

TRANSFORMATION OF WATER BODIES STAROOSKOLSKO- GUBKINSKY MINING REGION ON THE EXAMPLE OF THE RIVER STARY

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Abstract:

We present the results of hydro-chemical study and research of the small river sediment Oskoletz in the zone of influence of mining enterprises. A program of hydro studies of small rivers on the basis of zoning maps anthropofunctional watershed. It is shown that the leading influence on the hydrochemical situation has residential and industrial runoff in Gubkin. Some impact on the hydroecological situation has discharges of drainage water on the content of fluorine and lead compounds, from time to time - in relation to nitrogen compounds. As part of sediments show significant momentum compounds of cobalt, nickel, lead, chromium, manganese, copper, zinc and iron. In this case, violations of established norms of contaminants were not found.

Keywords: Hydroecological situation of a region intended for building and mining, anthropofunctional zoning mining region.

Studies carried out in the framework of the state task of the Ministry of Education and Science of the Russian Federation, Belgorod State National Research University in 2013 (№ project 5.1739.2011).

Oskoletz river originates at v. Petrovka, Gubkinsky district, Belgorod region. It flows predominantly from west to east through the territory of Stary Oskol and Gubkin areas and then into the river Oskol in Stary Oskol. The river is 40 km. Oskoletz pool is bordered by the following river basins: in the West - Seyma, in the south-west - Orlik, in the south - Dubenki and Chufichki. The basin area is 494 km².

The drainage basin of the river Oskoletz is located in Starooskolsky-Gubkinsky mining region and, therefore, full of agricultural and industrial enterprises of various sectors of the economy. Almost the entire basin area of Oskoletz is characterized by varying degrees of environmental disturbance due to human activities. Here, natural landscapes greatly altered under the influence of built-up urban Stary Oskol and Gubkin, and the whole complex of mining and other enterprises, such as JSC "Lebedinsky GOK", JSC "Stoilensky GOK" Gubkinsky CHP, plant "KMA Ruda", the food industry, construction industry, etc. The geological structure of the basin participate rock chalk and marl, on top they are covered by sandy-clayey and loamy sediments. Chalk breeds in many places on the slopes of the valleys and exposed beams are dismantled. Soils are mainly black soil in the bottom of the pool, on the right, there are gray forest ones. Soils on the flood plain are alluvial deposits of the river - loam and sandy loam, with occasional sand and silt on the floodplain wetlands silt-gley. The prevailing width of the river will change to 10 m depth in most parts of the river is 0.4 - 0.8 m in the floodplain surveys open, meadow, sometimes with sparse willow thickets along the coast, for - from quiet, moderate in areas with sedimentary bed ground up very fast on the rocky shoals in the constriction channel. The banks are flat, places - with small slopes. Shoals are formed by clusters of rocks and overburden in areas of dams and supports highway bridges.

With regard to the principles of basin approach for the assessment of hydro-ecological situation, r. Oskoletz a program for research [1, 2]:

- 1) Anthropofunctional zoning investigated basin;
- 2) Differentiation of the river on the land as the qualitative and quantitative changes coming to the river tributaries, including the discharge of wastewater from municipal and industrial facilities, as well as diffuse runoff from the different nature of the natural and man-made environment areas;
- 3) Identification of the control point for the selected sections of the river;
- 4) Conduct of hydrochemical and hydrobiological studies in control points;
- 5) Analysis of hydro-ecological situation, r. Oskoletz.

