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## JUDGING CRITERIA FOR WATER BODIES STATUS IN ROSCI 0226 – SEMENIC CHEILE CARAȘULUI SITE

Carabeț Adrian<sup>1</sup>  
Visescu Mircea<sup>1</sup>

Gherman Vasile<sup>1</sup>  
Boboescu Iulian Zoltan<sup>1</sup>

**Abstract:** This paper presents the criteria for assessing the status of water bodies according to Water Framework Directive 2000/60/EC. In this case study the values of quality indicators in ROSCI 0226 - Semenice Cheile Carasului site are presented.

**Keywords:** ecological status, biologic elements

### 1. INTRODUCTION

Natura 2000 Network is a European network of protected natural areas which includes a representative sample of wild species and natural habitats of interest. It was established not just for nature protection but also for maintaining these natural riches in the long-term, to ensure necessary resources for socio-economic development.

From 1992 European Union promotes as the main tool for the development of network conservation areas - Natura 2000, which will cover EU members and candidate countries, network originally planned to be designated by the year 2000.

Protective areas are those areas of territory in a river basin which were designated on the basis of special requirements of protection required by European legislation.

The proposed areas for habitats protection or species where improvement of water status is an important factor is done based on Directive 94/43/EEC which promotes the protection of natural heritage of European Community transposed in the Romanian legislation by Law number 462/2001 and Directive 79/409/EEC which refers to protection of birds transposed in Romanian legislation by Law number 13/1993. These were transposed in government ordinance OUG 57/2007 on the regime of natural areas protection, conservation of natural habitats, flora and fauna.

ROSCI 0226 - Semenice Cheile Carasului was designated on 02.07.2008 as site of community importance, part of European ecological network Natura 2000.

This site is situated in south-west of the country, Caras-Severin county south, south-east of Resita town and along with ROSPA 0086 Semenice Mountains - Cheile Carasului site of National Park Semenice - Cheile Carasului.

Geographically, the site is located at 48°8'7" N latitude, 21°25'34" E longitude and stretches on a surface of 37729.79 ha. Minimum altitude is 105 m, a

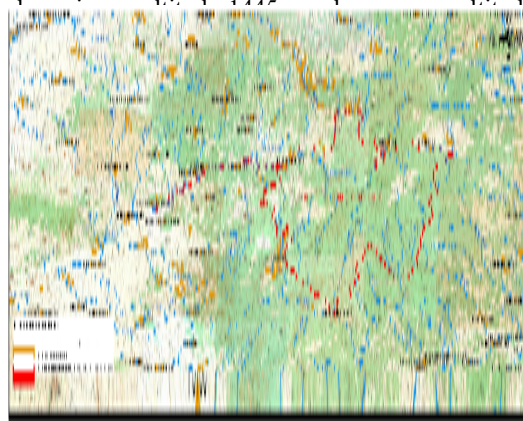


Fig. 1 The geographic position of ROSCI0226 – Semenice Cheile Carasului site

The geographic network corresponding to ROSCI 0226 – Semenice Cheile Carasului site is complex, including both surface water courses and underground courses. The most important rivers are Timis, Caras, Barzava, Nera, Semenice, Trei Ape reservoir, Gozna reservoir. The hydrographic network in limestone is disorganized with numerous catchments and emergence's.

### Judging criteria

**a. Ecological status – biologic elements – phytoplankton – Rivers.**

In order to evaluate the status of water bodies by phytoplankton, 5 indexes were selected for lotic systems, to which a list of corresponding species was added.

For the determination of intervals between ecological states by phytoplankton basis we opted for determination of quality grades by statistical basis. Taking into account types of available data we used reference conditions method to determine the limits

37 between ecological states. On the basis of univariate

<sup>1</sup>Faculty of Civil Engineering Timisoara, Hydrotechnical Department, George Enescu Street. No. 1/A, Zip Code 300022, Timisoara, E-mail: [carabet\\_adrian@yahoo.com](mailto:carabet_adrian@yahoo.com)

statistics, the limits for ecological states were set, for each typology in part. Twenty types of rivers limits were established. For unsteady river courses values were not proposed. In some cases, where data was not sufficient, we resorted to proposal values via aggregation of types, by realization of an average between the adjacent types or substitution. For every type of river course guideline values for reference state were proposed.

