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ОЦЕНКА РЕКРЕАЦИОННОЙ НАГРУЗКИ И ДИГРЕССИИ ДУБОВЫХ НАСАЖДЕНИЙ ПРАВОБЕРЕЖНОГО ЛЕСНИЧЕСТВА УЧЕБНО-ОПЫТНОГО ЛЕСХОЗА ВГЛТУ

ASSESSMENT OF RECREATIONAL LOAD AND DIGRESSION OAK PLANTATIONS PRAVOBEREZHNY FORESTRY DEPARTMENT OF THE EDUCATIONAL AND EXPERIMENTAL FORESTRY OF VGLTU

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Аннотация: В статье представлены результаты натурных исследований рекреационной нагрузки в дубравах Правобережного лесничества учебно-опытного лесхоза ВГЛТУ. Целью работы являлась оценка современного состояния древостоев и определение стадий рекреационной дигрессии в зависимости от местоположения участков. В ходе исследования было проведена таксация древостоя, оценка состояния подроста, подлеска и травяного покрова, а также рассчитана рекреационная ёмкость исследуемых

участков. Авторами предложены рекомендации по оптимизации рекреационного лесопользования.

Abstract: The article presents the results of field studies of recreational load in the oak forests of the Right-Bank forestry training and experimental forestry VGLTU. The aim of the work was to assess the current state of stands and determine the stages of recreational digression depending on the location of the sites. During the study, the forest stand was taxed, the condition of undergrowth, undergrowth and grass cover was assessed, and the recreational capacity of the studied areas was calculated. The authors propose recommendations for optimizing recreational forest management.

Ключевые слова: рекреационная нагрузка, дигрессия, дубрава, пробная площадь, устойчивость насаждений, вытаптывание, рекреационная ёмкость.

Keywords: recreational load, digression, oak forests, test area, plant stability, trampling, recreational capacity.

Introduction

The oak forests of the European part of Russia perform crucial environment-forming, water protection, and sanitary-hygienic functions. Under conditions of increasing anthropogenic pressure and the growing popularity of outdoor recreation, studying the recreational impact on forest ecosystems acquires special significance [1, 5]. Recreational forest management leads to a complex of negative phenomena, collectively termed “recreational digression”: soil compaction, damage to undergrowth and understory, depletion of the species composition of grass cover, and deterioration of the sanitary condition of the forest stand [3].

The territory of the Training and Experimental Forestry experiences significant recreational load due to its proximity to the city of Voronezh and the presence of a developed road and path network [2]. The Right-Bank Forestry, where valuable oak forests predominate, is the most visited. The aim of this work is to study the recreational load and determine the stages of digression in the oak stands of the

Right-Bank Forestry to develop measures for preserving their sustainability.

Objects and Research Methods

The research was conducted in 2024-2025 on the territory of the Right-Bank Forestry of the VSUFT Training and Experimental Forestry. The objects of the study were oak stands of various origins (plantations and coppice) aged 40 to 60 years.

To assess the recreational impact, 6 temporary sample plots (SPs), each of 0.5 hectares, were established. The sample plots were established along a gradient of distance from impact sources (roads, paths):

- SP No. 1, 2 – deep within the forest (conditionally background areas);
- SP No. 3, 4 – near the road network;
- SP No. 5, 6 – in areas with a mixed type of impact.

On each sample plot, a complete tally of trees was conducted, determining the species, diameter at breast height (1.3 m), and height. The forest type, type of growing conditions, stand density, and merchantability class were determined. A reconnaissance survey of undergrowth, understory, and living ground cover was carried out.

The stage of recreational digression was established according to the generally accepted methodology [OST 56-69-83] based on the ratio of areas with varying degrees of trampling and changes in ground cover. The recreational assessment of the territory and the calculation of recreational capacity were performed according to the method of V.P. Chizhova as presented by M.T. Serikov [3].

Results and Discussion

1. Taxation Characteristics of Stands

Analysis of taxation indicators (Table 1) showed that the studied stands are predominantly represented by English oak (*Quercus robur* L.) with an admixture of European ash (*Fraxinus excelsior* L.), Norway maple (*Acer platanoides* L.), and aspen (*Populus tremula* L.).

