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## MONITORING OF PHOSPHORUS IN SELECTED PROFILES OF THE VEVERKA STREAM

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### ABSTRACT

The leaching of certain minerals (e.g. apatite, variscite, etc.) is the natural source of phosphorus in water courses. Anthropogenic sources of phosphorus in water are especially phosphate fertilizers, waste water (detergents), etc. (Pitter, 1999) The phosphorus content in water is one of the main elements causing its eutrophication which has negative influence on the quality of water.

Veverka stream begins near the village Ostrovačice and flows into the Brno reservoir next to the Veveří castle. Five specific profiles were used to monitor phosphorus and assess water quality. Water samples for the determination of phosphorus and phosphates are taken periodically every 14 days and are subsequently evaluated in the laboratory of DALE. Other factors affecting the water quality are also monitored. These are determined directly on the specific profiles including pH, conductivity, and temperature and dissolved oxygen.

**Key words:** stream, phosphorus, phosphates, sampling profile, water quality

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## INTRODUCTION

This work is developed in cooperation with Povodí Moravy s.p. Laboratory equipment is financed from the resources of this company.

Monitored phosphorus is one of the elements causing the eutrophication. This is an increase of phosphorus and nitrogen content due to anthropogenic activity. It causes excessive incidence of some types of algae and with them associated health risks not only for humans (Hubačíková, Opletová, 2008).

Veverka stream is located in the South Moravian Region, northwest from Brno (see the figure 1). Catchment area is 31.16 km<sup>2</sup>. The total length of the stream is 8.3 km and average annual flow is 0.04 m<sup>3</sup>/s. Stream begins near the village Ostrovačice and flows into the Brno reservoir next to the Veverčí castle. Five sampling profiles were determined along the stream and its tributaries where the water samples are taken and the other parameters are assessed.

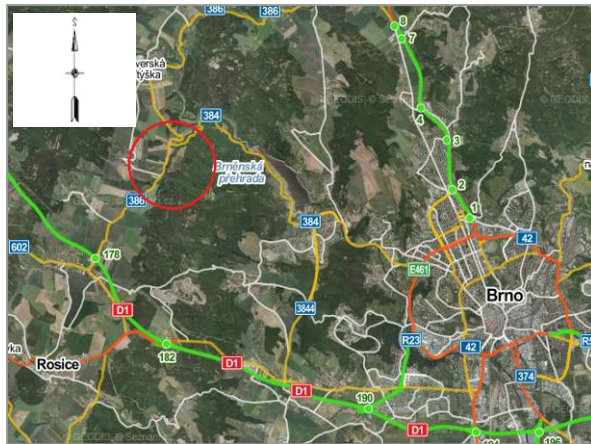


Figure 1 definition of the area – represented by the red circle (www.mapy.cz, edited by the author)

## MATERIAL AND METHODS

The sampling period on the Veverka stream started in April 2013 and the year-round continuous measurement is planned in the diploma thesis, which will be completed in April 2014.

The measurements are made in two-week intervals. The samples are taken at five sampling profiles (see the figure 2). Four profiles are located at the tributaries of Veverka stream: Knínický potok – P1, Melkranský potok – P2, Hlinka – P3, U myslivecké prádelny – P4. The last selected profile is located at the Veverka stream near the confluence with Brno reservoir under the Veverčí castle – P5.

The measurement of selected criteria (pH, conductivity, dissolved oxygen, temperature - figure 1) is performed in the field using a portable instrument HQd (HACH Company) and particular INTELLICAL probes. Water samples for phosphorus determination are taken into the plastic bottles and then they are analyzed in laboratory of DÁLE (Hubačíková, a kol, 2013).

During the work in the laboratory, the samples are filtered and placed in thermo reactor - Digital Reactor Block 200 (DRB 200). To measure the amount of phosphorus and phosphates the spectrophotometer - DR/4000 is used.



Figure 2 – picture of the selected profiles (www.mapy.cz, edited by the author)

## RESULTS AND DISCUSSION

According to the figures no. 3, 4 the measured values of phosphorus and phosphates exceeded the Environmental Quality Norm (NEQ) – Government Regulation No. 61/2003 Coll. in almost all cases.

