STUDY OF SELECTED OBJECTS OF THE VOLGA-AKHTUBA FLOODPLAIN

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Abstract. This article presents the results of field studies of selected objects of the Volga-Akhtuba floodplain Natural-territorial complex.

Keywords: water availability, tree stand, hydrological network, adjacent landscape.

The research of natural-territorial complexes is the main direction in preserving the biosphere balance on the territory of the earth. Timely detection of the altered state can activate additional measures to restore the biological cycle. This article provides an analytical review of field studies of the Natural-Territorial Complex (hereinafter referred to as the PTK) Volga-Akhtuba floodplain conducted in 2015-2016.

The natural territorial complex of the Volga-Akhtuba floodplain is a natural formation in the interfluve of the dry-steppe climatic zone. The peculiarities of the microclimate contribute to the development of a special biocenosis distinctive from the surrounding biological community. The imbalance and intrusion into the biological cycle of human activity leads to irreversible consequences that cannot be corrected, and the manifested changes will be reflected in subsequent time periods. A person changes the biological cycle of the territory, not only directly interfering in the process of this object, but also indirectly.

Field studies of the territory of the Volga-Akhtuba floodplain were carried out within the boundaries of the Sredneakhtuba district of the Volgograd region. With the commissioning of the bridge across the Volga, this area has received a significant additional anthropogenic load, which is increasing every year.

The objects of research were channels, rivers and lakes between which, during the flood, a hydraulic connection is established, which is the center in the floodplain water supply, due to it the uniqueness of this ecosystem is formed [1,2,10,13,14].

The hydrological network of the Volga-Akhtuba floodplain, through which the flow is redistributed, has an atypical level of the Volga River and the Akhtuba River, namely, the excess of the Akhtuba River over the Volga is about 2 m.

During the expedition, a study of the eriks was carried out. The territory between the rivers in the hydrological aspect is represented as a system of basins that fill at high water levels and are a kind of receivers-accumulators of surface runoff [1,4,6,[1,2,3,4,6,7].8,9,11,12]. The data obtained are presented on the chart of the occupancy of the studied water bodies (Figure 1).
Considering the features of the constructed graphs, which show ambiguous parameters of the occupancy of water bodies over the years of the study, it is possible to draw conclusions taking into account the information received:

2015 - water supply in this year was at a low level, as the low flow of the spring flood was only about 50% of the required flow. The received volume of runoff was used for filtration, since most of the watercourses in 2014 remained without the necessary filling capacity. High summer temperatures contributed to intense evaporation, which negatively affected the quantitative damage to the filling capacity of water bodies.

Figure 1. Chart of the occupancy of the studied water bodies

Figure 2. Consequences of low spring flood
2016 - in comparison with the low-income previous years, the occupancy of water bodies in the spring period amounted to about 80% of the required volume. A sufficient volume of incoming water entered the biological cycle of PTK, which qualitatively affected the flooding of water bodies and adjacent territories, but it was revealed that insufficient water supply in 2014-2015 caused a significant disturbance in the biocenosis of this territory, the species composition of grasses from meadow to steppe is changing.

Based on the results of a full-scale study of water bodies and to compile an ecological characteristic, a trail route was compiled, the results are shown in Table 1.

| № plot | Length, m | Width, m | Steepness of ascent (+), descent (-), deg. | The trail | Characteristic |
|--------|-----------|----------|------------------------------------------|----------|----------------|
| 1      | 22,1      | 2,0-3,0  | 2,5 +1                                   | Entrance to the trail | Festuca valesiaca (Hask.), Convolvulus arvensis L, Artemísia absinthium |
|        |           |          |                                         | The eastern part of the landscape clearing | |
| 2      | 98,6      | 1,5-2,0  | 1,7 -1                                   | The trail in the form of a terrace on the slope, the type of coating is compacted, sandy soil | Stipa pennata L., Euphórbia virgáta, Elytrígia répens, Artemísia austriaca, Stipa pennata L. |
|        |           |          |                                         | The slope to Eric Bulgakov with a steepness of 5o, Crataégus | |
| 3      | 157,4     | 2,0-3,0  | 2,5 +2                                   | The same route direction from East to West | Sandy slope, a type of forest poplar grove with free-standing Quércus |
|        |           |          |                                         | Sandy slope, a type of forest poplar grove with free-standing Quércus | Medícágo, Siléne vulgáris, Tripleurospérmu m inodórum, Euphórbia virgáta Convólulus arvénis, Sónchus arvénis |

Studies have shown that representatives of semi-desert flora are present in a small area, which signals an ongoing violation in the biological community of the Volga-Akhtuba floodplain PTK.