Due to limitations imposed by the quality of data and predisposition for errors, the following indexes were selected in order to be utilized in a first stage of quality state evaluation of lotic (rivers) aquatic systems:

- Saprobity index
- Chlorophyll concentration
- Simpson diversity index
- Taxon number
- Numerical abundance (Bacillariophyceae)
- Species list

In lotic systems, especially the ones with a lower order, phytoplankton community is representative for evaluating the ecological status and is utilized to deliver supplementary information to the evaluation achieved on the basis of other biological elements.

#### **b. Ecological Status – biological elements – macro invertebrates benthic – Rivers.**

The evaluation of water bodies on the basis of macroinvertebrates communities is performed upon the list of species from a station and calculation of every one of the 7 proposed indexes.

1. Saprobity index (IS)
2. EPT\_I index (individuals) (IEPT\_I)
3. Shannon-Wiener index (ISH)
4. Number of families (FAM)
5. OCH index (Oligochaeta-Chironomidae) (IOCH/O)
6. Functional group index (IGH)
7. Water course preference index (reofil 7.A or limnofil 7.B) (REO/LIM).

#### **c. Ecological status – biological elements – fish fauna – Rivers**

For evaluating and classifying water bodies on the basis of fish fauna EFI+ method was used. To achieve this index over 10 000 cases were processed in most EU countries. There have been considered 254 fish species which were grouped in 15 categories of guilds, every one having between 3 and 7 groups of species. Data was processed using fish typology model resulted from FAME project.

The selected matrices for EFI+ are:

- salmonid water bodies
- Cyprinid water bodies

Field collected data are going to be registered on a sheet which permits data processing through automated software and contributes to achieve a national data base.

#### **d. Ecological status – hydro morphological elements – Rivers**

In order to evaluate the status of water bodies on the basis of hydro morphological elements the following hydro morphological elements were taken into account:

- Hydrological regime
- Discharge
- Connectivity with underground water bodies
- Continuity of river flow

##### **Morphological parameters**

- River depth and width variation
- Cross section modification
- Alteration of reduction coefficient - major

##### **riverbed**

- Major riverbed bed structure and substrate
- Structure and substrate of riverbed bed
- Riveran area structure

After the analysis of all hydro morphological parameters the final ecological status derived from this quality elements, is represented by the most unfavorable situation.

#### **e. Ecological status – physico-chemical elements: general physico-chemical elements Rivers**

For assessing ecological status the following physico-chemical elements were taken into account:

- Thermo conditions water temperature

In order to evaluate the ecological status temperature limits for the following surface water types are defined: salmonid water, cyprinid waters.

- Acidification status – pH

Ecological status data, for assessment, are obtained by analysis of pH indicator, P90 percentile is calculated for a number of 12 measurements a year.

- Oxygen regime – dissolved oxygen in concentration terms

Data is obtained on the basis of analysis made on dissolved oxygen indicator, P10 percentile is calculated for a number of 12 measurements per year.

- Nutrients – N-NH<sub>4</sub>, N-NO<sub>2</sub>, N-NO<sub>3</sub>, P-PO<sub>4</sub>, P Total

Data is obtained upon analysis, nitrogen and phosphorus nutrients forms are checked in order to see if ortho phosphate concentration is lower than the total phosphorus (not using zero values). Percentile P90 is calculated for a series of measurements, no lower than 12 per year for every considered indicator.

#### **f. Ecological status – physico-chemical elements: specific pollutants**

An analysis of synthetic and non-synthetic pollutants (organic and metals) is performed for surface waters – natural bodies, artificial water bodies, as well for heavily modified water courses.

For this, a few steps must be made: use the monitoring software which ensures minimum 12 of concentration values per year for the followed substances; calculate the yearly average, which is the arithmetic average, then the yearly average is evaluated in relation to limit values which delimitates the 3 ecological states, namely: very good status, good status, moderate status.

