EVALUATION OF CHEMICAL AND PHYSICO-CHEMICAL INDICATORS OF WATER OF THE LAKES IN THE CITY OF SZCZECIN ON THE BASIS OF THE EU WATER FRAMEWORK DIRECTIVE

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Received: 2013.05.15 Accepted: 2013.06.17 Published: 2013.07.10

ABSTRACT

The work shows the evaluation of physico-chemical parameters the city of Szczecin of the landscape based on the European Union Water Framework Directive. The study was conducted on three lakes within the boundaries of the city of Szczecin on the three lakes: Glebokie, Rusalka, Szmaragdowe. Szczecin is situated in North-West Poland, in the western part of West Pomeranian Voivodeship at Polish-German border. Research was carried out in the years 2008–2012, in the period from April to October. Water samples were taken from three stations on each of the three lakes. Sample water pH was measured. The water tests were taken according to the Polish Standards. The collected water samples were fixed in accordance with the recommendations in the Polish Standards. Other indicators for the quality of the waters have been tagged within 24 hours from the moment of sampling.

Keywords: water, lake, chemical and physico-chemical indicators, European Union Water Framework Directive

INTRODUCTION

After the accession to the European Union Poland is committed to the implementation of the European Union Water Framework Directive (2000/60/EC), whose main objective is to achieve good ecological and chemical surface water status by 2015 [7-9, 10, 16, 19, 23, 27, 29].

Evaluation of the quality of the structure and the functioning of aquatic ecosystems, by comparing the status of the existing undisturbed conditions expected in status (reference), is a requirement for monitoring and evaluation systems of classification by the European Directive 2000/60/EC, known as the European Union Water Framework Directive [10, 11, 16, 20, 23, 25, 29, 30].

In Poland, there are more than 7080 natural lakes larger than 1 ha. Most of the lakes in the North Polish focused on central part of Polish, on tracks within the limits of the last ice age, creating a clearly identified Lake [13].

EXPERIMENTAL

The study was conducted on three lakes within the boundaries of the city of Szczecin on three lakes: Glebokie, Rusalka and Szmaragdowe.

Szczecin is situated in North-West Poland, in the western part of West Pomeranian Voivodeship at Polish-German border [13].

Głebokie Lake is classified as an eutrophic lake, shallow type. The catchment area of the lake is almost entirely forested. The area to the east of the lake is developed with buildings. The Lake is a basin reservoir for the endorheic river, with only a small periodical outflow. Lake morphometric data: area 31.3 ha, length – 1550 m, 300 m, maximum depth – 6.0 m, volume – 751 thousand m³ [13].

Rusałka Lake, also called the Sea Eye, is located in Szczecin Kasprowicz Park in Niebuszewo district. This is the reservoir formed by a medieval Mill River House Osówka [13]. Lake morphometric data: Length – 670 m, width – 70 m, the height of the mirror -16 m above sea level, type of lake: prohibitive [13].

The Szmaragdowe Lake – the origin is artificial in the Beech Forest, it was formed on 26 July 1925 as a result of flooding the mines existing there before the World War I. The water colour owes its name to lake's origin (the effect of the content of calcium carbonate) [13]. Lake morphometric data: area – 4.5 ha, average depth – 8.2 m, maximum depth – 15.8 m [13].

The research was carried out in the years 2008–2012. Upon sampling, the water pH was measured. Water was tested in compliance with the Polish Standards. The collected water samples were stabilised pursuant to the guidelines of the Polish Standards [4, 8, 9].

Other indicators of water quality were marked within 24 hours of sampling. The oxidation of dissolved organic matter was measured with the COD-Mn method, in accordance with Polish Standards [4, 8, 9].

Dissolved oxygen was marked in accordance with the methodology described by Winkler in Daniszewski's work [4, 8, 9].

The degree of water oxygenation was specified by arrays described by Nemerov [23]. The levels of Total Suspended Solids, BOD_5 , NH_4^+ , NO_2^- , NO_3^- , PO_4^{3-} and P_{tot} were marked – in accordance with the methodology described by Daniszewski [4, 8, 9].

The quality objectives were evaluated according to the criteria recommended for assessing inland surface waters as set out in the European Union Water Framework Directive (Directive 2000/60/EC) [10].

RESULTS AND DISCUSSION

The results of the seven lakes in the city of Szczecin along with the classification in accordance with the European Union Water Framework Directive are presented in tables 1 to 3.

The level of water pH in the lakes was influenced by physico-chemical and biotic interactions of environmental factors [1, 4, 7, 9, 14, 16, 17].

Among others, the degree of acidity directly affects life processes occurring in ecosystems. It is responsible for the correct uptake of nutrients by organisms. High alkalinity is beneficial for assimilation, and therefore, the nitrogen and phosphorus compounds found in water are much more accessible than in an acid medium. Apart from high acidity, excessive alkalinity of natural waters (pH above 9) also has a clearly detrimental impact on organisms [2, 12, 13, 14, 24, 27].

pH level in the studied lakes was close to neutral pH: 7.59 to 7.97. All lakes, in accordance with the classification of the European Union Water Framework Directive, have been included in the first class.

The aquatic ecosystems of the studied lakes experienced loss on ignition and non-corresponding values of COD-Mn according to the estimates, which were based on the measurements of "loss on drying" and "residue on ignition" in accordance with the methodology set out by Macioszczyk (1987) and on the basis of COD-Mn results, which invariably matched III class water quality. In the tested lake waters, considerable levels of organic matter, including reducing agents, were maintained throughout the year. The reasons for this state of affairs should also be sought in the lake bed sediment, which is rich in organic matter [4-9, 18, 20-24, 28, 30].

The most important elements involved primary production of phosphorus and nitrogen [8, 12, 13, 15, 23, 24, 25].

The presence of these substances determines the productivity of water body, as well as its quality. One nutrient significantly affecting the quality of water is phosphorus [1, 4, 7, 14-17]. It is the primary factor which constrains the development of phytoplankton, and thus, affects massive algal blooms. It can occur in water bodies in a form of inorganic phosphorus as well as dissolved organic forms [1, 2, 12, 13, 15, 24, 25].

Phosphates, or the mineral forms of phosphorus, are best absorbed by organisms and play a huge role in the primary production of a reservoir [19, 23]. They are involved in the circulation of matter in any water body. Therefore, one should pay attention to phosphorus compounds in the demersal zone [1, 2, 8, 9, 12, 13, 15, 24, 25].

Nitrogen occurs in a form of gas dissolved in the water, ammonium ions, nitrate and nitrite. In lakes, it is the main factor limiting the growth of organisms [1, 2, 8, 12, 13, 15, 24, 25, 29, 31].

The tests have demonstrated that water quality in the lakes varied with regards to the tested indicators. By analyzing average annual values, one can note that the pH, O_{2diss} and NO_3^- concentrations showed relatively small variations in all the investigated lakes.

