

Abstract

The subject of this thesis is a description of various types of mathematical models aimed at the spread of pollution in the river downstream and selection of the most suitable type of model and design the new one with using MATLAB. The application of the model is performed on Karlický creek, where it will be put into operation a new wastewater treatment plant Vysoký Újezd. Using the assembled model there are presented three simulation studies showing the dependence of time on the concentration of nitrate. These are:

- Simulation of accident of the wastewater treatment plant Vysoký Újezd
- Excessive intake of nitrate caused sheet erosion from adjacent agricultural land
- Combination of both simulations

Individual studies present the effect of nitrate on the water quality in Karlický creek, which falls into two categories of protection, Český kras area and Nature Reserve Karlické údolí. The aim of the above simulation studies is to demonstrate the spread of the nitrate into the various compartments along the entire length of the watercourse, and to show the loss of the nitrate over time and to compare the effects of point and diffuse sources of pollution.

The model is calibrated according to the samples taken in Karlík creek during the period from 30 June 2008 to 31.12. 2009th.

The results of simulation studies demonstrated the fact that the sewage treatment plant accident is much more robust intervention into Karlický stream sheet erosion than non-point sources. Interesting is also the evolution of concentration in time, which demonstrates the importance of time, during which the contaminant penetrated into the watercourse.

The results presented by this thesis are mainly charts of the mathematical model created in MATLAB. I used GIS in order to improve the clarity of output data of the simulation studies. Karlický creek basin area of interest was excluded from Orthophoto maps, a chart of nitrate concentrations is attached to each of its compartments. Two studies are supplemented with extra set of maps with a color differentiation of the watercourse according to nitrate concentrations to the four categories.

Crash simulation wastewater treatment plant Vysoký Újezd may in practice serve as a basis for solving similar situations in the operating rules of the plant.

After changing the parameters and calibrations the mathematical model may be

used for any small or medium water flow.