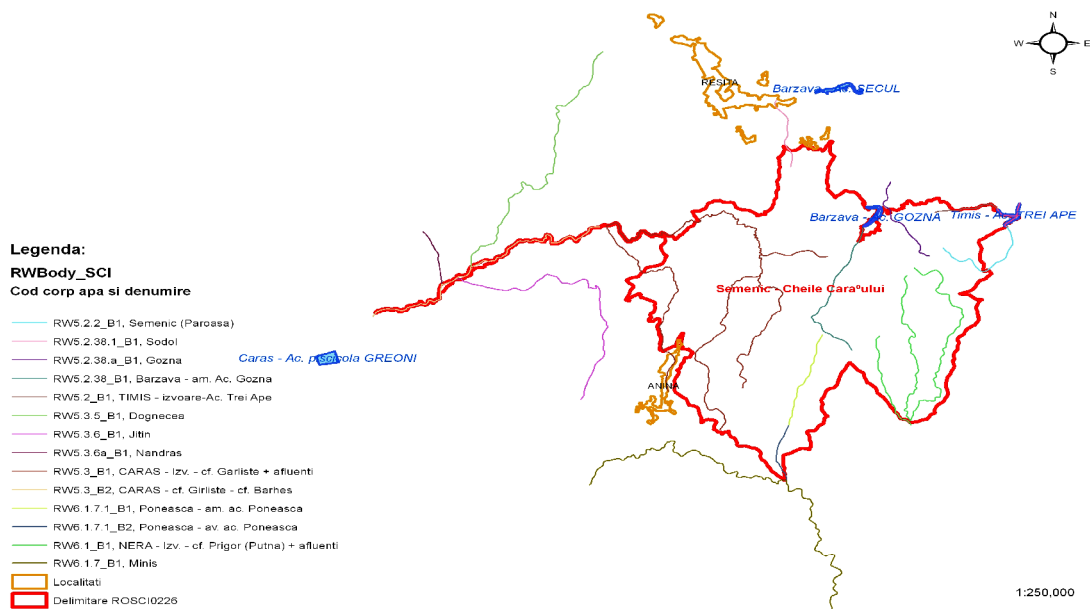
For evaluating of the chemical status of hazardous and priority hazardous substances, both synthetic (organic) and non-synthetic (metals), for surface water bodies (rivers, natural lakes, ponds) – natural bodies and modified bodies (modified in terms of hydro morphological) the specific software is run – which must ensure a minimum 12 concentration values per year for every followed chemical substance. Every primary statistical monitored parameter of a substance will be calculated/determined especially:

- Yearly average concentration (arithmetic average);
- Yearly maximum concentration of those substances that EQS are provided for that value.

In the case of non-synthetic substances (metals), for bodies of water in which these metals exist naturally, the concentration of natural fund si determined.

#### Measurements results

In ROSCI 0226 Semenice Cheile Carasului site the ecological status/ecological potential as to chemical status of surface water bodies was determined on a number of 14 river water bodies (of which 13 natural water bodies and one heavily modified water bodies). (Fig. 2)



**Fig. 2 – Water bodies ROSCI 0226 Semenice Cheile Carasului site**

In table 1 indicator values calculated from ROSCI 0226 Semenice Cheile Carasului site are presented.

Table 1 – Calculated indicator values from water bodies in ROSCI 0226 Semenice Cheile Caraşului site

Station	Index average							Ecological status
	IS	IEPT_I	ISH	FAM	IOCH	IGF	REO/ LIM	
RORW5.2.2_ Semenice (Păroasa)-B1	1,83	0,75	2,71	11,00	0,00	0,50	0,92	VERY GOOD
RORW5.2.38.1_B (Secul)	1,99	0,74	2,43	7,00	0,00	0,53	0,79	GOOD
Gozna-RORW5.2.38.a_B1	1,40	0,59	2,78	20,00	0,05	0,41	0,90	VERY GOOD
Bârzava - am. Ac. Gozna- RORW5.2.38_B1	1,89	0,79	2,77	13,00	0,00	0,47	0,92	VERY GOOD
TIMIŞ - spring-Ac. Trei Ape-RORW5.2_B1	1,40	0,59	2,78	20,00	0,05	0,41	0,90	VERY GOOD
Dognecea-RORW5.3.5_B1	2,03	0,71	2,43	7,50	0,00	0,53	0,72	VERY GOOD
RW5.3.6_B1 (Jitin)	1,93	0,67	2,72	11,67	0,03	0,51	0,79	VERY GOOD
RW5.3.6a_B1 (Nandras)	2,25	0,00	1,58	6,00	0,00	0,10	0,79	MODERATE
RW5.3_B1 (CARAŞ - Izv. - cf. Gârlişte + affluent) - Loc. Carasova (MZB)	1,99	0,58	2,78	11,00	0,00	0,54	0,80	GOOD
RW5.3_B1 (CARAŞ - Izv. - cf. Gârlişte + affluent) - Am.cf.Caraş on river Gârlişte	1,86	0,61	2,54	11,67	0,02	0,48	0,86	VERY GOOD
Poneasca – am. Ac. Poneasca – RORW6.1.7.1_B1	1,89	0,79	2,77	13,00	0,00	0,47	0,92	VERY GOOD
Poneasca - av. ac.Poneasca – RORW6.1.7.1_B2	1,74	0,80	2,77	10,00	0,00	0,42	0,94	VERY GOOD
RORW6.1_B1, NERA - Izv. - cf. Prigor (Putna) + affluents	1,94	0,71	2,57	9,50	0,00	0,50	0,90	GOOD
RORW6.1_B1, NERA - Izv. - cf. Prigor (Putna) + affluents	1,79	0,63	2,65	10,00	0,00	0,35	0,82	GOOD
Station	Index average							Ecological potential
	IS	IEPT_I	ISH	FAM	IOCH	IGF	REO/ LIM	
RW6.1.7_B1 (Miniş)	1,91	0,62	2,97	12,33	0,00	0,48	0,77	MAXIMUM

