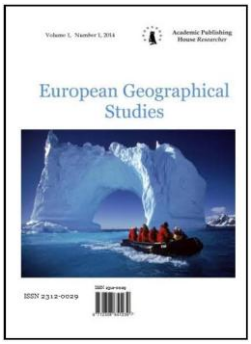
Published in the Russian Federation
European Geographical Studies
Has been issued since 2014.
ISSN: 2312-0029
Vol. 2, No. 2, pp. 70-74, 2014

DOI: 10.13187/egs.2014.2.70
www.ejournal9.com



UDC 551

The Environmental Problems of the Delta Areas (on the Example of the Delta of the Volga)

[1] Anna V. Fedotova
[2] Lyudmila V. Yakovleva
[3] Elena G. Loktionova

[1-3] Astrakhan State University, Russian Federation
414000, Astrakhan, Shaumyana, 1

Abstract

The ecosystem of the Lower Volga exists and grows depending on the variable and peculiar mode of the river Volga. The levels of floods and their duration are directly dependent on the flow of the Volga and the level of the Caspian Sea. In the period of intense uplift of the Caspian Sea and the Volga flow increased the height of spring-summer floods and their duration significantly increased, which caused the redistribution of soluble salts in the soil. Adapting to such a mode of soil when the soil depending on the location and the intensity of floods is salinizated or desalinizited, on this part of the delta the unique biocenosis forme. The observations carried out by the authors, suggest that changes in the structure and thecomposition of the plant communities have a directional character. During the lowering of the Caspian Sea and the low flood the halophytizatongrass occurs, and with increasing water content of the area (and reducing the salt content) of the soil are as in flood plain. The industrial complex of the city is represented in shipbuilding, timber and fish processing industry. The leading industries is engineering, electric power, food processing. The region has extensive natural resources (fish, minerals, land). The region is almost inexhaustible supplies of gas, oil, sulfur and salt. In the region there are five oil and gas fields, and one gray-gas condensate, which is the largest in Europe. Compared with other regions, Astrakhan is located in a region with relatively high average annual temperature that causes high activity of biological organisms in the aquatic complexes.

Urbanization leads to a change in the hydrological regime of urban ponds and streams, affect the water balance, hydrochemical regime change due to discharge of sewage: industrial, household, stormwater, wastewater from construction sites. All this calls for an objective assessment of its current state. The hydrochemical analysis showed that the content of pollutants in the municipal water reservoirs significantly exceeds the background values, whereby an aqueous medium becomes unsuitable for living organisms. The high toxicity of the environment and confirm the results of the parallel bioassay. The existing work has revealed an extremely unfavorable ecological situation in the territory of Astrakhan. The conducted comparative analysis of content in water reservoirs of all intra-toxic substances identified the trend of ecological deterioration of the situation in terms of time.

Keywords: Environmental Problems; Delta Areas; Volga.

Nowadays only a few of European rivers have natural regime alongside the majority of them are regulated for water supplies storage, maritime traffic and flood pattern changes [1].

Volga (the ancient name was Ra, in the Middle Ages was Itil) is the largest river in Europe – the area of pool is 1 360 000 км² It originates on Valdai hills, runs in to the Caspian sea, forming delta the area – 19 thousand km².

Volga basin covers 8% of Russia, but there are 40% of the population living in this area (approximately 60 million people) and 445 cities and towns. Concerning the types of production there are 45% of industrial production and 50% of agricultural one. The forest squares are 23% of the Volga basin territory and it's 14% of all-Russian forest recourses.

Volga delta is situated between 45°23' - 48°52' north latitude and 47°33'- 49°27' east longitude in the south-east of East-European flatland within the north-west part of the Caspian Plain (fig. 1). The climate of the Astrakhan region is temperate, severely continental one with wide range of annual and summer daytime ambient temperatures, low level of deposits and high evaporation [2].

Fig. 1. Astrakhan region

The ecosystem of the Lower Volga exists and grows depending on the variable and peculiar mode of the Volga River. Levels of floods and their duration are directly dependent on the flow of the Volga and the level of the Caspian Sea. The important feature of the study area is a natural tendency to soil salt accumulation [3]. Many scientists have noticed the leading role of water in the soil-forming processes of deltaic areas. The flood regime manages the processes of salinization / desalination, namely the length and height of the flood has a direct impact on the regime and the level of ground water, which in it's turn causes salt accumulation and leaching of salts.

With the long-term increase in the level of the Caspian Sea and ground water is a change of soil coverage. Increased humidity and soil moisture for security between lows of the hills, the consequence of which is the development of processes gleying and then waterlogging. Earlier (when the level of the Caspian Sea) automorphic soil slopes of hills exposed to ground water during floods and follow the path of salinity that in the future does not rule out their transition into the category of salt marshes.

The increasing of availability with moisture of marshes leads to leaching of salts from the profile (especially toxic) and the salt can take the path of desalination.

Soil-forming processes occur in the opposite way with the decreasing level of the Caspian Sea, i.e. the processes of desertification and steppe formation were observed.