Considering we held in 2007-2012 years researches and on the basis of the modern remote sensing data was compiled refined zoning map anthropofunctional basin. Oskoletz which highlighted six areas and cross-sections follow:

1. The zone of high agricultural loads. Water quality is determined by the washout from the territory of the agricultural land, rural communities such as suspended solids, nutrients (nitrogen compounds, phosphorus, pesticides, to some extent).
2. Area from the western border to the place in Gubkin wastewater MUP "Water canal" in Gubkin. Here to surface run-off of agricultural type (vegetable gardens in flood, etc.), added unorganized surface runoff and groundwater flow from residential and industrial areas.
3. Area of the discharge MUP "Water canal" to the location area of mining facilities. In connection with the discharge of urban waste water, increasing the water flow in the river Oskoletz, increasing saturation of water biogenic components (nitrogen, phosphorus, etc.), which in part contributes to the development of both aerobic flora and fauna, as well as in heavy silt deposition and the lack of bottom aeration, anaerobic communities.
4. Zone location of mining facilities.
5. Area of wastewater and distillery plant nutrient yeast in v. Peschanka to the western border city of Sary Oskol. Wastewater is characterized by potentially high content of nitrogen compounds (ammonia, nitrite), phosphorus.
6. The active zone of influence of the informal runoff from residential and industrial areas Sary Oskol.

Hydroecological studies were carried out on the river. Oskoletz in the following alignments:

- 1) Gubkin below the reset MUP "Water canal";
- 2) the middle zone of the location of mining sites;
- 3) out of the river from the area of the location of mining sites;
- 4) v. Peschanka below the reset distillery plant and feed yeast;
- 5) the western outskirts of the city of Sary Oskol;
- 6) Sary Oskol railway bridge.

In the studied section lines we measured the content of heavy metals in sediments, as well as specific hydrochemical indicators in the water of the river. Sary based on the data of similar studies in 2007.

Analysis of the results of hydrochemical investigations showed the following (Fig. 1).

