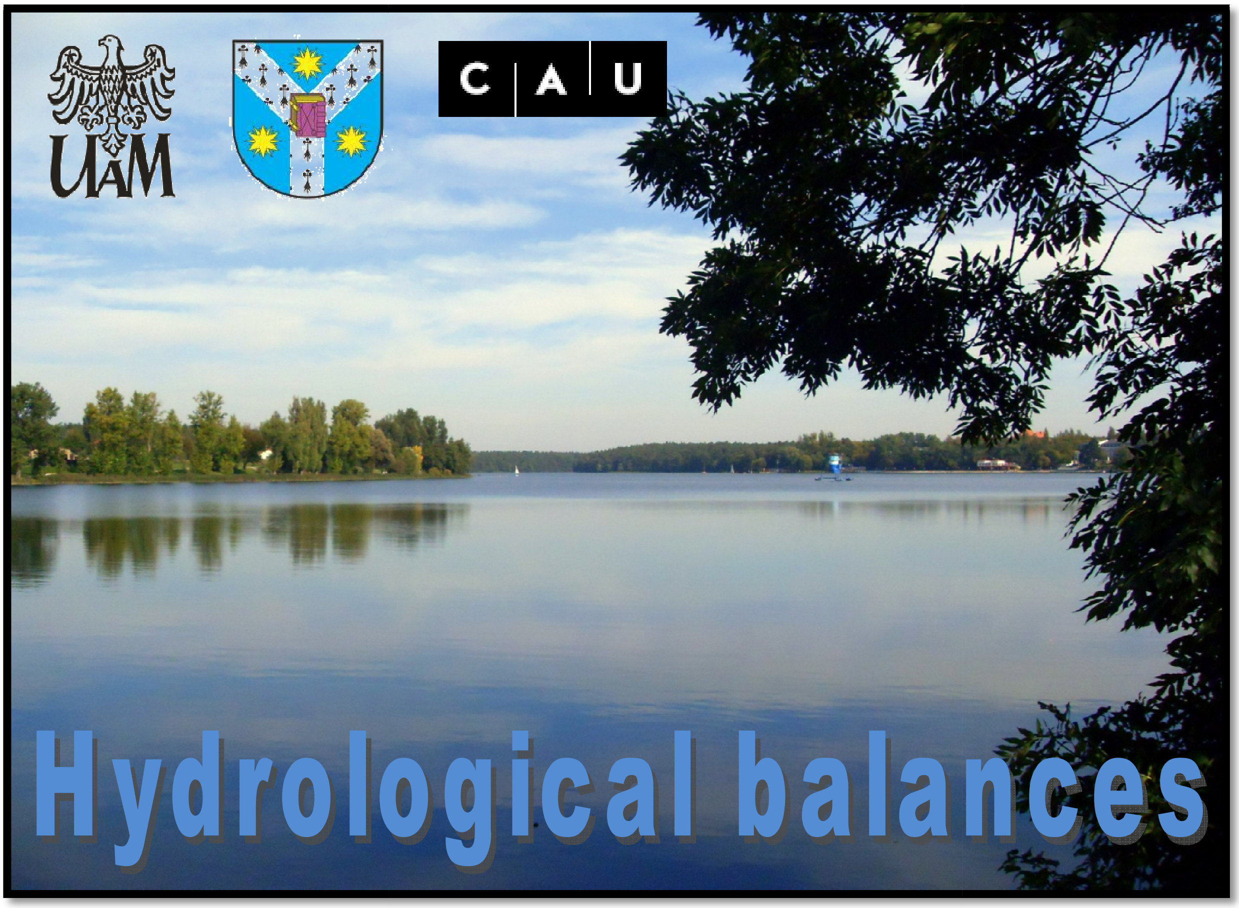

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1 Introduction

The Durowskie Lake is located in northwestern Poland. It is close to Poznań and Bydgoszcz – 50 km from both cities. Lake Durowskie is located in center of town Wągrowiec with geographical coordinates of N 52°49’6’’ and E 17°12’1’’.

We conducted the research from the 2nd till the 7th of July 2012. We choose three sampling sites – inflow and outflow of Durowskie Lake and inflow of lake Kobyleckie. We collected water samples and measured the water discharge at these points. In correlation with their position, the sampling sites were named as follows:

1. Inflow Durowskie – N 52°50’40’’; E 17°12’30’’.
2. Outflow Durowskie – N 52°48’29’’; E 17°11’30’’
3. Inflow Kobyleckie – N 52°51’25’’; E 17°13’35’’.

Figure 1. Sampling points map

The first sampling site was the Durowskie Lake inflow. It is located on the Struga Gołaniecka, in the northern part of the lake. The stream flows under the bridge of county road 190. The approximate distance from the sampling site to the lake Durowskie is 850 m. The bottom of the stream is covered by stones and the shores are covered by grass and some macrophytes.

The second sampling site was Durowskie Lake outflow. It is located in the south part of the lake Durowskie, under a railway bridge. We chose this location because there are regular anthropomorphic shorelines and the water discharge measurements can be done more accurate. The sampling site has bottom.

The third sampling site was inflow of the lake Kobyleckie located in the northern part. The surrounding consists of large vegetation cover- a coniferous and deciduous forests. The bottom of the stream is irregular and it has muddy parts at the shoreline, but also has hard and stable areas especially in the middle, covered with mussels.

2 Materials and methods

The temperature, *p*H, conductivity, concentration and percentage of oxygen were measured by a multiparameter measurement device in both outflow and inflow of the lake. The width and the depth of the river were measured (Figure 2), in order to calculate the cross section of the river. The flow velocity was measured using a flow meter (Figure 3) at three points at one or more water depths. The cross section and the flow velocity were later used to calculate the flow volume (Q m^3/s) of the river both at the inflow and the outflow.

Flow meter

The cross section of the river at both points was calculated using the areas of small subsections. The flow volume was then calculated by multiplying the cross sub-sectional area with the average velocity of each section.

ts at inflow

The total discharge Q (m^3/s) is calculated by multiplication of the area of each subsection a_i (m^2) with the average velocity v_i (m/s) of each section:

