Veda mladých 2018

SLOVAK UNIVERSITY OF AGRICULTURE IN NITRA
FACULTY OF HORTICULTURE AND LANDSCAPE ENGINEERING

VEDA MLADÝCH 2018 - SCIENCE OF YOUTH 2018

proceedings

ISBN 978-80-552-1844-1
ISSN 2585-7398

June 20 - 22, 2018, Vinné, Slovakia

FAKULTA ZÁHRADNÍCTVA A KRAJINNÉHO INŽINIERSTVA SPU NITRA

edu FZKI

Veda mladých 2018, Science of Youth 2018

PROCEEDINGS OF REVIEWED CONTRIBUTIONS

Hotel Vinnay, Vinné, Slovakia
20.06. - 22.06.2018

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ISBN 978-80-552-1844-1

Editors: Ing. Mária Tárníková, PhD., Ing. Andrej Tárník, PhD.

Schválil rektor Slovenskej poľnohospodárskej univerzity v Nitre dňa 6.6.2018 ako zborník prác z vedeckej konferencie.

CONTENT

CHANGES IN LANDSCAPE USE AND POTENTIAL OF ITS RESTORATION FROM THE PERSPECTIVE OF INDIVIDUAL PROGRAMS
Monika BILLIKOVÁ, Ján SUPUKA....................5

LAND READJUSTMENT A TOOL FOR TRANSFORMATION OF INFORMAL SETTLEMENTS IN KABUL, AFGHANISTAN
Mirwais FAZLI....................31

RESPONSES OF ROOT SYSTEM OF WOODY PLANTS TO DROUGHT
Marek HUS, Viera PAGANOVÁ....................43

THE EFFECT OF INPUT PARAMETERS IN THE MODELLING OF DMR
Anita KISOVÁ, Jozef HALVA....................56

DENDROLOGICAL CHANGES AS AN INDICATOR OF WATER STRESS
Vladimír KIŠŠ, Viliam BÁREK....................64

EROSION OF TOURIST TRAILS IN FORESTS WITH HIGH PEDESTRIAN TRAFFIC
Ondřej NUHLÍČEK....................71

DIFFERENT METHODS FOR DETERMINING THE INTENSITY OF WATER EROSION IN SLOVAKIA AND THE CZECH REPUBLIC
Jakub PAGÁČ, Alexandra MOKRÁ....................82

UTILIZATION OF DRONES FOR DATA ACQUISITON FOR FOREST STAND LEVEL INVENTORY
Martin SLAVÍK....................95

CHANGES IN THE RURAL LANDSCAPE AND THE POTENTIAL FOR ITS RENEWAL AND INNOVATIVE DEVELOPMENT
Ján SUPUKA, Monika BILLIKOVÁ....................104

CLIMATE-RELATED PHYSICAL PROPERTIES IN FLUVISOL
Jozef VARGA, Radoslava KANIANSKA....................115

COMPUTATIONAL MODEL OFSIGLE TREE FOR STRUCTURAL ANALYSIS
Radko VINCÚR, Ľuboš MORAVČÍK....................126

Poster section

SURFACE STABILITY OF THE SLOPE
Dagmar DOBIAŠOVÁ...135

LANDSCAPE CHARACTER AND THE POSSIBILITIES OF ITS GRAPHIC PRESENTATION
Lucie HAVRÁNKOVÁ...136

CONWATER – APPLICATION OF THE CONNECTIVITY CONCEPT IN WATER EROSION RESEARCH
Elena KONDRLOVÁ, Gisela M. EBERHARD, Lisa HUMER, Tatiana KALETOVÁ, Karol ŠINKA, Andrej TÁRNÍK, Ronald PÖPPL...137

METHODS OF SOIL MOISTURE SPATIAL INTERPOLATION IN GIS
Matúš PERHALA, Andrej TÁRNÍK, Mária TÁRNÍKOVÁ..138

LAND CHANGE MODELER- A TOOL FOR PREDICTION LAND CHANGES IN COUNTRY (MODEL AREA - CADASTRAL AREA BÁB)
Mária TÁRNÍKOVÁ, Andrej TÁRNÍK...139

THE SLOVAK UNIVERSITY OF AGRICULTURE IN NITRA
HORTICULTURE AND LANDSCAPE ENGINEERING FACULTY
DEPARTMENT OF LANDSCAPE PLANNING AND LAND CONSOLIDATION,

Surface stability of the slope

Dagmar Dobiašová

Measurements were carried out at the study locality in the cadastral area of Liptovský Mikuláš, where the erosion and slope processes were monitored from March 2010 until February 2012 due to landslide event creating pressure on the local road. Firstly, we estimated soil erosion risk using the Universal Soil Loss equation by Wischmeier, Smith (1978) G = R.K.L.S.C.P and the annual mean soil loss was calculated in tonnes per hectare per year. Geodetic measurements have been performed for the purposes of determining planar and elevation information to subsequently determine the values of soil erosion factors. Also pedological properties and representative soil cover were evaluated. The territory threated by landslides was located on Cambisol originating from the flysh. Medium heavy deep soils with a Soil Unit Code BPEJ 0869412 are represented on the area of 4.2 ha. The proportion of 0.8 ha of that area is threatened by soil erosion and landslides. This process is also noticeably visible on the satellite image in the Figure 2. The slope is medium with an average slope of 17% and inclining towards south, east and west. Currently the slope was covered by pasture. The bottom of the slope is afforested with mixed forest (predominantly oak, beech, spruce).

