

OBSERVATIONS REGARDING THE VARIATION OF PHYSICAL-CHEMICAL AND BIOLOGICAL CLASSES OF QUALITY OF UZ RIVER

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Key words: *The Uz River, oviation of physical – chemical and biological closes of quality-monitoring*

INTRODUCTION

The hydrographic sub-basin of Uz River belonging to the hydrographic basine of Trotus River is positioned in the SE part of Oriental Carpathians (near its bend).

1. Hydrography

Right affluent of Trotus River, the Uz River springs from The Ciucului Mountains and it is 165 km long. The sub-basin of Uz River is characterized through a large density of hydrographic network. Among the biggest aflents on enumerate: on right part – Bărzăuța (20 km), Izvorul Negru, Tulburea, Basca, Groza, Izvorul Alb (it flows in the accumulation lake "Poiana Uzului"), on left part - Eghersecul, Oregul, Rata, Sovetul, Magherusul, Copuria, while in the lake flows the brooks: Răchitiș 1 and Răchitiș 2, Popu, Chitici, Campului, Boistea.

The Uz River and its affluents carved the relief, contributing strongly to its fragmentation and actual energy. The Uz Valley traversing different hardness geologic formations presents itself as a succession of depression basinetes and sectors with aspect of gorge.

These gorges are accompanied by enormous detritus as can be observed on the versant located between Bărzăuța (right affluent of Uz River), and the waterfall Nasolea Mare (from Uz River) (fig.1). Only at the crossing of the high combs, the Uz valley is narrowing and the longitudinal profile presents a large slope breakdown of 7,2 m/km. Here, on remark a high number of waterfalls and hasties.

The lakes are represented through natural barrage lakes and artificial lakes.

The Balatau Lake, that is situated at 3 km distance is formed as a result of a massive slip of weekly cemented rocks , of 30-40 m thickness, on a slope of 30 degree, barring the river bed Izvorul Negru, in the point named "Rupturile de la Focul lui Ivan".



Fig. 1. The Nasolea Mare waterfall from Uz River

The "Poiana Uzului" accumulation lake is an antropic lake located in the Uz River, at its entrance in the Darmanesti depression. It was constructed with the purpose of alimentation with water and energy production. It has a total volume of 88,0 mil.mc. from which the utile volume is 86,0 mil. mc and a surface at NNR of 335 ha. The lake was created for the alimentation with water and subordinately for hydro energy (fig.2).

The undergrown waters are framed in the macro region of Carpathian orogen. In this arra, the aquatic layers are intensive and relatively rich due to the pretty rich rainfalls, which lead to the existence of a positive hydrographic balance. The underground waters participate in a proportion of 30% to the alimentation of superficial hydrographic network in the mountain area and less in depression.

2. Geographic and geo-morphologic conditions

From geologic point of view, in the Uz basin we can differentiate two areas:

- a) the area of cretacic and Paleocene flis very spread and that occupies the entire montan area;
- b) the neogen area that can be seen in the inferior sector of the valley, respectively the postectonica intramontana Darmanesti depression.



Fig. 2. The Mountains Ciucului and the accumulation lake Poiana Uzului

The relief from the Uz basin presents a complex joining of forms, in which we can meet mountains of moderate and small heights, hills and depression. The highest relief forms are represented by the Nemira Mountains with the picks: Nemira Mare 1648 m, Nemira Tiganca 1626 m, Sandru Mare 1639 m, Osoiul 1553 m, Carunta 1517 m. The orientation of Nemira-Sandru Mare peak on N-S direction has an evident influence over the flow directions of brooks.

The climate of Uz Valley reported to the entire surface of the hydrographic basin of this river allows the observation of many climatic nuances, the major factors that produced this variety being first of all the geographic locations, the complexity of relief and the main components of general circulation of atmosphere. The climate in the West part of Darmanesti city is the one that is specific to the mountains with middle altitude from the Oriental Carpathians, while in the East corresponding to the Darmanesti Depression we can find a depression climate (climate of shelter or thermal inversions). The annual media of air humidity is 76%. In the interior of depression due to the constructions and industry on ascertain lower values of relative humidity 60-70%, while in the mountain unit the values reach to 80-84%. Nebulosity: is influenced by the relief that plays a role of moderator of air and fronts masses. In the

depression, due to the shelter offered by the mountain area, the air has a descendent character, which leads to the clouds. The atmospheric precipitations: the rainfall regime is determined by the geographic position of the region and by the relief thus the annual average quantity has value ranged between 630-1000 mm, appearing net differences between the inferior and superior sector of Uz Valley. For the mountain unit with altitudes until 1500-1600 m the quantity of precipitations registered annually is almost 1000 mm from which 650 mm falls as snow, here the snow layer being maintained for 120-180 days. The vegetation is influenced by the relief, climate, soil and antropic factor. The degree of forestation is high (around 68 %), preponderant in the area being the mix forests. As a result of the complexity of climato-orographic factors the flora is very heterogenic.