$$Q \qquad \vec{v}$$

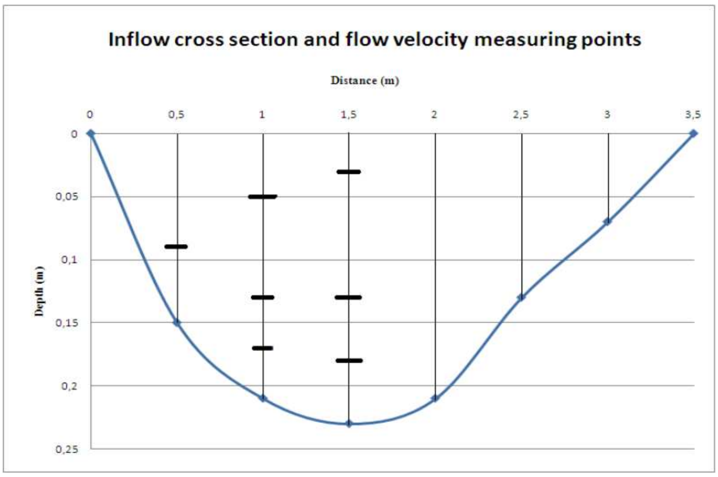

Figure 5. Inflow cross section and flow velocity at inflow Durowskie

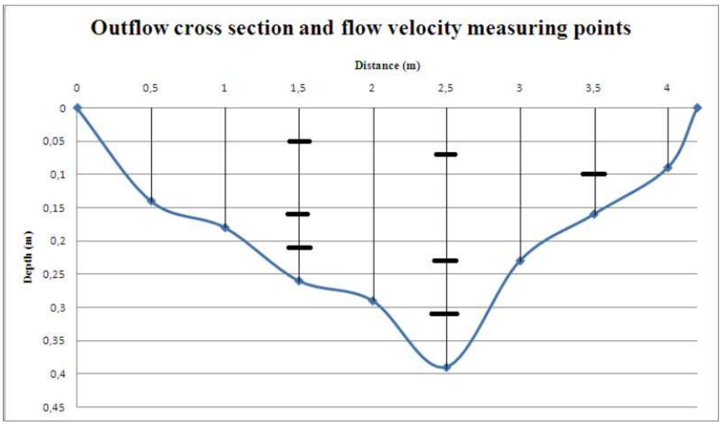

Figure 6. Outflow cross section and flow velocity at inflow Durowskie

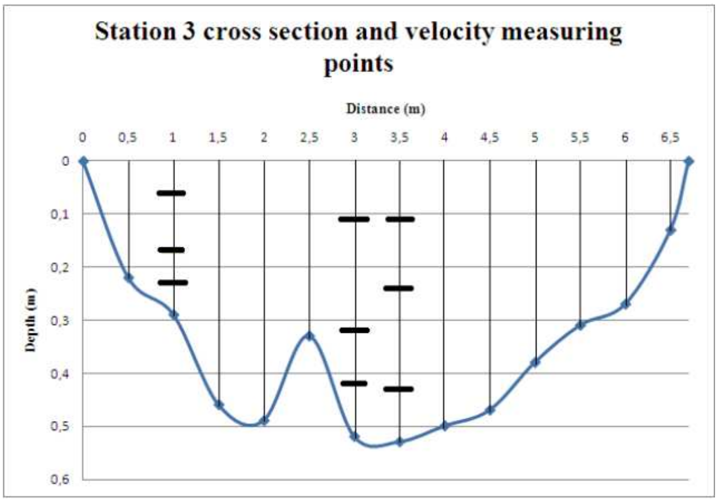

Figure 7. Inflow cross section and flow velocity at inflow Kobyleckie

Along with the measurements, water was collected from both inflow and outflow to measure the chlorophyll *a*, PO_4, P, NH_4 and NO_2^- in the lab. Chloroform was added to this water in order to prevent any organic reaction from taking place.

The parameters we analyzed are conductivity, temperature, *p*H, concentration of oxygen, nitrate and phosphate, the amount of chlorophyll *a*.

2.1 Conductivity

It is the ability of water to conduct an electrical current. It is often used as the first ratio of mineralization and pollution of water. It highly depends on the amount of dissolved solids in the water. The more dissolved solids are in the water the higher the value of conductivity is. Surface waters in Poland usually reach a conductivity of 100 to 500 μS/cm.

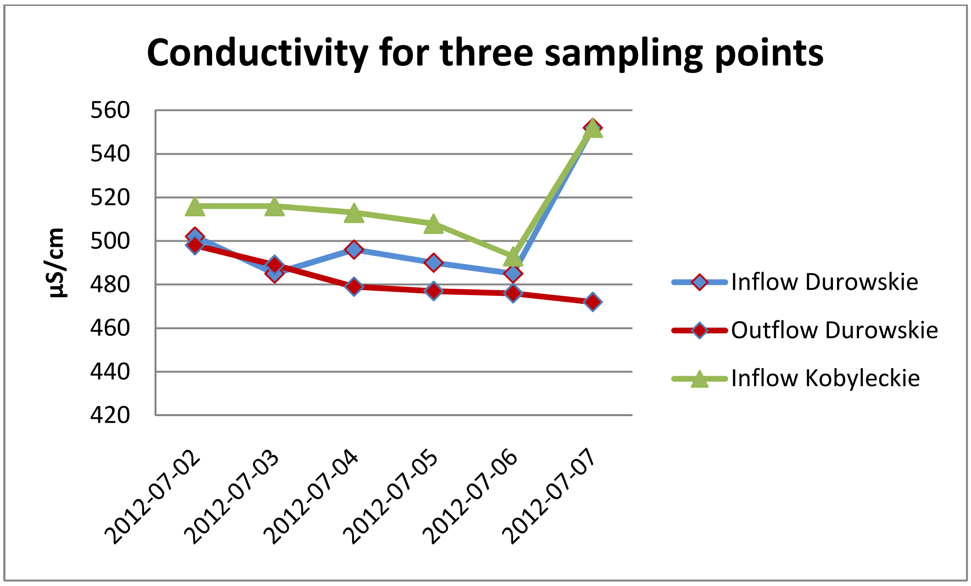

Figure 8. Conductivity of three sampling points

As we can see from Figure 2, the highest conductivity (552 µS/cm) was measured at both inflows on the 7th of July. During the sampling period, the values of conductivity decreased for all the sampling points, with the exception of the last day of sampling where we can see a sudden increase of conductivity in the sampling points of both inflows.

2.2 pH

The *p*H value varies between 0 (acidic) and 14 (basic) and is neutral at *p*H 7. It gives an idea about the amount of free hydrogen ions in the solution. The *p*H of water determines biological availability of chemical compounds such as nutrients (phosphorus, nitrogen, and carbon) and heavy metals (lead, copper, cadmium). For natural waters, *p*H varies from 4 to 9.

Pollution, sewage, or rain can change the *p*H, which has an impact on water plants animals. A *p*H change in a stream can be an indicator of increasing pollution or some other environmental factors.

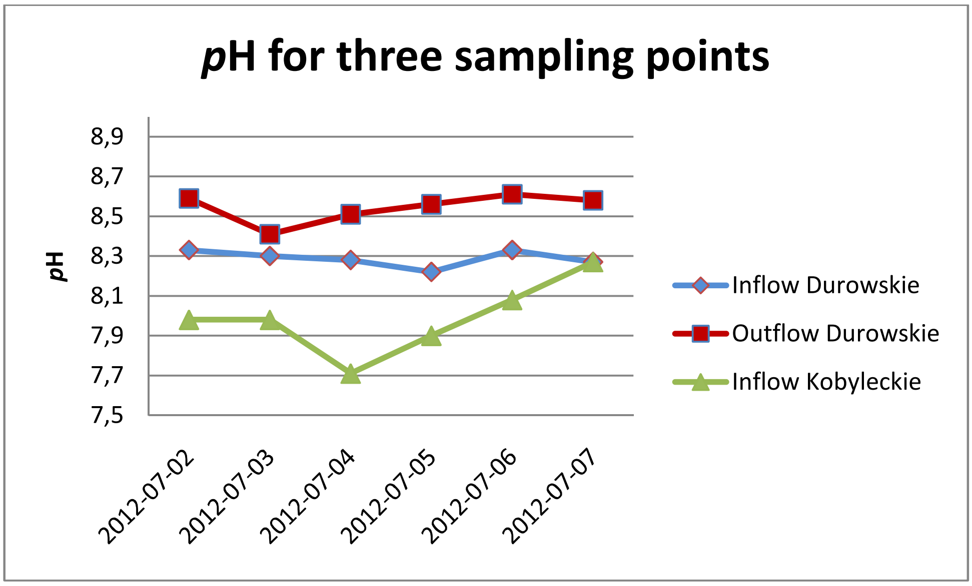

Figure 9. pH values for the sampling points

The above graph shows a low range of fluctuation, from 7,71 at the inflow of lake Kobyleckie to 8,6 at the outflow of lake Durowskie so we can see a steady increase in *p*H as we move further away from the inflow towards the outflow.

