



Gully erosion balance in the context of pedological-sedimentological research, geodesic measurements and Aerial Laser Scanning (Lublin Upland, E Poland)

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The dissection of loess covers by Neoholocene gullies in east Poland particularly depends on relative heights. In the case of height differences not exceeding 30 m, gullies hardly exist. In areas with height differences exceeding 50 m, gullies develop a network with a density of several km⁻² of the catchment, and locally even more than 10 km⁻². Systems of dissections called badlands are then abundant, as well as piping landforms with no surface runoff. The gullies are covered by forest vegetation – particularly dry-ground forest *Tilio-carpinetum*.

In such conditions, it is difficult to accurately mark the gullies on a map, and perform geodesic measurements in the field. Even the measurement of the length and calculation of the volume of the gullies is problematic. Due to the diversity of their types and shapes, the calculation of the volume of the gullies, and therefore the determination of the total amount of gully erosion, is approximate, particularly in many kilometres long branched out systems. An additional difficulty is posed by the agricultural use of some slopes and bottoms of the gullies in the past. This considerably changed the features of such landforms, making them resemble Late Pleistocene trough valleys. The determination of their genesis requires conducting pedological research.

For the above reasons, calculations of the volume of the gully and its erosion balance were performed for a small gully catchment with an area of 0.19 km². The total length of gullies in the catchment amounts to approximately 2 km, and their density exceeds 11 km⁻². The studied gully dissects the left slope of the Bystra River valley near Celejów on the Nałęczów Plateau, a loess mesoregion constituting a fragment of the western part of the Lublin Upland. The difference in height between the valley floor and the plateau amounts to 58 m (204-146 m a.s.l.).

Nine height difference and soil transects were performed within the analysed system, and geodesic measurements of the gully floor and edges were performed. The basic image was obtained from ALS (Aerial Laser Scanning) data. Pedo-geomorphic research permitted the determination of phases of development of the gully. Dates 14C obtained from sediments on the fan at the mouth of the gully were also used.