The level of the General Suspension in Szmaragdowe Lake, the peasant was on level II class,

Table 1. Results of the quality of surface water of Glebokie Lake (spring, summer and autumn 2008-2012) alon	g
with the classification values of indicators according to the criteria of the European Union Water Framework	
Directive (2000/60/EC)	

		Glebol	kie Lake		
		2008	year		
No	Water quality indices	Linite	17.04.2008	24.07.2008	15.10.2008
INU	Water quality indices	Units	Spring	Summer	Autumn
1.	General Suspension	mg O ₂ ·dm ⁻³	38.7 (III)	47.3 (III)	42.8 (II)
2.	рН	-	7.73 (I)	7.76 (I)	7.73 (I)
3.	COD-Mn	mg O ₂ ·dm ⁻³	9.6 (III)	10.4 (III)	8.4 (III)
4.	BOD ₅	mg O ₂ ·dm ⁻³	4.9 (III)	5.6 (III)	4.1 (III)
5.	O _{2 diss}	mg O₂ dm-3	5.7 (III)	5.4 (III)	5.7 (III)
6.	NO ₃	mg N•dm⁻³	2.52 (I)	3.63 (I)	1.48 (I)
7.	NO ²	mg N·dm ⁻³	0.041(II)	0.061 (II)	0.056 (II)
8.	NH ²⁺	mg N·dm-3	0.68 (II)	0.82 (II)	0.61 (II)
9.	PO ³ -	mg PO, dm-3	0.41 (III)	0.57 (III)	0.46 (III)
10.	P	mg Pdm⁻3	0.49 (III)	0.55 (III)	0.48 (III)
		2009	vear		
N.		1.1-21-2	15.04.2009	22.07.2009	21.10.2009
NO	water quality indices	Units	Spring	Summer	Autumn
1.	General Suspension	mg O ₂ ·dm ⁻³	48.2 (III)	51.7 (III)	47.4 (III)
2.	pH		7.62 (I)	7.79 (I)	7.61 (I)
3.	COD-Mn	mg O ₂ dm ⁻³	6.3 (III)	9.8 (III)	7.9 (III)
4.	BOD ₅	mg O ₂ dm ⁻³	4.7 (III)	5.8 (III)	5.6 (III)
5.	O _{2 diag}	mg O dm-3	5.7 (III)	5.2 (III)	5.4 (III)
6	NO ₂ ^{2 diss.}	ma N ² dm ⁻³	3.58 (1)	4.53 (I)	2.58 (I)
7	NO	ma Ndm ⁻³	0.062 (II)	0.085 (II)	0.071 (11)
8	NH +	ma N·dm-3	0.78 (II)	0.94 (II)	0.71 (II)
Q.	PO 3-	ma PO dm ⁻³	0.45 (III)	0.59 (III)	0.46 (III)
10	P diss.	ma Pdm ⁻³	0.48 (III)	0.57 (III)	0.40 (III)
10.	tot	2010	0.40 (11)	0.57 (11)	0.42 (11)
		2010	21.04.2010	14.07.2010	20 10 2010
No	Water quality indices	Units	Spring	Summer	Autumn
1	General Suspension	mg O ₂ dm ⁻³	37.9 (III)	46.8 (III)	36.4 (III)
2	nH	-	7 64 (I)	7 71 (I)	7 74 (1)
3	COD-Mn	mg O ₂ dm ⁻³	89(11)	11.5 (11)	9.7 (11)
4	BOD	ma O ² .dm ⁻³	53(11)	59(11)	5.6 (III)
		mg O ₂ ·dm ⁻³	5.5 (11)	5.2 (11)	5.0 (11)
5.	2 diss.	ma N·dm ⁻³	2.06 (1)	3.2 (III) 4.72 (I)	5.4 (III) 4.10 (I)
0.		mg N·dm ⁻³	2.90 (1)	4.72 (1)	4.19(1)
1.		mg N·dm ⁻³		0.069 (11)	0.079 (11)
8.		ma PO dm-3	0.86 (11)	0.95 (11)	0.82 (11)
9.	PO ₄ diss.	$ma Pdm^{-3}$	0.49 (11)	0.59 (III)	0.46 (11)
10.	P _{tot}	ing runi	0.46 (11)	0.63 (11)	0.48 (111)
		2011	year	20.07.0011	40.40.0044
No	Water quality indices	Units	20.04.2011 Spring	20.07.2011 Summer	19.10.2011 Autumn
1	General Suspension	ma Q ·dm-3	/3.2 (III)		
2		-	7 70 (1)	7.05 (1)	7.99 (1)
2.		ma O ·dm-3	7.79(I) 9.4 (III)	11.95 (1)	7.00 (I) 0.5 (III)
J. →		mg O dm-3	0.4 (11)	<u> </u>	5.3 (11)
4. E		ma O ·dm-3	4.1 (III)	5.9 (11)	5.2 (III) E E (III)
5.	U _{2 diss.}	ma N/dm ⁻³		5.2 (III)	5.5 (III)
ю. 		mg Nidm-3	3.28 (I)	4.31 (l)	2.62 (I)
1.		ma Nidm-3	0.079 (11)	0.084 (II)	0.061 (II)
8.		mg DOdm-3	0.85 (II)	U.95 (II)	U.59 (II)
9.	PO ₄ -diss.		0.46 (III)	0.68 (III)	0.43 (III)
10.	P _{tot}		0.45 (III)	0.57 (III)	0.48 (III)
2012 year					
No	Water quality indices	Units	18.04.2012 Spring	18.07.2012 Summer	27.09.2012 Autumn
1.	General Suspension	mg O _a ·dm ⁻³	35.2 (III)	43.9 (III)	38.5 (III)
2.	pH		7.72 (I)	7.79 (I)	7.74 (I)
3.	COD-Mn	mg O ₂ ·dm ⁻³	8.1 (III)	10.3 (11)	8.7 (III)
4.	BOD_	mg O_dm ⁻³	5.2 (11)	5.8 (III)	5.5 (11)
5	0	mg O ⁻ dm ⁻³	5.8 (11)	5.2 (11)	5.6 (11)
6	NO -	ma N·dm-3	3 74 (1)	4 18 (1)	3 91 (1)
7	NO ³	ma N·dm-3	0.083 (1)	0.075 (II)	0.079 (II)
Q.	NH +	ma N.dm-3	0.74 (11)	0.77 (II)	0.62 (II)
0.	PO 3-	ma POdm-3			
9.	D 4 diss.		0.43 (11)		0.40 (11)
10.	F tot		0.41 (111)	U.03 (III)	0.43 (111)

Explanation: I, II, III - classification of values of examined indicators in accordance with the European Union Water Framework Directive (2000/60/EC)

