

# Ecological features of Lake Karasun

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**Abstract.** A special role belongs to the closed reservoirs in the circulation of substances, water in nature, and also a special microclimate is formed around such reservoirs. Long ago, the Karasun River took off from the village of Starokorsunskaya and flowed westward, falling into the Kuban River, and subsequently the Kuban River, changing its course, swallowed part of the Karasun bed, separating several lakes. According to some maps of the city, the Karasunsky lakes are called "Pokrovskys". Karasun lakes are natural reservoirs, they are formed where in the depressions of the earth's surface (lake basins) due to the prevailing natural conditions, water accumulates from precipitation, melting snow and ice, and groundwater. Today, people are trying to breathe a second life into the ecosystem of the Karasun Lakes. trying to breathe a second life into the ecosystem of the Karasun Lakes.

## 1 Introduction

Lakes and rivers are crucial in natural landscapes, they are actively involved in the formation of the relief of their basins. A special role belongs to the closed reservoirs in the circulation of substances, water in nature, and also a special microclimate is formed around such reservoirs [1].

The climate is significantly softened, the air humidity increases and the landscape is transformed. Often, water resources are sources of water supply of settlements, industrial enterprises, provide moisture to rice plantations, fields, gardens. Rivers and lakes are of great importance as sources of energy, as well as a short transport route. In the city of Krasnodar, water sources are represented by the Kuban River, the Krasnodar reservoir and the Karasunsky lakes.

Let's stop the look on the closed reservoir in a city landscape - it is lake Karasun. But the lake was not originally. Long ago, the Karasun River took off from the village of Starokorsunskaya and flowed westward, falling into the Kuban River, and subsequently the Kuban River, changing its course, swallowed part of the Karasun bed, separating several lakes [2].

In the 1870s, the Black Sea Cossacks began to build dams across the river in order to have land crossings to the other bank, and as a result, the river turned into several lakes fed by underground sources.

In the 60-70s of the twentieth century, a significant part of the lakes peresushili, covered with earth. In their place built residential areas.

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**Fig. 1.** Lake Karasun in 1978

The name of the river and lakes comes from the Turkic "Karas" - "spring", "small lake". So called low-water rivers that feed on groundwater. According to some maps of the city, the Karasunsky lakes are called "Pokrovskys".

## 2 Results and discussion

Karasun lakes are natural reservoirs, they are formed where in the depressions of the earth's surface (lake basins) due to the prevailing natural conditions, water accumulates from precipitation, melting snow and ice, and groundwater. The reservoir is located on the territory of the Central District of Krasnodar. Lake Karasun belongs to the Kuban River water collection. Currently, there are fifteen lakes on the territory of Krasnodar: two Pokrovsky lakes (near the Kuban stadium, separated by the Dmitrievskaya dam), three lakes of Kalininskaya gully (located between the streets of Seleznev and Stavropol, one behind the Kuban State University, two at the administration of the Karasunsky district, divided by Starokubanskaya street) and ten Pashkovsky lakes (in fact - the riverbed, divided into dams). The channel above the Pashkovsky lakes is practically not traceable.



**Fig. 2.** Shore area ecosystem

During the initial formation of the Kuban River, in the territory of the city of Ekaterinodar (Krasnodar) there existed a bend of the Kuban - the Karasun River, which was inhabited even 2,500 years ago.

The population of the Kuban capital began to fight the river since 1820. Her water was not considered potable. Zaporozhtsy, who founded the Pashkovsky Kuren of 40 yards on its bank in 1794. New settlers ruthlessly cut down oak trees and moisture-loving trees along the riverbed, covering the water protection zone. For convenience, the Cossacks built a dam and formed Small and Large Karasuni ponds, which are interconnected by means of bypass pipes. Small Karasun has a total area of 6500 m<sup>2</sup> or 0.65 hectares, the water surface area is 2925 m<sup>2</sup>. Large Karasun has a water surface area of 4675m<sup>2</sup>.

In the village of Pashkovsky, there were 10 lakes, 3 of them were covered and disappeared from the map of the city. But the ancient channel of the Black River, as the Cossacks called it, was blocked by pedestrian and passing dams. In 1910 there were still wooden bridges for swimming. 1939 almost turned out to be for lakes the last year of life, when they were asked to fall asleep, but the cost of the soil then turned out to be astronomical and only this prevented [3].

Often you can find coastal areas, covered with construction debris. For many years, the reservoir, blocked by a dam, stood silently reproaching urbanization. In the conservation area, petrol stations were built, after which, according to the Krasnodar Regional Center for Hydrometeorology and Environmental Monitoring, the background concentrations of harmful substances polluting the atmospheric air are: 80% suspended solids, 90% nitrogen dioxide, 100 carbon monoxide % Sanitary protection zone is 7-10m instead of 15m. Lakes forced waterlogging in 1997-1998, when the village of Pashkovskaya was submerging. Today, people are trying to breathe a second life into the ecosystem of the Karasun Lakes.



