Scientific Bulletin of Politehnica University of Timişoara

Transactions on HYDROTECHNICS

Volume 60(74), Issue 2, 2015

Trends and predictive research on Bistra River water quality, Caras Severin County

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Abstract: In the paper it was present the state of the Bistra river water quality, from Caras Severin county, in the last years, taking into account several fundamental parameters for the state of global quality. It provides dates from the monitoring sections of Banat Water Branch. Subsequently make an interpretation of the ecological potential of a body of water. It was present the evolution of the Bistra river water quality and what are the predictive researches in quality in terms of chemical water status.

Keywords: predictive research, water body, ecological state, ecological potential, hydromorphologic.

1. INTRODUCTION

Managing the quality and quantity of water resources, managing work water management and implementing the strategy and national policy with national practice is performed by the National Administration "Romanian Waters" by administrations basin water subordination. The legislative framework for the sustainable management of water resources is provided by the Water Law no.107 / 1996, as amended and supplemented.

Ecological status assessment and ecological potential for surface waters was carried out according to the Water Law no. 107/1996 amended and supplemented, based on the methodologies regarding the systems of classification and global assessment about the status of surface water, prepared according to the requirements of the Water Framework Directive 2000/60 / EEC. The evaluation took into account the results obtained in the years 2011-2014 in the control monitoring section of surface water that has annually monitoring program.

2. ECOLOGICAL STATE OF A WATER BODY

Ecological status is an expression of the aquatic ecosystems quality associated with surface waters, classified in accordance with Annex V of the Water Framework Directive. For surface water categories, the ecological status assessment is performed on five states of quality, namely: high, good, moderate, poor and bad with the corresponding color code (blue, green, yellow, orange and red) [2]. This is related in figure no 1.

Quality class	Ecological state	Colours code
I	Very good	
II	Good	
III	Moderate	
IV	Poor	
V	Bad	

Figure 1. Correspondence between the ecological state and colours code, regarding the river quality class

Evaluation of environmental / ecological potential of surface water bodies has been done through quality elements (biological, physical and chemical support, specific pollutants). Ecological status / ecological potential final take into account the principle that the lowest value sets quality status, that the worst situation [2]. Schematically, these issues are presented in Figure no 2.

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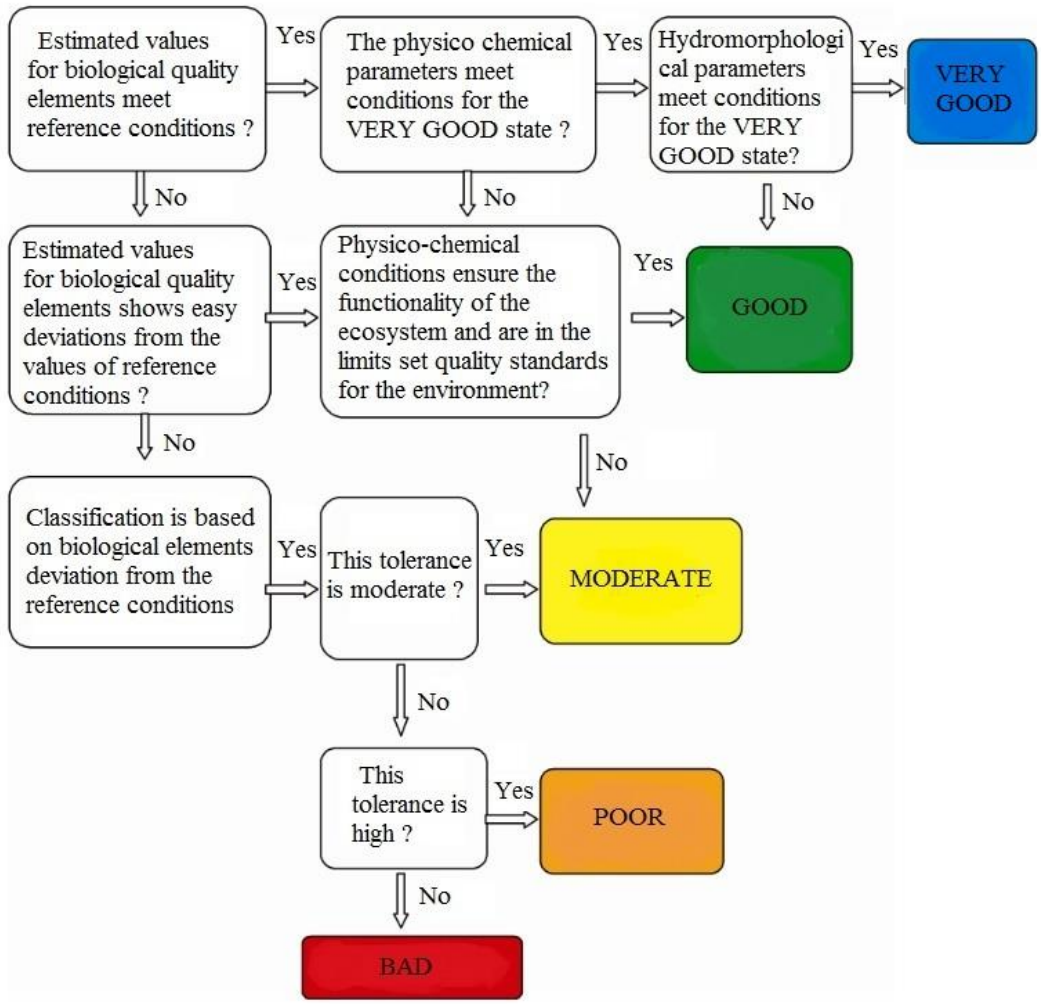

