

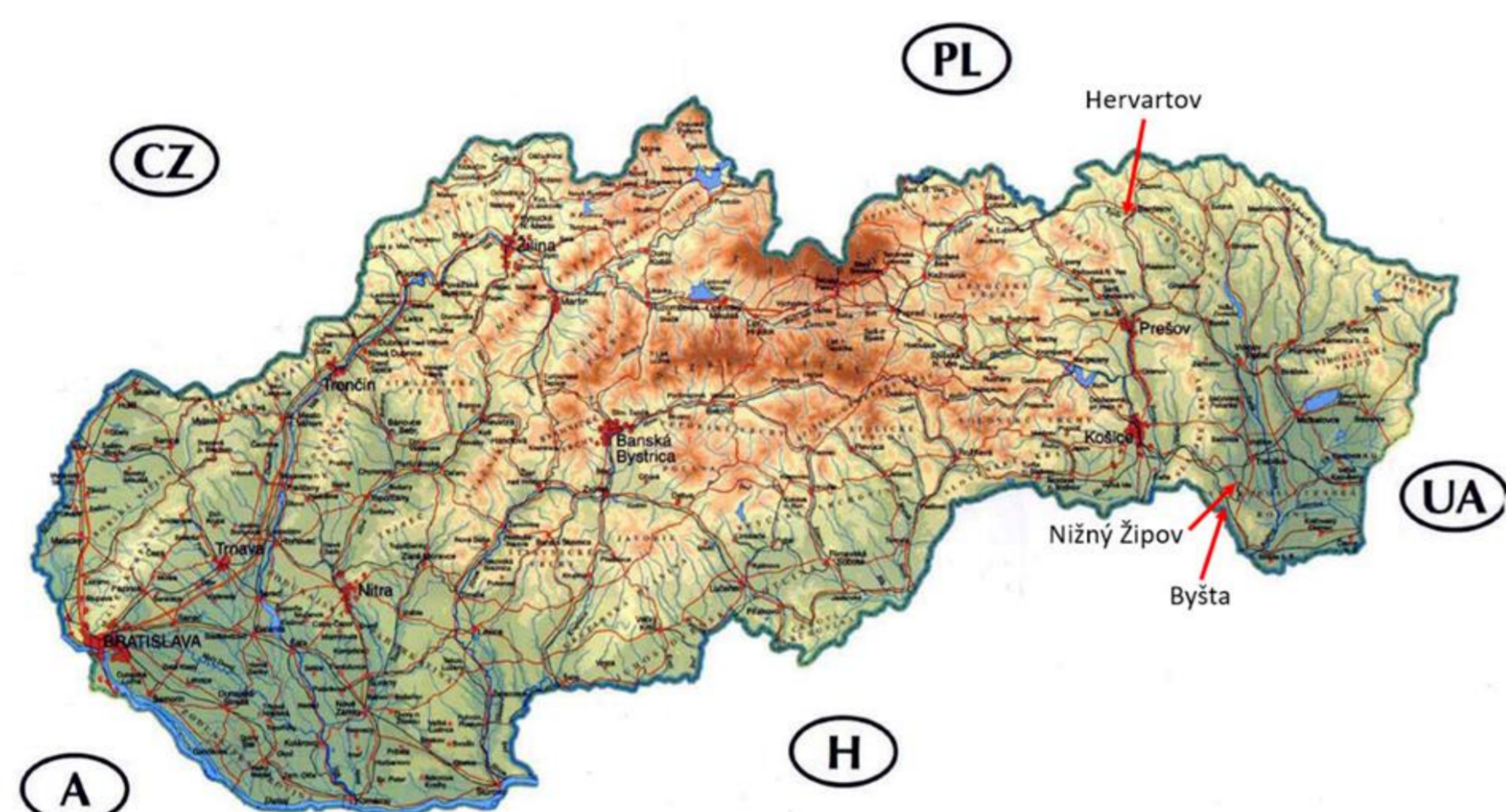
# THE QUALITY OF BOTTOM SEDIMENTS IN SMALL WATER RESERVOIRS LOCATED IN AGRICULTURAL WATERSHEDS

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## Abstract

Silting of water reservoirs by sediments detached through soil erosion is a serious water management problem. One of the solutions is direct application of sediments to the soil. The aim of the paper is to monitor the quality of bottom sediments taken from selected water reservoirs in the eastern Slovakia (Hervartov, Nižný Žipov, Byšta) and to evaluate their quality according to legislation. The results showed that the concentrations of total nitrogen, phosphorus and potassium in sediments are higher than in soils taken from the vicinity of reservoirs. Simultaneously, it was confirmed that the sediment in the evaluated reservoirs meets the physicochemical parameters according to the Act No. 188/2003 Coll. for direct application to the soil.