The spontaneous flora from the region belongs also to the Central European province with the two sub-provinces:

- the Carpathian sub-province of resinous forests;
- the peri-Carpathic sub-province of foliose forests;

The forests from the sector traversed by Uz from The Oriental Carpathian are populated mainly with mammalians. The most frequent are: buck, bear, wolf, lynx, deer, wild boar, squirrel, wild cat. Among the birds we can find: the mountain cock, blackbird, titmouse, turtle, starling, and woodpecker. Of high interest is the aquatic fauna which include the indigene trout (*Salmo trutta fario*)

MATERIAL AND METHODS

2. The description of control sections from the Uz River

The Uz River was analyzed in 2 control sections (upstream Uz Lake and downstream Uz Lake) utilizing the afferent monitoring programs: S(supervise), P(drinkable), IH(ihtio-fauna) (fig. 3, 4, 5, 6; table 1).

Table 1. The morpho-metric elements of Uz River (after the Atlas of Water Cadastre from Romania -Bucharest 1992)

No	River (affluent)	Lenght km	Cote		Slope River ‰	Coeff. sinuoz.	Surface kmp	Med. height m	Forrests	
			Izv.	Confl					S.kmp	Coef. imp.
1	am.Uz	79	1380	321	13	1.94	1280	970	722	0.56
2	Uz	50	1150	321	17	1.28	469	972	318	0.68

Raul Uz - harta morfologica

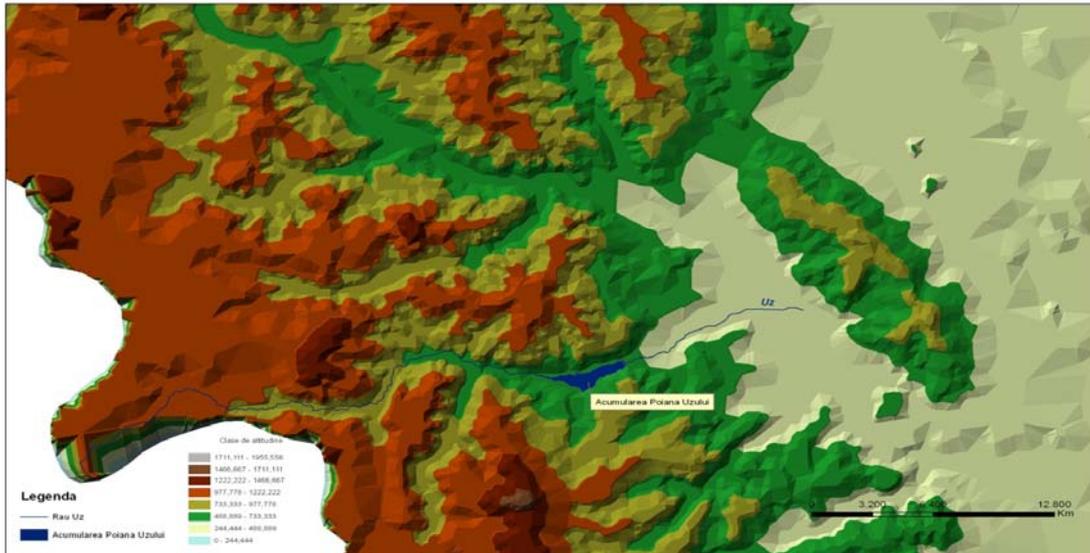


Fig 3. The morphologic map of Uz River sub-basin



Fig. 4. Uz River - upstream Uz Lake

3.1 the upstream section Uz Lake

Geology: siliceous rock
 Surface: 157 km²
 Altitude: 1090 m
 Slope: 19‰
 The average multiannual specific debit Q_m: 1,70 m³/s
 The average monthly specific debit minimum annual with assurance 95% Q_{95%}: 0,36 m³/s
 The structure of river bed: stone, gravel, sand



Fig. 5. Uz River - downstream Uz Lake

3.2 downstream section Uz Lake

Geology: siliceous rock
 Surface: 421 km²
 Altitude: 1026 m
 Slope: 17‰
 The average multiannual specific debit Q_m: 1,70 m³/s
 The average monthly specific debit minimum annual with assurance 95% Q_{95%}: 0,44 m³/s
 The structure of river bed: stone, gravel, sand

