ORIGINAL PAPER

EVALUATION OF POTOP RIVER QUALITY
I. PRELIMINARY INVESTIGATION AND RISK ASSESSMENT OF POLLUTED DEGREE

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Abstract. *The Potop River quality parameters, which arose from the Piedmont Cândeşti, Dambovita county, were analysed by analitycal technique. The evolution of electrical conductivity σ (µS), Total Dissolved Solids (TDS), salinity and pH variation of water samples collected from different zone of Potop River were investigated on the period March 2010 – April 2010. During on the monitoring period the recorded values of chemical and physical parameters indicates a tendency to maintain constant the water quality parameters in the same collection points of the Potop River.*

Keywords: *quality parameter, TDS, Potop River, pollution.*

1. INTRODUCTION

Environmental pollution is an important problem both in developed and developing countries. Many factors such as population growth, industrialization and urbanization invariably led to the increasing occurrence of pollution on the planet. One of the problems of water pollution results from interactions between water and contaminated soil, as well as from deposition of air contaminants (e.g. acid rain). It is very important to mention synergistic effects of pollutants on the surface water. While interacting with each other, pollutants can produce greater impacts than when acting individually. Water quality criteria for the protection of aquatic life may take into account only physicochemical parameters which tend to define a water quality that protects and maintains aquatic life.

Many studies [1-8] admit that water quality criteria have been widely established for a number of traditional water quality variables such as pH, total dissolved solids, dissolved oxygen, biochemical oxygen demand for periods of five or seven days (BOD_5 and BOD_7), chemical oxygen demand (COD) and nutrients. Such criteria guide decision makers, especially in countries with rivers affected by severe organic pollution, in the establishment of control strategies to decrease the potential for oxygen depletion and the resultant low BOD and COD levels. The TDS describes all solids (usually mineral salts) that are dissolved in water. The TDS and the electrical conductivity are in a close connection. The more salts are

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dissolved in the natural water, and the higher is the value of the electric conductivity. The majority of solids, which remain in the water after a sand filter, are dissolved ions. Most of the times in natural water samples, the Total Dissolved Solids (TDS) usually is correlated well with total hardness (expressed as total [Ca^{2+}] + [Mg^{2+}]), which is a useful parameter for evaluating the softening need as well as the corrosiveness of water. A high level of TDS is an indicator of potential concerns, and warrants further investigation. Most often, high levels of TDS are caused by the presence of potassium, chlorides and sodium. These ions have little or no short-term effects, but toxic ions (lead arsenic, cadmium, nitrate and others) may be dissolved in the water as well.

This paper aims to analyze the Potop River quality parameters, which arose from the Piedmont Cândeşti, Dambovita County. The selected area is affected by oil scaffolding work from SC Petrom Group deposits Strâmbu-Cobia-Leordeni-Ludeşti: Ilfov, Cobia, Saru, Strâmbu.

2. EXPERIMENTAL

Representative water samples had collected in order to be able to take into account the presence of suspended particles, both at point of collection, and beyond, in the sample preparation in laboratory. The sampling procedure was achieved during of March and April from 22 well-established points (Table 1 and Fig. 1), within a week.

Table 1. The collected points for water samples.

No	Latitude N (°)	Longitude E (°)	Altitude (m)	Locality
1.	44.97444	25.19909	356	Scheiu de Sus - Gura Ursului/punte
2.	44.97169	25.19997	366	Scheiu de Sus - Bridge /Valea Prodilei
3.	44.96606	25.19782	356	Scheiu de Sus - Bridge /Baleanca
4.	44.95376	25.19212	340	Scheiu de Sus - Bridge /Ţarina
5.	44.95268	25.19143	338	Scheiu de Sus - (V. Banului)
6.	44.94884	25.19311	335	Scheiu de Sus - limit
7.	44.93629	25.19630	319	Scheiu de Jos - Street
8.	44.92475	25.20514	314	Scheiu de Jos - Bridge (Valea Ostrii)
9.	44.91818	25.20381	297	Scheiu de Jos – Forest Road
10.	44.91084	25.21411	297	Scheiu de Jos – Forestry Canton
11.	44.91153	25.21626	313	Scheiu de Jos - Bridge Valea Hotarului
12.	44.89463	25.22426	284	Teleşti - Church
13.	44.87657	25.23918	264	Teleşti - Park Oil (Potocelu)
14.	44.87685	25.23678	271	Teleşti - Road Miloşari
15.	44.86076	25.23957	255	Limita Ludeşti-Hulubeşti
16.	44.85735	25.24390	247	Hulubeşti (V. Bisericii)
17.	44.84375	25.24807	246	Hulubeşti School
18.	44.82443	25.24510	242	Hulubeşti Bridge Măgura
19.	44.82992	25.25398	245	Hulubeşti Bridge Vărzari Water Station
20.	44.82046	25.25037	239	Hulubeşti Bridge DJ
21.	44.83101	25.25899	248	Hulubeşti (Butoiu de Jos)
22.	44.80595	25.25409	220	Valea Mare Bridge Gârleni