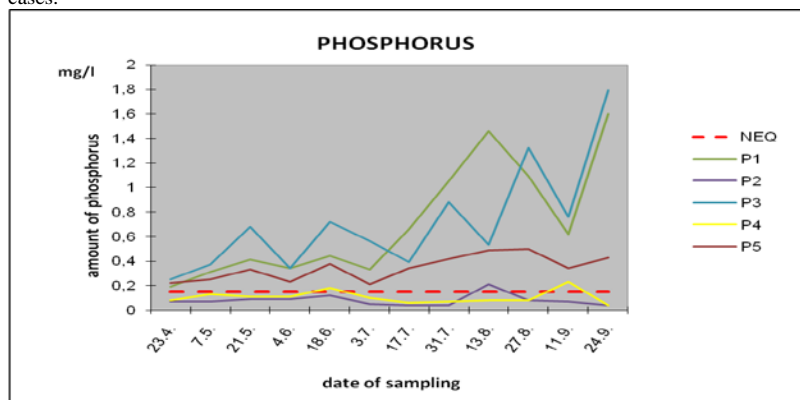


Figure 3 – The amount of phosphorus in the selected profile (P1-P5) and the level of permissible phosphorus amount (NEQ) (author)

This can be caused by many factors which affect water quality in the individual profiles. The main reason related to all profiles is probably runoffs from agricultural land in association with erosion. Elevated levels of the first profile may be caused by the absence of drainage in Veverské Knínice

and higher concentration of recreational facilities in this area. The highest values are almost always measured below Hvozdec at the profile no. 3. There is the waste water treatment plant in this village and its discharging results in elevated levels of phosphorus at the profile no. 3. The waste water treatment plant does not use the technology for removal of phosphorus yet. According to the mayor of the village Hvozdec the technology will be introduced till the 2014 to instruct of Povodí Moravy s.p.

pH values which are determined in the field meet the criteria of the regulation No. 61/2003 Coll. The highest temperature was measured at 17.5 °C. This also meets the norm which requires a maximum of 29 °C. The values of conductivity and dissolved oxygen have not been evaluated yet.

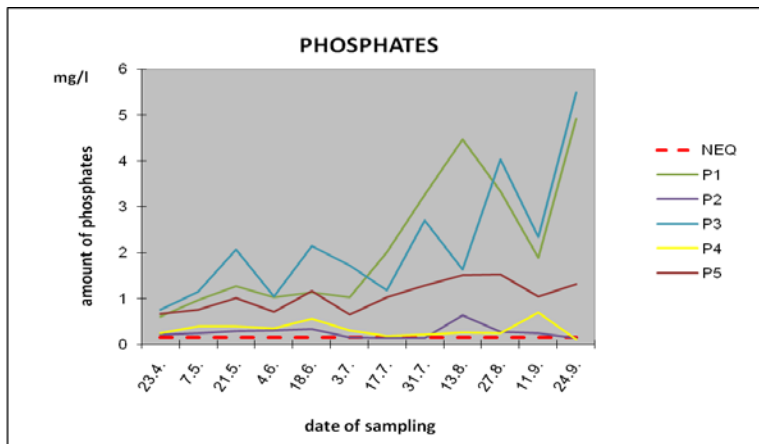


Figure 4 – The amount of phosphates in the selected profiles (P1 – P5) and the level of permissible phosphorus amount (NEQ) (author)

## CONCLUSION

The preliminary data shows that the water quality in the stream is negatively affected by the increased amount of phosphorus and phosphates. The flow brings these increased concentrations to Brno reservoir and therefore causes the eutrophication. Both, pH value and temperature at the profiles are in the norm. Other parameters have not been evaluated yet. According to the field survey results we have been able to identify the agricultural activity and absence of the drainage in the village as the main polluter in the catchment area.

Regarding the water quality monitoring in Veverka catchment the water from profile above Veverské Knínice is also collected. Water is collected quarterly and serves as a comparison with the values from the sampling profile no. 1. Possible polluters in Veverské Knínice solves Karel Gross's bachelor thesis which will be focused on possible pollution sources in the land registry of Veverské Knínice. His results could supplement and clarify the values obtained from the measurements on the lower profiles. The additional measurements and field survey are necessary to complete and discover the polluters in whole Veverka catchment. These results could lead to the clarification of elevated phosphorus levels in Veverka stream.

## REFERENCES

ČSHMÚ, Hydrometeorologické poměry Československé socialistické republiky, 1965.

ČSN 75 7221. *Jakost vody - Klasifikace jakosti povrchových vod*. Praha, 1998

Government regulation No. 61/2003 Coll. about indicators and values of permitted pollution of surface waters and waste waters, essentials permit to discharge wastewater into surface waters and sewers and sensitive areas; the current version

HUBAČÍKOVÁ, V., TOMAN, F., KREJČÍ, J.: Zhodnocení míry znečištění na toku Bihanka v katastru obce Rácovice. *Rekreace a ochrana přírody - s člověkem ruku v ruce*. 1. vyd. Brno: Mendelova univerzita v Brně, 2013, ISBN 978-80-7375-731-1.

PITTER, P.: *Hydrochemie*. 3. přepracované vydání Praha: VŠCHT, 1999, 568 s. ISBN 80-7080-340-1.