

Adjustment of the river channel due to block ramps introduction: Porębianka mountain creek, Polish Carpathians

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The paper includes a description of 25-five interlocked boulder block ramps with increased roughness located on Porębianka creek and presents an analysis how those low head hydraulic structures fit to a natural river system: riffle-pool. These block ramps with increased roughness structures might be called "close to the nature", and in hydraulics engineering they are replacing traditional drop hydraulic structures. One of the main advantages of block ramps is that they are supposed to be placed in a natural sequence distances which follows pools and riffles pattern along a river, also block ramps allows free movement of fish upstream and downstream without necessity of fish pass construction.

The analysis of geomorphological justification for cascades of block ramps in the river system has been done on the basis of inspection of orthophotos. These maps have been used for 1999, 2003 and 2009 from [<http://miip.geomalopolska.pl/imap/>] and for 2015 for [<https://www.google.com/maps>]. Maps from 1999 show the Porębianka riverbed before the construction of block ramps with increased roughness. In maps from 2003 one can see 9 located in the lower section of the stream (structures 1 - 9). Moreover, in those maps one can see the boulder ramps 17 and 18 which were under construction that time. Next map from 2009, shows the riverbed and 18 rapids (structures 1 - 18). The last map shows all already built hydraulic structures (structures 1 – 25). Based on all orthophotos from the years 1999 - 2015, one can notice the width of the water table and the river bed, as well as the surface of the gravel bars. The analysis shows that during the period of ramp construction, the distance between only 1 pair of ramps corresponded to the range of 5-7 channel widths.

Also along the paper we determined variability braided parameters and their changes along 16 years of existing of block ramp cascades, which values indicate a tendency to reduce braiding of Porebianka. Finally we determined the changes of width of the water table and river bed and river gravel bars area and so called active riverbed along the period of observations.