		Rusalka	a Lake		
	1	2008	year		
No	Water quality indices	Units	17.04.2008 Spring	24.07.2008 Summer	15.10.2008 Autumn
1. 2	General Suspension	mg O ₂ ·dm ⁻³	32.4 (III) 7.93 (I)	41.2 (III) 7 78 (I)	36.8 (III) 7 85 (I)
3	COD-Mn	ma O ·dm-3	94 (111)	11.3 (III)	10.2 (11)
4	BOD	ma O dm ⁻³	4.8 (III)	52(11)	5 1 (III)
5.	Q	ma O ₂ ·dm ⁻³	5.7 (111)	5.1 (III)	5.3 (III)
6.	NO ₂ diss.	ma N·dm ⁻³	1.29 (I)	3.69 (I)	2.39 (1)
7.	NO ³	mg N dm ⁻³	0.051 (II)	0.079 (II)	0.058 (II)
8.	NH, ⁺	mg N·dm⁻³	1.43 (III)	1.82 (III)	1.55 (III)
9.		mg PO, dm ⁻³	0.51 (III)	0.66 (III)	0.43 (III)
10.	P _{tot}	mg Pdm⁻³	0.45 (III)	0.68 (III)	0.49 (III)
		2009	year		
No	Water quality indices	Units	15.04.2009 Spring	22.07.2009 Summer	21.10.2009 Autumn
1.	General Suspension	mg O ₂ ·dm ⁻³	39.5 (III)	47.1 (III)	41.6 (III)
2.	pH	-	7.76 (I)	7.73 (I)	7.91 (I)
3.	COD-Mn	mg O ₂ ·dm ⁻³	9.2 (III)	10.8 (III)	7.1 (III)
4.	BOD₅	mg O ₂ ·dm ⁻³	5.2 (III)	5.9 (III)	4.5 (III)
5.	O _{2 diss.}	mg O ₂ ·dm ⁻³	5.8 (III)	5.2 (III)	5.4 (III)
6.	NO ₃ -	mg N₁dm⁻³	3.24 (I)	4.46 (I)	3.71 (I)
7.	NO ₂ -	mg N∙dm⁻³	0.054 (II)	0.071 (II)	0.063 (II)
8.	NH ₄ ⁺	mg N₁dm⁻³	1.32 (III)	1.87 (III)	1.48 (III)
9.	PO _{4 diss.}	mg PO₄ dm⁻³	0.49 (III)	0.53 (III)	0.51 (III)
10.	P _{tot.}	mg Pdm⁻³	0.45 (III)	0.64 (III)	0.48 (III)
		2010	year		
No	Water quality indices	Units	21.04.2010 Spring	14.07.2010 Summer	20.10.2010 Autumn
1.	General Suspension	mg O ₂ ·dm ⁻³	31.2 (III)	49.4 (III)	35.8 (III)
2.	pH .	-	7.82 (I)	7.65 (I)	7.59 (I)
3.	COD-Mn	mg O ₂ ·dm ⁻³	8.4 (III)	11.3 (III)	10.6 (III)
4.	BOD₅	mg O ₂ -dm-3	5.1 (III)	5.6 (III)	4.8 (III)
5.	O _{2 disc}	mg O ₂ -dm-3	5.3 (III)	5.1 (III)	5.7 (III)
6.	NO ₃ ²	mg N ⁵ dm⁻³	3.09 (I)	4.26 (I)	2.63 (I)
7.	NO ³ -	mg N⋅dm-3	0.031 (II)	0.085 (II)	0.049 (II)
8.	NH ²⁺	mg N⋅dm-3	1.58 (III)	1.75 (III)	1.51 (III)
9.	PO ³ -	mg PO₄ dm-3	0.46 (III)	0.62 (III)	0.57 (III)
10.	P _{tot}	mg Pdm⁻³	0.51 (III)	0.69 (III)	0.64 (III)
		2011	year		-
No	Water quality indices	Units	20.04.2011 Spring	20.07.2011 Summer	19.10.2011 Autumn
1.	General Suspension	mg O ₂ ·dm ⁻³	34.1 (III)	46.0 (III)	38.5 (III)
2.	PH	-	7.74 (1)	7.89 (1)	7.73(1)
3.	COD-Min	mg O ₂ ·dm ⁻³	9.3 (11)	10.8 (11)	9.7 (11)
4.	BOD ²	$mg O_2 dm^3$	4.7 (111)	5.7 (III)	4.9 (11)
5.	U 2 diss.	mg O ₂ ·dm ^{-s}	5.3 (III)	5.1 (III)	5.8 (III)
0.		mg N·dm ^{-o}	2.75 (1)	4.53 (1)	3.47 (1)
/. 0		mg N dm ⁻³	0.062 (11)	0.075 (II)	
8.			1.48 (111)	1.84 (11)	1.62 (11)
9.	PO _{4[°] diss.}	mg PO ₄ 'um*	0.45 (11)	0.00 (11)	0.46 (11)
10.	P _{tot}		0.46 (111)	0.05 (11)	0.34 (11)
No	Water quality indices	Units	18.04.2012	18.07.2012 Summer	27.09.2012
1	General Suspension	ma O ·dm ⁻³	34 7 (III)	39.3 (III)	31 3 (III)
2.	H	-	7.91 (I)	7.84 (1)	7.85 (1)
3	COD-Mn	ma O ·dm-3	8.7 (11)	10.3 (11)	8.3 (11)
4.	BOD.	ma O_dm ⁻³	4.2 (11)	5.3(111)	3.8 (III)
5	O	ma O dm ⁻³	5.2 (11)	5.1 (11)	5.7 (11)
6	NO ₂ -	ma N·dm ⁻³	2.37 (1)	3.72 (1)	1.72 (1)
7.	NO.	ma N·dm-3	0.081 (II)	0.096 (II)	0.062 (II)
8	NH.+	ma N·dm ⁻³	1.72 (11)	1.86 (11)	1.59 (11)
9	PO. ³	mg PO. dm ⁻³	0.55 (11)	0.68 (III)	0.43 (III)
10.	P _{tot} diss.	mg Pdm ⁻³	0.48 (III)	0.52 (III)	0.57 (III)

Table 2. Results of the quality of surface water of Rusalka Lake (spring, summer and autumn 2008-2012) along with the classification values of indicators according to the criteria of the European Union Water Framework Directive (2000/60/EC)

Explanation: I, II, III - classification of values of examined indicators in accordance with the European Union Water Framework Directive (2000/60/EC)

Table 3. Results of the quality of Szmaragdowe Lake surface water (spring, summer and autumn 2008-2012) along with the classification values of indicators according to the criteria of the European Union Water Framework Directive (2000/60/EC)