2.3 Temperature

Temperature is an important parameter for stream water ecology because it is controlling factor of many biological processes. It has also an impact on other physical and chemical parameters in this kind of environment. For instance the temperature increase causes decrease in amount of dissolved oxygen. That leads to the acceleration of chemical processes and increase of microbiological productivity. Temperature of surface waters depends on different factors: climate zone, season of the year, origin of water and pollution distributing (for instance a sewage load).

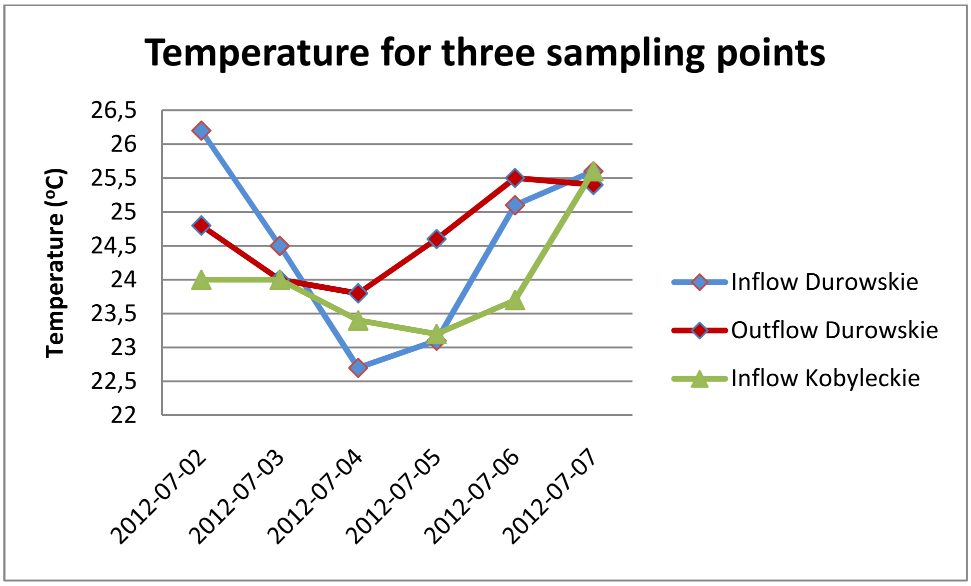

Figure 10. Temperature for three sampling points

The graph shows a tendency of temperature increase towards the end of the sampling period, which is probably correlated with the atmospheric temperature.

2.4 Dissolved oxygen

Oxygen concentration is an important ecological and biological parameter. Too little oxygen combined with high temperatures and big amount of nutrients may cause severe eutrophication in fresh waters. Oxygen is necessary for the survival of nearly all water plants and animals, but the concentration of oxygen dissolved in water is much lower than in atmosphere. Measuring the dissolved oxygen in water is the most important water quality test to determine the suitability of water quality for many aquatic organisms.

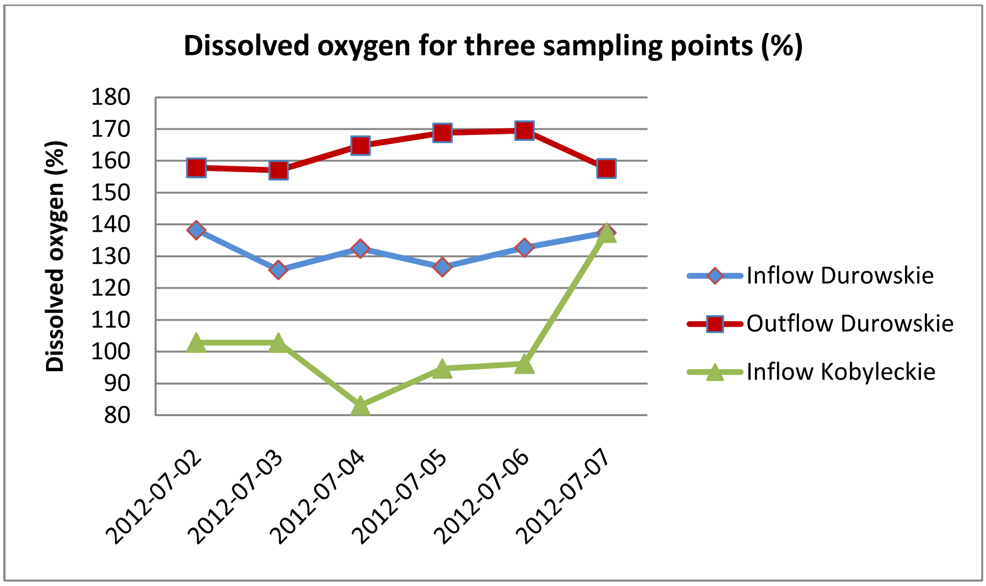

Figure 11. Dissolved oxygen for the sampling points

During the study period, the values of dissolved oxygen were quite stable, which is in accordance to phytoplankton productivity.

2.5 Trophic status

Of all lake classification schemes, trophic classification has the widest acceptance and use at the present time. The quantities of nitrogen, phosphorus, and other biologically useful nutrients are the primary determinants of a body of water's trophic state index. Nutrients such as nitrogen and phosphorus tend to be limiting resources in standing water bodies, so increased concentrations tend to result in increased plant growth, followed by corollary increases in subsequent trophic levels. Consequently, a body of water's trophic index may sometimes be used to make a rough estimate of its biological condition. Depending on the amount of chlorophyll, phosphorus, nitrogen and other parameters, a lake is usually classified as *oligotrophic*, *mesotrophic* or *eutrophic*.

Table 1. Trophic class classification of lakes

	Trophic class		
	Oligotrophic	Mesotrophic	Eutrophic
Chlorophyll (µg/l)	0 – 2,6	2,6 – 20	20 – 56
Phosphorus (µg/l)	0 – 12	12 – 24	24 – 96
Nitrogen (mg/m^3)	<400	400 – 600	>600

Nitrogen is readily available when combined with oxygen as nitrate (NO_3^-), while nitrite (NO_2^-) is a result of denitrification. Ammonium NH_4^+ on the other hand is contained in excreta biota. In wetter climates, nitrogen can be more abundant because of leaching from agricultural land, and wet deposition. Phosphorus is generally known as being the most limiting factor for algal growth, but after a certain threshold, nitrogen may become the most important nutrient. The major sources of nitrogen are from wet deposition (rainfall), leaching from agricultural areas, groundwater and waste water treatment plants. In large quantities they can encourage the growth of nuisance aquatic plants and provoke algal blooms.