Table 2. Framing of quality classes after the saprob index

Value indices saprob	Zone saprob	Impurification	Class	Ecologic status
<1,5	Oligosaprob	Absent	I	Very good
1,5 < 1,8	Oligo-beta-mezosaprob	Poor		
1,8 < 2,3	Beta-mezosaprob	Moderate	II	Good
2,3 < 2,7	Beto-alfa mezosaprob	Moderate till critical	III	Moderate
2,7 < 3,2	Alfa mezosaprob	Strong	IV	Poor
3,2 < 3,5	Alfa polisaprob	Strong till very strong	V	Degraded

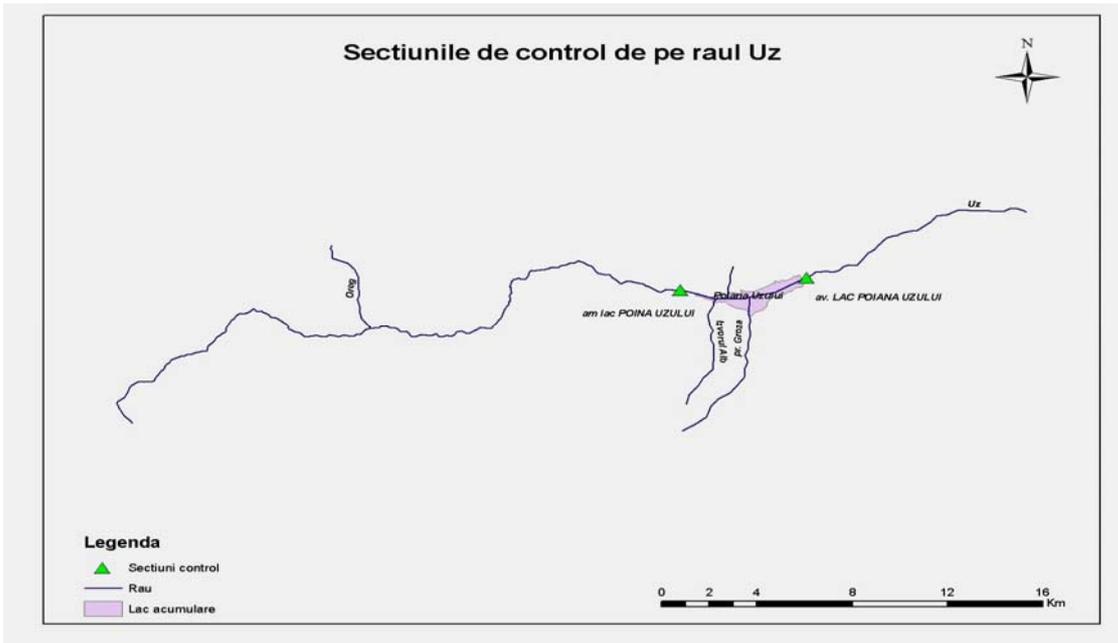


Fig. 6. Monitoring sections from Uz River

RESULTS

A. Biological characterisation

The biologic analysis establish the type of saprobic zone, respectively the intensity of organic charge of water, in function with the particularities of biocenosis, to each zone being specific – along with a certain chimism – a certain specific component, the abundance of species, quantitative ratio between these species, bio-indicators for the organic charger of water.

During 2005 – 2007 we accomplish a number of 14 samplings of bentic macro-invertebrates from the 2 control points (upstream Uz Lake and downstream Uz Lake) thus:

- in 2005 we took 2 probes in trimesters 2 and 3 (June and September)
- in 2006 we took 2 probes in trimesters 2 and 3
- in 2007 we took 3 probes in trimesters 2, 3 and 4 but available dates are only for the trimester 2 in May.

$$S = \frac{\sum (s_i * h_i)}{\sum h}$$

where:

s = the numeric value that is characteristic for the affiliation to the saprob zone

h = the organism frequency

i = taxon

$\sum (s_i * h_i)$ = the sum of products from the numeric value and the frequency for each taxon

$\sum h$ = the sum of frequencies of identified taxons

The probes were sampled with Suber draga. The sampling is the quantitative type, while the probe is composed from all types of substrate from the respective region. (we took at least one draga and after that we mixed all the sub-probes resulting a single probe). We harvest between 4 and 8 draga depending on the substrate and the material was conserved in formalin 4%.

The material was partially sorted out in the field and totally in the laboratory where it was also analyzed. After sorting, the material was conserved in alcohol 70%.

The determination of material was accomplished in medium with alcohol and glycerin.

For the evaluation of ecological status of rivers we employed the Pantle and Buck method. This method is agreed by many countries situated in the Danube space. We utilized the bio-indicator forms cited in the specialty literature both from our country and abroad. The saprob index (S) was calculated (estimated) after the following formula:

The establishment of quality status of surface water (physico-chemical, biological and bacteriological) was accomplished according with

The Direction 161/2006 of classification on five classes of quality (as it is illustrated in table 2).