To water quality indices Units 7.04 2008 Summer Autumn 1 General Suspension mg 0, dm ⁻¹ 197 (11) 22.8 (11) 16.7 (11) 2 pH - 7.69 (1) 7.86 (1) 7.73 (1) 2.4 (11) 5.7 (11) 2.4 (11) 5.8 (1) 4.3 (11) 4 BODs, mg 0, dm ⁻¹ 2.1 (11) 2.7 (11) 2.4 (11) 5.6 (1) 1.6 (2) (1) 5.6 (1) 0.5 (11) 0.25 (11) 0.7 (11) 2.4 (11) 5.6 (1) 0.5 (11) 0.0 (2) (11) 0.2 (11) 0.2 (11) 0.2 (11) 0.7 (11) 2.5 (11) 0.2 (11) </th <th></th> <th colspan="6">Szmaragdowe Lake</th>		Szmaragdowe Lake						
No Water quality indices Units 17.04.2006 Spring 24.07.2008 Spring 15.10.2008 Autumn 1. General Supension mg 0, dm ⁻¹ 1.97.01 22.8 (11) 16.7 (11) 3. COD-Mn mg 0, dm ⁻¹ 3.4 (10) 5.8 (11) 2.4 (11) 5. O ₁ , ass. mg 0, dm ⁻¹ 3.4 (10) 2.4 (11) 2.4 (11) 5. O ₁ , ass. mg 0, dm ⁻¹ 6.8 (11) 6.1 (111) 2.2 (11) 6. NO ₂ ⁺⁺ mg Ndm ⁺¹ 0.053 (11) 0.056 (11) 0.059 (11) 7. mg Ndm ⁺¹ 0.22 (11) 0.357 (11) 0.22 (11) 0.25 (11) 10. P ₂ ⁺⁺ mg Ndm ⁺¹ 0.27 (11) 0.23 (11) 0.25 (11) 11. General Suspension mg 0, dm ⁺¹ 77.79 (1) 7.86 (1) 7.81 (11) 2.3 (11) 2. GOD-Mn mg 0, dm ⁺¹ 2.1 (11, 200 (11) 2.3 (11) 2.4 (11) 3. GOD-Mn mg 0, dm ⁺¹ 2.7 (10) 7.85 (1) 3.4 (1) 4.			2008	year				
1. General Suspension mg 0 d ^{m²} 19.7 (i) 22.8 (i) 16.7 (i) 3. COD-Mn mg 0 d ^{m²} 3.4 (i) 5.8 (i) 7.73 (i) 3. COD-Mn mg 0 d ^{m²} 3.4 (i) 5.8 (i) 2.4 (i) 5. O _{2,min} mg 0,d ^{m²} 8.6 (i) 6.1 (ii) 2.4 (i) 5. NO ₂	No	Water quality indices	Units	17.04.2008 Spring	24.07.2008 Summer	15.10.2008 Autumn		
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	1.	General Suspension	mg O ₂ ·dm ⁻³	19.7 (II)	22.8 (II)	16.7 (II)		
3. COD-MIT Intro Order 3.4 (U) 3.6 (U) 2.7 (U) 2.4 (U) 5. O _{1,m} mg O ₁ dm ² 2.1 (U) 2.4 (U) 3.6 4 (U) 2.4 (U) 5. O _{1,m} mg O ₁ dm ² 6.8 (U) 6.1 (U) 2.2 (U) 3.64 (U) 1.45 (U) 7. NO mg Ndm ² 0.053 (U) 0.056 (U) 0.059 (U) 0.73 (U) 9. PO _{2,mn} mg PO ₁ dm ³ 0.32 (U) 0.37 (U) 0.22 (U) 20.7 2009 year 16 0.42 (U) 2.2 (U) 0.22 (U) 0.22 (U) 20.7 2009 year 16 0.42 (U) 2.3 (U) 2.1 (U) 2.3 (U) 1.0 (D) 2.1 (U) 2.1 (U) 2.1 (U) 2.0 (U) 2.3 (U) 2.1 (U) 2.1 (U) 2.1 (U) 2.1 (U) 2.1 (U) 2.1 (U) 2.1 (U) 2.1 (U) <td 2"2"2"2"2"2"2"2"2"2"2"2"2"2"2"2"2"2<="" colspan="2" td=""><td>2.</td><td></td><td>- ma O dm-3</td><td>7.09(1)</td><td>7.00 (I) E.0.(II)</td><td>1.13 (I) 4.2 (II)</td></td>	<td>2.</td> <td></td> <td>- ma O dm-3</td> <td>7.09(1)</td> <td>7.00 (I) E.0.(II)</td> <td>1.13 (I) 4.2 (II)</td>		2.		- ma O dm-3	7.09(1)	7.00 (I) E.0.(II)	1.13 (I) 4.2 (II)
4. BOUs Optimize Imp Optimize 2.1 (II) 2.7 (III) 2.7 (III) 2.4 (III) 6.2 (III) 6.3 (III) 0.055 (III) 0.055 (III) 0.075 (III) 0.025 (III) 0.075 (III) 0.075 (III) 0.075 (III) 0.075 (III) 0.075 (III) 0.075 (III) 0.055 (III) 0.075 (III) 0.055 (III) 0.075 (III) 0.055 (III) 0.075 (III) 0.055 (III) 0.075 (III) 0.075 (III) 0.055 (III) 0.075 (III) 0.055 (III) 0.075 (III) 0.055 (III) 0.075 (III) 0.055 (III) 0.075 (III) 0.075 (III) 0.075 (III) <th0< td=""><td>З. 4</td><td></td><td>mg O₂·dm⁻³</td><td>3.4 (II) 2.4 (II)</td><td>5.0 (II) 2.7 (II)</td><td>4.3 (II) 2.4 (II)</td></th0<>	З. 4		mg O ₂ ·dm ⁻³	3.4 (II) 2.4 (II)	5.0 (II) 2.7 (II)	4.3 (II) 2.4 (II)		
5. O_{2} arrow by the set of the s	4.	BOD₂	$\operatorname{mg} O_2 \operatorname{dm}^3$	2.1 (11)	2.7 (11)	2.4 (11)		
b. NU ₃ mg Ndm ³ 2.42 (I) 3.54 (I) 0.45 (I) 0.45 (I) 8. NH ₄ mg Ndm ³ 0.45 (II) 0.56 (II) 0.73 (II) 0.73 (II) 9. PQ ₃ *ms mg PO, dm ³ 0.27 (II) 0.33 (II) 0.35 (II) 0.28 (II) 10. P _m mg PO, dm ³ 0.27 (II) 0.35 (II) 0.28 (II) 11. General Suspension mg Q, dm ³ 2.07 (II) 2.3.1 (II) 1.8.2 (II) 2. DP - 7.7.9 (I) 7.86 (I) 7.61 (I) 2.3.1 (II) 2. DQ ₁ mg Q, dm ³ 2.1 (II) 2.7.1 (II) 2.3.1 (II) 2.3.1 (II) 3. DQ ₁ mg Q, dm ³ 2.1.1 (II) 2.7.1 (II) 2.3.1 (II) 3.4.1 (III) 5.3.1 (III) 3.4.1 (III) 5.3.1 (III) 4.4.1 (III) 5.3.1 (III) 4.4.1 (III) 5.3.1 (III) 4.4.1 (III) 5.3.1 (III) 4.4.1 (III) 5.3.1 (III) 4.3.1 (III) 5.3.1 (IIII) 4.3.1 (IIII) 5.3.1 (IIIII) 4.3.1 (IIII) 5.3.1 (IIIII) <	5.	O _{2 diss.}	mg O ₂ ·dm ⁻³	6.8 (II)	6.1 (III)	6.2 (II)		
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	6. 7	NO ₃	mg N·dm ⁻³	2.42 (1)	3.64 (1)	1.45 (I)		