## Material and methods



Location of studied small water reservoirs

Basic characteristics of small water reservoirs

Name of reservoir	District	Stream	Altitude (MSL)	Average depth (m)	Surface area (m)	Total reservoir capacity (m <sup>3</sup> )		
						Dead storage (m <sup>3</sup> )	Active storage (m <sup>3</sup> )	Flood reserve (m <sup>3</sup> )
Hervartov	Bardejov	Tisovec	343.00	3.5	2.20	72 128		
						1 215	60 310	10 603
Nižný Žipov	Trebišov	Žipov creek	139.00	2.5	6.50	50 500		
						28 000	120 000	30 000
Byšta	Trebišov	Byšta	198.50	3.7	4.33	152 500		
						10 000	130 000	12 500

### Sampling methodology:

#### Soil samples:

- taken from agricultural land in vicinity of reservoirs
- average soil sample composed of at least 30 point samples
- sampling depth of 0.30 m

#### Water samples:

- taken at the reservoir dam

#### Sediment samples:

- taken from each reservoir
- average sediment sample composed of 5 point samples
- sampling sites located in the area of the dam

## Results and discussion

Chemical analyses of **soil** samples taken from the agricultural land

Parameter	Unit	Hervartov	Nižný Žipov	Byšta
N <sub>total</sub>	(%)	0.08	0.07	0.09
P <sub>total</sub>	(%)	0.069	0.03	0.028
K <sub>total</sub>	(%)	1.80	1.65	1.30

Chemical analyses of **water** samples

Parameter	Hervartov (%)	Nižný Žipov (%)	Byšta (%)	Limit concentration (Regulation no. 269/2010) mg/L
N <sub>total</sub>	2.08	1.4	2.0	9
P <sub>total</sub>	0.2	0.07	0.15	0.4

Chemical analyses of bottom **sediment** samples according to Act No. 188/2003 Coll.

Parameter	Unit	Hervartov	Nižný Žipov	Byšta	Limit value (Act No. 188/2003)
Sediment pH	(-)	7.39	7.39	7.44	> 5
Dry mater (105°C)	(%)	97.75	63.94	67.25	-
Organická hmota	(%)	3.01	1.20	1.80	-
N	(%)	0.20	0.09	0.11	-
P	(%)	0.09	0.031	0.035	-
K	(%)	2.05	1.78	1.41	-
Mg	(%)	0.77	0.61	0.32	-
As	(mg/kg)	9	9	9	20
Cd	(mg/kg)	< 0.3	< 0.5	< 0.5	10
Cr	(mg/kg)	100	87	85	1000
Cu	(mg/kg)	25	19	11	1000
Hg	(mg/kg)	0.09	0.03	0.04	10
Ni	(mg/kg)	39	29	15	300
Pb	(mg/kg)	26	24	25	750
Zn	(mg/kg)	136	76	56	2500
AOX	(mg/kg)	31.3	< 10	< 10	500
PCB	(mg/kg)	< 0.01	< 0.01	< 0.01	0.8
PAU	(mg/kg)	1.15	< 0.05	0.19	6

## Conclusions

Results of this study showed that the concentrations of total nitrogen, phosphorus and potassium in monitored reservoirs' sediments are higher than in original soils taken from the vicinity of reservoirs. This is mainly because nutrients are found in large amounts in the upper layers of the soil and fine fractions of the soil are easily washed away. The analyzes of physicochemical parameters of sediments indicate the possible direct application of monitored sediments to agricultural land. The results of the chemical analysis of the water showed that the requirements for surface water quality are met. This situation may be influenced by the fact that the studied sediments act as an adsorbent of phosphorus from the aqueous environment. The presence of organic matter in the sediment may contribute to lower concentrations of total nitrogen in the water.

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