

## **Experiences of a gully survey in the Gödöllő Hillside Landscape Protection District, Hungary**

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In the 1970s when Highway No. 3. was built in Hungary, environmental issues were not thoroughly considered. The main scope of our survey is the analyses of a gully created by the runoff from the highway and from the upper watershed. These excess waters were channeled into natural valleys alongside the highway. Five outlets were created where the runoff water developed deep gullies and deposited huge amount of sediment at the tail of the gullies.

The surveyed gully can be found in central Hungary, at the border of Gödöllő city, which area belongs to the Gödöllő Hillside Landscape Protection District. The experimental area is situated 175–220 meters above the sea level and it is crossed by the M3 motorway which took part in the development of the surveyed linear erosion form. During our survey, several dams and channel modifications, buffer ditches were built from materials found mainly locally, in order to decrease the energy of waters, to hold up the runoff and this way to eliminate the erosion damage in this protected area. However it is difficult to install and to maintain the protective measures. Due to the nature protection status the possible use of the materials and methods are limited. We surveyed the longest gully, which is 320 meters long and its width is exceeding 3 meters at its head, close to the motorway. The average depth is 1 meter.

In order to monitor the amount of the runoff we planted some rods, where the height aboveground was known. The survey was made with GPS (Global Position System- Trimble Juno SB ArcPad 8.0) where along the gully the GPS recorded the position in every 20 seconds. Besides we recorded every dams and every sudden changes, where the direction, slope angle, depth, width or other characteristic was different. The data processing and the maps was made in ArcMap10.2, QGIS 2.2 and in Google Earth. Furthermore, micro soil profiles were taken from the riverbed to know the thickness of the runoff after bigger rainfall events.

The size of the catchment of the investigated gully was measured as 214,873 square meters. We estimated the amount of the runoff arriving into the surveyed gully for 14 months, the result of the measure was 22,741.6 cubic meter per month. In case of 4 dams the retention effect was examined. The four protection measures hold up nearly 160 tons of sediment in the gully bed.