8. NH_{1}^{*} $mg PO_1 dm^{*}$ $0.45 (ll)$ $0.52 (ll)$ $0.73 (ll)$ $0.22 (ll)$ 10. P_{u_1} $mg PO_1 dm^{*3}$ $0.27 (ll)$ $0.23 (ll)$ $0.22 (ll)$ No Water quality indices Units $15.04,2009$ $22.07,2009$ $22.101,2009$ 1. General Suspension $mg O_1 dm^{*3}$ $20.7 (ll)$ $23.3 (ll)$ $18.2 (ll)$ 2. pH_1 $ 7.79 (ll)$ $7.86 (ll)$ $7.61 (ll)$ 3. $codd m^3$ $4.1 (ll)$ $5.3 (ll)$ $4.8 (ll)$ $4.8 (ll)$ 4. BOD_5 $mg Q_1 dm^3$ $2.1 (ll)$ $2.7 (ll)$ $2.3 (ll)$ $6.5 (ll)$ 6. NO_5^{**} $mg N dm^3$ $0.467 (ll)$ $0.52 (ll)$ $0.52 (ll)$ $0.52 (ll)$ NO $mg Ndm^{**}$ $0.38 (ll)$ $0.75 (ll)$ $0.64 (ll)$ $0.56 (ll)$ $0.52 (ll)$ 9. $PO_5^{*} ms$ $mg PO_3 m^{**}$ $0.38 (ll)$ $0.25 (ll)$ $0.23 (ll)$ </td <td>1.</td> <td></td> <td></td> <td>0.053 (II)</td> <td>0.065 (11)</td> <td>0.059 (11)</td>	1.			0.053 (II)	0.065 (11)	0.059 (11)		
9. PQ_{a}^{+} and PQ_{a}^{+} $0.32 (ll)$ $0.35 (ll)$ $0.29 (ll)$ 200 year 200 year 21.10.2009 21.10.2009 All water quality indices Units 15.04.2009 22.07.2009 21.10.2009 Autumn 1. General Suspension mg $0_c dm^3$ 22.07.2009 21.10.2009 2.10.2009 2.10.2009 2.10.2009 Autumn 0.000 Colspan="2">2.20.7.2009 2.10.2009 2.20.7.2009 2.1.0.2009 Autumn 0.20.000 2.20.7.2009 2.1.01.2000 0.20.0000 0.21 (ll) 2.20.7.201 2.20.7.201 2.20.7.201 0.0000000000000000000000000000000000	8.		mg N·dm ^{-s}	0.45 (II)	0.59 (11)	0.73 (11)		
10. P _x Imp Part 0.27 (II) 0.35 (II) 0.29 (II) No Water quality indices Units 15.04.2009 22.07.2009 21.10.2009 No General Suspension mg Q ₂ (m ³) 20.7 (II) 23.1 (II) 11.0 (II) 11.0 (II) 11.0 (III) 11.0 (IIII) 11.0 (IIIII) 11.0 (IIII) 11.0 (IIIII) 11.0 (IIIII) 11.0 (IIIII) 11.0 (IIIII) 11.0 (IIIIII) 11.0 (IIIIIII) 11.0 (IIIIIIII) 11.0 (IIIIIIIIIIIIIIII) 11.0 (IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	9.	PO ₄ ³⁻ diss.	mg PO ₄ dm ⁻³	0.32 (II)	0.37 (11)	0.25 (11)		
Vo Visit of the second secon	10.	P _{tot}	mg Pam ⁻³	0.27 (II)	0.35 (11)	0.29 (11)		
No Water quality indices Units 1: 0.42,2009 22.07,2009 24.01,101 24.01,101 23.01,101 24.01,101 23.01,101 24.01,101 23.01,101 25.01,101 24.01		1	2009	year	00.07.0000	04 40 0000		
1. General Suspension mg Q_{c} dm ³ 20.7 (l) 23.1 (l) 18.2 (l) 2. pH - 7.79 (l) 7.86 (l) 7.81 (l) 3. COD-Mn mg Q_{c} dm ³ 4.1 (l) 5.3 (l) 4.8 (l) 5. $O_{sma_{a}}$ mg Q_{c} dm ³ 6.7 (l) 6.3 (l) 6.5 (l) 6. NO_{s}^{-1} mg Ndm ³ 0.47 (l) 0.069 (l) 0.052 (l) 7. NO_{s}^{-1} mg Ndm ³ 0.31 (l) 0.76 (l) 0.54 (l) 9. PO_{s}^{-1} mg PO_{d}^{-1}^{30} 0.31 (l) 0.36 (l) 0.26 (l) 0.39 (l) 0.23 (l) 10. Put mg PO_{d}^{-1}^{30} 0.31 (l) 0.24 (l) 2.33 (l) 2.4 (l) 2. pH - 7.66 (l) 7.89 (l) 7.85 (l) 3.9 (l) 2.4 (l) 4.8 (l) 2. pH - 7.66 (l) 7.89 (l) 3.23 (l) 2.6 (l) 2.4 (l) 2. pH - 7.66 (l) 2.4 (l) <t< td=""><td>No</td><td>Water quality indices</td><td>Units</td><td>Spring</td><td>Summer</td><td>Autumn</td></t<>	No	Water quality indices	Units	Spring	Summer	Autumn		
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	1.	General Suspension	mg O ₂ ·dm ⁻³	20.7 (II)	23.1 (II)	18.2 (II)		
	2.	pH	-	7.79 (I)	7.86 (I)	7.61 (I)		
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	3.	COD-Mn	mg O₂∙dm⁻³	4.1 (II)	5.3 (II)	4.8 (II)		
5. O_{2am} mg O_{c} dm ³ 6.7 (l) 6.3 (l) 6.5 (l) 6. NO ₂ ⁻ mg Ndm ³ 0.047 (l) 0.069 (l) 0.052 (l) 7. NO ₂ ⁻ mg Ndm ³ 0.38 (l) 0.75 (l) 0.54 (l) 9. PQ ₂ ⁻ dam mg PQ ₁ dm ³ 0.28 (l) 0.38 (l) 0.25 (l) 0.39 (l) 9. PQ ₂ ⁻ dam mg PQ ₁ dm ³ 0.26 (l) 0.39 (l) 0.24 (l) 10. Pereconstructure 2010 year - - - No Water quality indices Units Spring Summer Autumn 1. General Suspension mg Q ₂ dm ³ 19.2 (l) 23.8 (l) 21.4 (l) 2. pH - 7.86 (l) 7.89 (l) 7.85 (l) 3. COD-Mn mg Q ₂ dm ³ 3.9 (l) 5.7 (l) 4.8 (l) 4. BOD ₂ mg Q dm ³ 3.48 (l) 4.69 (l) 3.29 (l) 7. NO ₂ ⁻ mg Ndm ³ 0.49 (l) 0.38 (l)	4.	BOD₅	mg O ₂ ·dm ⁻³	2.1 (II)	2.7 (II)	2.3 (II)		
	5.	O _{2 diss.}	mg O₂ [.] dm⁻³	6.7 (II)	6.3 (II)	6.5 (II)		
	6.	NO ₃	mg N∙dm⁻³	3.15 (I)	3.94 (I)	3.67 (I)		
	7.	NO ₂ -	mg N∙dm⁻³	0.047 (II)	0.069 (II)	0.052 (II)		
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	8.	NH ₄ ⁺	mg N₁dm⁻³	0.38 (II)	0.75 (II)	0.54 (II)		
$\begin{array}{ c c c c c c c } \hline 10. \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$	9.	PO _{4 diss.}	mg PO₄ dm⁻³	0.31 (II)	0.36 (II)	0.24 (II)		
2010 year No Water quality indices Units $21.04.2010$ Spring Summer Summer $21.04.2010$ Autumn 1. General Suspension mg 0_2 dm ³ 19.2 (II) 23.8 (II) 21.4 (II) 2. pH - 7.86 (I) 7.89 (I) 7.85 (I) 7.85 (I) 3. COD-Mn mg 0_2 dm ³ 3.9 (II) 5.7 (II) 4.8 (II) 4. BOD _g mg 0_2 dm ³ 6.7 (II) 6.1 (II) 6.8 (II) 5. O_{2} dms. mg 0_3 dm ³ 3.48 (I) 4.69 (I) 3.29 (I) 7. NO ₃ ⁻ mg Ndm ³ 0.49 (II) 0.84 (II) 0.47 (II) 8. NH ₄ ⁺ mg PO ₄ dm ³ 0.25 (II) 0.38 (II) 0.22 (II) 9. PO ₄ ⁺ dms. mg PO ₄ dm ³ 0.25 (III) 0.84 (II) 0.47 (II) 9. PO ₄ ⁺ dms. mg PO ₄ dm ³ 0.25 (II) 0.38 (II) 0.22 (II) 10. Peres - 7.83 (I) 7.97 (I) 7.78 (I) <t< td=""><td>10.</td><td>P_{tot}</td><td>mg ₽dm⁻³</td><td>0.26 (II)</td><td>0.39 (II)</td><td>0.33 (II)</td></t<>	10.	P _{tot}	mg ₽dm⁻³	0.26 (II)	0.39 (II)	0.33 (II)		
