Summary of Ph. D. dissertation

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Use of the GIS techniques for water erosion estimation on the example of the Mątny basin in the Beskid Wyspowy

The aim of the work was the analysis of possibilities of use of the GIS techniques in investigations of chosen aspects of water erosion. Examinations were carried out for the Mątny stream basin, being subbasin of the Raba river, located in the West Carpathians. The Mątny basin has an area of 1,47 km^2 and is the basin of agricultural use. of changing in the following years use structure. It is the small basin, in which occur some ecological problems connected with high level of suspended sediment and nutrients concentration in the main stream in periods of high precipitation. At present large part of the area is occupied by grasslands, where great amount of organic fertilizers is used. The chosen problems concerned: use of models USLE group (standard USLE, MUSLE, RUSLE, modyfication according to Barioso, USPED and G2) for estimation of actual intensity of erosion, use of chosen models for estimation of potential intensity of sheet and rill erosion, use of the SWAT model for estimation of actual and potential concentration of suspended sediment and nutrients concentration, assuming change of basin use structure, problem of humidity and its distribution based upon physiography and topography of the basin and modeling nutrients concentration in the main stream depending upon basin physiography. The analysis was carried out based on field determinations, realized in the years 2012-2014 and analysis of thematic maps and remote sensing data. Calculations were carried out using the most contemporary methods, belonging to known as the GIS techniques, including programs: Arc GIS, SWAT, Surfer as well as artificial neural networks and geostatistical methods. Field and laboratory investigations covered among others: determination of physical and water properties of basin soils, determinations of suspended sediment, total nitrogen and phosphorus concentration and flow intensities in streams. Obtained results shows very high possibilities of use of the GIS techniques using USLE models. Replacement of direct field measurements by analysis of thematic maps, remote sensing observations and databases, enables quick analysis of erosion intensity and determination of local places especially threatened by erosion. Properly graduated model SWAT allow to simulate influence of various basin use version on water quality in mountainous areas. Geostatistical methods enables exact determination of influence of topographic and physiographic parameters on humidity distribution. The

calculations of influence.of initial conditions of humidity on surface flow showed high significance of this parameter in erosion estimation. Artificial neural networks enables to determine significance of chosen factors in soil humidity distribution and nutrients concentration depending upon chosen parameters of a basin.

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