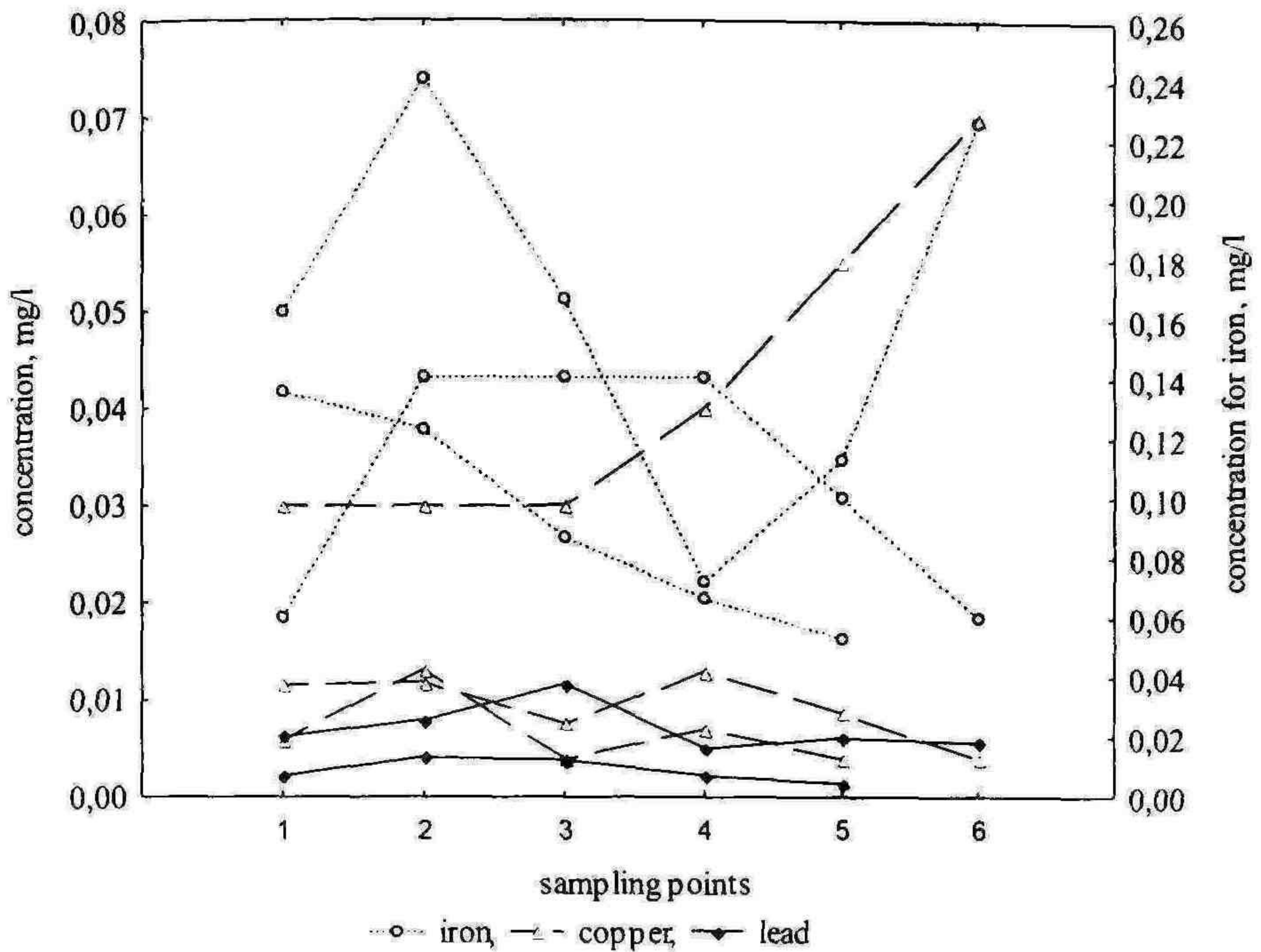


Fig. 1: The content of polluting ingredients of the target r. Oskoletz

The content of biogenic compounds such as ammonia, nitrites, nitrates naturally decrease with increasing distance from the discharge of MUP "Water canal" in Gubkin.

At the same time, depending on the technological and climatic situation there are occasional cases of a moderate increase in the concentration of nitrate in the mining area, nitrite in the zone of influence of the food industry.

In regard to the content of iron compounds of an impact of mining areas in the district Oskoletz is not revealed, although sometimes there an increase in its concentration, and rates of mineralization naturally higher in range number 3, although this increase is negligible.

The concentrations of copper and zinc behave differently, but generally charts indicate a large contribution of residential areas in the content of these elements.

We can see a weak but steady trend in part to the increase in mining areas of fluoride and lead compounds.

In addition to the chemical analysis of the water district Oskoletz, in these alignments is sampled sediments. MPC for sediment is not set, so the results were discussed with the limit values for soil, with the excess content of the test did not reveal the ingredients, except for slightly higher lead content in the background alignment of number 1 and manganese in the alignment number 5 (sediment pond in the west, the Stary Oskol).

The content of most ingredients defined (beryllium, vanadium, cadmium, mercury, selenium, antimony, tellurium, molybdenum, silver, barium, strontium, zirconium, aluminum, sulfur) shows no significant progress through dynamics control target by r. Oskoletz. The content of cobalt, nickel, lead, chromium, manganese, copper, zinc, iron, arsenic shows significant momentum (Fig. 2), in particular:

1) to residential areas regularly observed high levels of lead in sediments;

2) in an area of mining enterprises positive dynamics of the concentration of copper, zinc, iron, chromium, nickel, although the elevated levels are not always correct timing to the area of influence of the enterprise without further detailed research since due to the relatively high mobility of these elements can be placed here and "stretched" deposition area thereof coming in r. Oskoletz located with the above residential areas.

