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## Use of data about past river activity for delimiting an erodible river corridor: the Biała River, Polish Carpathians

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The Biała is a gravel-bed river in the Polish Carpathians that was severely affected by human activity over the last century. To restore the river, establishing an erodible corridor in two river sections was proposed. We analysed changes in planform river geometry over the last 130 years to determine hydromorphological river degradation and thus verify a need of river restoration. The belt of historical river migration on the valley floor was subsequently identified to help delimit boundaries of the erodible corridor. Finally, the degree of narrowing of the contemporary river in relation to its historical width was determined to predict the river potential for future bank retreat in the erodible corridor.

The study used topographic maps from 1878, 1935 and 1962, aerial photos from 1967, 1977 and 1987, and orthophotos from 1998 and 2009. For each date, boundaries of active river zone and river geomorphic units were digitized and their average width in 8 river reaches was determined. Overlays of an extent of active river zone from all analysed dates indicated the belt of river migration during the last 130 years. A comparison of contemporary river width with the largest river width recorded during the study period indicated the degree of river narrowing caused by its channelization and channel incision.

Between 1878 and 2009 the Biała experienced a marked reduction in width: three-fold in the upper study section and more than six-fold in the lower one. The river narrowing was associated with a reduced occurrence of channel bars in the river and nearly complete elimination of islands. These changes did not reflect a river metamorphosis that would require a substantial increase in channel sinuosity, but they were accompanied by deep channel incision with nearly unchanged river sinuosity, hence demonstrating hydromorphological degradation of the Biała.

The belt of the river migration over the last 130 years was 4.9 times wider than the contemporary river in the upper section of the proposed erodible corridor and 5.3 times wider in the lower section. This allowed for delimiting an erodible river corridor on a substantially larger area of the valley floor than the area of the river from 2009.

The contemporary river is narrower than the largest river width recorded between 1878 and 2009 along nearly the whole length of the investigated river sections, more than twice narrower along three-fifths of the upper section of the erodible corridor and two-thirds of the lower section, and more than four times narrower along one-fifth of both river sections. These values indicate that the concentration of flood flows in the narrow channel increasing their unit stream power is a factor markedly increasing the future potential of the river for bank erosion and channel widening in the erodible corridor.

This study demonstrated that analysis of historical channel changes is useful for diagnosing hydromorphological river degradation, delimiting an erodible corridor and predicting the river potential for future widening in the corridor.

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