**Fig. 3.** Karasun Lake

In 1999, an improvement order was signed, it was supposed to connect the chain of lakes with special engineering devices-siphons, and to rebalance the coastal soil, but in order to make the beam alive, it must be provided with a fivefold annual water exchange. Weeds reclaimed 99% of the mirror area. At the bottom is a 500m<sup>3</sup> layer of silt and debris. Lowering the level by 2.5m due to cleaning from the bottom of the soil will weaken the backwater of the soil waters. It is impossible to reanimate the ecosystem without replacing old pipes with new ones, and the existing hydraulic structures are high for the channel and

some of them have lost the necessary bias. However, water exchange in Karasuny is possible when turning water from the drainage curtain of the Krasnodar reservoir.

The deepening of the reservoir will allow the entire chain of lakes to acquire a slope to the Kuban River.



**Fig. 4.** Lake Karasun

Primary lakes, which have arisen during the filling of natural basins with water, gradually inhabit plants and animals. Young lakes have clear transparent water, their bottom is covered mainly by sand, overgrowing is insignificant. Such lakes are called oligotrophic (from the Greek words oligo's - "small", and the trophy - "food"), i.e. nourishing. Gradually, these lakes are saturated with organic matter. Dying aquatic organisms descend to the bottom, forming silty bottom sediments, and serve as food for animals living on the bottom. Organic substances are accumulated in water, released by animals and plants and remaining after their death. The increase in the amount of nutrients in the reservoir stimulates the further development of life in the reservoir.

Microbiological data from water and bottom sediments. Microbiological studies, obtained for four seasons in the city of Krasnodar, or rather in the center and on the outskirts of the city of Krasnodar. High rates of coli-index within the city, especially in recreation areas. Self-cleaning of flowing water bodies is more intensive. The rate of self-purification of water bodies is influenced by the competitive relationship that develops between different groups of microorganisms in the struggle for free oxygen and nutrients. The formation of biocenoses of aquatic microbes occurs in the coastal zone and at the bottom of water bodies. In bottom sediments, the microflora is not very different from the content in water [4].

Most of the water bodies in the European part of our country have long passed the oligotrophic stage. They belong to the mesotrophic classes (from mesos - "average") or eutrophic (from eu - "good"). Eutrophic lakes are well supplied with nutrients, their water is literally saturated with life. These lakes are very overgrown, the water in them can be greenish, yellowish, brown. At the bottom, sediments accumulate in the form of sludge with a high content of organic substances, the lake gradually becomes shallower. A characteristic feature of eutrophic lakes is the "blooming" of water. Most of the small and small lakes, as well as ponds are eutrophic [5-15].



**Fig. 5.** Some lakes

Some lakes can remain oligotrophic for quite a long time if the soil of the coast is poor in terms of fertility, and the supply of nutrients (contributing to the development of living organisms) substances is difficult.

The transformation of lakes into eutrophic - eutrophication - is a natural process. But in recent decades, this process has accelerated significantly and led to the death of some reservoirs. This phenomenon is called anthropogenic eutrophication (from Greek anthropos - "man"), i.e. associated with a person, his economic activities. It has been established that it is caused by the introduction of pollutants, primarily soluble nitrogen and phosphorus compounds, which come from fields where organic and inorganic fertilizers are used, as well as with wastewater from enterprises and sewage. The smaller the reservoir, the more difficult it is for it to cope with the anthropogenic load [6-12].

Usually the lake basin is not completely filled with water, its boundary is conditionally determined by the highest water level that was observed in the past [7-10]

During the existence of the lake the water level in it can fluctuate. Such perennial fluctuations lead to the fact that more or less flat areas appear on the slopes of the basin — these are lake terraces. Depending on the past of the reservoir and the history of its development, the number, width and height of the terraces can be different. They can be composed of sandy or clayey sediments - those that were deposited at its bottom at different periods in the life of the reservoir. On large lakes terraces can be clearly visible with the naked eye. On small reservoirs, the number of terraces near the lake can be determined by leveling the slope of the basin. On the drawn profile, lake terraces are usually well marked.

The characteristic territory of Krasnodar is located on the right bank of the Kuban River. The length of the territory is more than 20 km; it is represented by two terraces and the floodplain of the Kuban River. The main part of the territory (more than 80%) is located on the main terrace of the r. Kuban, the surface of which is a fairly flat plain with a weak inclination towards the Sea of Azov. The characteristic elements of the relief of this territory are numerous closed depressions - depressions. Zapadins in their configuration, area, depth of subsidence is very different, their shape is rounded, elongated, and the depth varies from a few centimeters to a meter or more, the area varies from several square meters to several hectares. Most of the closed depression is a relic of the former relief. The beam network on the characterized area is poorly developed, in the northern part, bordering the Dinsky district, the beams are the deepest, characterized by great length and water logging.