The collection and storage of samples was made in sterile high-density polyethylene bottles, and analysis was carried out immediately after sampling. Most contaminants in water are inorganic salts which are in dissolved state. Thus, TDS parameter has relevant. Usually, TDS is correlated well with total hardness (expressed as total [Ca2+] + [Mg2+]), which is a useful parameter for evaluating the softening need as well as the corrosiveness of water.

The method most commonly used for the analysis of TDS in water is the measurement of specific conductivity with a conductivity probe that detects the presence of ions in water. Conductivity measurements are converted to TDS values by a factor that varies with the type of water.

The pH was performed with a pH meter WTW 720 at room temperature. Determination of wastewater parameters (electrical conductivity, salinity and total dissolved solid) was achieved by using a portable HACH CO150 Conductivity - conductometric cell with platinum electrodes. Conductivity/TDS meter was calibrated with 0.001M KCl to give a value of 14.7µS/m at 25ºC. Turbidity was performed with a Turb-550 apparatus, in accordance with SR EN ISO 7027:2001. The samples were thoroughly rinsed with distilled water after each measurement. Levels of turbidity and total suspended solid of the wastewater samples were determined using standard procedures.

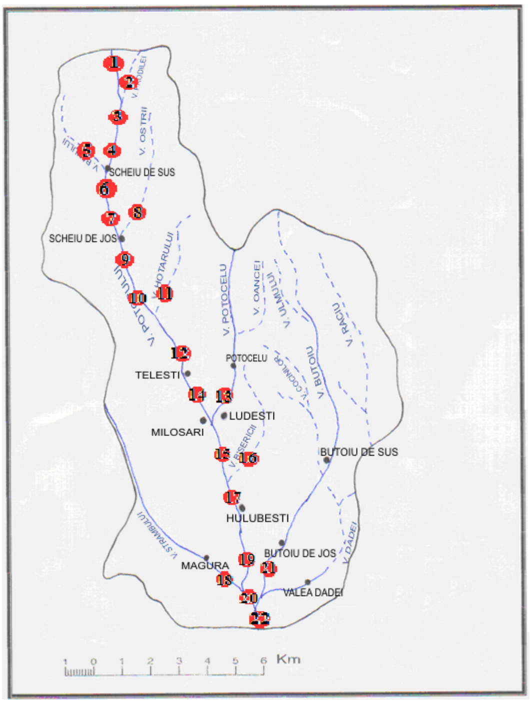

Fig. 1. The 22 well-established points of Potop River, Dambovita County.

3. RESULTS AND DISCUSSION

The results obtained by analytical techniques were presented in Tables 2-5, Figs. 2-5. The increase of electrical conductivity (Table 1 and Fig. 1) was observed from upstream to downstream of the Potop River. A significant deviation of conductivity is observed on the collected point of Magura creek, which is caused by the discharge of salted water from nearby of oil field.

