

**ANALYSIS OF CHANGES IN THE ECOLOGICAL STATE
OF THE DESNA RIVER OVER 10 YEARS**

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The Desna River is one of the main rivers of the Dnipro basin and a key water source for Sumy region, particularly its northern districts. In the region, the Desna River sub-basin accounts for 47%, covering an area of 17.6 thousand square kilometers. The Desna River is of international importance as a wetland and is also a part of the Desniansko-Starogutskyi National Nature Park (Regional report on the state of the environment in Sumy region in 2023, 2024, p. 3).

Environmental protection, rational use of natural resources, and ensuring the environmental safety of human life are essential for sustainable economic and social

development. The state of the water in the Desna River is an important aspect, as it is the main source of drinking water and water for agricultural purposes in Sumy Oblast. The problem of river water pollution has become particularly acute since the start of active hostilities in the north-eastern regions of Ukraine. This fact has made it harder to control water quality and increased the number of factors that lead to its pollution.

According to the data, the intake from the river decreased by 15.7 million cubic meters in 2023 (Regional report on the state of the environment in Sumy region in 2023, 2024, p. 35) compared to 2020 (Regional report on the state of the environment in Sumy region in 2020, 2021, p. 28), which is difficult to compare with 2013, as the latter provides information only on the annual resource and approved operational resources. More detailed information is provided in Table 1.

Year	Extraction, million cubic meters	Used, million cubic meters	Allocated, million cubic meters	
			Total	Polluted
2020	18,67	12,01	8,57	1,76
2023	34,39	31,75	19,53	2,775

Table 1.

The percentage of contaminated water returned in 2023 was 20.5%, in 2020 – 14.2%. Pollution increased by 6.3%. It is worth noting that the percentage of use compared to abstraction decreased by 28%.

About the chemical state of the river's surface water, we have noticed that changes have been taking place over the years. For example, in 2013, the water exceeded the maximum permissible concentration of phosphate, iron, and ammonium nitrogen (Report on the state of the environment in Sumy region in 2013, 2014, p. 31). In 2020, the main problems were exceeding the maximum permissible concentration of phosphates, iron, and biochemical consumption (Regional report on the state of the environment in Sumy region in 2020, 2021, p. 36). However, in 2023, the content of hemic compounds in water and an increased level of iron were observed. However, over the years, the radiation background of the water in the

Desna River has been normal – no exceedances of permissive levels of radionuclides have been detected (Regional report on the state of the environment in Sumy region in 2023, 2024, p. 44).

In 2013, there was no information on invasive fish species. But in 2020, such information was already available. The 2020 report states that there has been an increase in the number of the invasive Silver Crucian species. It was noted that local populations of Crucian do not have wide adaptive qualities, so they can be displaced from their habitats (Regional report on the state of the environment in Sumy region in 2020, 2021, p. 68). In 2023, the most numerous invasive species of the ichthyocomplex were recorded: Sea Needle (3.2%), Silver Crucian (0.6%), the share of other alien species is 0.01-0.08%. It was noted that silver Crucian has wide adaptive abilities, so it quickly increased its number. At the same time, the development of the invasive ichthyocomplex in the Desna River is rather low. The main factor that ensures the conditions for the existence of invasive aquatic species in the river network of Sumy region is the gradual transformation of the river ecosystem into a lake-river ecosystem. From this, we can conclude that the Desna River does not show a slowdown in water exchange and the processes of massive overgrowth of shallow areas (Regional report on the state of the environment in Sumy region in 2023, 2024, p. 72).

Before drawing any conclusions, it should be noted that water quality monitoring in 2023 was carried out at two locations, as military operations made it difficult to access some monitoring sites. For 2020 and 2013, the monitoring was carried out at transboundary sites and shows some deviations from the norm. Therefore, the data for 2023 can be considered incomplete, as a full analysis by monitoring sites was not conducted.

We can note the following changes that have occurred to the Desna River over the past 10 years. In 2013, the intensive use of water by enterprises caused a deterioration in water quality and exceeded the maximum permissible concentration of certain substances. In 2020, the river is experiencing anthropogenic impacts, with water use affecting water availability and water quality. In 2023, a change in water

content, shallowing due to climate change and anthropogenic impact on the flow regime were recorded. Water was observed reaching the floodplain in the Desna River, the maximum water level almost reached critical levels, and a road was flooded.

To summarize, between 2013 and 2023, there was a noticeable change in the chemical composition of water, its level and biological diversity. It can be said that in 2023 the water became cleaner of chemicals, but there are still problems with the water level reaching a critical point, which caused flooding of a section of the Shostka-Novhorod Siverskyi road.

References:

1. Department of Ecology, Fuel and Energy Complex and Natural Resources of Sumy Regional State Administration. (2014). *Dopovid pro stan navkolyshnyoho pryrodnyoho seredovyschca v Sumskiy oblasti u 2013 rotsi*. Retrieved from <https://www.pek.sm.gov.ua/images/docs/DOP/sumy2013.pdf> [in Ukrainian].
2. Department of Environmental Protection and Energy of the Sumy Regional State Administration. (2021). *Rehionalna dopovid pro stan navkolyshnyoho pryrodnyoho seredovyschca v Sumskiy oblasti u 2020 rotsi*. Retrieved from <https://www.pek.sm.gov.ua/images/docs/DOP/sumy2020.pdf> [in Ukrainian].
3. Department of Environmental Protection and Energy of the Sumy Regional State Administration. (2024). *Rehionalna dopovid pro stan navkolyshnyoho pryrodnyoho seredovyschca v Sumskiy oblasti u 2023 rotsi*. Retrieved from <https://www.pek.sm.gov.ua/images/docs/dopovid/Sum2023.pdf> [in Ukrainian].