Figure 2. Classification scheme for surface water ecological estate

Morphological elements are taken into account only if the high ecological status is achieved for biological and physico-chemical elements, in this case check if whether hydromorphological condition is very good. These conditions being met, the body can be employed in very good ecological status [2].

Within every group of -biological and physico-chemical (general and specific pollutants), morphological - is considered a worst - defining condition.

Environmental status (based on biological elements and support members hydromorphological and physicochemical) is determined by applying the principle worst case situations.

3. WATER QUALITY ELEMENTS

To characterize the water quality it is necessary to know:

• Biological elements: aquatic flora - phytoplankton and phytobenthic; macrozoobenthic (composition and abundance of benthic no vertebrate fauna); Fish fauna (composition, abundance and age structure);

• Physico-chemical elements: thermal conditions: temperature; Oxygenation conditions: dissolved oxygen, BOD_5, COD; Acidification status: pH; Conditions of nutrients: $N\text{-}NO_3$, $N\text{-}NO_2$, $N\text{-}NH_4$, $P\text{-}PO_4$, total phosphorus;

• Specific pollutants - Cu, Zn, As, Cr, xylene, PCBs, toluene and phenol acenaphthen.

The quality environmental objective for a surface water body is considered to be achieved when the body of water falls in very good or good ecological status or maximum ecological potential or good [2].

The water quality classification was made according to Order 161 / June 2006 in line with EU practice in protecting the quality of surface rivers.

Framework Directive - Annex II 1.3 (i) establishes reference conditions for rivers on the basis of factors specific to each type of water body. These are the hydromorphological, physico-chemical and biological values, that have undisturbed or with minimal anthropogenic influences, corresponding to current or past situations. These issues were systematized by setting the reference sections of rivers.

These reference sections take into account the following aspects:

• Land use in river basin: urbanization, land usage - be very low;

• Streams and habitats: the reference section must be covered with natural vegetation or forest untapped,

waste wood has not been removed, protective measures against floods have minor influence and there are no obstacles to migration bodies or transport sediment;

• Vegetation banks and floodplains: be allowed lateral migration;

• Hydrological regime is not disturbed the natural flow, not altered the hydrological regime of watercourses;

• Physico-chemical criteria: there is no point of organic pollution source or nutrient diffuse pollution, does not manifest acidification; salinization or alkalinity phenomena, there are no alterations in temperature regime;

• Biological: no alterations of indigenous biota.

Considering all these aspects, on the Bistra river are three monitoring sections: Obreja, Crâşma – Oţelu Roşu and Upper Pârâul Lupului Confluence.

For the years 2013 and 2014 is shown in the following tables the quality class of river water for various parameters monitored and general class quality.