The measurement of concentrations of algae is a good measure of lake trophic status though it is difficult to measure algae directly. Chlorophyll *a* concentration is used to give an indirect measure of algal concentrations.

In order to determine the **orthophosphates (PO_4)** in the water, we used the ascorbic acid method so we poured 50 ml of each sample into Nessler glasses and then added 1 ml of ascorbic acid. After mixing we added 2 ml of molybdenic acid and we had to wait 10 minutes for the coloration to appear and then it was ready to measure the absorbance on the spectophotometer in the wavelength of 850 nm. To start the mineralization and to convert all phosphate compounds into orthophosphate we had to heat the samples at 220^0 C for 50 minutes.

To determine the **amonium (NH_3)** we used the Nessler's reagent method. In 50 ml of sample we added 1 ml of sodium-potassium tartrate and 1 of Nessler's reagent mixed. Ammonia and ammonium salts can be detected by the addition of this solution, wich gives a yellow coloration in 10 minutes time. We then can measure the absorbancy in the wavelength of 410 nm.

The last step is to use the sulfanilic acid method to determine the **nitrite nitrogen (NO_2)** in our samples so we pour 100 ml of sample into Nessler glasses. Nitrate reacts with sulfanilic acid and naphthyl composition by changing colour into purple so we put 1 ml of each substance with a 5 minute break in between. Afterwards we added 1 ml of acetate buffer we measured the absorbance, after 10 minutes, in the spectophotometer in the wavelength of 520 nm.

3 Results

The 16 water samples taken in the three streamflows from July 2 to July 7 have been analyzed by the six groups in Poznan during the second week. As many people from different backgrounds have measured the chemical properties of the water, errors are possible, both for measurements on the field and in laboratory. Furthermore, the analysis of hydrological balances is at its second year only, and unfortunately, the person in charge of supervising the measurement processes hasn't been able to come to the summer school this year. There was also missing data for the inflow of Lake Kobyleckie for the two first days. This gap has been mitigated by evaluating the inflow measuring the average of the ratios between the data collected at the inflow of Lake Durowskie and Lake Kobyleckie, multiplied by the data of the inflow of lake Durowskie for the two first days.

$$IB_n=(ID_3/IB_3+ID_4/IB_4+ID_5/IB_5+ID_6/IB_6)/4*(ID_n)$$

IB_n: Inflow of Lake Kobyleckie (day 1 and 2)

ID: Inflow of Lake Durowskie

Finally, the area of Wągrowiec does not possess instruments to measure valuable parameters for hydrological balance, such as evapotranspiration, rainfall and change in storage (Davie, 2003). Therefore, a thorough evaluation of the water balance is hardly possible, and the analysis of the results should be taken as a basis for further studies.

3.1 Discharge

Discharge is a very important element in the water balance. It is generally the main source of inflowing water in lakes, depending on the influence of groundwater. In our case, stormy events during the week led to an increase in discharge with peaks on the 2^{nd} and 5^{th} day. There is also a large difference between the discharges of 2011 and 2012, probably because of a higher amount of rainfall for the latter period. We can expect that with a higher discharge in the inflows, there will be more nutrients in the runoff, as well as more dissolved organic carbon.

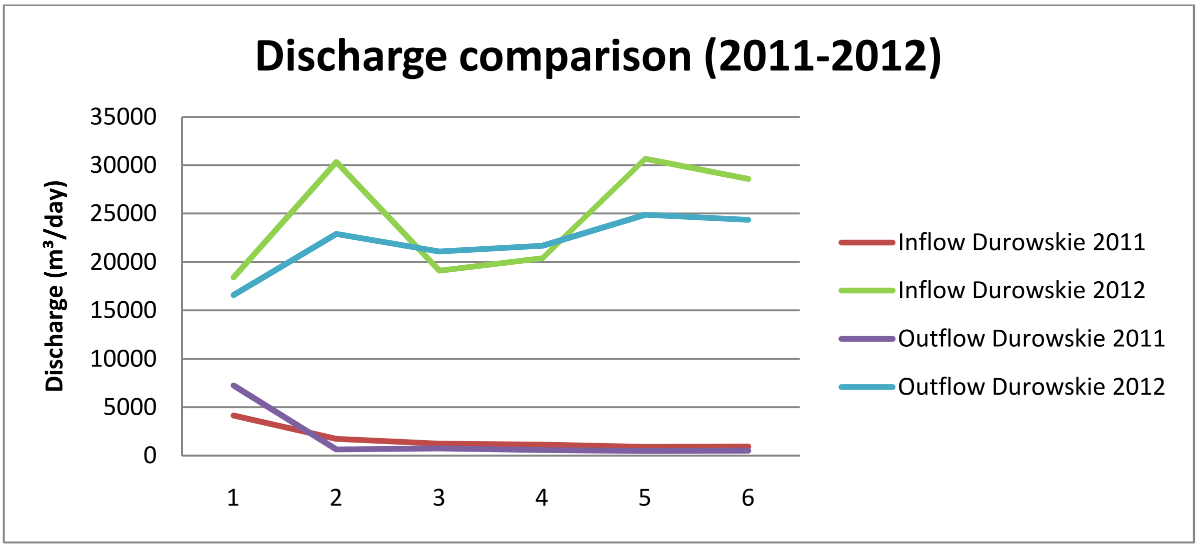

Figure 12. Discharge comparison

The discharge allows us to estimate the load of nutrient in the streamflows with the following formula:

$$\text{Load} = \text{Concentration (mg l}^{-1}\text{)*Discharge (m}^{3}\text{s}^{-1}\text{)*86,4}$$

3.2 Total Phosphorus

The result of the analysis of total phosphorus shows a prominent increase on the third day of measurement. This peak is unlikely to be realistic as it does not follow the second increase in discharge at the end of the week. It is possible however, that a substance rich in phosphorus was released at the day or the day before.

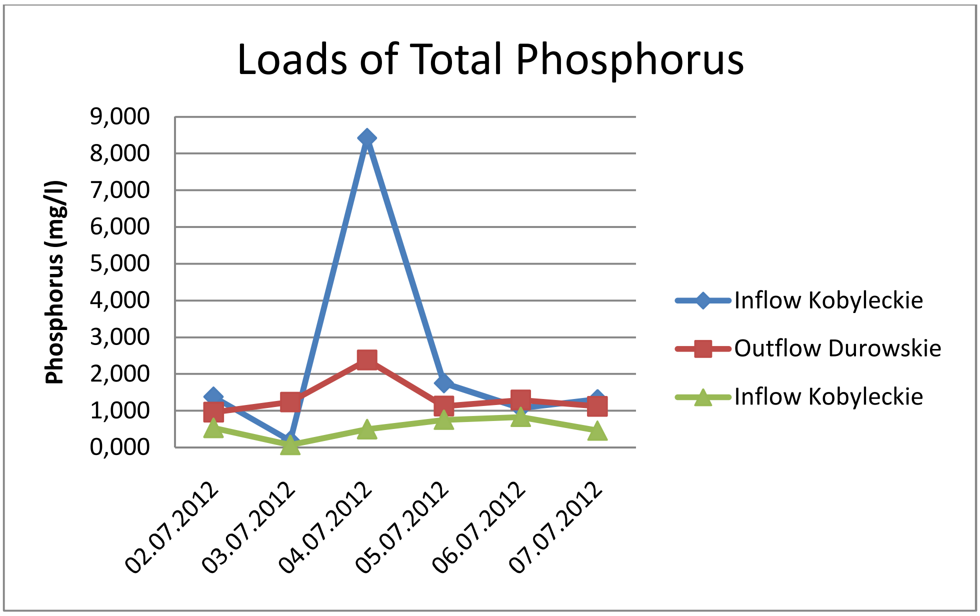

Figure 12. Load of total phosphorus

The graph above shows that there is a stable concentration of phosphorus; even though it shows an abnormality on the third day, probably due to an error in measurement. We assume this because of the improbability of such an abnormal increase overnight followed by a sudden decrease the next day.