Table 3. The average value of saprob index in the control sections

Control sections	2005		2006		2007		
	22.06	30.08	22.06	24.08	18.03	20.07	3.09
Upstream Poiana Uzului Lake	1,48	1,4	1,2	1,47	1,5	1,51	1,48
Downstream Poiana uzului Lake	1,5	-	1,67	1,29	1,45	1,23	1,37

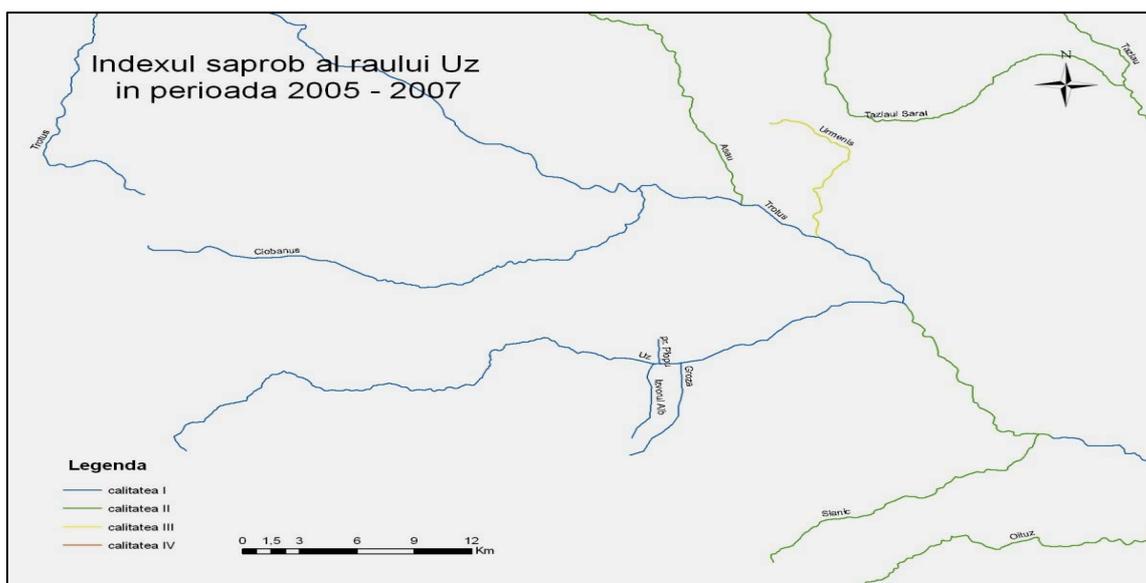


Fig. 7. The saprob index of Uz River (2005-2007)

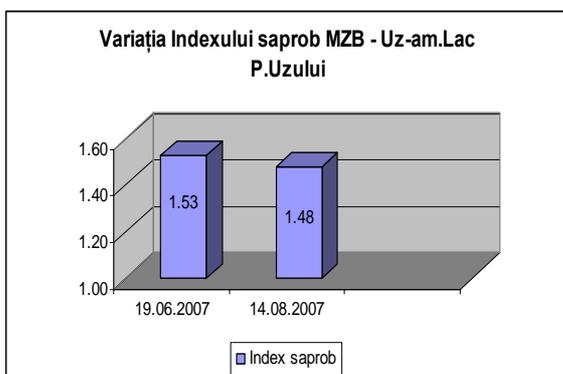


Fig. 8. The biologic quality of Uz River water (2005-2007)

The river water in the two control sections, upstream Poiana Uzului River and downstream Poiana Uzului River is framing in the I class of quality, with an average saprob index $S=1,4$, being weakly unpurified and having a very good ecologic estate. The ecologic status of water was maintained at very good levels during the entire period of study (2005-2007).

We mention that in the trimester III from 2005 year, we couldn't calculate the saprob index due to the fact that the zoobentos was not representative, the sampling of probes was

accomplished after the period in which the flooding produced significant modifications in the substrate structure and implicit in the structure of bental biocenosis from the respective section.

Conclusions: In the upstream of Poiana Uzului Lake, the waters of Uz River proved to be in a very good ecological state (table 3; fig. 7, 8).

B. Physico-chemical characterization

From physico-chemical point of view the following parameters were analyzed:

- physical parameters: temperature, pH and material in suspension
- chemical parameters: the oxygen regime, nutrients, salts and toxic pollutants with natural origin.

We sampled 4 annual companies for probe collection, one for each trimester.

As a result of the physico-chemical analyses accomplished in the DAS Bacau laboratory, the values obtained in the three years of study are presented in the following tables and

they represent the average arithmetic values on the 4 champagnes accomplished in the control sections: upstream Poiana Uzului Lake and downstream Poiana Uzului Lake.

a. In 2005 year – section Uz upstream Poiana Uzului Lake((program S,P,IH)

The upstream section of Poiana Uzului Lake was analyzed based on the programs: supervision, supervising, drinkable and ichtyofauna.