In the arid zone of the south of the European part of Russia in some areas (the Astrakhan region and Kalmykia) creates tension of environmental situation due to lack of fresh water and the intense process of land degradation (desertification, salinization, soil erosion, etc.). Processes of degradation of soils have already occurred in menu areas. The priorities are not just issues related to changes in ecosystems and their main components, but first of all – an early alarm of desertification and degradation, a detailed assessment of the cause-effect relationships, the assessment of stability and carrying capacity of ecosystems and energy aspects of the thermodynamics of natural and anthropogenic processes in such conditions [4].

The estimation of degraded soils Steppe landscape of the delta of the Volga. The usefulness of such studies in the South of Russia in the delta of the river Volga is due to the uniqueness of this natural-climatic zone and its high environmental vulnerability.

As the objects of study, selected areas with different forms of soil degradation are spatially located in the Astrakhan region on the slopes of the Mount of Baer and near the hills. The each type of soil is associated with the specific elements of the relief and formed with the participation of original vegetation [5].

The test sites conventionally classified into groups by type of external load and degradation of soil:

- erosion on the slopes of the hill (brown semidesert soils);
- severe cracking of the upper soil horizon (meadow saline soils, salt marshes);
- solonetzic spots in the absence of vegetation (alkaline soils).

It is established that the soil Steppe landscape that differ by type of degradation processes have identity by physical indicators, but significantly differ from each other in soil moisture. These soils have a similar morphological structure of the soil profile, slightly differing power of genetic horizons and the presence of tumors in them and inclusions.

The content of soluble salts in the soils of the lowest in the surface layer. The soil with a strong erosive process on the northern slope of the lowest salt content differs in its thickness (up 1.7%).

Over the last half-century evolution of the Volga delta soils proceeded along two main lines. The automorphic soil of the hills tops entered the salt stage. However, the increased heterogeneity of soil is a key factor in biodiversity. In those parts of the delta, where the effects of regulating the flow of the Volga and the raising of the Caspian Sea, most heavily affected, soil between slides of the hills were hydromorphic processes and one part of the meadow soils passed in the discharge of peat bog. Soil mounds loops that were not previously flooded and non-semihydromorphic were in the range of influence of ground water and part of the territory was subjected as a meadow. In the delta of the Volga, such as the West Ilmen caught "cut off" from the direct influence of watercourses as a result of meandirovaniya mainstream intensive development process of salinization and in the high relief elements is salting. The most of the ilmens dries to form aggressive weed salt marshes, which are soil, including coastal areas devoid of vegetation. The remaining fresh water marsh overgrown with vegetation. In the soils of the coast areas hydromorphic and anaerobic processes dominated.

The preliminary analysis of threats to biodiversity lands of the Volga delta shows that the most important and dangerous effects on plant communities of the delta are:

- overgrazing and grazing in the meadows;
- reducing hay acreage with increasing array of reed and cattail;
- introduction and acclimatization of ruderal, segetal and ornamental species;
- No return to the natural circulation abandoned, saline soils;
- regular fires in the spring, wood destroying vegetation.

The construction of dams and hydropower plants, bonding wetlands for agriculture and flood protection and pollution – all of this had a negative impact on the state of nature and the quality of the river and its tributaries.

Over the last century the natural ecosystems of the Volga delta developed and operated under increasing anthropogenic influence and under the influence of natural processes of delta foaming

and transgressions of the Caspian Sea. The population growth creates increasing urbanization, the development of transport and energy infrastructures.

Astrakhan is a kind of southern port city. The branch Kutum, erik Kazachiy, Pervomaiskiy channel and other channels divide it into sections associated with each other more than 30 bridges. The industrial complex of the city is represented in shipbuilding, timber and fish processing industry. The leading industries are engineering, electric power and food processing. The region has extensive natural resources (fish, minerals, land). The region is almost inexhaustible source of gas, oil, sulfur and salt. There are five oil and gas fields and one gray-gas condensate in the region, which is the largest in Europe.

In the comparison with other regions, Astrakhan is located in a region with relatively high average annual temperature that causes high activity of biological organisms in the aquatic complexes.

Urbanization leads to a change in the hydrological regime of urban ponds and streams, affect the water balance, hydrochemical regime change due to discharge of sewage: industrial, household, stormwater, wastewater from construction sites. All these things are calls for an objective assessment of its current state.

The hydrochemical analysis showed that the content of pollutants in the municipal water reservoirs significantly exceeds the background values, whereby an aqueous medium becomes unsuitable for living organisms. The high toxicity of the environment and confirm the results of the parallel bioassay [6, 7].

The existing work has revealed an extremely unfavorable ecological situation in the territory of Astrakhan. The conducted comparative analysis of content in water reservoirs of all intra-toxic substances identified the trend of ecological deterioration of the situation in terms of time.

The studies have shown that natural aquatic systems are not only quantitative characteristics of the quantities of pollution, but also qualitative indicators that record the presence of toxic waters of natural bodies of water. The test organisms are quite diverse, and equally sensitive to the toxic effects. The sensitivity to the same toxicant different species varies, some organisms are more sensitive to one poisons others to another. Thus, to obtain an objective quality assessment and operative as waste, and natural water including drinking by a bioassay method is recommended to use an integrated approach, i.e. to use multiple methods of test organisms of different groups of aquatic organisms [8].