To assess the condition of the stands, a trial plot was selected, the condition was assessed according to external signs on a 5-point scale (Table 2).
Table 2. Scale of assessment of the condition of trees by external signs.

| Mark | Characteristics of the state of trees |
|------|--------------------------------------|
| 1    | Healthy trees without external signs of damage, the amount of growth corresponds to the norm |
| 2    | Weakened trees. The crown is weakly shaded, individual branches have shrunk. The leaves are often tinged with yellow. |
| 3    | Severely weakened trees. The crown is thinned, with significant drying of branches, the top is dry. The leaves are light green, the needles have a brown tinge and lasts 1-2 years. The leaves are small, but there are also enlarged. The increment is reduced or absent. The current itself is strong. Significant areas of the bark have died off. |
| 4    | Shrinking trees. Drying of branches throughout the crown. The leaves are small, underdeveloped, pale green with a yellow tinge; early leaf fall is noted. There is no increase. On the trunks there are signs of colonization by bark beetles and other pests. |
| 5    | Dry trees. The crown is dry. There are no leaves, the needles are yellow or brown (crumbling or crumbling). The bark on the trunks is peeling off or completely fallen off. The trunks are inhabited by xylophages (consumers of wood). |

After visual inspection, the coefficient of the condition of tree species for each type of tree was determined by the formula:

\[ K_1 = \sum b_i \times n_i / N \]

where: 
- \( K_1 \) - is the coefficient of the state of a particular type of tree; 
- \( b_i \) - state scores of individual trees of the same type; 
- \( N \) - is the total number of registered trees of each species.

The results of the study are shown in Table 3.

Table 3 - Assessment of the state of the stand

| Types of trees | Number of trees | Tree condition, points | Ratio |
|----------------|-----------------|------------------------|-------|
| Quercus        | 5               | 22234                  | 2.6   |
| Sálix          | 6               | 112323                 | 2.0   |
| Acer           | 3               | 432                    | 3.0   |
| Ulmus          | 4               | 1221                   | 1.5   |
| Fópulus nigra  | 7               | 2345111                | 2.4   |

The formula [5] helped us to determine the coefficient of the state of the forest stand as a whole at the trial site:

\[ K = K_1 + K_2 + \ldots \ldots / R, \]

where: 
- \( K \) - are the coefficients of the state of tree species 
- \( R \) - is the number of tree species.

The assessment was carried out according to the state of the stand in the following gradation: 
- \( K = 1.5 \) - healthy stand; 
- \( K = 1.6 \ldots 2.5 \) - weakened stand; 
- \( K = 2.6 \ldots 3.5 \) - a severely weakened tree stand;
K=3,6...4,5 - shrinking stand.

Based on the results of the research of the trial plots, conclusions were formed:

- tree stand with a coefficient of up to 2.0 - tree species more adapted to arid conditions - elm and willow, the latter usually grows in places with sufficient moisture;
- with a coefficient from 2.0 to 2.5 - namely sedge, the state of the plantation is assessed as threatening, its restoration is possible only with an increase in the level of water availability of the territory;
- over 2.5 is oak and maple, the condition is assessed as critical, corresponding to the beginning of the decay of forest plantations. Conducted field studies in 2015-2016 of the Volga-Akhtuba floodplain PTK, helped in the implementation of a search study on the study of sapropel deposits. This type of raw material resource in its formation directly depends on the conditions of water availability and the biological cycle of the biocenosis of the studied territory. The study of the sediments under study and their effect on soil fertility, as well as the effect on plant immunity, are reflected in subsequent tests [1,2,3,4,6,7].

The analysis of the state of the ecological environment of the Volga-Akhtuba floodplain allows us to draw the following conclusion: anthropogenic activity takes the main place in terms of the negative impact on the system.

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