In table 2 the results from application of classical method based on saprobity system developed by Kolkwitz and Marsson, revised by Liebmann, which

covers a large number of species that characterizes different grades of water loading with organic substances.

Table 2 Grade on sections corresponding to water bodies

Station	Average indicators for macrozoobentos						Grade
	density	Indicators oligo O	Indicators beta $\beta$	Indicators alfa $\alpha$	Indicators poli p	Index sapro	
RORW5.2.2_ Semenice (Păroasa)- B1	1,83	0,75	2,71	11,00	0,00	0,50	VERY GOOD
RORW5.2.38.1_B (Secul)	1,99	0,74	2,43	7,00	0,00	0,53	GOOD
Gozna-RORW5.2.38.a_B1	1,40	0,59	2,78	20,00	0,05	0,41	VERY GOOD
Bârzava - am. Ac. Gozna- RORW5.2.38_B1	1,89	0,79	2,77	13,00	0,00	0,47	VERY GOOD
TIMIȘ - springs-Ac. Trei Ape- RORW5.2_B1	1,40	0,59	2,78	20,00	0,05	0,41	VERY GOOD
Dognecea-RORW5.3.5_B1	2,03	0,71	2,43	7,50	0,00	0,53	VERY GOOD
RW5.3.6_B1 (Jitin)	1,93	0,67	2,72	11,67	0,03	0,51	VERY GOOD
RW5.3.6a_B1 (Nandraš)	2,25	0,00	1,58	6,00	0,00	0,10	MODERATE
RW5.3_B1 (CARAȘ - Izv. - cf. Gârliște + afluenți) - Loc. Carasova (MZB)	1,99	0,58	2,78	11,00	0,00	0,54	GOOD
RW5.3_B1 (CARAȘ - Spring. - cf. Gârliște + affluents) - Am.cf.Caraș on river Gârliște	1,86	0,61	2,54	11,67	0,02	0,48	VERY GOOD
Poneasca – am. Ac. Poneasca – RORW6.1.7.1_B	1,89	0,79	2,77	13,00	0,00	0,47	VERY GOOD
Poneasca - av. ac.Poneasca – RORW6.1.7.1_B2	1,74	0,80	2,77	10,00	0,00	0,42	VERY GOOD
RORW6.1_B1, NERA - Spring. - cf. Prigor (Putna) + affluents	1,94	0,71	2,57	9,50	0,00	0,50	GOOD
RORW6.1_B1, NERA - Spring. - cf. Prigor (Putna) + affluents	1,79	0,63	2,65	10,00	0,00	0,35	GOOD

## CONCLUSIONS

After all interpretation and determinations performed on monitored sections of water bodies in ROSCI 0226 Munții Semenici – Cheile Carașului site according to Saprobity System, the following results were obtained:

- Of a total of 14 characteristic sections corresponding to water bodies of ROSCI 0226 Munții Semenici – Cheile Carașului site
- 2 sections class I
- 11 sections class II
- 1 section class III
- 1 section without monitoring
  - Of a total of 2 hydrotechnical catchments:
    - 1 hydrotechnical catchment fits to mesotrophic quality class according to eutrophication degree indicators, and pursuant to physico-chemical indicators/specific pollutants in global class I.
    - 1 hydrotechnical catchment fits Eutrophic quality class according to eutrophication grade indicators, pursuant to physico-chemical indicators/specific pollutants in global class I.

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