The results of laboratory bioassays of natural waters significantly complement and support the data and give a hydro-chemical analyzes to make informed environmental decisions. In the cities such as Astrakhan, where much of the population, industry and transport, are a qualitatively new manmade habitat. It is characterized by a whole set of different kinds of influences: the high level of contamination, specific thermal conditions, the effects of the interaction of impurities, depression vegetation, water pollution. That leads to the necessity of urgent measures to protect and restore natural water, the development of ecological passports city reservoirs, including geographic, climatic, hydrological, hydrochemical, toxicological characteristics and recommendations to improve the water quality of surface water bodies in urban areas.

Примечания:

1. Бармин А.Н. Волго-Ахтубинская пойма и дельта Волги: динамика травянистого растительного покрова в меняющихся природных и антропогенных условиях: Автореф. дис... д-ра геогр. наук, Волгоград, 2002.

2. Владыческий С.А. Вопросы мелиорации Волго-ахтубинской поймы и дельты // Вестник МГУ. 1952. № 5.

3. Karpachevskii L.O., Yakovleva L.V., Fedotova A.V. Soil salinization of the Baer Mounds in the Volga river delta Eurasian Soil Science. 2008. Т. 41. № 2. p. 135-139.

4. Федотова А.В., Яковлева Л.В., Сорокин А.П., Стрелков С.П. Оценка современного состояния постагрогенных почв дельты Волги // Вестник Оренбургского государственного университета. 2013. № 10. С. 275-278.

5. Пилипенко В.Н., Федотова А.В., Перевалов С.Н., Сагалаев В.А. Экологические последствия влияния зарегулирования стока реки Волги на флору, растительность и почвенный покров дельты Волги // Вестник Оренбургского государственного университета. 2006. Т. 2. № 2. С. 22-29.

6. Локтионова Е.Г., Болонина Г.В., Яковлева Л.В. Изучение загрязнения внутренних водоёмов г. Астрахани тяжёлыми металлами // Вестник Московского государственного областного университета. Серия «Естественные науки». 2012. Вып. Химия и химическая экология. № 2. С. 79–88.

7. Локтионова Е.Г., Болонина Г.В., Яковлева Л.В. Изучение загрязнения органическими соединениями внутренних водоемов г.Астрахани // Вестник Оренбургского государственного университета, июнь, 2012, № 142. С. 112-116.

8. Жижимова Г.В., Локтионова Е.Г., Леднева Н.Х. Экологическая оценка состояния внутренних водоемов города Астрахани // Проблемы региональной экологии. 2009. № 2. С. 99-101.

References:

1. Barmin A.N. Volgo-Akhtubinskaya poima i del'ta Volgi: dinamika travyanistogo rastitel'nogo pokrova v menyayushchikhsya prirodnykh i antropogennykh usloviyakh: Avtoref. dis... d-ra geogr. nauk, Volgograd, 2002.

2. Vladycheskii S.A. Voprosy melioratsii Volgo-akhtubinskoi poimy i del'ty // Vestnik MGU. 1952. № 5.

3. Karpachevskii L.O., Yakovleva L.V., Fedotova A.V. Soil salinization of the Baer Mounds in the Volga river delta Eurasian Soil Science. 2008. T. 41. № 2. p. 135-139.

4. Fedotova A.V., Yakovleva L.V., Sorokin A.P., Strelkov S.P. Otsenka sovremennogo sostoyaniya postagrogennykh pochv del'ty Volgi // Vestnik Orenburgskogo gosudarstvennogo universiteta. 2013. № 10. S. 275-278.

5. Pilipenko V.N., Fedotova A.V., Perevalov S.N., Sagalaev V.A. Ekologicheskie posledstviya vliyaniya zaregulirovaniya stoka reki Volgi na floru, rastitel'nost' i pochvennyi pokrov del'ty Volgi // Vestnik Orenburgskogo gosudarstvennogo universiteta. 2006. T. 2. № 2. S. 22-29.

6. Loktionova E.G., Bolonina G.V., Yakovleva L.V. Izuchenie zagryazneniya vnutrennikh vodoemov g. Astrakhani tyazhelymi metallami // Vestnik Moskovskogo gosudarstvennogo oblastnogo universiteta. Seriya «Estestvennye nauki». 2012. Vyp. Khimiya i khimicheskaya ekologiya. № 2. S. 79–88.

7. Loktionova E.G., Bolonina G.V., Yakovleva L.V. Izuchenie zagryazneniya organicheskimi soedineniyami vnutrennikh vodoemov g.Astrakhani // Vestnik Orenburgskogo gosudarstvennogo universiteta, iyun', 2012, № 142. S. 112-116.

8. Zhizhimova G.V., Loktionova E.G., Ledneva N.Kh. Ekologicheskaya otsenka sostoyaniya vnutrennikh vodoemov goroda Astrakhani // Problemy regional'noi ekologii. 2009. № 2. S. 99-101.