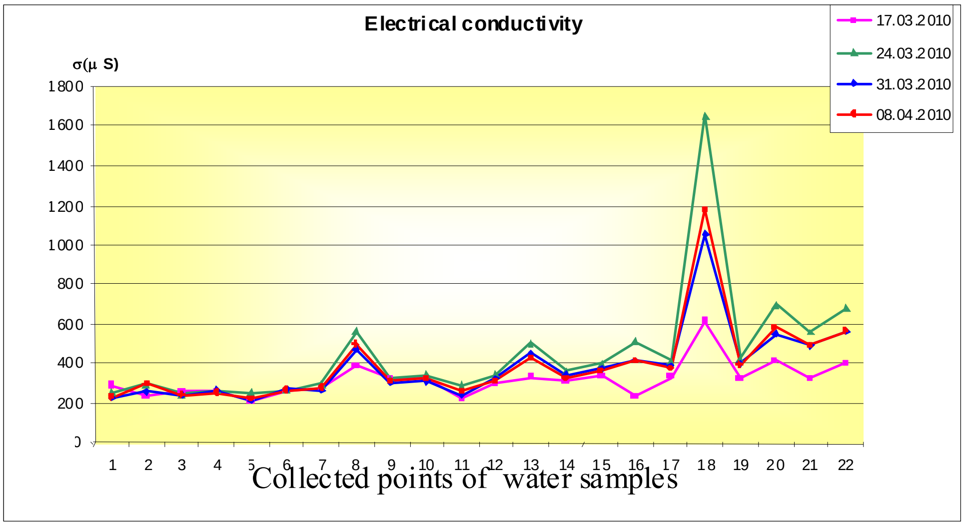

Fig. 2. Electrical conductivity in the first week of monitoring.

Table 2. Conductivity of samples collected from Potop River.

Sample	**Conductivity, σ[μS]**			
	March17, 2010	March 24, 2010	March 31, 2010	April 8, 2010
1	293	255	230	229
2	238	295	261	301
3	260	252	244	246
4	264	267	266	256
5	211	253	210	224
6	260	270	273	269
7	275	298	266	277
8	390	565	475	498
9	320	325	305	319
10	324	346	308	330
11	222	292	242	262
12	299	348	327	311
13	336	505	455	429
14	318	366	346	327
15	339	399	374	363
16	238	511	418	411
17	332	413	388	376
18	616	1656	1051	1176
19	328	425	404	393
20	421	698	555	581
21	324	559	494	493
22	404	681	568	568

In Figs. 3-6 was represented the distribution maps that include the electrical conductivity measured in every week on the collected points of Potop River.

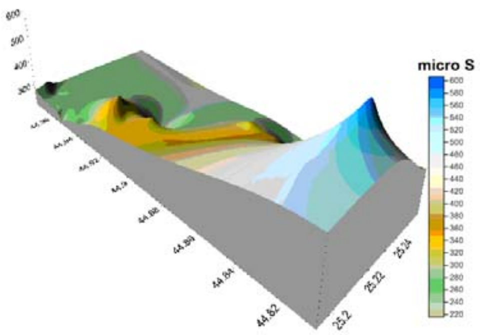

Fig. 3. Evolution of electrical conductivity values in the first week of monitoring.

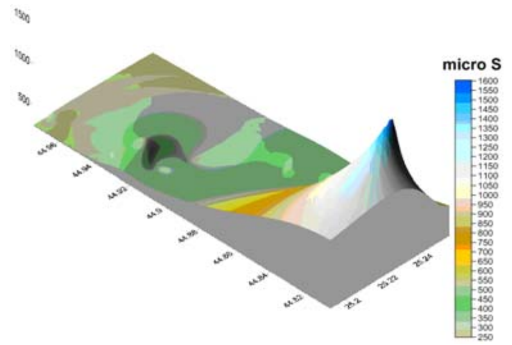

Fig. 4. Evolution of electrical conductivity values in the second week of monitoring.

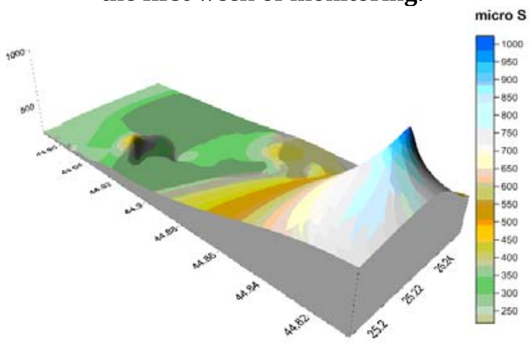

Fig. 5. Evolution of electrical conductivity values in the third week of monitoring.