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$			2010	year				
1. General Suspension mg Q_{2} dm ³ 19.2 (l) 23.8 (l) 21.4 (l) 2. pH - 7.86 (l) 7.89 (l) 7.85 (l) 23.8 (l) 21.4 (l) 3. COD-Mn mg Q_{2} dm ³ 3.9 (l) 5.7 (l) 4.8 (l) 4. BOD ₅ mg Q_{2} dm ³ 2.3 (l) 2.6 (l) 2.4 (l) 5. Q_{2} ms mg Q_{2} dm ³ 6.7 (l) 6.1 (l) 6.8 (l) 6. NO ₅ ' mg Ndm ³ 0.49 (l) 0.082 (l) 0.063 (l) 7. NO ₂ ' mg Ndm ³ 0.49 (l) 0.84 (l) 0.47 (l) 9. PO ₄ *ms mg Pd_4''''''''''''''''''''''''''''''''''''	No	Water quality indices	Units	21.04.2010	14.07.2010 Summer	20.10.2010		
1. Definition obspectivities Img 0 g dm1 mg 0 g dm3 19.2 (fr) 3. 2.0 (fr) CDD-Mn 2.1.9 (fr) mg 0 g dm3 2.0 (fr) 3.9 (fr) 2.1.9 (fr) 5.7 (fr) 7.88 (fr) 4.8 (fr) 4. BOD ₀ mg 0 g dm3 3.9 (fr) 5.7 (fr) 4.8 (fr) 5. $O_{2 dm4}$ mg 0 g dm3 2.3 (fr) 2.6 (fr) 2.4 (fr) 6. NO ₃ mg N dm3 3.48 (fr) 6.1 (fr) 6.8 (fr) 7. NO ₂ mg N dm3 0.058 (fr) 0.082 (fr) 0.063 (fr) 8. NH ₄ ⁺⁻ mg N dm3 0.49 (fr) 0.38 (fr) 0.24 (fr) 0.24 (fr) 9. PO ₄ ³⁻ dm4. mg PO ₄ dm3 0.25 (fr) 0.38 (fr) 0.24 (fr) 10. P _{est} mg Q dm3 19.5 (fr) 23.1 (fr) 19.10.2011 11. General Suspension mg Q dm3 3.9 (fr) 5.8 (fr) 4.10 (fr) 2. pH - 7.83 (fr) 7.97 (fr) 7.78 (fr) 3. COD-Mn mg Q dm3 6.7 (fr) 6.6 (fr) </td <td>1</td> <td>General Suspension</td> <td>ma O :dm⁻³</td> <td>10.2 (II)</td> <td>23.8 (II)</td> <td>21 / (II)</td>	1	General Suspension	ma O :dm ⁻³	10.2 (II)	23.8 (II)	21 / (II)		
1 mg O $_{2}$ dm ³ 1.00 (f) 1.00 (f) 1.00 (f) 1.00 (f) 3. COD-Mn mg O $_{2}$ dm ³ 3.9 (f) 5.7 (f) 4.8 (f) 4. BOD $_{5}$ mg O $_{2}$ dm ³ 2.3 (f) 2.6 (f) 2.4 (f) 5. O_{2} dms mg O $_{2}$ dm ³ 6.7 (f) 6.1 (f) 6.8 (f) 6. NO $_{1}^{-1}$ mg Ndm ³ 0.48 (f) 4.89 (f) 0.052 (f) 0.052 (f) 0.063 (f) 8. NH $_{4}^{+}$ mg Ndm ³ 0.49 (f) 0.082 (f) 0.063 (f) 0.49 (f) 0.44 (f) 0.47 (f) 0.78 (f) 0.44 (f) 0.47 (f) 0.25 (f) 0.33 (f) 0.32 (f) 0.29 (f) 0.44 (f) 0.47 (f) 0.25 (f) 0.33 (f) 0.32 (f) 0.29 (f) 0.44 (f) 0.47 (f) 0.77 (f) 0.78 (f) 7.97 (f) 7.78 (f) 1.8.6 (f) 2.5 (f) 5.7 (f) 4.8 (f) 4.4 (f) 4.5 (f) 5.7 (f) 5.7 (f) 5.7	2	nH	-	7.86 (1)	7 89 (1)	7 85 (I)		
b BOD Inf y_{2} gins z_{3} (i) z_{4} (i) z_{4} (ii) 5. Q_{2} gas. mg Q_{2} dm ³ z_{3} (ii) z_{4} (ii) z_{4} (ii) 6. NO_{3}^{-1} mg N dm ³ 3.48 (i) 4.69 (i) 3.29 (i) 7. NO_{2}^{-1} mg Ndm ³ 0.49 (ii) 0.84 (ii) 0.47 (ii) 8. NH_{4}^{-1} mg Ndm ³ 0.49 (ii) 0.84 (ii) 0.47 (ii) 9. PO_{4}^{-1} diss. mg PO_{4} dm ³ 0.25 (ii) 0.38 (ii) 0.22 (ii) 10. P_{w}^{-1} mg PO_{4} dm ³ 0.25 (iii) 0.33 (iii) 0.22 (iii) 7.83 (i) 7.77 (i) 7.78 (i) 0.22 (ii) 0.32 (iii) 0.42 (iii) 1. General Suspension mg Q_{2} dm ³ 3.9 (ii) 7.97 (i) 7.77 (i) 2. pH - 7.33 (i) 7.97 (i) 7.78 (i) 3. COD-Mn mg Q_{2} dm ³ 2.5 (ii) 2.5 (ii)	3	COD-Mp	ma O ·dm-3	3.9 (11)	5.7 (11)	4.8 (II)		
1. DO g_{abs} Ing $Q_2 dm^3$ E.C (1) E.C (1) E.C (1) E.C (1) 5. Q_{2abs} mg $Q_2 dm^3$ $G.7 (11)$ $G.1 (11)$ $G.8 (11)$ 6. NQ_2^- mg Ndm^3 $3.48 (1)$ $4.69 (1)$ $3.29 (1)$ 7. NQ_2^- mg Ndm^3 $0.49 (11)$ $0.84 (11)$ $0.47 (11)$ 8. NH_4^+ mg Ndm^3 $0.25 (11)$ $0.38 (11)$ $0.24 (11)$ 9. PQ_4^3_{dass.} mg PQ_4 dm^3 $0.25 (11)$ $0.38 (11)$ $0.24 (11)$ 10. Pea_* mg PQ_4 dm^3 $0.25 (11)$ $0.33 (11)$ $0.37 (11)$ $0.29 (11)$ 11. General Suspension mg Q_2 dm^3 $19.5 (11)$ $23.1 (11)$ $18.6 (1)$ 2. pH - 7.83 (1) 7.97 (1) 7.78 (1) 3. COD-Mn mg Q_2 dm^3 $3.9 (11)$ $4.8 (11)$ $4.5 (11)$ 4. BOD_5 mg Q_2 dm^3 $0.73 (11)$ $6.2 (11)$ $6.6 (1)$ 5. <td< td=""><td>4</td><td>BOD</td><td>mg O₂dm⁻³</td><td>2.3 (II)</td><td>2.6 (II)</td><td>2 4 (II)</td></td<>	4	BOD	mg O ₂ dm ⁻³	2.3 (II)	2.6 (II)	2 4 (II)		
b. O_{2}^{des} Ingl Q_{2} dm ³ O_{1} (I) O_{2} (I) O_{1} (I) O_{2} (II) O_{2} (III) O_{2	5	0	mg O ₂ dm ⁻³	6.7 (II)	6.1 (II)	6.8 (II)		
Job Nog	6	2 diss.	ma N.dm ⁻³	3.48 (I)	4.69 (1)	3 29 (1)		
Ing Num	7	NO ³	ma N.dm ⁻³	0.058 (II)	0.082 (II)	0.063 (II)		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	8	NH ⁺	ma N.dm ⁻³	0.000 (II)	0.84 (II)	0.003 (II)		