As it can be seen on Figure 7, the load of PO_4 has been accumulating from the first sampling point to the last one. The loads of the two inflows are similar with a more important load in the inflow of Lake Durowskie. The load of phosphorus in the outflow of Lake Durowskie exceeds the loads of the two inflows, except for the last day, despite a higher discharge in the inflow. Thus, even though the total phosphorus seems to be similar for the three sampling points, the load and concentration of PO_4 is constantly higher in the outflow. The loads seem to be correlated to the discharge with a pronounced increase on the second day.

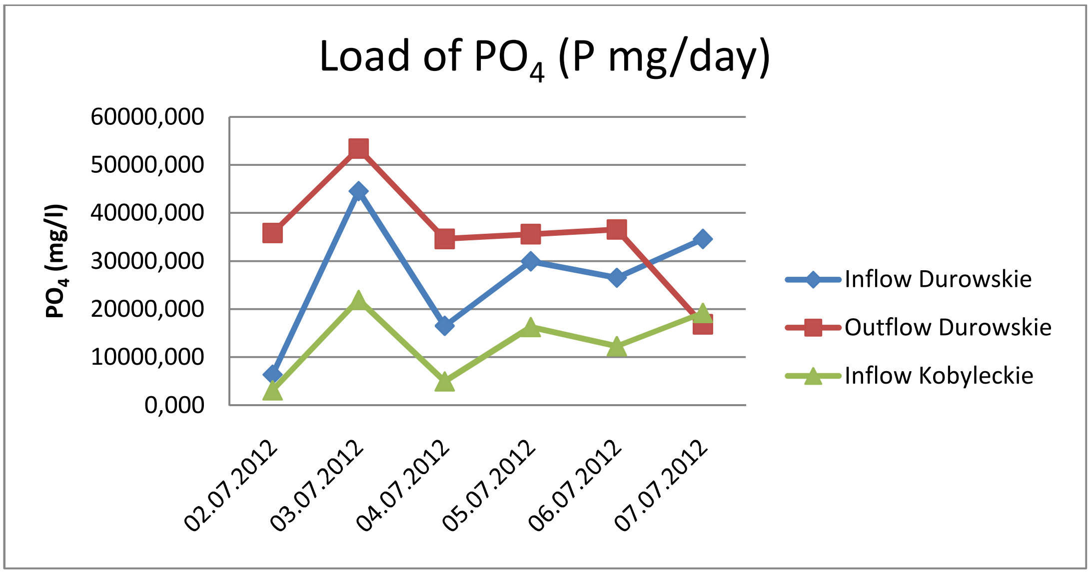

Figure 14. Loads of PO4

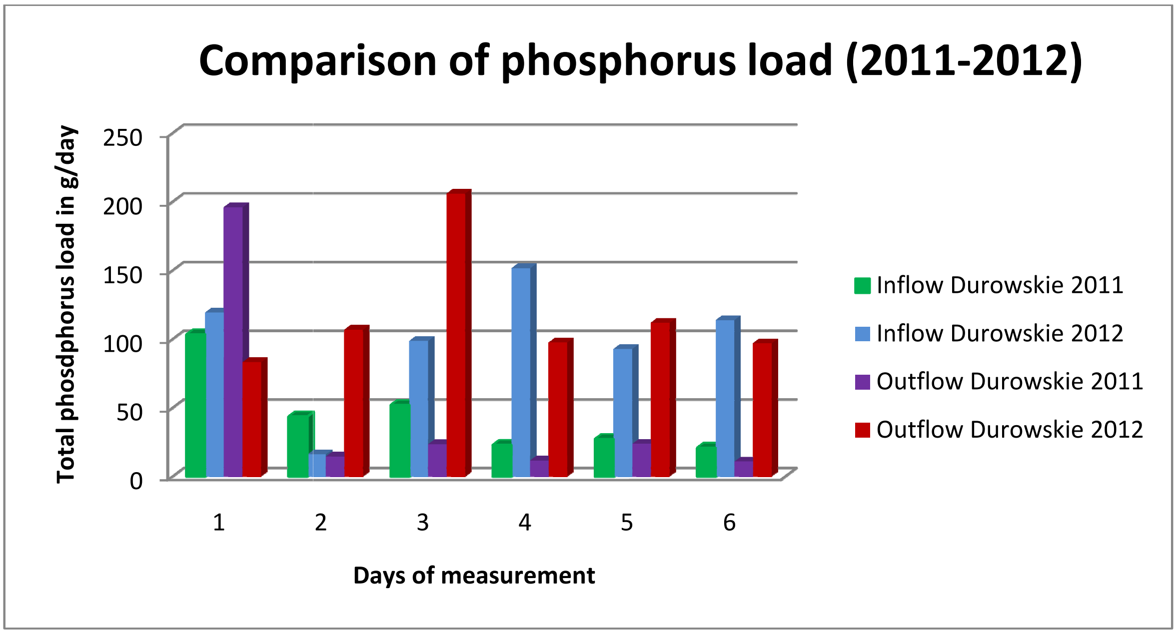

Figure 15. Comparison of phosphorus load

To assess the development of the restoration of Lake Durowskie, it is relevant to compare the data with the previous years. In our case, only the load of total phosphorus was available. Figure 8 shows a clear increase in the inflow and outflow of Lake Durowskie in 2012. This variation is most probably the result of the increased discharge in 2012.

3.3 Total Nitrogen

The evolution of the total nitrogen load through time shows a marked peak on the second day of the sampling for the inflow of lake Durowskie and the inflow of lake Kobyleckie. The load of total nitrogen in the lake Durowskie experiences less variations than for the inflow. Furthermore, except for the two days following the peak of nitrogen in the inflow, the load of total nitrogen in the outflow is lower than the one in the two inflows. This indicates that lake Durowskie serves as a buffer system and nutrient sink.

