always guarantee a successful renewal. The germination of seeds is impeded not only by the powerful forest litter, which is highly developed in the forests of the North, but also by the closed canopy, under which the emerging seedlings cannot develop and are doomed to death. This phenomenon is repeated until a loose canopy is formed and the density of the parent stand decreases. Only under these circumstances are the necessary conditions for the growth of the younger generation provided.

In the absence of the impact of forest-destroying anthropogenic factors, a natural forest, as a self-renewing, self-regulating ecological system, can exist forever. The main component that determines the course, the intensity of formation and constancy of the forest as a system is woody vegetation [7, 8].

In the economic assessment of the success of natural regeneration, we took into account: the height, age and vital state of the undergrowth, the number and uniformity of its distribution over the area (table 3). The number of undergrowth varied greatly according to the objects of research. The undergrowth is heterogeneous in composition.

Table 3. Silvicultural assessment of the success of the natural forest-forming process according to the research objects.
All stationary sites (test plots) are dominated by the main forest-forming species of the Vologda region. At the same time, the dominant position in the emerging tree canopy is occupied by aspen (more than 5.0 thousand ind./ha) and birch (more than 0.5 thousand ind./ha).

Undergrowth of deciduous and coniferous species is evenly distributed over forest area. Pine does not occur when undergrowth is taken into account. The quantitative composition of spruce undergrowth under the canopy exceeds 1.0 thousand ind./ha. In all stationary objects, in the overwhelming majority, viable individuals are widespread. In terms of height gradation, the undergrowth is represented by large specimens (from 1.5 m to 4.0 m).

In general, at the time of the survey, the process of natural reforestation is still ongoing. But it should be noted that without forestry activities, the formation of the younger generation with the domination of economically valuable tree species will proceed extremely slowly. Among the necessary economic measures to stimulate the forest formation process, timely maintenance should be recognized.

### 7. Conclusion

An important component of forest management is the principle of taking into account possible consequences. According to the definition, HCVF represent the most valuable forest areas from a nature conservation or social perspective, depending on the type identified. In this regard, it is extremely important that the revealed value is not lost. To record changes in the state and structure of HCVF, a monitoring observation system is needed, which will allow timely identification and prevention of negative impacts on forest stands, thereby increasing their safety and stability. At the same time, the forest management system in the leased area is being improved.

In general, at the time of the survey, the process of natural reforestation is proceeding more actively, in the so-called windows of renewal. At the same time, it should be noted that without carrying out forestry activities, the formation of a young generation with the domination of economically valuable tree species is impossible.

The analysis of the data collected during the monitoring made it possible to determine the degree of forest management efficiency. Climatic, edaphic, orographic conditions of the research area are favorable for the growth, formation and cultivation of coniferous plantations.
References

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