Chemical parameters						
N total	N-NO3 (mgN/l)	N-NO2 (mg N/l)	N-NH4 (mg N/l)	P total (mg P/l)	P-PO4 ((mg P/l)	Class cal.
	0,616	0,005	0,196	0,057		I

Salinity							
Filterable residuum dried at 105 °C	Chlorines (Cl) mg/l	Sulfates (SO42+) mg/l	Calcium (Ca2+)mg/l	Magnesium (Mg2+) mg/l	Sodium (Na+) mg/l	Bicarbonates	Class cal.
139	3,2	25,3	35,2	6,6	5	88,4	I

Specific toxic pollutants with natural origin		
Fe total (mg/l)	Mn (mg/l)	Class cal.
0,28	0,007	I

In the section upstream Poiana Uzului Lake the waters were classified in the first class of quality for all the groups of indicators. In what concern the oxygen regime the minimum value is framing in the limits of second category.

As a drinkable source Uz River can be classified, for the upstream section Poiana Uzului Lake in the quality class A2 (cf. HG 100/2002).

In what concern the group of risky/priority risky substances, after finishing the laboratory

analyses at D.A.S. Bacau laboratory we can underline the lack of investigated substances SP-MO group (cf. H.G. 351/2005).

b. In 2005 year – Uz section downstream Poiana Uzului Lake (program S,P, IH,CAMP) (fig.9).

The section downstream Poiana Uzului Lake was analyzed based on the programs: supervision, supervising, drinkable and ichtyofauna and antropic factor.

Physical parameters 2005			Oxygen regime				
Temp	pH	MTS	O Dizolv (mg O/l)	CBO5 (mg O/l)	CCOCr (mg O/l)	CCOMn (mg O/l)	Class cal.
10,3	7,3	24,2	10,15	1,65	5,74	8	II

Chemical parameters						
N total	N-NO3 (mgN/l)	N-NO2 (mg N/l)	N-NH4 (mg N/l)	P total (mg P/l)	P-PO4 ((mg P/l)	Class cal.
	0,6	0,01	0,191	0,087		II

Salinity							
Filterable residuum dried at 105 °C	Chlorines (Cl) mg/l	Sulfates (SO42+) mg/l	Calcium (Ca2+) mg/l	Magnesium (Mg2+) mg/l	Sodium (Na+) mg/l	Bicarbonates	Class cal.
122,8	3	26,7	34,5	2,9	11	90	I

Specific toxic pollutants with natural origin		
Fe total (mg/l)	Mn (mg/l)	Class cal.
0,32	0,002	II

Physical parameters 2005			Oxygen regime				
Temp	pH	MTS	O Dizolv (mg O/l)	CBO5 (mg O/l)	CCOCr (mg O/l)	CCOMn (mg O/l)	Class cal.
12	7,7	33	10,3	1,72	8,73	5,21	II