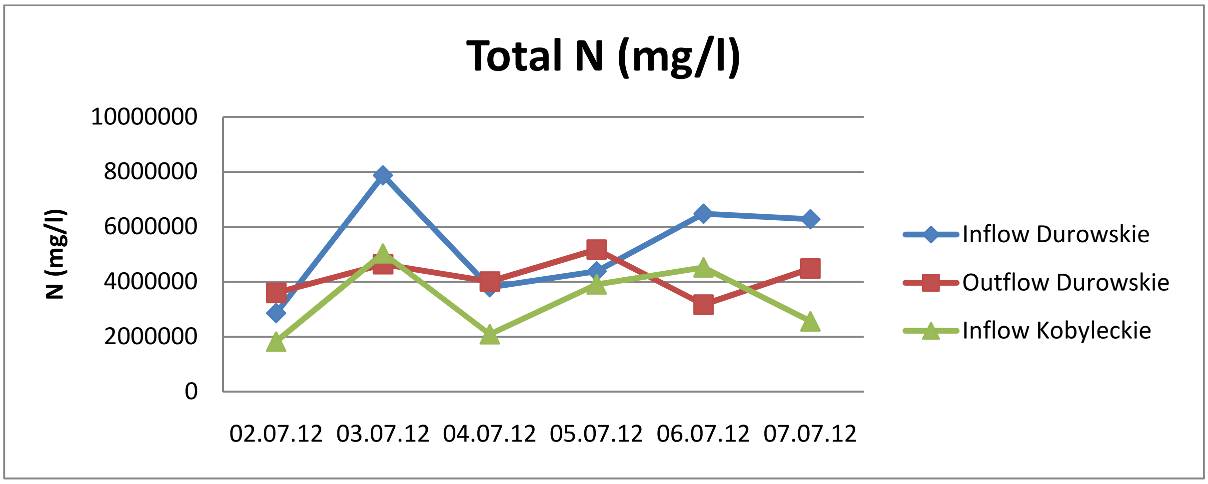

Figure 3. Total N

3.4 Nitrite (NO_2^-)

There was a high amount of nitrite observed in the outflow water compared to the two other sampling points. The important difference in the content of nitrite in the outflow as opposed to the inflow streams is caused by denitrification occurring in anoxic sediments and hypolimnion. In this case, the oxygen contained in nitrate (NO_3) is taken up for biological production and is thus reduced to nitrite NO_2. A high amount of nitrite in Lake Durowskie is an indicator of high organic pollution, low oxygen content and lake eutrophication.

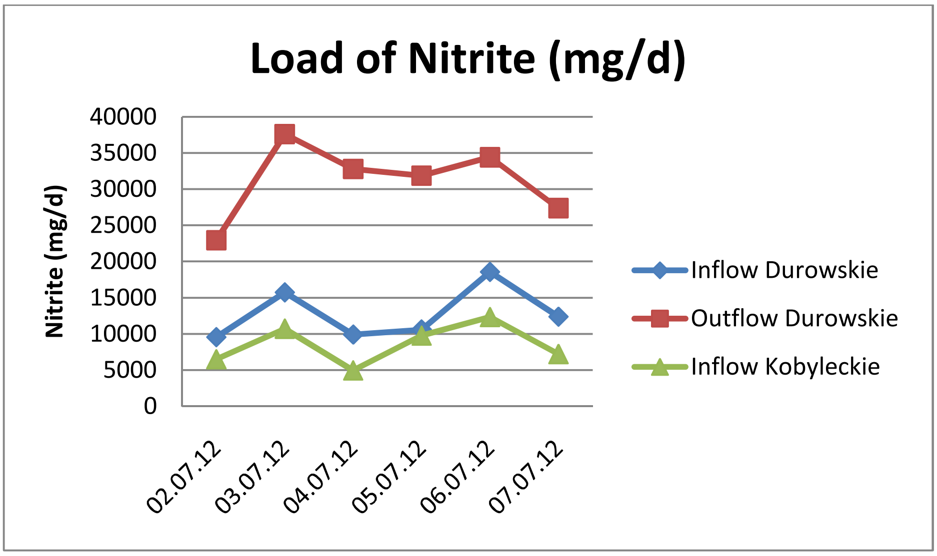

Figure 17. Load of Nitrite

3.5 Nitrate (NO_3^-)

There were no data for nitrate after the measurement in laboratory in Poznan. This indicates a high consumption of available nitrogen by phytoplankton. We can assume that such a high nutrient uptake leads to an algal bloom in Lake Durowskie. Compared to the data of the previous summer school, the amount of nitrate seems to be lower this summer. This rapid uptake shows that nitrate is not the most limiting factor.