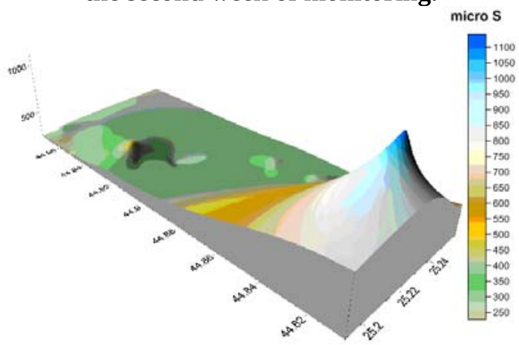

Fig. 6. Evolution of electrical conductivity values in the fourth week of monitoring.

Table 3. Total dissolved solid in collected samples.

Sample	TDS [mg/L]			
	March17, 2010	March 24, 2010	March 31, 2010	April 8, 2010
1	140	121	109	110
2	114	142	124	142
3	124	119	116	117
4	125	129	127	123
5	101	120	100	106
6	123	129	130	128
7	131	143	127	133
8	188	269	226	239
9	154	155	145	151
10	152	166	148	156
11	106	140	114	124
12	143	168	155	158
13	162	242	218	204
14	153	176	164	155
15	150	191	172	174
16	112	244	201	195
17	159	198	184	179
18	295	810	506	572
19	157	204	133	188
20	201	336	265	278
21	154	269	236	236
22	193	326	272	272

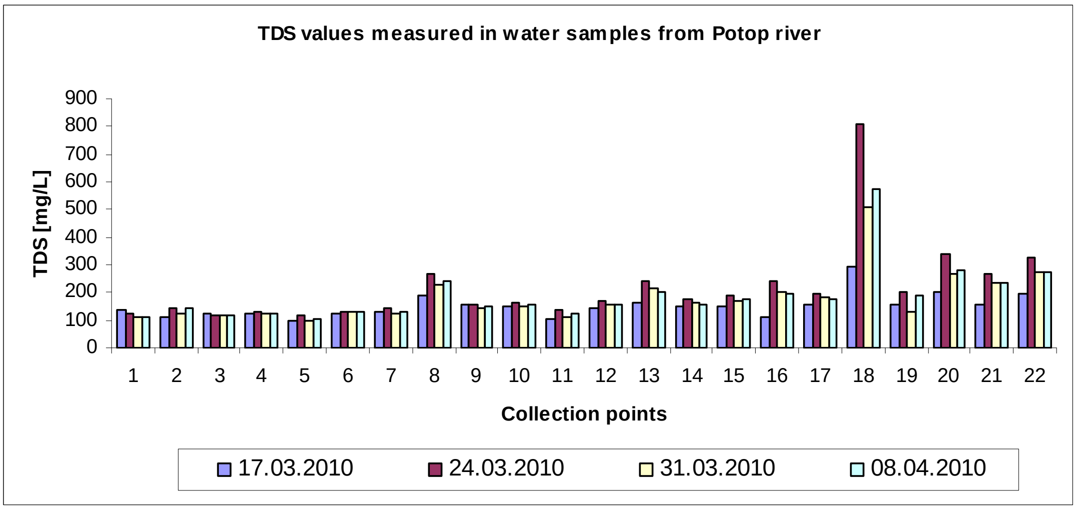

Fig. 7. TDS values distribution in water samples.

Figs. 8-11 present the distribution maps of TDS values from Potop River in four weeks of TDS monitoring.

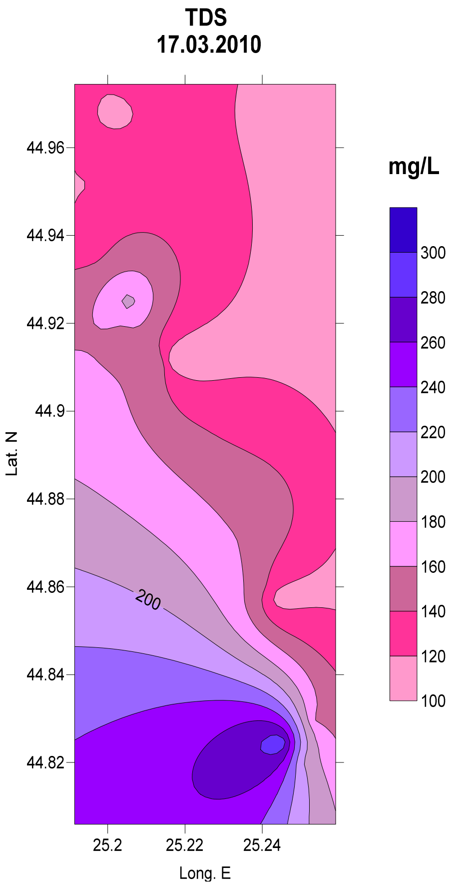

Fig. 8. TDS map in the first week.