s. Ing i Q ₄ din mg Pdm ³ 0.33 (ii) 0.33 (ii) 0.33 (ii) 0.37 (ii) 0.24 (ii) 0.29 (ii) No Water quality indices Units 2004.2011 Spring Summer Summer Autumn 1. General Suspension mg O ₂ dm ³ 19.5 (ii) 23.1 (ii) 18.6 (ii) 2. pH - 7.83 (i) 7.97 (i) 7.78 (i) 3. COD-Mn mg O ₂ dm ³ 3.9 (ii) 5.8 (ii) 4.5 (ii) 4. BOD ₅ mg O ₂ dm ³ 6.7 (ii) 6.2 (ii) 6.6 (ii) 5. O ₂ dms. mg O ₂ dm ³ 0.36 (ii) 0.093 (ii) 0.069 (ii) 8. Nd ₄ * mg Ndm ³ 0.86 (i) 0.093 (ii) 0.069 (ii) 8. Nd ₄ * mg PO ₄ dm ³ 0.36 (ii) 0.38 (ii) 0.27 (ii) 9. PO ₄ * diss. mg PO ₄ dm ³ 0.36 (ii) 0.34 (ii) 0.21 (ii) 10. P ₆₄ * mg O ₂ dm ³ 17.4 (i) 2.2 (ii) 27.09.2012 Autumn mg PO ₄ dm ³ 0.26 (ii) 0.34 (ii) 0.21 (ii) 2.1 (ii) 10. General Su	0. 0	PO 3-	ma PO .dm-3	0.45 (II)	0.38 (II)	0.47 (11)		
No Water quality indices Units 20.04.2011 Spring 20.07.2011 Summer 19.10.2011 Autumn 1. General Suspension mg O_2 dm ³ 19.5 (ll) 23.1 (ll) 18.6 (ll) 2. pH - 7.83 (l) 7.97 (l) 7.78 (l) 3. COD-Mn mg O_2 dm ³ 2.5 (ll) 2.8 (ll) 4.5 (ll) 4. BOD ₅ mg O_2 dm ³ 2.5 (ll) 2.8 (ll) 2.5 (ll) 5. O_2 diss. mg O_2 dm ³ 6.7 (ll) 6.2 (ll) 6.6 (ll) 6. NO ₅ ⁻ mg Ndm ³ 0.86 (ll) 0.093 (ll) 0.069 (ll) 8. NH ₄ ⁺ mg Ndm ³ 0.73 (ll) 0.86 (ll) 0.45 (ll) 9. PQ ₄ ³ mg Pd ₄ dm ³ 0.26 (ll) 0.34 (ll) 0.27 (ll) 10. P _{wet} mg Pd ₄ dm ³ 0.26 (ll) 0.34 (ll) 0.31 (ll) 2. pH - 7.84 (l) 7.70 (l) 7.87 (l) 3. CDD-Mn mg O ₂ dm ³ 17.4 (ll)	10	P diss.	ma Pdm-3	0.23 (II)	0.37 (II)	0.24 (11)		
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	10.	l tot	2011	0.00 (II)	0.07 (11)	0.20 (11)		
NoWater quality indicesUnitsSpringSummerAutumn1.General Suspensionmg O_2 dm319.5 (ll)23.1 (ll)18.6 (ll)2.pH-7.83 (l)7.97 (l)7.78 (l)3.COD-Mnmg O_2 dm33.9 (ll)5.8 (ll)4.5 (ll)4.BOD ₅ mg O_2 dm32.5 (ll)2.8 (ll)2.5 (ll)5. O_{2} diss.mg O_2 dm36.7 (ll)6.2 (ll)6.6 (ll)6.NO_3 -mg N dm32.84 (l)4.62 (l)2.73 (l)7.NO_2 -mg N dm30.086 (ll)0.093 (ll)0.069 (ll)8.NH_4 +mg N dm30.73 (ll)0.86 (ll)0.45 (ll)9.PO_4 - diss.mg PO_4 dm30.36 (ll)0.38 (ll)0.27 (ll)10. P_{1w} mg PO_4 dm30.26 (ll)0.34 (ll)0.31 (ll)11.General Suspensionmg O_2 dm317.4 (ll)22.9 (ll)21.4 (ll)2.pH-7.84 (l)7.70 (l)7.87 (l)3.COD-Mnmg O_2 dm317.4 (ll)2.9 (ll)2.6 (ll)4.BOD ₅ mg O_2 dm32.3 (ll)2.9 (ll)2.6 (ll)5. O_{2} diss.mg O_2 dm318.4 (l)3.62 (l)2.04 (l)1.General Suspensionmg O_2 dm317.4 (ll)2.9 (ll)2.6 (ll)2.pH-7.84 (l)7.70 (l)7.87 (l)3.COD-Mnmg O_2 dm32.3 (ll)2.9 (ll)			2011	20.04.2011	20.07.2011	19 10 2011		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	No	Water quality indices	Units	Spring	Summer	Autumn		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	1.	General Suspension	mg O ₂ ·dm ⁻³	19.5 (II)	23.1 (II)	18.6 (II)		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	2.	pH	-	7.83 (I)	7.97 (I)	7.78 (I)		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	3.	COD-Mn	mg O ₂ ·dm ⁻³	3.9 (II)	5.8 (II)	4.5 (II)		
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	4.	BOD ₅	mg O, dm³	2.5 (II)	2.8 (II)	2.5 (II)		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	5.	O _{2 diss}	mg O ֶ̄ dm⁻³	6.7 (II)	6.2 (II)	6.6 (II)		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	6.	NO ₃ ⁻	mg N [•] dm⁻³	2.84 (I)	4.62 (I)	2.73 (I)		
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	7.	NO ₂ -	mg N∙dm⁻³	0.086 (II)	0.093 (II)	0.069 (II)		
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	8.	NH ⁺	mg N₁dm⁻³	0.73 (II)	0.86 (II)	0.45 (II)		
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	9.	PO ³⁻ dise	mg PO₄ dm-3	0.36 (II)	0.38 (II)	0.27 (II)		
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	10.	P _{tot}	mg Pdm ⁻³	0.26 (II)	0.34 (II)	0.31 (II)		
$\begin{array}{ c c c c c c c c c c c c c c c c c c c$		2012 year						
1. General Suspension mg $O_2 dm^{-3}$ 17.4 (II) 22.9 (II) 21.4 (II) 2. pH - 7.84 (I) 7.70 (I) 7.87 (I) 3. COD-Mn mg $O_2 dm^{-3}$ 4.7 (II) 5.6 (II) 5.2 (II) 4. BOD ₅ mg $O_2 dm^{-3}$ 2.3 (II) 2.9 (II) 2.6 (II) 5. $O_{2 diss.}$ mg $O_2 dm^{-3}$ 6.4 (II) 6.1 (II) 6.7 (II) 6. NO ₃ mg Ndm ⁻³ 1.84 (I) 3.62 (I) 2.04 (I) 7. NO ₂ mg Ndm ⁻³ 0.068 (II) 0.089 (II) 0.072 (II) 8. NH ₄ * mg Ndm ⁻³ 0.31 (II) 0.37 (II) 0.26 (II) 9. PO ₄ ⁻ diss. mg PO ₄ dm ⁻³ 0.24 (II) 0.32 (II) 0.28 (II)	No	Water quality indices	Units	18.04.2012 Spring	18.07.2012 Summer	27.09.2012 Autumn		
2. pH - 7.84 (l) 7.70 (l) 7.87 (l) 3. COD-Mn mg $O_2 dm^3$ 4.7 (ll) 5.6 (ll) 5.2 (ll) 4. BOD ₅ mg $O_2 dm^3$ 2.3 (ll) 2.9 (ll) 2.6 (ll) 5. $O_{2 diss.}$ mg $O_2 dm^3$ 6.4 (ll) 6.1 (ll) 6.7 (ll) 6. NO ₃ ⁻¹ mg N dm^3 1.84 (l) 3.62 (l) 2.04 (l) 7. NO ₂ ⁻² mg N dm^3 0.068 (ll) 0.089 (ll) 0.072 (ll) 8. NH ₄ ⁺ mg N dm^3 0.31 (ll) 0.37 (ll) 0.26 (ll) 9. PO ₄ ³ - mg Pd _m ⁻³ 0.24 (ll) 0.32 (ll) 0.28 (ll)	1.	General Suspension	mg O_·dm-3	17.4 ()	22.9 (II)	21.4 (II)		