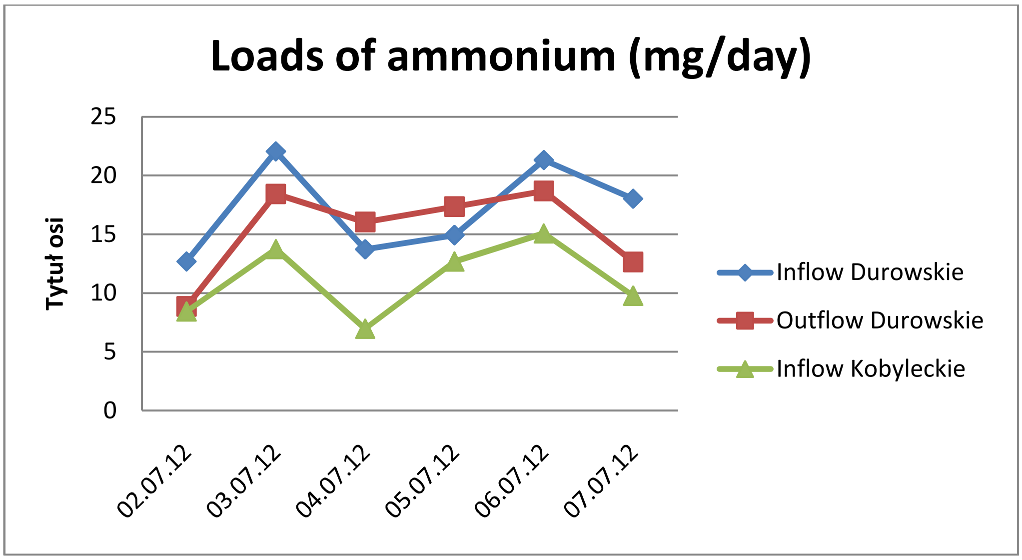

Figure 18. Loads of ammonium

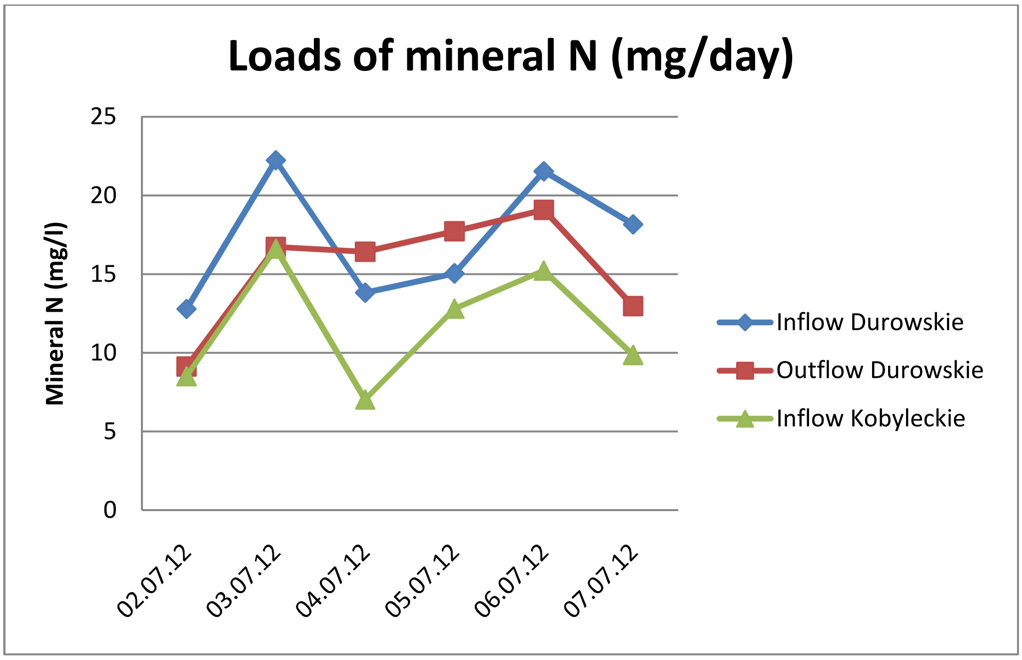

Figure 19. Loads of mineral N

3.6 Total Organic Nitrogen

The amount of total organic nitrogen in the outflow and inflow of Lake Durowskie seems to be at a similar level. However, except on the second and sixth day of the measurement, the organic nitrogen was higher in the outflow than in the inflow. This is consequent with the previous founding, since a higher amount of total nitrogen results in an increase in biomass. The senescence of this biomass increases the concentration of organic nitrogen that has not yet been decomposed by bacterial metabolism. Thus, the organic nitrogen is higher in the outflow of the lake than in the inflow. The peaks of organic nitrogen in the inflow of the 3rd and 5th of July are followed by peak

3.7 Chlorophyll a

This pigment has long been used as a surrogate of algal biomass and therefore it is logical to expect its concentration in lake waters to reflect trophic conditions. The main advantage of chlorophyll *a* as a trophic indicator is its ease of measurement and therefore, availability of data.

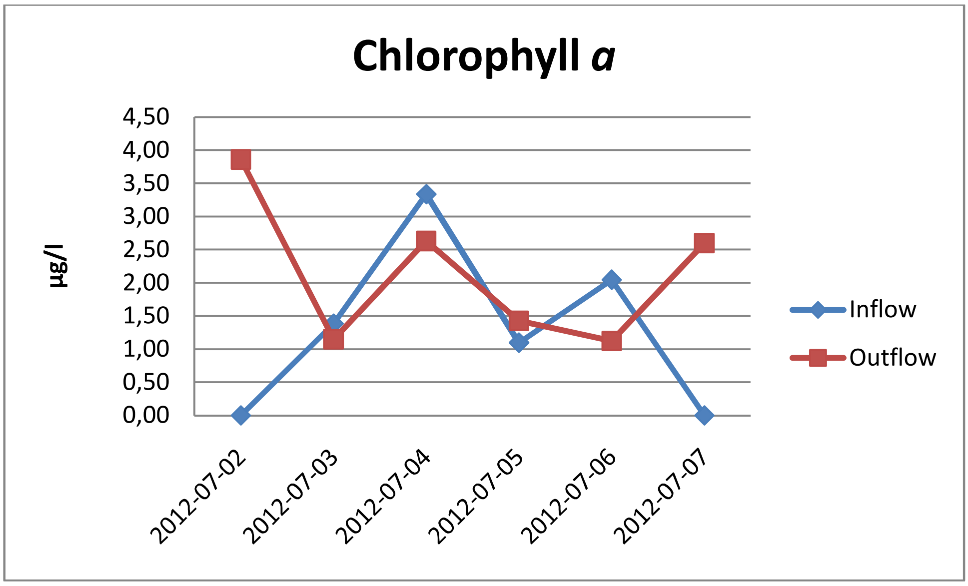

Figure 20. Amount of chlorophyll *a*

The above graph shows a high variability in chlorophyll *a* amount during the sma

4 Discussion

An interesting point of the result is the rapid uptake of nitrate by phytoplankton from water sample. Phosphorus is generally the most limiting nutrient in lakes, but when found in a high amount, nitrogen can become limiting. Nitrate was taken up very fast, while orthophosphate was still present in the water samples for the analysis in Poznan. The group assessing the algae at Lake Durowskie concluded in a clear decreasing biomass of phytoplankton. This could be related to a decrease in nitrogen load and an increase in phosphate from last year.

There a certain possibility that the most limiting nutrient has switched from orthophosphate to nitrate.

4.1 Quality of water

Quality of water is estimated by three kinds of parameters: physical, chemical and biological. Using these indicators we can define the ecological state of water bodies. The biological parameter is the most important indicator that defines ecological state and quality of water. Different groups of organisms are used as biological indicators, like phytoplankton, bacteria, zoo benthos. Physical and chemical parameters are complementing the biological ones. The most important are temperature, odor, color, turbidity and of water as physical parameters. Chemical parameters used in defining the state of water are pH, dissolved oxygen, water hardness, dissolved solids, total phosphorus, total nitrogen.

Table 2. Lake quality index

	Inflow Durowskie	Class	Outflow Durowskie	Class	Inflow Kobyleckie	Class
pH	8,3	1	8,5	1	8	1
Temperature (^oC)	24,53	2	24,68	2	23,98	2
Oxygen (mg/l)	11,02	1	13,51	1	8,57	1
Conductivity (µS/cm)	501,66	1	481,83	1	516,33	1
Ammonium N (mg/l)	0,699	1	0,699	1	0,69	1
Total N (mg/l)	2,42	1	2,236	1	2,305	1
Total P (mg/l)	0,115	1	0,063	1	0,034	1
$P-PO_4$ (mg/l)	0,012	1	0,019	1	0,009	1
Final state	**good state**		**good state**		**good state**	

5 Conclusion

The assessment of the hydrological balance of lake Durowskie is essential for the restoration of its ecological state. Any control of pollutant in a lake starts by its reduction or elimination at the source of the water body. Therefore, it is very important to compare the outflow of lake Durowskie with its inflow, and also consider the inflow of lake Kobyleckie upstream. In our study, three main points were of particular interest. First, the discharge was much more important in 2012 than in 2011. This, in turn, influences the load of nutrients in the lake. A reduction of total nitrogen was observed from last year despite a greater discharge. However, the load of orthophosphate increased, probably due to the suspended particles brought into the lake by surface run-off after stormy events.

Suggestions

In order to improve the study of the hydrological balance, more component of the water balance should be included. For example, a rain gauge in the area, with the analysis of the chemistry of the rainfall, would be a major improvement. The measurement of the amount of water pumped out of the lake for irrigation would also be useful, and a measurement of stemflow could help to calculate the interception by vegetation cover.

We have heard, from the Lake-management working group, that the community-based management should be expanded to other towns upstream for a more efficient cooperation and ecological restoration. Similarly, the hydrological balance study could be done on a catchment level to include the whole area susceptible to affect the nutrient load in lakes Durowskie and Kobyleckie. This could be done by using a catchment model such as SWAT (Soil and Water Assessment Test), and would greatly improve the assessment of the hydrological balance and consolidate the restoration initiatives.