However, this afforestation was incomplete. Moreover, deforestation was performed above our study site and the site did not go through reclamation in the form of new planting. Average annual precipitation for this site was 96.08 mm, but during the period May - August 2010 there was 285 mm of precipitation and the slides began to form. In 2011, there was 168 mm of precipitation during May -August. The meteorological data were provided by Slovak Hydrometeorological Institute.

Figure 1: Significant disruption of slope surface stability

Figure 2: Satellite imagery of the observed area

The resulting estimates from USLE confirmed our assumptions. The highest degree of erosion processes occurred at the bottom of the slope. Figure 2 shows these areas as red dots. Soil loss by erosion ranged from 13 t/ha/year up to 91 t /ha /year. The weighted arithmetic mean was 52 t/ ha/ y. According to Act No. 220/2004 Coll., the tolerable soil loss on deep soils is 30 tonnes per hectare per year. The soil loss from areas covered by grass was much smaller; it ranged from 0.14 t/ha/year up to 1.82 t/ha/year. To decrease the erosion risk on the site we recommended restoration of the protective forest cover above the boundary of the study area. Another measure would be to return and restore the soil cover at the bottom of the slope. Since the upper part of the soil was flushed away and the subsoil was visible, replenishment of the missing soil would be appropriate. Evenly distributed along the slope, harrowed soil would be the foundation for the infiltration strip along the contour. This would act as a temporary solution, followed by planting woody plants.

The areas with occurrence of the highest erosion intensity (the dark blue areas in Figure 3), were suggested for planting by trees from Salix family, in particular to properly manage the excessive accumulation of surface runoff. As a result of upper slope afforestation and bottom slope revegetation the slope would be stabilized without creating pressure of loosened soil on the public road. Moreover, transpiring vegetation would contribute to lowering the groundwater level by draining the excess water. The forest type of landscape would be restored and, above all, the population would not more endangered destruction of public road leading to dwellings because of landslides.

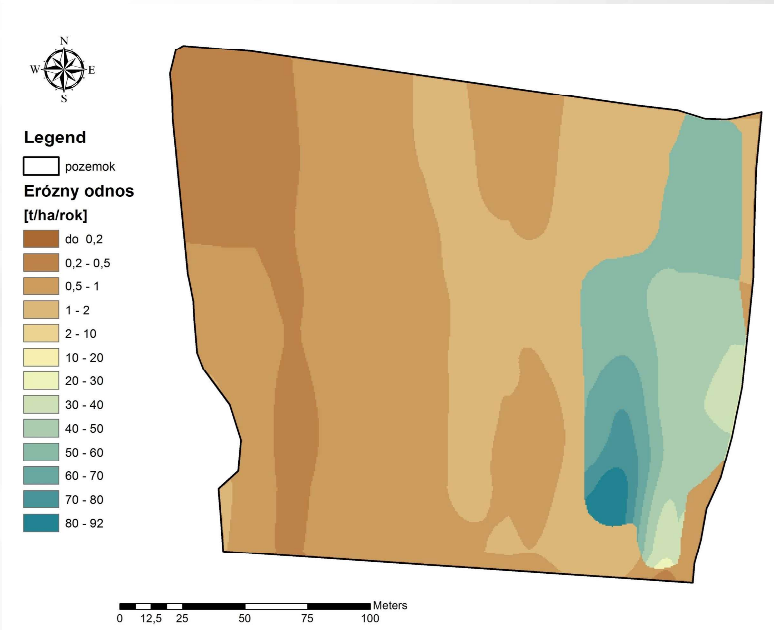

Figure 3: Mean annual soil loss in t/ha/y

Acknowledgements – Conducted research was supported by projects VEGA no. 1/0673/16 and KEGA no. 008SPU-4/2017.

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SCIENCE OF YOUTH 2018 - PROCEEDINGS OF REVIEWED CONTRIBUTIONS

Hotel Vinnay, Vinné, Slovakia
20.06. - 22.06.2018

Held under the auspices
doc. Ing. Klaudia Halászová, PhD., dean of FZKI SPU in Nitra.

Edition: first

Year of publication: 2018

Approved by the Rector of the SUA in Nitra as a proceedings from a scientific conference on June 6, 2018.

Editors: Ing. Mária Tárníková, PhD., Ing. Andrej Tárník, PhD.

Publisher: Slovak University of Agriculture in Nitra

ISBN 978-80-552-1844-1

It didn't go through editorial editing in the publishing house.