Role of floodplains in nutrient dynamics

This masterclass will explore the potential role of floodplains in biogeochemical cycles related to hydrological connectivity and considering other aspects such as biodiversity and ecosystem services.

Floodplains are key ecosystems of riverine landscapes and provide key ecosystem functions for riverine systems such as nutrient cycling and a multitude of ecosystem services such as nutrient retention. In most of the large river systems worldwide, a tremendous reduction of floodplain area has occurred in the last 100 years and this loss continues due to pressures such as land use change, river regulation, and dam construction, and are seen as the most relevant threats to their biodiversity, ecosystem functioning and ecosystem services both, worldwide and in Europe. In the Danube River Basin, the extent of floodplains has been reduced by 68 % compared to their pre-regulation area, with the highest losses occurring in the Upper Danube and the lowest in the Danube Delta. On the other hand, floodplains are seen as biogeochemical active areas and hotspots of carbon, phosphorus and nitrogen transformation and important sites in regulating the transport and storage of key elements of large-scale biogeochemical cycles.

The alterations of floodplain connectivity make management interventions such as restoration of areas and functions an urgent task to secure key roles and services of floodplain systems locally and at the river system scale. Restoring lateral exchange conditions, such as improving lateral hydrological connectivity is one aims of restoration schemes in river management and influence nutrient dynamics in various ways.

The masterclass will address relevant aspects of nutrient dynamics including the role of exchange conditions with the river channels as well as aquatic-terrestrial linkages. In a next step, current limitations of human modified river – floodplain systems will be discussed and in a final step during the masterclass we will identify potential approaches for floodplain restoration considering relevant biogeochemical cycles, general biodiversity aspects and interactions with ecosystem services. Students are invited to read and analyze key articles in advance, prepare short presentations on specific topics to inform the group work on defining critical deficits and potential approaches for future river-floodplain systems.