6 References

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Davie, T. 2003. *Fundamentals of Hydrology*. Routledge Fundamentals of Physical Geography

Rozporządzenie Ministra Środowiska z dnia 9 listopada 2011 roku w sprawie sposobu klasyfikacji stanu jednolitych części wód powierzchniowych oraz środowiskowych norm jakości dla substancji priorytetowych.

7 Appendix

Inflow D					
Date	**Conductivity (µS)**	***p*H**	**Temperature (°C)**	**Oxygen (mg/l)**	**Oxygen (%)**
02.07.2012	502	8,33	26,2	11,19	138,2
03.07.2012	485	8,3	24,5	10,44	125,7
04.07.2012	496	8,28	22,7	11,42	132,4
05.07.2012	490	8,22	23,1	11	126,6
06.07.2012	485	8,33	25,1	10,94	132,7
07.07.2012	552	8,27	25,6	11,16	137,4

Outflow D					
Date	**Conductivity (µS)**	***p*H**	**Temperature (°C)**	**Oxygen (mg/l)**	**Oxygen (%)**
02.07.2012	498	8,59	24,8	13,34	157,8
03.07.2012	489	8,41	24	13,15	157
04.07.2012	479	8,51	23,8	14,05	164,8
05.07.2012	477	8,56	24,6	13,8	168,8
06.07.2012	476	8,61	25,5	13,67	169,5
07.07.2012	472	8,58	25,4	13,06	157,6

Inflow K					
Date	**Conductivity (µS)**	***p*H**	**Temperature (°C)**	**Oxygen (mg/l)**	**Oxygen (%)**
02.07.2012	516	7,98	24	8,57	102,85
03.07.2012	516	7,98	24	8,57	102,85
04.07.2012	513	7,71	23,4	7,14	83,1
05.07.2012	508	7,9	23,2	8,08	94,7
06.07.2012	493	8,08	23,7	7,92	96,2
07.07.2012	552	8,27	25,6	11,16	137,4

Discharge ($m^3 d^{-1}$)			
Date	Inflow Durowskie	Outflow Durowskie	Inflow Kobyleckie
02.07.2012	18403,2	16588,8	12362,55193
03.07.2012	30326,4	22896	20372,09262
04.07.2012	19094,4	21081,6	9590,4
05.07.2012	20390,4	21686,4	18835,2
06.07.2012	30672	24883,2	23760
07.07.2012	28598,4	24364,8	13910,4

Date	Station	Water flow velocity (m^3s^{-1})
02.07.2012	inflow	0,213
	outflow	0,192
03.07.2012	inflow	0,351
	outflow	0,265
04.07.2012	inflow	0,221
	outflow	0,244
05.07.2012	inflow	0,236
	outflow	0,251
06.07.2012	inflow	0,355
	outflow	0,288
07.07.2012	inflow	0,331
	outflow	0,282

Date	Station	Orthophosphates		Total P	
		PO_4(mg l^{-1})	P (mg l^{-1})	PO_4(mg l^{-1})	P (mg l^{-1})
02.07.2012	inflow	0,013	0,004	0,229	0,075
	outflow	0,007	0,025	0,176	0,058
03.07.2012	inflow	0,053	0,017	0,188	0,006
	outflow	0,083	0,027	0,164	0,054
04.07.2012	inflow	0,030	0,010	1,350	0,441
	outflow	0,059	0,019	0,345	0,113
05.07.2012	inflow	0,053	0,017	0,264	0,086
	outflow	0,059	0,019	0,159	0,052
06.07.2012	inflow	0,030	0,010	0,106	0,035
	outflow	0,053	0,017	0,159	0,052
07.07.2012	inflow	0,042	0,014	0,141	0,046
	outflow	0,024	0,008	0,141	0,046

		Load (mg/day)			
Date	Station	Orthophosphates		Total P	
		PO_4 (mg /day)	P(mg /day)	PO_4 (mg /day)	P (mg /day)
02.07.2012	inflow	0,239	0,074	4,214	1,380
	outflow	0,116	0,415	2,920	0,962
03.07.2012	inflow	1,607	0,516	5,701	0,185
	outflow	1,900	0,618	3,755	1,236
04.07.2012	inflow	0,573	0,191	25,777	8,421
	outflow	1,244	0,401	7,273	2,382
05.07.2012	inflow	1,081	0,347	5,383	1,754
	outflow	1,279	0,412	3,448	1,128
06.07.2012	inflow	0,920	0,307	3,251	1,074
	outflow	1,319	0,423	3,956	1,294
07.07.2012	inflow	1,201	0,400	4,032	1,316
	outflow	0,585	0,195	3,435	1,121

Load (mg/day)			
Date	Station	Ammonium (NH_4 [mg l^{-1}])	Nitrite N mgN-NO_2 l^{-1}
02.07.12	Inflow Durowskie	1095535,135	9540,21888
	Outflow Durowskie	765367,4189	22932,35712
	Inflow Kobyleckie*	729101,2643	6500,30045
03.07.12	Inflow Durowskie	1904886,098	15721,20576
	Outflow Durowskie	1592462,592	37586,0736
	Inflow Kobyleckie *	1267741,05	10711,76271
04.07.12	Inflow Durowskie	1184524,923	9898,53696
	Outflow Durowskie	1386123,633	32786,10432
	Inflow Kobyleckie	602399,8771	4971,66336
05.07.12	Inflow Durowskie	1289586,77	10570,38336
	Outflow Durowskie	1498963,968	31852,98432
	Inflow Kobyleckie	1096841,503	9764,16768
06.07.12	Inflow Durowskie	1841792,256	18550,4256
	Outflow Durowskie	1614581,268	34398,53568
	Inflow Kobyleckie	1303568,64	12317,184
07.07.12	Inflow Durowskie	1556668,109	12354,5088
	Outflow Durowskie	1092556,616	27366,54336
	Inflow Kobyleckie	844906,5677	7211,15136

Load (mg/day)				
Date	Nitrate (NO_3 [mg l^{-1}])	Mineral N (mg l^{-1})	Organic N (mg l^{-1})	Total N (mg l^{-1})
02.07.12	nd	1105075,354	1753810,237	2858885,591
	nd	788299,776	2806347,203	3594646,979
	nd	735569,0804	1109674,073	1827415,279
03.07.12	nd	1920607,304	5945235,978	7865843,282
	nd	1630048,666	3004907,674	4634956,339
	nd	1278409,969	3761680,758	5027889,972
04.07.12	nd	1194423,46	2603315,22	3797738,68
	nd	1418909,737	2591923,692	4010833,428
	nd	607371,5405	1485698,734	2093070,275
05.07.12	nd	1300157,153	3075981,558	4376138,711
	nd	1530816,952	3642482,442	5173299,395
	nd	1106605,67	2799061,402	3905667,072
06.07.12	nd	1860342,682	4613755,853	6474098,534
	nd	1648979,804	1515685,478	3164665,283
	nd	1315885,824	3208626,432	4524512,256
07.07.12	nd	1569022,618	4704596,951	6273619,569
	nd	1119923,159	3357664,358	4477587,517
	nd	852117,719	1712648,448	2564766,167