Table 1 Water quality class in the year 2014

Month	Water cours	Monitoring section	Oxygen	Nutrients	Salinity	Specific toxic pollutants	Other relevant chemical indicators	General quality
January	Bistra	Upper Pârâul Lupului Confluence	I	I	I	-	-	I
	Bistra Mărului	Oţelu Roşu Crâşma	I	I	I	I	I	I
	Bistra	Obreja	I	I	I	-	-	I
May	Bistra	Upper Pârâul Lupului Confluence	II	I	I	-	-	II
	Bistra Mărului	Oţelu Roşu Crâşma	I	I	I	II	II	II
	Bistra	Obreja	II	I	I	-	-	II
September	Bistra	Upper Pârâul Lupului Confluence	I	I	I	-	-	I
	Bistra Mărului	Oţelu Roşu Crâşma	I	I	I	I	I	I
	Bistra	Obreja	I	I	I	-	-	I
November	Bistra	Upper Pârâul Lupului Confluence	I	I	I	-	-	I
	Bistra Mărului	Oţelu Roşu Crâşma	I	I	I	II	I	II
	Bistra	Obreja	I	I	I	-	-	I

Table 2 Water quality class in the year 2013

Month	Water cours	Monitoring section	Oxygen	Nutrients	Salinity	Specific toxic pollutants	Other relevant chemical indicators	General quality
January	Bistra	Upper Pârâul Lupului Confluence	I	I	I	-	-	I
	Bistra Mărului	Oţelu Roşu Crâşma	I	I	I	-	-	I
	Bistra	Obreja	I	I	I	-	-	I
May	Bistra	Upper Pârâul Lupului	I	I	I	-	-	I

		Confluence						
	Bistra Mărului	Oţelu Roşu Crâşma	I	I	I	I	I	I
	Bistra	Obreja	I	I	I	-	-	I
September	Bistra	Upper Pârâul Lupului Confluence	I	I	I	I	-	I
	Bistra Mărului	Oţelu Roşu Crâşma	I	I	I	I	I	I
	Bistra	Obreja	I	I	I	-	-	I
November	Bistra	Upper Pârâul Lupului Confluence	I	I	I	-	-	I
	Bistra Mărului	Oţelu Roşu Crâşma	I	I	I	II	I	II
	Bistra	Obreja	I	I	I	-	-	I

Analyzing the general quality of water in sections monitories in slow flow [5], situation presented by representative groups of quality indicators (oxygen regime, nutrients, salinity, specific toxic pollutants, other relevant chemical indicators and general quality) of the watercourse representing category worst quality of representative groups, it can be concluded that in the monitoring interval studied, respectively years 2013-2014 the Bistra river water quality was good, ensuring water necessary to operate the utilities category.

In terms of water quality of a river course, this classification is given according with the chemical status of a body of water. Assessment of chemical status of a body of water is given priority substances by applying the provisions of the Directive on environmental quality standards in the field of water (Directive 2008/105 / EC).

Chemical status of a body of water may be good chemical status or other condition than good (disrepair).

In assessing the chemical status has been taken to comply with environmental quality standard values for priority substances defined in Directive 2008/105 / EC, for the arithmetic mean value and the maximum admissible concentration value [6].

Chemical status will be determined by the worst situation (any excess leads to compliance and employment in poor chemical status).

To establish the chemical status of the river water, the water body has been established RW5.2.20.5_B2 (Bistra Mărului - downstream Poiana Mărului and their affluent) with a length of 18.093 km, having RO01 typology, characterized by Section Upper Pârâul Lupului confluence.

Evaluation of ecological potential of the water body, in the year of 2012

In terms of biological elements, the body of water has a good ecological potential. Biological elements assessed were classified as benthic no vertebrates classified as good ecological potential and phytobenthic classified as maximum ecological potential.

In terms of physico-chemical elements, the body of water was within moderate ecological potential, because group-related indicators, oxygen.

In terms of specific pollutants, the body of water was within good ecological potential.

Framing the body of water in good ecological status is determined by biological and physico-chemical elements. The physico-chemical elements were considered statistical, 90% percentile.

Following the assessment of chemical status, water bodies ranged in good condition [5].