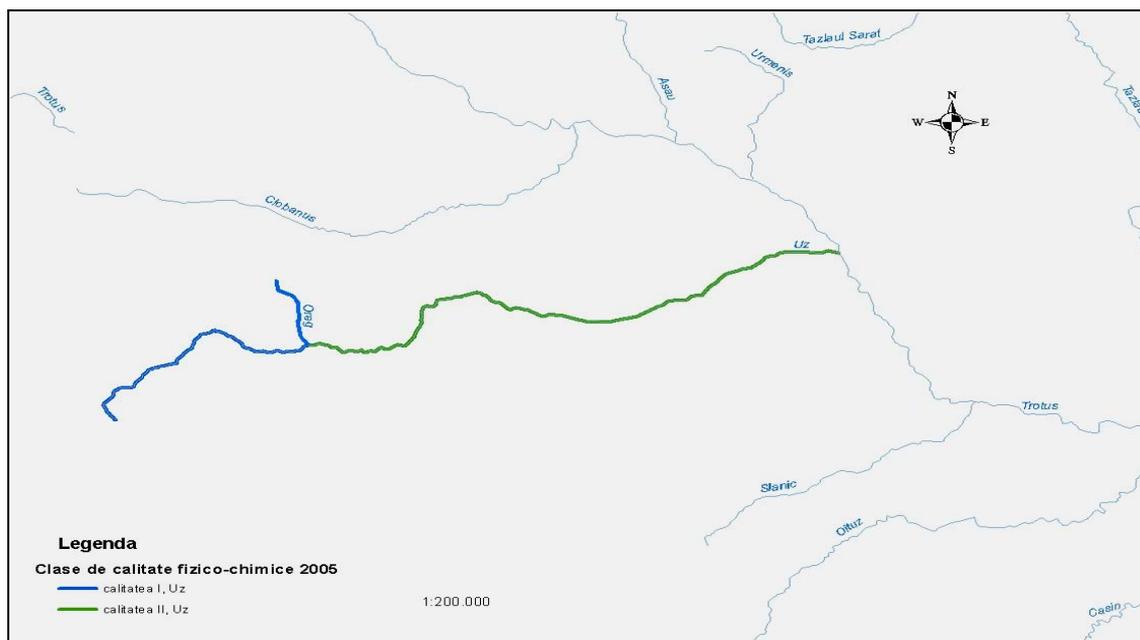


Fig. 9. The physico-chemical quality classes on Uz River in 2005 year

The control section is framing in the second class of quality at the following groups of indicators: oxygen regime, chemical parameters and specific pollutants (the total iron registered exceeding). As a drinkable source The Uz River could be framed in the section downstream Poiana Uzului Lake in the quality class A2 (cf. HG 100/2002).

c. In 2006 year – upstream Uz section Poiana Uzului Lake (program S,P,IH)

The upstream section of Poiana Uzului Lake was analyzed based on the programs: supervision, supervising, drinkable and ichtyofauna.

Physical parameters 2005			Oxygen regime					Class cal.
Temp	pH	MTS	O Dizolv (mg O/l)	CBO5 (mg O/l)	CCOCr (mg O/l)	CCOMn (mg O/l)		
14	8	12,3	9,5	1,65	7,85	4,76	I	

Chemical parameters							Class cal.
N total	N-NO3 (mgN/l)	N-NO2 (mg N/l)	N-NH4 (mg N/l)	P total (mg P/l)	P-PO4 ((mg P/l)		
0,77	0,55	0,007	0,11	0,04	0,042	I	

Salinity							
Filterable residuum dried at 105 °C	Chlorines (Cl-) mg/l	Sulfates (SO42+) mg/l	Calcium (Ca2+) mg/l	Magnesium (Mg2+) mg/l	Sodium (Na+) mg/l	Bicarbonates	Class cal.
112	3,5	24,1	30,3	5	8,5	155,5	I

Specific toxic pollutants with natural origin			Class cal.
Fe total (mg/l)	Mn (mg/l)		
0,32			II

In 2006 year, upstream section of Poiana Uzului Lake the waters framed in the first classes of quality at all the groups of indicators. In what concern the group of toxic pollutants, the value of total iron is in the limits of second category.

As drinkable source Uz River, in the upstream section of Poiana Uzului Lake, can be classified in the quality class A2 (cf. HG 100/2002).

In what concern the group of risky/priority risky substances, after finishing the laboratory analyses at D.A.S. Bacau laboratory we can underline the lack of investigated substances SP-MO group.

d. In 2006 year – Uz downstream section, Poiana Uzului Lake (program S,P, IH,CAMP) (fig. 10).

The section downstream Poiana Uzului Lake was analyzed based on the programs: supervision, supervising, drinkable, ichtyofauna and antropic factor.

Physical parameters 2006			Oxygen regime				
Temp	pH	MTS	O Dizolv (mg O/l)	CBO5 (mg O/l)	CCOCr (mg O/l)	CCOMn (mg O/l)	Class cal.
10,8	7,8	15,8	9,45	2,18	9,33	5,52	I

Chemical parameters						
N total	N-NO3 (mgN/l)	N-NO2 (mg N/l)	N-NH4 (mg N/l)	P total (mg P/l)	P-PO4 ((mg P/l)	Class cal.
0,905	0,69	0,008	0,201	0,06	0,07	I

Salinity							
Filterable residuum dried at 105 °C	Chlorine (Cl) mg/l	Sulfates (SO42+)mg/l	Calcium (Ca2+) mg/l	Magnesium (Mg2+) mg/l	Sodium (Na+) mg/l	Bicarbonates	Class cal.
114	6,1	14	31,4	6,5	3,5	91,5	I

Specific toxic pollutants with natural origin		
Fe total (mg/l)	Mn (mg/l)	Class cal.
0,32		II