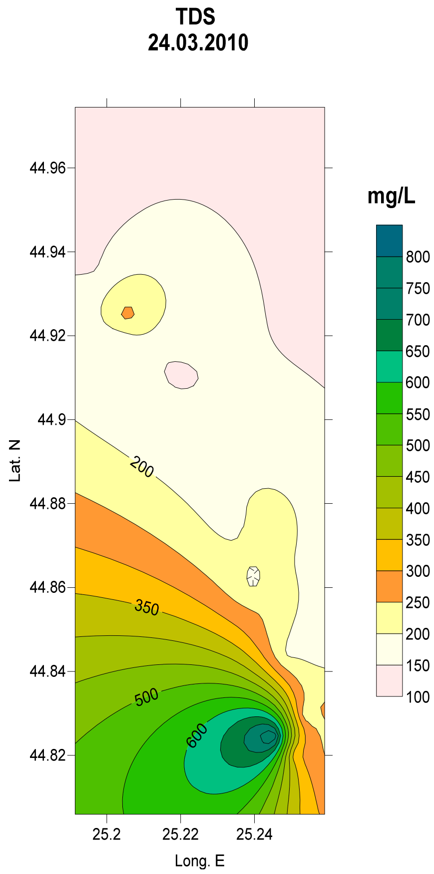

Fig. 9. TDS map in the second week.

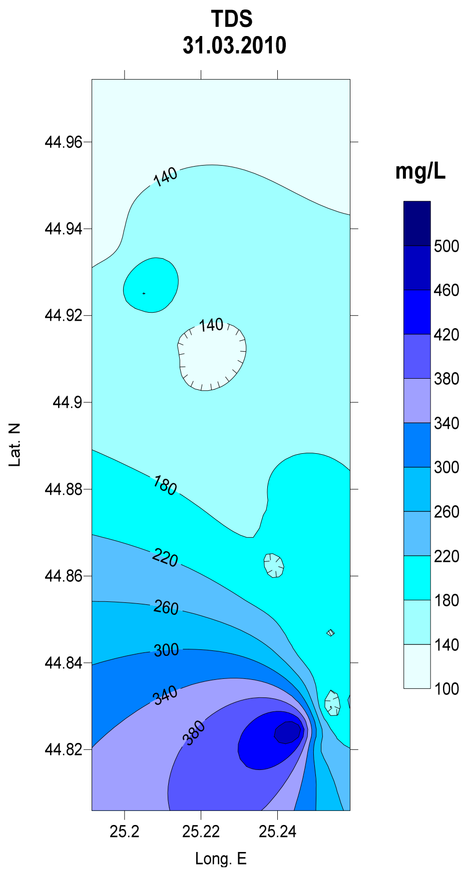

Fig. 10. TDS map in the third week.

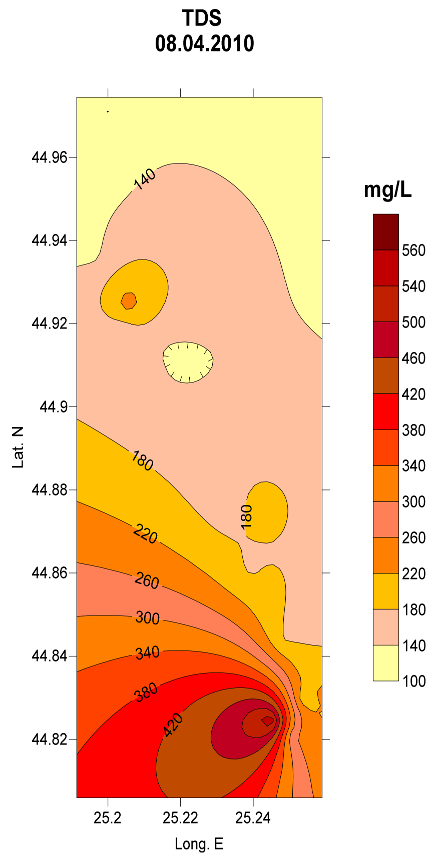

Fig. 11. TDS map in the fourth week.

