The impact of river channelization structures on the vegetation state in mountain river valleys

Riparian ecosystems are sensitive to anthropogenic disturbances which have been documented worldwide. River regulation and implementation of bank reinforcement is the triggering factor of channel incision and terrestrialization of river floodplain irreversibly changing riparian vegetation. This human impact which is reflected in the river flow changes also affect the reduction of native plant cover as well as facilitates exotic invasion in riparian wetlands.

Despite the above-rmentioned study result it is still poorly understood and quantified, how initial morphology of river and trajectory of its morphological changes and floodplain management occuring after river channelization, modulate adjustments of riparian vegetation and its present state. In the majority of Polish Carpathian rivers channelized in the past, riparian forest occurred along without built-up and agricultural areas during the second half of the 20th century. In the same time the forest developed also in the valley floor where the river forms the natural channel pattern. However, in contemporary conditions, there is a noticeable difference between the riparian vegetation state in the part of the river valleys with the different channel morphology. In this project, we hypothesize that:

H1 Hydromorphological changes induced by mountain river channelization in the long-term perspective (60 years), result in decreased species richness and diversity of riparian vegetation. We expect significantly higher diversity and species richness of riparian vegetation along the unmanaged section of the river than along the channelized one. To compare vegetation along natural versus human altered river channels, we will use numerous indices related to the vegetation.

H2 The above-hypothesized loss of diversity of riparian vegetation will favor an expansion of non-native species on river floodplain. This will be tested by statistical comparison of proportion of native to non-native species along the channelized and unmanaged section of studied rivers.

In sections of three rivers valleys of the Polish Carpathians, we plan to establish the river channel pattern, the diversity and condition of riparian vegetation as well as the linkage between the extent of past and present floods and the state of the islands and floodplain plants. By comparison of riparian forest chracteristics in adjacent river sections having different channel management histories, we plan to indicate where riparian forests need to be restored and also evaluate to what degree such actions will improve the state of riparian vegetation.

The project research will contribute to understanding the driving factors of riparian vegetation changes under human and climate stress. It will highlight the need of restoring natural river channel in order to improve the hydrological conditions for the development and survival of riparian forests and also will present the importance of repeated floods in the river valley.
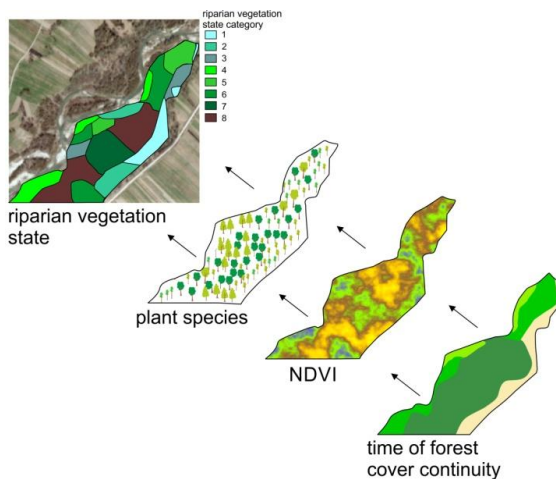
The result of the project will be a proposal of an innovative method for evaluating riparian forests using the most accurate techniques of remote sensing enabling to obtain of images with increased detail. The riparian vegetation state map (Fig. 1) obtained based on this research will be an original tool to compare the plant formations within the river sections with different channel morphology.

Figure 1. Schematic flow chart to produce a map of the riparian vegetation state