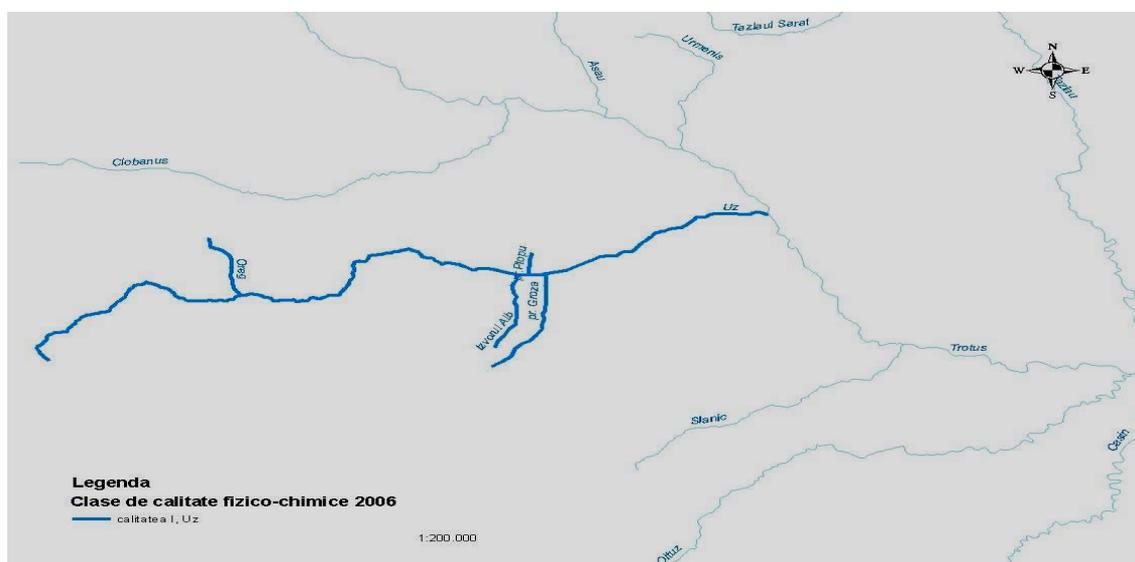


Fig. 10. The physico-chemical classes of quality on Uz River in 2006 year

This control section analyzed in 2006 year framed in the first class of quality for all the groups of indicators, with the exception of specific toxic pollutants where we registered exceeding at the total iron amount. As drinkable source Uz River, the section downstream of Poiana Uzului Lake can be classified in the quality class A2.

e. In 2007 year – Uz section upstream Poiana Uzului Lake (program S,P,IH) (fig. 11).

The upstream section of Poiana Uzului Lake was analysed based on the programs: supervision, supervising, drinkable and ichtyofauna.

Physical parameters 2007			Oxygen regime				
Temp	pH	MTS	O Dizolv (mg O/l)	CBO5 (mg O/l)	CCOCr (mg O/l)	CCOMn (mg O/l)	Class cal.
12,8	7,9	49,7	9,5	1,88	8,65	5,22	I

Chemical parameters						
N total	N-NO3 (mgN/l)	N-NO2 (mg N/l)	N-NH4 (mg N/l)	P total (mg P/l)	P-PO4 ((mg P/l)	Class cal.
0,64	0,623	0,005	0	0,035	0,06	I

Salinity							
Filterable residuum dried at 105 °C	Chlorines (Cl) mg/l	Sulfates (SO42+) mg/l	Calcium (Ca2+) mg/l	Magnesium (Mg2+) mg/l	Sodium (Na+) mg/l	Bicarbonates	Class cal.
145,5	3,9	16,8	34,8	5,3	5,8	111,2	I

Specific toxic pollutants with natural origin		
Fe total (mg/l)	Mn (mg/l)	Clasa cal.
0,12		I

This control section analyzed in 2007 year according with the monitoring program is framed in the first class at all the indicator groups. As drinkable source Uz River, the section downstream of Poiana Uzului Lake can be classified in the quality class A2.

f. In 2007 year – Uz section downstream Poiana Uzului Lake (program S,P, IH,CAMP)

The section downstream Poiana Uzului Lake was analyzed based on the programs: supervision, supervising, drinkable, ichtyofauna and antropic factor.

Physical parameters 2007			Oxygen regime				
Temp	pH	MTS	O Dizolv (mg O/l)	CBO5 (mg O/l)	CCOCr (mg O/l)	CCOMn(mg O/l)	Class cal.
13,8	7,5	21,3	9,74	1,65	7,7	5,27	I

Chemical parameters						
N total	N-NO3 (mgN/l)	N-NO2 (mg N/l)	N-NH4 (mg N/l)	P total (mg P/l)	P-PO4 ((mg P/l)	Class cal.
0,45	0,667	0,005	0,011	0,025	0,024	I

Salinity							
Filterable residuum dried at 105 °C	Chlorine (Cl-) mg/l	Sulfates (SO42+) mg/l	Calcium (Ca2+) mg/l	Magnesium (Mg2+) mg/l	Sodium (Na+) mg/l	Bicarbonates	Class cal.
135,3	3,3	20,7	33,3	4,3	6,3	97,6	I

Specific toxic pollutants with natural origin		
Fe total (mg/l)	Mn (mg/l)	Class cal.
0,10		I

Also in this control section analyzed in 2007 year according with the monitoring program, framed in the first class of quality at the all groups of indicators. As drinkable source Uz

River, the section downstream of Poiana Uzului Lake can be classified in the quality class A2 (table 4).