Values recorded during the monitoring period are close with one exception at the Magura Creek collected point. On 24 March 2010 were achieved maximum values for this parameter in the monitoring period.

Salinity not change during the monitoring period, the small values with a slight increase from upstream to downstream were observed. The exception is the same point in the Magura (Table 4 and Fig. 12).

Table 4. Salinity results of samples.

Sample	Salinity, S[‰]			
	17.03.2010	24.03.2010	31.03.2010	08.04.2010
1	0,10	0,10	0,10	0,10
2	0,10	0,10	0,10	0,10
3	0,10	0,10	0,10	0,10
4	0,10	0,10	0,10	0,10
5	0,10	0,10	0,10	0,10
6	0,10	0,10	0,10	0,10
7	0,10	0,10	0,10	0,10
8	0,20	0,30	0,20	0,20
9	0,10	0,20	0,10	0,10
10	0,20	0,20	0,10	0,20
11	0,10	0,10	0,10	0,10
12	0,10	0,20	0,20	0,20
13	0,20	0,20	0,20	0,20
14	0,10	0,20	0,20	0,20
15	0,10	0,20	0,20	0,20

Sample	Salinity, S[‰]			
	17.03.2010	24.03.2010	31.03.2010	08.04.2010
16	0,10	0,20	0,20	0,20
17	0,20	0,20	0,20	0,20
18	0,30	0,80	0,50	0,60
19	0,20	0,20	0,20	0,20
20	0,20	0,30	0,30	0,30
21	0,20	0,30	0,20	0,20
22	0,10	0,10	0,10	0,10

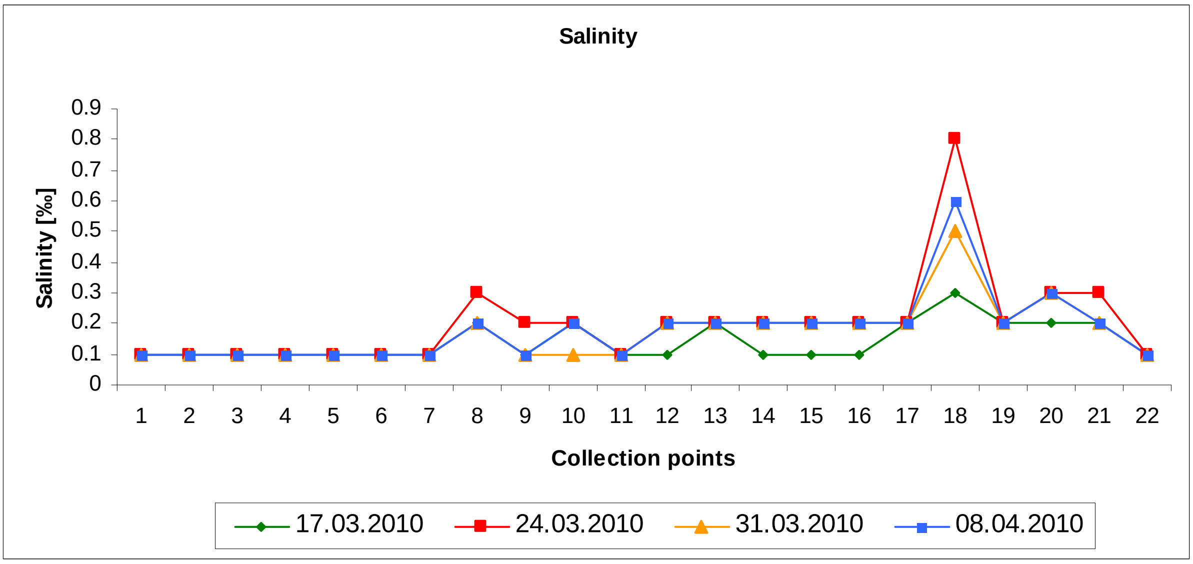

Fig. 12. Salinity variation of samples.

