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THE EFFECT OF FUNCTIONING OF AGRICULTURAL ENTERPRISES ON WATER QUALITY OF RIVER SYNYUKHA WITHIN KIROVOGRAD OBLAST

G.N. Vovkodav , cand.tech.sci.
Odessa State Environmental University

River water quality condition of Synyukha due to agricultural activities is getting worse. It was established that the water in Kirovograd region BOD_5 value and concentration of ammonium ions, nitrites, nitrates and heavy metal ions is much higher than the accepted limit. Exceeding standards indicates the need for systematic sanitization. For certain quality index can assume that the river water Synyukha in Kirovograd oblast reached a critical pollution.

Key words: integral indicator of pollution, environmental assessment, surface water, the maximum allowable concentration.

Introduction. The main sources of chemical and bacteriological contamination of hydrosphere also owns modern agriculture where pesticides are used on a large scale (pesticides) for pest control and fertilizers. If dilution by rain water infiltrate harmful chemicals into the soil and ground, polluting groundwater washed into surface water bodies and watercourses. Some pesticides are very stable and persist in the soil for more than 10 years [1]. Water pollution by pesticides over the accepted limit is especially common in areas with regular irrigation. In inorganic pollution of natural waters, agriculture contributes organic and bacterial contamination. Enriched with organic matter and bacteria breeding drains freely enter into surface and ground water [2]. Man-made pollution has reached the point at which the very existence of humanity in jeopardy. In many countries, there is a general shortage, increasing pollution and the gradual destruction of freshwater sources. Factors that cause these effects are improperly sewage water intake loss of natural areas, sub-optimal farming, which leads to penetration of pesticides and other chemicals in the water. 75% of our population consumes water from surface water sources. Today, all these sources, according to official figures, dirty. Virtually no water surfaces that meet the first class hygiene. This means that oxygen water in Ukraine already left. For many years the reservoir Ukraine fell not enough cleaning or cleaning wastewater, and thus human impacts on water bodies exceed their self-cleaning ability. The result was the accumulation in reservoirs of physical, chemical, including radioactive, mutagenic biological pollution that are dangerous. Chemical pollution is the inflow into reservoirs of various inorganic contaminants (acids, alkalis, mineral salts) and organic (oil, detergents, pesticides, etc.) origin. Physical pollution is caused by an increase in water solid impurities - sand, clay, silt due to washing of rain water from cultivated areas. Biological contamination is in the flow of wastewater various

microorganisms (bacteria, viruses). Pollution of water bodies on the basic parameters exceed environmentally acceptable limits. Under existing state water quality standards streamflow hydrochemical parameters estimated from slightly polluted to very polluted: for bacterial indicator only 2% have a satisfactory condition, while 65% are not suitable for all kinds of water [3].

Analysis of recent research and publications. Rate qualitatively and quantitatively the river Synyukha waters are influenced by human agricultural activity, rather difficult task, because it depends on many factors [4-6]. Determination of both parameters is not always necessary and feasible. Almost (depending on the purpose of research) assessment of surface water quality based on selected parameters, the values of which are determined by standardized methods of analysis of the components of the environment [7]. Realistic assessment of ecological conditions and processes occurring in the waters of the river, are impossible without the use of the most reliable criteria, ie qualitative or quantitative evidence taken as abasis for classification of surface water, which may be water pollution index (MAC).

Problem. Environmental degradation river Synyukha in Kirovograd region is due to unsustainable use of water resources, significant anthropogenic impact and is very noticeable problem and is hidden danger for present and future generations. Environmental classification based on integrated pollution index is the criterion for the environmental assessment of surface water quality. Perform environmental assessment was conducted using the integral indicator of water pollution.

The purpose of research. The purpose of research is the environmental assessment of river water Synyukha in control sections within Kirovogradska obl.

The results of the research. Analysis of the pollution of surface waters in the reference alignment is based on the observational data on the content of hydrochemical parameters provided Kirovograd regional management of water resources. Basin Synyukha located in Novoarkhangelsk i Vilshany areas Kirovograd region and Pervomayskyi Mykolaiv Oblast, left tributary of the Bug. The length of the river 111 km, basin area 16,700 km^2. Formed by the confluence of the Great Buci i Tikich. On the ecological status of surface water district. Synyukha affect a variety of factors that are closely linked together. In the test pool can separate such factors causing pollution of surface waters: 1) wastewater discharges into surface waters without proper treatment. The problem is that wastewater is not a complete cleaning cycle. Often made only biological treatment. In 2010, the volume of return water to the river basin was approximately 4 million m3 (42% more than in 2009). The biggest polluters performing discharges to the river. Synyukha treatment plant city Novomyrhorod (their share in the total volume of return water coming into the basin. Synyukha in 2010 amounted to 58,8%, in 2011 - 37, 6%); 2) unauthorized discharge of waste water; 3) appearance on the banks of the natural landfill.