Fig. 10. The physico-chemical quality classes on Uz River in 2007 year

Table 4. The status of water from the accumulation lake Poiana Uzului in 2007 year (acc. with Dir. 161/2006)

The quality state of lake waters from the hydrographic basin Trotus in 2007 year												
No	Lake	Section	Water course	V total/ V utile (mil. mc)	Time of retention (days)	Overlapping chem. indic. mg/l	Indicators of trophic degree				Quality categories	
							Chemical		Biological		Chemical	Ecological
							Dissolved oxyg (%)	N total (mg/l)	P total (mg/)	Bm. Phytopl. (mg/l)		
	Poiana Uzului	Barrage Lake end	Uz	90,0/88,0	243	-	9,9	0,7	0,01	2,97	Category I	Oligotrofe
							9	1,5	0,015	3		

Thus, the Poiana Uzului Lake is characterized as a mountain lake is “oligotrofe” (at total phosphor) and “mezotrofe” (after minimum nitrogen) and this represents its natural potential of quality.

From the analysis of quality indexes regarding the water quality in Uz accumulation lake, we can conclude that its water can be framed, both from chemical and ecologic point of view, in the best quality class and it is suitable to be used for the alimentation with water of population.

CONCLUSIONS

The Uz River in upstream section can be categorized as being in a very good ecologic stage, both from biologic and physico-chemical point of view.

In this section the Uz River waters have a low degree of pollution, keeping in mind that in the upstream of accumulation lake Poiana Uzului, there are no sources of antropic pollution and no sources of natural pollution.

We must underline the fact that Uz River has a torrential flow regime, due to the abrupt slopes of flowing because of the mountains situated on each side of the river.

At the present, upstream of Poiana Uzului Lake there are no significant hydro-morphologic alterations, thus the migration of fish population in the area is not influenced, the circulation of fish realizing naturally.

The deforestation in the area doesn't have an advanced character, fulfilling the natural conditions, without significant antropic influences.

The situation in the downstream sector of Poiana Uzului Lake is different comparing with the upstream area.

Here the fish fauna presents different degrees of influences due to the hydro-morphologic modifications, having a character that is strongly modified because of the accumulations from Poiana Uzului.

Still, from our observations accomplished during 2005-2007 we concluded that both from biologic and physico-chemical point of view the aquatic ecosystem are not significantly changed. As a result, the section downstream The Poiana Uzului Lake is characterized as being in a very good ecologic estate.

Still, in the conditions imposed by the Frame Directive regarding Water 60/2000 EC, the section located between upstream and downstream the Poiana Uzului Lake, from hydro-morphologic point of view, this range represent a water sector strongly modified.

ABSTRACT

The river Uz is one of the main affluent of Trotus River and especially of the superior basin of Trotus river. On this range on find the accumulation Poiana Uzului, an accumulation lake utilized for the alimentation with water of cities Bacau, Darmanesti, Comanesti, Tg Ocna and other.

In the same time in the hydrographic basin of Uz River on find different protected areas, for example scientific reservations with local importance (Bolatau Lake or Izvorul Alb), or protected areas from Nature 2000 network, the site with communitary importance Creasta Nemirei.

As a result of studies accomplished during many years the entire Uz River can be classified as being in a very good ecological state, both from biological and physical-chemical point of view, with a low pollution degree.

In the section upstream of Poiana Uzului Lake the waters of Uz Piver have a very low degree of pollution due to the fact that in the upstream area of poiana Uzului accumulation lake there are nor antropic sources of pollution or natural sources of pollution.

The section downstream of Poiana Uzului Lake, due to the hydro-morphogical alterations due to the presence of the accumulation lake, that impress a strongly modified character, on observed that the aquatic ecosystem is not significantly changed. Thus on conclude that the downstream section can also be classified as being in a very good ecological state.

Still in the conditions imposed by the Cadre Directive regarding the Water 60/2000 EC, the area situated between the sections upstream and downstream of Poiana Uzului Lake, from hydro-morphological point of view, represents a sector of water strongly modified.

REFERENCES

1. C.N.A Institutul de Cercetări și Proiectări pentru Gospodărirea Apelor, București
2. MALACEA I., 1969 – Biologia apelor impurificate, Editura Academiei Române
3. * * (1984) – Îndrumar metodologic pentru urmarirea evoluției calității apelor, prin intermediul analizelor biologice –
4. * * Directiva Cadru a Apelor – UE 60/2000
5. * * Sinteza anuala – privind protectia calitatii apelor in bazinul hidrografic Siret

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