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Multi-compartment approach to identify minimal flow and maximal recreational use of a lowland river

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Most approaches to establish a minimum flow rate for river sections subjected to water abstraction focus on flow requirements of fish and benthic invertebrates. However, artificial reduction of river flow will always affect additional key ecosystem features, as sediment properties and the metabolism of matter in these ecosystems as well, and may even influence adjacent floodplains. Thus, significant effects e.g. on the dissolved oxygen content of river water, on habitat conditions in the benthic zone, and on water levels in the floodplain are to be expected.

Thus, we chose a multiple compartment method to identify minimum flow requirements in a lowland River in northern Germany (Spree River), selecting the minimal required flow level out of all compartments studied.

Results showed that minimal flow levels necessary to keep key ecosystem features at a 'good' state depended significantly on actual water quality and on river channel morphology. Thereby, water quality of the Spree is potentially influenced by recreational boating activity, which causes mussels to stop filter-feeding, and thus impedes self-purification. Disturbance of mussel feeding was shown to directly depend on boat type and speed, with substantial differences among mussel species. Thus, a maximal recreational boating intensity could be derived that does not significantly affect self purification.

We conclude that minimal flow levels should be identified not only based on flow preferences of target species, but also considering channel morphology, ecological functions, and the intensity of other human uses of the river section.