3. COD-Mn mg $O_2 dm^3$ 4.7 (II) 5.6 (II) 5.2 (II) 4. BOD ₅ mg $O_2 dm^3$ 2.3 (II) 2.9 (II) 2.6 (II) 5. $O_{2 dms}$ mg $O_2 dm^3$ 6.4 (II) 6.1 (II) 6.7 (II) 6. NO ₃ mg Ndm ³ 1.84 (I) 3.62 (I) 2.04 (I) 7. NO ₂ mg Ndm ³ 0.068 (II) 0.089 (II) 0.072 (II) 8. NH ₄ * mg Ndm ³ 0.67 (II) 0.83 (II) 0.51 (II) 9. PO ₄ ³ diss. mg Pd ₄ dm ³ 0.24 (II) 0.37 (II) 0.26 (II) 10. P _w mg Pdm ³ 0.24 (II) 0.32 (II) 0.28 (II)	2.	pH	-	7.84 (I)	7.70 (I)	7.87 (I)		
4. BOD_5 $mg O_2 dm^3$ $2.3 (II)$ $2.9 (II)$ $2.6 (II)$ 5. $O_{2 diss.}$ $mg O_2 dm^3$ $6.4 (II)$ $6.1 (II)$ $6.7 (II)$ 6. $NO_3^ mg N dm^3$ $1.84 (I)$ $3.62 (I)$ $2.04 (I)$ 7. $NO_2^ mg N dm^3$ $0.068 (II)$ $0.089 (II)$ $0.072 (II)$ 8. NH_4^+ $mg N dm^3$ $0.67 (II)$ $0.83 (II)$ $0.51 (II)$ 9. $PO_{4 diss.}^3$ $mg Pd_4 dm^3$ $0.31 (II)$ $0.37 (II)$ $0.26 (II)$ 10. P_{ws} $mg Pdm^3$ $0.24 (II)$ $0.32 (II)$ $0.28 (II)$	3.	COD-Mn	mg O ₂ ·dm ⁻³	4.7 (II)	5.6 (II)	5.2 (II)		
5. $O_{2 \text{ diss.}}$ $mg O_2 \text{ dm}^3$ $6.4 (II)$ $6.1 (II)$ $6.7 (II)$ 6. $NO_3^ mg N \text{ dm}^3$ $1.84 (I)$ $3.62 (I)$ $2.04 (I)$ 7. $NO_2^ mg N \text{ dm}^3$ $0.068 (II)$ $0.089 (II)$ $0.072 (II)$ 8. NH_4^+ $mg N \text{ dm}^3$ $0.67 (II)$ $0.83 (II)$ $0.51 (II)$ 9. PO_4^3 $mg PO_4 \text{ dm}^3$ $0.24 (II)$ $0.37 (II)$ $0.26 (II)$ 10. P_{was} $mg Pdm^3$ $0.24 (II)$ $0.32 (II)$ $0.28 (II)$	4.	BOD	mg O ₂ ·dm ⁻³	2.3 (II)	2.9 (II)	2.6 (II)		
$0.2^{cliss.}$ $0.7^{cliss.}$ $mg N dm^3$ $1.84 (l)$ $3.62 (l)$ $2.04 (l)$ 6. NO_3^{-1} $mg N dm^3$ $1.84 (l)$ $3.62 (l)$ $2.04 (l)$ 7. NO_2^{-1} $mg N dm^3$ $0.068 (ll)$ $0.089 (ll)$ $0.072 (ll)$ 8. NH_4^+ $mg N dm^3$ $0.67 (ll)$ $0.83 (ll)$ $0.51 (ll)$ 9. $PO_4^{3}_{-diss.}$ $mg PO_4 dm^3$ $0.31 (ll)$ $0.37 (ll)$ $0.26 (ll)$ 10. P_{usc} $mg Pdm^3$ $0.24 (ll)$ $0.32 (ll)$ $0.28 (ll)$	5.		mg O_dm-3	6.4 (II)	6.1 (II)	6.7 (II)		
7. NO_2^{-} mg Ndm30.068 (II)0.089 (II)0.072 (II)8. NH_4^{+} mg Ndm30.67 (II)0.83 (II)0.51 (II)9. $PO_4^{3}_{-diss.}$ mg PQ_4 dm30.31 (II)0.37 (II)0.26 (II)10. P_{ue} mg Pdm30.24 (II)0.32 (II)0.28 (II)	6.	NO ₂ ^{c oiss.}	ma N ² dm ⁻³	1.84 (I)	3.62 (I)	2.04 (l)		
8. NH_4^{++} mg N·dm ⁻³ 0.67 (II) 0.83 (II) 0.51 (II) 9. $PO_{4^{-diss.}}$ mg PO_4 dm ⁻³ 0.31 (II) 0.37 (II) 0.26 (II) 10. P_{m} mg Pdm ⁻³ 0.24 (II) 0.32 (II) 0.28 (II)	7.	NO [°] -	mg N dm ⁻³	0.068 (II)	0.089 (II)	0.072 (II)		
9. PO_4^{3} mg PO_4 dm^30.31 (II)0.37 (II)0.26 (II)10. P_{ext} mg Pdm^30.24 (II)0.32 (II)0.28 (II)	8.	NH.+	mg N·dm-3	0.67 (11)	0.83 (II)	0.51 (II)		
10. P_{tat} mg Pdm ⁻³ 0.24 (II) 0.32 (II) 0.28 (II)	9.	PO ⁴ 3	mg PO. dm ⁻³	0.31 (II)	0.37 (II)	0.26 (II)		
	10.	P _{tot} ⁴ alss.	mg Pdm ⁻³	0.24 (II)	0.32 (II)	0.28 (II)		

Explanation: I, II, III - classification of values of examined indicators in accordance with the European Union Water Framework Directive (2000/60/EC)

while in Lakes Głebokie, Rusałka it was on level III class.

The concentration in the surface layer of P_{tot} . Lakes is little differentiated, it is at level II and III quality class according to the classification of the European Union Water Framework Directive. The concentration of total phosphorus is 0.41 - 0.68 mg·dm⁻³. The largest concentration of phosphorus total recorded in Lakes Głebokie and Rusałka.

The concentrations of the PO_{4}^{3-} in the tested water lakes were changing; these concentrations correspond to water quality from II to III. The increase of the concentrations of phosphorus in the Lake may indicate a decrease in the amount of oxygen in the waters of the shallow and changes their status to release phosphorus compounds accumulated redox in sediment bottom. [5-7, 11, 16, 17, 24].

In case of nitrogen-compounds, nitrates and nitrites values for these indicators were at level I and III class in all the surveyed lakes in accordance with the classification of the European Union Water Framework Directive.

Indicator which indicates the high productivity of Lakes is the biochemical oxygen demand (BOD₅). The level of this indicator values on the studied Lakes was on level II and III class.

The highest concentration of oxygen in the waters of Lakes occur in the Lakes Glebokie and Rusalka.

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