About 15% of the territory belonging to the lands of the city of Krasnodar is located on the second terrace above the floodplain. Kuban.

The second terrace above the floodplain is a strip 1-6 km wide, which is east of the station. Elizabethan disappears.

On the device surface II floodplain terrace is close to the root.

The main part of the relief is plain, and the flatness is disturbed by depressions and ground-lowering. The transition between the main and second terraces above the floodplain is carried out by means of a gently sloping ledge, where in the lowering of the lowering it is not uncommon to wedge out the "top water" leading to over-wetting of the soil [2-18].

The transition of the second terrace above the floodplain to the floodplain takes place by means of a steep terraced ledge 12–13 m high, in which a powerful stratum of heavy loess loam can be traced.

The flood plain is covered with a network of small loop-like Eriks, riicule ridges, depressions, and depressions. As a result of the construction of the rice system, the relief in some part of the territory of the floodplain is smoothed.

Aboriginal and above-flood terraces are almost completely covered with chernozem. Light-clay black soil dominates on the root terrace, heavy loamy on II above-flood plain. On the slopes of the terraced ledges formed eroded black soil.

Meadow-and meadow-chernozem compacted soils form in the bottoms of shallow depressions, pots, and beam-like depressions, which may be flooded by surface water for a short or longer period.

In the bottoms of deeper depressions, meadow-chernozem-drained soils form, which in some cases have already been swamped.

In the riverine elevated part of the floodplain. Kuban formed alluvial meadow, and in lowlands of the floodplain - alluvial meadow-marsh soils.

In the past, in the territory belonging to the lands of the city of Krasnodar, there was grass-and-grass vegetation with a large number of meadow-steppe forbs.

At present, due to the development of the territory and the almost complete plowing of the remaining lands, remnants of natural steppe phytocenoses are found on sites that are inconvenient for the agricultural sector, near outbuildings and roads, although here too long grazing has changed the appearance of the former vegetation.

The natural vegetation cover of the flat areas and slopes of the Prikubanskaya Plain is represented by Soddy - grass - grassland - steppe communities.

The grassy fodder grounds here are mainly composed of densely - turfy grasses - Lessing's grass shearing grass, hairy feather grass feathering, furrowing fescue, as well as fine-footed and thin grass. Along with grasses, there are grasses-six-petal meadowsweet, sage whorbid, real tablecloth and others. Along with this, in natural forage lands of lowered relief elements, the grass stand is represented mainly by short rhizome grasses - meadow bluegrass, marrow bonfire, creeping creeping grass, creeping creeping grasses, creeping creeping grass grasses, cherries, crescent grasses, and a creeping heart pattern, reeds, etc. in highly waterlogged and marshy soils of the most significant in depth closed depressions and deep-cut beams.

In addition, marsh vegetation - reed, sedge, reed, and cattail occupy the dominant position in the river lower depressions and the bottoms of deep beams. In crops of crops everywhere weed vegetation grows. The most common are the following types and types of weeds:

- annual creeping: chicken millet, shchiritsa, white mary, mice, colza, etc.
- winter and wintering: field, shepherd's bag;
- perennial root shoots: field bindweed, yellow and pink thistle, etc.
- perennial rhizomatous: wheat grass, creeping grass, reed, etc.

In addition, quarantine weed is widespread - the ragweed, sometimes a dodder.

Scientific studies of recent years have shown that the biological diversity of ecosystems and communities can increase due to differentiation in coenopopulations of individuals of the same species, as well as through the formation of special cenotic heterogeneities caused by the interaction of individuals with each other. Therefore, considerable attention should be paid to the study of those species that play a large role in the material-energy balance of a certain system.

### 3 Conclusions

It should be noted that the banks of the reservoir do not differ from each other at different sites in terms of the composition of the composing rocks, the steepness, and the nature of the vegetation. The shores are composed of clayey, sandy and gravelly particles with an admixture of soil (possibly imported for the construction of an embankment, preventing it from spilling during the flood).

The nature of the vegetation on the territory adjacent to the reservoir was described. In the past, in the territory belonging to the lands of the city of Krasnodar, there was grass-and-grass vegetation with a large number of meadow-steppe forbs.

At present, due to the development of the territory and the almost complete plowing of the remaining lands, the remnants of natural steppe phytocenoses are found on sites that are inconvenient for the agricultural sector, near outbuildings and roads, although here too the long pasture of cattle has greatly changed the appearance of the former vegetation.

Attention was also paid to human activities in the catchment area and in the immediate vicinity of the reservoir — the presence of places of organized and unorganized recreation, etc [8-11].



**Fig. 7.** Lake Karasun

Lake Karasun is a drain less reservoir, and all drainage reservoirs may have tributaries, but they themselves have no flow (that is, nothing follows from them). Flow ability largely determines how the water in a pond changes - quickly or slowly, i.e. nature of water

exchange in the reservoir. Lake water exchange rate matters for the formation of water quality in it and its ability to self-purification.

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