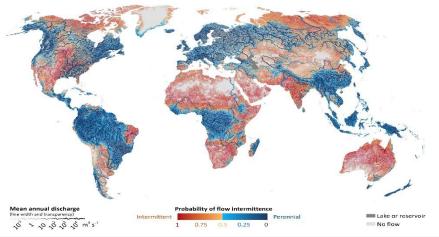




WHAT IS A DRYING RIVER NETWORK?

A river network is composed of a collection of tributaries, streams, or creeks, converging into one mainstem and forming a drainage basin. For decades, it was assumed that most river networks are perennial, implying they have flowing waters continuously.

The majority of the global river network is prone naturally to drying



A global map showing the probability of drying of the global river network. From M.L. Messager et al. (2021).



A drying river network in Southern Spain. Photo: N. Bonada.



A typical sequence of flowing, non-flowing and dry conditions in a streambed of the Calavon River, eastern France. Photo: B. Launay.

More than half of the global river network length is naturally prone to drying. This is due to meteorological, geological, and hydrogeological causes. Drying can lead to the presence of disconnected pools, with standing waters, or to the complete disappearance of surface water, with or without an underlying subsurface flow. Hence, drying is the norm rather than the exception. This recent finding calls for a shift in paradigm in the science and management of rivers and streams. For example, conceptual models available for river science does not well integrate drying, which is the master variable determining the biodiversity and ecological integrity of drying river networks. Similarly, most management tools used to assess the ecological status or define environmental flows in river networks do not account for drying.

Drying is an expanding hydrological phenomenon due to global change

Global change is altering the drying regimes of river networks and in many areas, is increasing the prevalence of drying. This can be caused by surface and groundwater abstraction, the construction of reservoirs to store and regulate the flow for irrigation, hydropower and recreational activities, the changes in land use, and climate change. Each of these non-natural drivers of drying has some specific hydrological signature and ecological consequences which are poorly explored but presumably more dramatic than for naturally drying river network. This is due to the lack of adaptation of species inhabiting perennial rivers. Consequently, management strategies should be different between natural and non-natural drying river networks.



Left and right: naturally intermittent streams in dry condition in the Mecsek Mountain, southeast Hungary (Photo: B. Pernecker). Middle: non-naturally dry riverbed of the Hármas-Körös below the dam at Békésszentandrás, southwest Hungary (Photo: G. Jakab)