For all water samples was measured pH as well, and the obtained values are presented in Table 4.5. Fig. 13 shows the evolution of pH during of the monitoring period. The results emphasize alkaline character of water throughout the course. Values have not a significant development, the limits of pH being between 7 and 8.

Table 5. pH results of samples.

Sample	pH			
	17.03.2010	24.03.2010	31.03.2010	08.04.2010
1	7,674	7,655	7,560	7,318
2	7,780	7,712	7,711	7,537
3	7,711	7,703	7,636	7,641
4	7,735	7,763	7,708	7,711
5	7,804	7,666	7,503	7,759
6	7,760	7,660	7,691	7,695
7	7,752	7,713	7,761	7,757
8	7,873	7,889	7,962	7,952
9	7,755	7,799	7,777	7,842
10	7,700	7,820	7,790	7,804
11	7,852	7,807	7,776	7,871
12	7,740	7,766	7,758	7,776
13	7,842	7,826	7,867	7,842
14	7,872	7,806	7,859	7,829
15	7,876	7,893	7,894	7,917

16	7,816	7,726	7,840	7,852
17	7,831	7,846	7,885	7,888
18	7,850	7,874	7,832	7,923
19	7,814	7,861	7,923	7,946
20	7,831	7,888	7,921	7,964
21	7,876	8,030	8,005	8,026
22	7,860	7,983	7,975	7,976

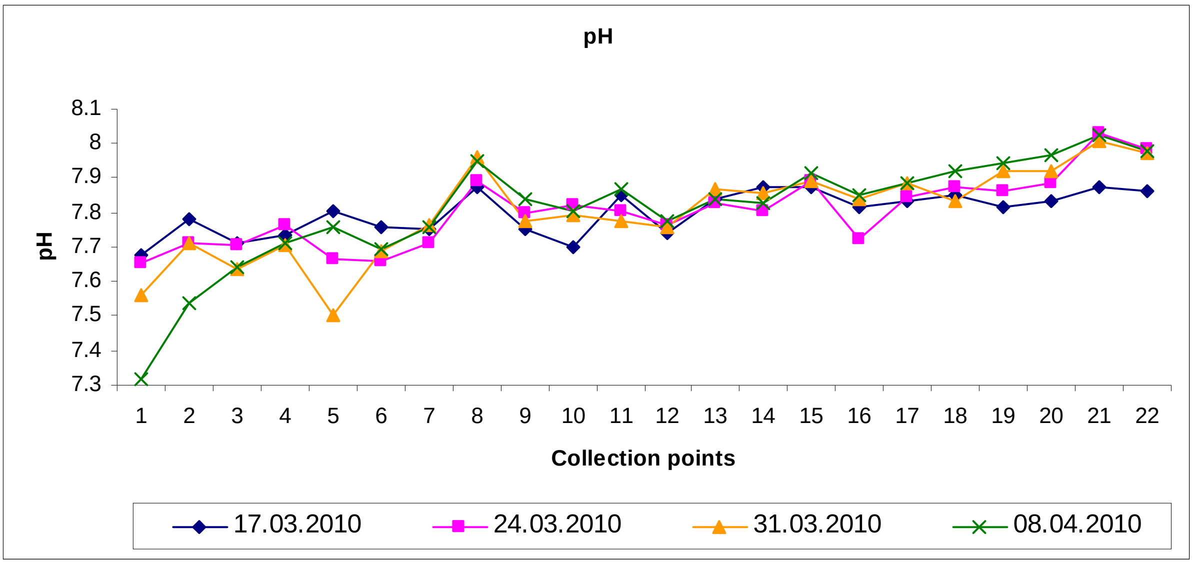

Fig. 13. pH variation of samples.

4. CONCLUSIONS

Water pollution affects drinking water, rivers, lakes and oceans all over the world. This consequently harms human health and the natural environment. Analyzing the results it can be concluded that during on the monitoring period the recorded values of chemical and physical indicators indicates a tendency to maintain constant the water quality parameters in the same collection points. This is explained first of all by the fact that not exist the industrial centers, near of collected points, which may cause environmental pollution, with one exception, Magura Creek, where maximum values were recorded significantly above the average value. Physical and chemical indicators of Potop River classified the water in Category II and III of quality, so it is not potable, but not exceed the permissible limits for surface waters in accordance with Romanian legislation.

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CONFERENCES

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