Thus, the greatest impact on the functioning of the river ecosystem provides anthropogenic factor, disrupting the natural state of the watercourse and bringing unusual ingredients that lead to changes in the composition and properties of water in water bodies, that cause deterioration of its quality. Active migration of elements such as cadmium, mercury, strontium, lead and zinc on the slopes, and their rapid

flow into the water with simultaneous reduction of runoff leads to heavy pollution of surface waters. Also infect groundwater and surface water fertilizer.Untreated wastewater agriculture is a source of water pollution. Wastewater carry dangerous chemicals, pathogens, insecticides and herbicides, nutrients that are part of the fertilizer. Value of industries, causing water pollution was. Synyukha is the most negative impact on water render services sector (18,56%), farms and sewage enterprises processing agricultural products (sugar mills, slaughterhouses, factories, that treated skin, etc.), the least negative - fuel and engineering industry in general, which is 6,76%. As a result of studies found excess indicators that indicate organic water pollution. The analysis and synthesis of observational data revealed that abnormalities observed in the following parameters:

- Suspended solids - 29-40 MPC;
- Dry residue - exceeding the maximum recorded 1.4 MAC;
- Value for BOD_5 throughout the observation period was significantly higher than normal. The maximum BOD_5 was 14,78 mg/dm^3, exceeding the MCL of 7,5 in 2006.; minimum - 2.29 mg/dm^3, which is 1.1 MAC in 2008 .;
- Ammonium ions. During the period 2006-2011 considerable exceeding the MCL over the content of ammonium ions. The maximum average annual concentration of ammonium ions recorded in 2000 - at the level of 3,0 mg/dm^3, which is 7,5 MAC, and the minimum in 2003 at 1,0 mg/dm^3, which is 2,5 MAC;
- Nitrites. Observations have exceeded the MAC for nitrates content. The minimum concentration of nitrite exceeded the MCL and was 7,0 mg/dm^3 in 2011, and the maximum - 15 mg/dm^3 in 2001;
- Sulphates. The largest average concentration of sulphate in water was 251,1 mg/dm^3, which is 2,5 MAC in 2007, the lowest – 48,9 mg/dm^3, which is 0,4 MAC in 2005;
- Calcium. Large amounts of calcium coming from wastewater of agricultural land, particularly in the application of fertilizers that contain calcium. The content of calcium in the water district. Synyukha quite dramatically changing, often exceeding the MCL. The maximum concentration of calcium in the water district. Synyukha recorded in 2010 – 398,8 mg/dm^3, which is 2,2 MAC, minimum 2005 – 26,11 mg/dm^3;
- Mineralization. In recent years, exceeding by salinity in the water district Synyukha registered. In the waters p. Synyukha mineralization was within the maximum allowable for the entire period of observation. The maximum level of mineralization traced in 2006 (1528 mg/dm^3, 1,5 MAC), minimum -2011 (650 mg/dm^3). In the study we used indicators content of pollutants in control sections, namely BOD_5, O_2, ammonia nitrogen, nitrite nitrogen, phenols, petroleum products, heavy metals (copper, zinc, chromium, iron).
- Iron. During the entire period of observation iron content in the river exceeded approved a maximum permissible limits. The maximum concentration of iron in the water district Synyukha was 1,74 mg/dm^3, which is 17,4 MAC in 2006, the lowest – 0,03 mg/dm^3, which is 0,03 MAC 2010.

- Chrome. During the entire period of observation chromium content in the river exceeded the approved maximum permissible limits in 2006. The maximum concentration of chromium in the water district Synyukha was 0,03 mg/dm^3, which is exceeding the norm by 1.5 times.

- Copper. During the entire period of observation copper content in the river exceeded the approved maximum permissible limits in 2001-2002. The maximum concentration of copper in the water district Synyukha was 0,02 mg/dm^3, which is the excess of the MCL over 20 times.

- Zinc. During the entire period of observation copper content in the river exceeded the approved maximum permissible limits in 2000. The maximum concentration of zinc in Synyukha was 0,1 mg/dm^3, which is in excess of the MAC 10 times.