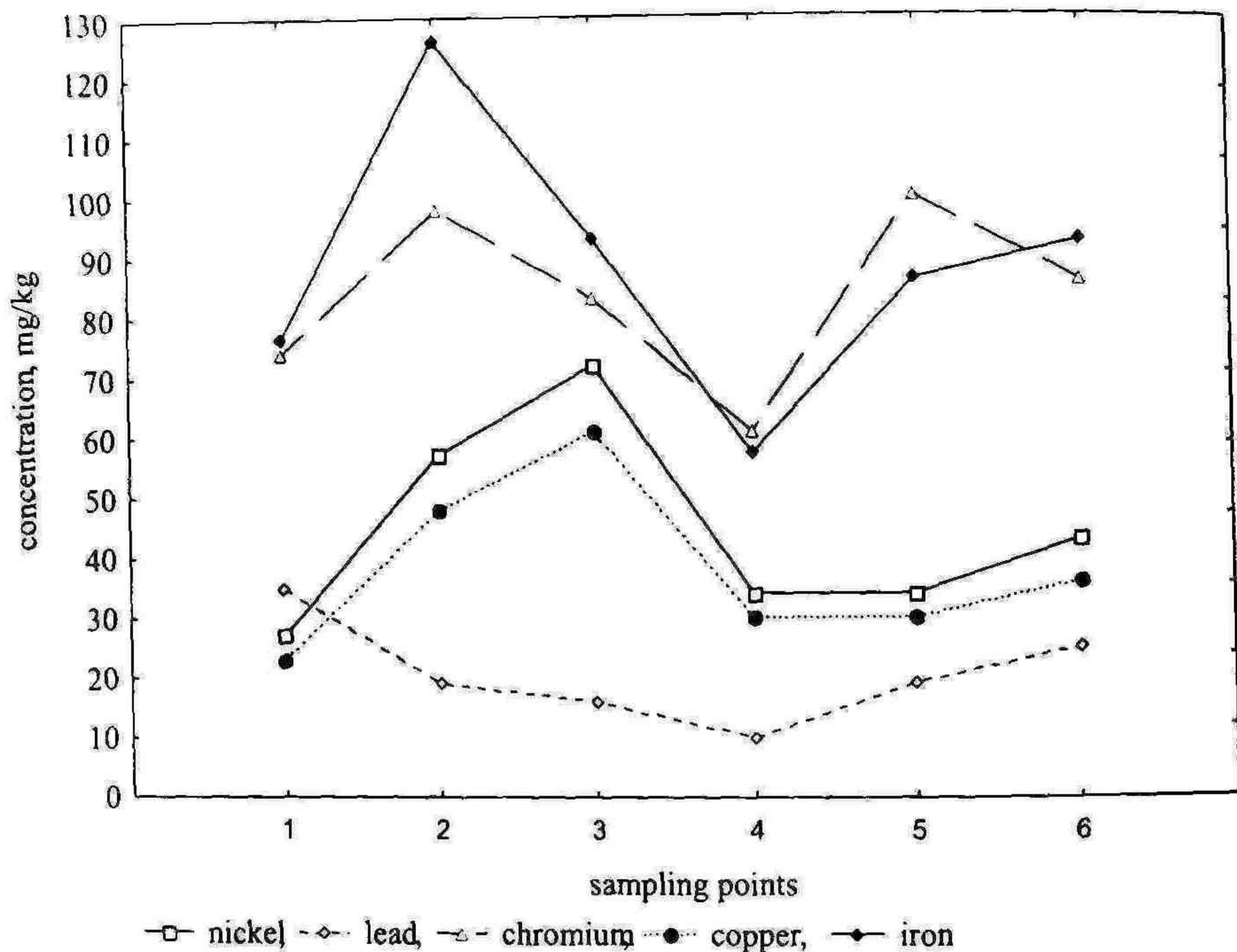


Fig. 2: The content of the test ingredients in sediments r. Oskoletz

Any impact residential and industrial projects on the hydroecological situation r. Oskoletz according to the radiological study of sediments not revealed.

Thus, studies on hydrochemical state r. Oskoletz show that the leading influence on the hydrochemical situation has residential and industrial runoff in Gubkin. Designated impact on hydrochemical and hydroecological situation and provide mining site to the content of fluorine and lead compounds which several indicators are increased in this region, as well as periodically against moderate nitrate. Against the background of the rate in the data for the other ingredients of the rivers of the Belgorod region said the impact can be considered negligible.

There are changes in the concentration of heavy metals in river sediments Oskoletz does not show a clear pattern. For MPC excess soil content researched ingredients in the sediments not revealed.

References

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