
DYNAMICS OF ECOSYSTEMS AND THEIR COMPONENTS

UDC 551.574.9

LONGTERM MONITORING OF THE LOWER VOLGA VALLEY

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Received May 24, 2024. Revised May 30, 2024. Accepted Juni 01, 2024.

The construction of dams on rivers for hydropower, flood control, irrigation and water supply are a widespread phenomenon in the world. Natural complexes above the dams, which were created over thousands of years, are completely destroyed now. The reservoirs affect the regime of water flow in the river downstream of the dam, and these changes disrupt the functioning of natural ecosystems in the remaining areas of river floodplains.

The Volga River did not escape the fate of transformation. It was converted into a reservoir system by the late 1960s. Filling of the reservoirs with water destroyed all natural ecosystems in their beds. However, there is an exception, the lowest section of the Volga River valley, about 500 km long from the Volgograd Hydroelectric Power Plant to the Caspian Sea. This area is known as the Volga-Akhtuba Floodplain and the Volga River Delta, and we call it the Lower Volga Valley. It's watered through the special spring-summer water releases into the lower pool of the Volgograd Reservoir.

In the 1960s, a project was planned out to create the Nizhnevolzhskaya Hydroelectric Power Plant in the Volga-Akhtuba floodplain. According to one of its options, the entire floodplain was supposed to become the bottom of the new reservoir. To compensate for the losses in the local fishery industry, a water divider would be built. Its function was to redirect water during floods to the eastern part of the delta and create a favorable habitat for the spawning of semi-anadromous fish. Meanwhile, the western part of the delta was planned to be transformed into the intensively used irrigated agricultural plantations.

However, due to the loss of large areas of agricultural land the idea of the Nizhnevolzhskaya Power Plant was abandoned. Only some of the projects, such as the water divider and transformation of the wetlands and meadows in the western delta, were fulfilled. Then, in the late XX century, during the transition from a planned Soviet economy to a market system, both the divider and the irrigation systems were abandoned and destroyed.

The first goal of this study was to characterize the materials stored at the Institute of Ecology of the Volga River Basin in order to monitor the dynamics of plant cover and partly soil cover of the Lower Volga valley. This material is of a great value as it has 15,675 geobotanical relevés of sample plots made in the valley in 1924-2023. For about 10,000 of them, the exact geographical coordinates were obtained.

The second goal of the article was to briefly summarize the results of a long-term monitoring of vegetation dynamics in the valley. The main results (since the 1970s) of this monitoring are also presented below.

We discovered that even after exclusion of the western part of the delta, its natural vegetation was preserved in the remaining territory nonetheless, although in a modified form. We also found out that such determining factor as the hydrological regime of the Lower Volga valley is not the only one that affects the vegetation cover and its productivity. Other significant factors are, for example, peculiarities of economic land use and invasions of alien plant species.

The Volga-Akhtuba floodplain underwent xerophytization and synanthropization of its vegetation cover which is especially noticeable in its northern part. Meanwhile, in its western part, where the irrigation systems were destroyed, large areas turned into fallow lands with specific type of vegetation.

Most importantly, its eastern part has transformed differently compared to the floodplain. There, the vegetation changed greatly between the 1980s and the early XXI century; reed and cattail thickets spread over large territories, and the area of halophytic phytocenoses decreased sharply. The main reasons for this were the increase in water flow of the Volga River at the end of the 1970s, and the cessation of hay harvesting for farm animals and reed for industrial use. Some recent changes towards xerophytization in the delta occurred only on the slopes of the Baer hillocks where the representation of xerophytic plant communities has increased, while the communities has spread down the slopes, which can be explained by climate aridization.

In conclusion, the author would like to emphasize that it is necessary to organize constant observations of the aforementioned phenomena and processes taking place in the region. This is important to justify and make management decisions on the conservation of biodiversity and biological productivity of ecosystems in the Lower Volga valley.

Keywords: Volga-Akhtuba floodplain, Volga River delta, regulation of water flow, stationary observation sites, lower pools of the hydroelectric system, reduction in flow volume, water factor, vegetation, xerophytization, anthropogenic factors, Volgograd reservoir, reed thickets, fires, soil desalinization, climate aridization.

DOI: 10.24412/2542-2006-2024-2-4-41

EDN: FRALCL