Evaluation of ecological potential of the water body, in the year of 2013

In terms of biological elements body of water has a good ecological potential. Biological elements benthic no vertebrates assessed were classified as maximum ecological potential, phytobenthic framed in good ecological potential and fishes engaged in maximum ecological potential.

In terms of physico-chemical elements, the body of water has a good ecological potential.

In terms of specific pollutants, the body of water was within good ecological potential.

The body of water has a good ecological potential.

Following the assessment of chemical status, water bodies ranged in good condition [5].

Evaluation of ecological potential of the water body, in the year of 2014

In terms of biological elements water body has the maximum ecological potential. Biological elements assessed were classified as benthic no vertebrates classified as maximum ecological potential and phytobenthic classified as maximum ecological potential.

In terms of physico-chemical elements, the body of water has a good ecological potential.

In terms of specific pollutants, the body of water has a good ecological potential.

The body of water has a good ecological potential.

Following the assessment of chemical status, water bodies ranged in good condition [5].

The pressures on the water quality are exercised and the potential impact of nutrients from livestock activities on surface water and groundwater; by inadequate storage of manures; by possible leakage of materials on common platforms, if they were not constructed and placed accordingly; by improper spreading of manure on agricultural land, if not respect the code of good agricultural practices; by failing wastewater effluent quality; by leakage from septic tanks and plumbing, if not properly maintained.

These pressures can be reduced by controlling and regular monitoring of surface water sources and groundwater, and by establishing buffer distances at avoiding the impact location of manure storage facilities on human settlements. Following research in our country was established that manure storage areas must be located at a minimum distance of 30 m from the rivers and lakes. Also not recommended for storage of manure on land where ground water is shallow.

Wetlands and land with a potential risk of slipping a high pressure on surface water and groundwater quality presents.

The residual organic material accumulated in the soil structure can be transported by flood water becoming a potential risk to the protection of surface and groundwater. This is another very important aspect that influences the water quality.

4. CONCLUSSIONS

Concept promoted by the Water Framework Directive on water status is based on a new, integrative approaches, that differ fundamentally from previous water quality, in which, the hydromorphological elements were not taken into account and it was for the predominance of physico-chemical elements. Characterization environmental status in accordance with the requirements of the Water Framework Directive (transposed into Romanian legislation by Law no. 310/2004 amending and supplementing Water Law no. 107/1996) is based on a classification system in five classes, namely: very good, good, moderate, poor and bad, defined and represented as follows:

The class is **Very good** if the values of biological elements are associated with those values of unspoiled areas (reference) or the anthropogenic alteration are minor. The values of hydromorphological and physicochemical surface waters are characterized by values that are associated with those of unspoiled areas (reference) or anthropogenic minor alterations occurred;

The class is **Good** in the following condition: the values of biological elements is characterized by slight deviations from the values that characterize unspoiled areas (reference) or the anthropogenic alterations are minor. The general values of the physico-chemical elements are characterized by minor deviations from the values that characterize unspoiled areas (reference) or anthropogenic minor alterations occurred;

The class is **Moderate** if the characteristic values of biological elements for surface water deviate moderately from unspoiled areas (reference) or anthropogenic minor alterations occurred;

The class is **Poor** if there are major alterations of biological elements; relevant biological communities differ substantially from those normally associated with unaltered conditions unspoiled areas (reference) or anthropogenic minor alterations occurred;

For the **bad** condition – exist severe deterioration in the values of biological elements, a large number of relevant biological communities are absent from those present in the unspoiled areas (reference) or major anthropogenic alterations.

The pressure of various causes of pollution of water sources has fallen in the past 20 years, mainly due to lower industrial and agricultural activities (wastewater in agriculture are very small, while the share of industry in total wastewater in ponds greatly decreased with the closure a large number of businesses).

On the other hand, a decrease in water consumption in technological processes while reducing water losses and implementing an economic mechanism for water management was observed.

The pressure on the water quality has decreased, but not enough. Economic status of the county has not allowed the proposed investments in water supply and sewege, especially in rural areas. More than half of local residents receive drinking water from centralized system and a centralized system of sewege. But some water and sewage networks are out of use and that require replacement. The rural population still has problems with the supply of water and the sewerage, which although were implemented, rural residents refuse to connect to the centralized system.

REFERENCES

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