Table 1. Taxation characteristics of forest stands on sample plots

Sample Plot	Stand Composition	Height, m	Age, years	Diameter, cm	TGC*	Density
1	7O3A	19	60	24	D2	0.8
2	10O+M+Asp	18	50	24	D2	0.8
3	9O1A+M	18	50	28	D2	0.4
4	10O+A+Asp	11	40	12	D2	0.5
5	10O+A	20	45	20	D2	0.7
6	10O+A	19	50	28	D2	0.6

**TGC – Type of Growing Conditions*

All surveyed areas belong to the fresh oak forest type (TGC – D2), indicating relatively favorable forest growing conditions. The highest density (0.8) is characteristic of areas deep in the forest (SP 1, 2), while near roads, the density decreases to 0.4-0.5 (SP 3, 4), indirectly indicating stand thinning due to recreation and mechanical damage.

2. Assessment of Forest Component Condition

The results of the visual assessment of the condition of vegetation layers are presented in Table 2.

Table 2. Condition of forest components on sample plots, %

Sample Plot	Condition of tree layer, %	Condition of undergrowth & understory, %	Condition of grass layer, %	Share of paths, %
1	85	85	85	10
2	80	90	95	15
3	75	50	30	60
4	60	45	25	65
5	85	50	55	50

Sample Plot	Condition of tree layer, %	Condition of undergrowth & understory, %	Condition of grass layer, %	Share of paths, %
6	75	65	55	55

A clear pattern was revealed: with an increase in the share of paths (turfed and trampled areas), there is a sharp decline in the condition of the lower vegetation layers. On SP 3 and 4, where the share of paths exceeds 60%, the condition of the grass cover is assessed as unsatisfactory (25-30%), and foreign inclusions (litter) and areas with completely absent grass stand were recorded on the soil surface.

3. Stages of Recreational Digression

Based on the analysis of the ground cover and the condition of the forest litter, the stage of recreational digression was determined for each sample plot:

- **First stage (slight change)** is characteristic of SP No. 1 and 2. The species composition of the ground cover corresponds to the native forest type, and the abundance of species is slightly reduced (10-20%). The forest litter is compacted, but its thickness has decreased by only 10-30%. These areas are remote from main roads and experience minimal anthropogenic impact.
- **Second stage (moderate change)** was recorded on SP No. 3, 4, 5, and 6. The ground cover is trampled by 40% or more. Trampling-resistant species (plantain, knotgrass, grasses) begin to dominate the grass stand composition. The forest litter is heavily compacted and fragmented, with thickness reduced by more than 40%. On SP 3 and 4, elements of the third stage (local areas with completely destroyed litter) are observed.

4. Recreational Assessment and Capacity

The calculation of recreational capacity (Table 3) was based on the standard recreational load for oak forests of this type (10-15 people/ha). For all sample plots of 0.5 ha, the simultaneous permissible capacity was 5 people. However, this indicator is averaged and does not account for the current stage of digression. The actual load on SP 3-6 exceeds the standard, which has led to their degradation.

Table 3. Recreational capacity of the object

Sample Plot No.	Area, ha	Recreational load (standard), people/ha	Recreational capacity, people
1	0.5	10	5
2	0.5	10	5
3	0.5	10	5
4	0.5	10	5
5	0.5	10	5
6	0.5	10	5

Based on the results of the recreational assessment (Table 4), the studied areas were distributed by value classes.

Table 4. Distribution of area by recreational assessment classes

Recreational Assessment Class	Sample Plot No.	Area, ha	Share, %
1 (highest)	-	-	-
2	3, 4, 5, 6	2.0	66
3	1, 2	1.0	34
4 (lowest)	-	-	-

The areas deep in the forest (SP 1, 2) are classified as **Class 3**. They have satisfactory passability but are remote from developed roads, which reduces their accessibility. The areas near roads (SP 3-6) are classified as **Class 2**, as they are more accessible and have a developed but unimproved path network; however, their conservation value is lower due to incipient digression.

Conclusions and Recommendations

The conducted research allows for the following conclusions:

1. The recreational impact on the oak forests of the Right-Bank Forestry has a pronounced focal nature, confined to the road and path network.

2. It was established that 66% of the surveyed area is at the second stage of recreational digression, which requires urgent measures to regulate the flow of visitors.

3. An inverse relationship was revealed between the proportion of the path network and the condition of the lower vegetation layers (undergrowth, understory, grass cover).

4. The recreational capacity of the studied areas (5 people per 0.5 ha) is currently exceeded in areas adjacent to roads.

To reduce the negative impact and increase the sustainability of the stands, it is recommended to:

- Conduct functional zoning of the territory, allocating quiet zones (closed to visitation).
- Improve existing trails: surface paths with special coatings, install benches and waste bins only in designated areas.
- Organize ecological trails with information boards to regulate the recreational flow.
- Conduct regular monitoring of the sample plots to track the dynamics of digression processes.

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