EGU21-1588
https://doi.org/10.5194/egusphere-egu21-1588
EGU General Assembly 2021

Mind the gap: extending the conceptual model of river island development to different environmental conditions and tree species

Walter Bertoldi[1] and Angela M. Gurnell[2]
[1]University of Trento, Civil, Environmental and Mechanical Engineering, Trento, Italy (walter.bertoldi@unitn.it)
[2]School of Geography, Queen Mary University of London, London E1 2NS, U.K.

We present recent results of field observations on an island braided reach of the middle Tagliamento River, Italy, where riparian vegetation survival and establishment depends on an unstable balance between vegetation growth and flood disturbance. We combined field observations and information extracted from aerial images, airborne lidar data, and river flow time series for the period 1986-2017 to investigate the changing spatial distribution of woody vegetation and the associated changes in river topography. We also explored the role of Alnus incana (a member of the Betulaceae family), in an environment dominated by the Salicaceae family (e.g. Populus nigra).

We observed that gaps between established islands and/or floodplain offer shelter to vegetation, supporting higher colonisation success and different vegetation-landform evolution pathways.

In particular, A. incana predominantly grows in lines along channel, island and floodplain edges, bordering wooded areas dominated by P. nigra. Given their association with floodplain and island edges and the relationship of taller (older) trees with more elevated surfaces, A. incana in the study reach appears to complement the physical engineering of the dominant species, P. nigra. This suggests that P. nigra may facilitate colonisation by alder but then both species trap sediments to aggrade channel edges and bar surfaces and build island and floodplain landforms.

Time sequences of aerial images in combination with the flood disturbance time series allowed us to interpret vegetation dynamics and to identify the fate of sexual and asexual reproduction strategies by observing vegetation expansion from lines of young plants and shrubs and from uprooted deposited trees and pioneer islands, respectively. Field observations are then generalized to extend a conceptual model of island development.

Growing conditions, disturbance energy, and time (window of opportunity) between major floods are the main controls on vegetation colonization. These vary among rivers, among reaches along the same river and locally, as in the investigated gaps, allowing different tree species with different life history traits (e.g. Populus nigra, Alnus incana) to engineer local river landforms in different and complementary ways.

Although the conceptual model is inspired by observations on the Tagliamento River, consideration of species life history traits and the joint influences of growing conditions, disturbance energy and windows of opportunity provide a framework that may be applied to other temperate rivers where trees drive landform development.