Thus, for eleven years in the dumps observed excess of MPC, almost all indicators, especially in 2006, when the waters of the river Synyukha occurred significant violations of MAC for content BOD_5, dissolved oxygen, chromium and iron. In 2001, there have been large excess of the MCL zinc and copper. Studies indicate river pollution by organic substances. The category of the most used methods to assess water quality of water bodies include hydrochemical water pollution index. This technique is one of the easiest methods of integrated assessment of water quality and allows for a short time to assess the quality of surface water. Methods of assessing water quality for water pollution index (WPI) has been recommended for use by departments State Committee for Hydrometeorology. Hydrochemical water pollution index is a comprehensive indicator of water quality [3]. Hydrochemical WPI is additive and is a measure of the average proportion of the excess of the MAC for a limited number of individual components and is calculated by the formula (1):

$$WPI = \frac{1}{n} \cdot \sum_{i=1}^{n} \frac{C_i}{MAC_i} = \frac{1}{6} \cdot \sum_{i=1}^{6} \frac{C_i}{MAC_{в_i}} \qquad (1)$$

where n - number of indicators used to calculate the index; C_i - concentration of the chemical in water, mg/l; MAC_i - maximum permissible concentration of substances in water, mg/l. Depending on the size of WPI areas of water quality results are divided by 7 classes that are listed in the table. 1.

Table 1. **Classification of water quality of water objects based on complex WPI .**

The value of water quality	Value of WPI	Class quality of water
Very clean	< 0,2	1
Clean	0,2 – <1,0	2
Slightly contaminated with	1,0 – <2,0	3
Moderately contaminated with	2,0 – 4<,0	4
Dirty	4,0 – <6,0	5
Very dirty	6,0 – <10,0	6
Extremely dirty	≥ 10,0	7

Evaluation of surface water quality in areas where treatment facilities for the period from 1999 to 2011 for the following parameters: pH, dissolved oxygen, BOD_5,

comprehensive index WPI (including BOD_5, dissolved oxygen, ammonium ions, nitrite ions, mineral oils and phenols) and WPI modified (including BOD_5, dissolved oxygen, ion heavy metal ions such as copper, zinc, chromium and iron).

For research facility by the formula (1) WPI calculated results are given in Table 2.

Table 2 . **Criteria for assessing the quality of water for WPI .**

Year	Value of WPI	class quality of water	WPI_{mod}	class quality of water
1999	3,1	IV	13,7	VII
2000	7,3	VI	13,7	VII
2001	7,4	VI	14,1	VII
2002	7,6	VI	13,6	VII
2003	6,8	VI	13,2	VII
2004	7,5	VI	13,3	VII
2005	7,8	VI	12,9	VII
2006	6,9	VI	12,6	VII
2007	6,8	VI	13,1	VII
2008	6,8	VI	12,7	VII
2009	6,8	VI	13,2	VII
2010	6,7	VI	12,8	VII
2011	6,8	VI	12,6	VII

The research was designed two types of indicators WPI - ordinary and modified. In terms of normal values WPI possible to conclude that during 1999-2011 Synyukha river water can be classified as class VI and evaluated as very dirty, in terms of the values of the modified WPI classes river water quality Synyukha slightly different, namely in 1999, 2002 2003, 2004, river water Synyukha can be attributed to VII class quality and assessed as extremely dirty. During the study period the overall level of pollution by means of the pollution index is constant and ranges from "very dirty" (VI class water quality) to "extremely dirty" (VII class water quality). To date, no single, adequate and balanced comprehensive methodology for evaluating the quality of water body. However, some of them allow for the large number of aspects of ecological status of water bodies. These indicators include integrated ecological condition index (IIES). The data (IIES) is the basis for decision-making in environmental activities and the establishment of urgent measures to eliminate environmental hazards. According to the research parameters were calculated IIES. In terms of values IIES may conclude that during 1999-2011 the river water Synyukha meet critical environmental load, i.e the increased intensity of anthropogenic factors in the environment.

Conclusions: On the basis of research, despite the fact that the river water is used Synyukha, as we already mentioned above only for technical purposes, we can conclude that today Synyukha river water not suitable for use in cultural - Home and fish - economic purpose. The river Synyukha meet critical environmental load, i.e the increased intensity of anthropogenic factors in the environment.

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ВЛИЯНИЕ ФУНКЦИОНИРОВАНИЯ СЕЛЬСКОХОЗЯЙСТВЕННЫХ ПРЕДПРИЯТИЙ НА КАЧЕСТВО ВОД РЕКИ СИНЮХИ В ГРАНИЦАХ КИРОВОГРАДСКОЙ ОБЛАСТИ

Вовкодав Г.Н.

Ключевые слова: интегральный показатель загрязнения, экологическая оценка, поверхностные воды, предельно-допустимая концентрация.

Резюме

Качественное состояние вод реки Синюхи в результате сельскохозяйственной деятельности постоянно ухудшается. Установлено, что в воде на территории Кировоградской области значение $БПК_5$, а также концентрация ионов аммония, нитритов, нитратов и ионов тяжелых металлов значительно превышает предельно допустимые нормы. Превышение норм свидетельствует о необходимости проведения системной санитарной обработки. По определенным индексам качества можно судить, что воды реки Синюхи на территории Кировоградской области достигли критического загрязнения.

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Summary

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