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Connected or disconnected: functioning and management of (dis)connectivity in fluvial systems.

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Connectivity provides a powerful framework for analysis of fluvial system functioning at a range of scales but identification of disconnectivity and application to management presents challenges. Three stages of evaluation are suggested, depending on the purpose of study and aims of management, and on the underlying strategy and approach. An overall premise of management is assumed of working with nature and allowing or enabling the system to function as sustainably as possible.

The first stage entails identification of the connectivity status and the disconnectors in the system. This includes analysis of what is being disconnected (water, fine sediment, coarse sediment, pollutants), under what conditions and when the disconnector operates, and the types and locations of disconnector. Various methods can be used but present modelling has deficiencies and requires field validation. That presents challenges in recognition of disconnectors across a range of spatial and temporal scales, but recommended strategies are discussed.

A second stage for management is to analyse to what extent the present functioning is influenced and controlled by human actions, such as land use and structures, and how it departs from a more natural or less disturbed functioning. This can then provide a platform for developing a strategy that amends past disturbances and moves the functioning towards identified management goals. However, these goals can differ and may be in conflict for different components of the same system. For example, for many ecological restoration goals the strategy may be to remove disconnectors such as dams and weirs, to allow greater connectivity of species, e.g. fish. On the other hand, if the problem to be addressed is the increased soil erosion or flooding caused by human disturbance then the goal may be to increase the disconnectivity and reduce fluxes through the system. Our research has proposed that use of vegetation is a sustainable and adaptable method of fulfilling this goal, and discusses how analysis of connectivity and identification of key points for disconnection allows the development of spatial strategies for management.