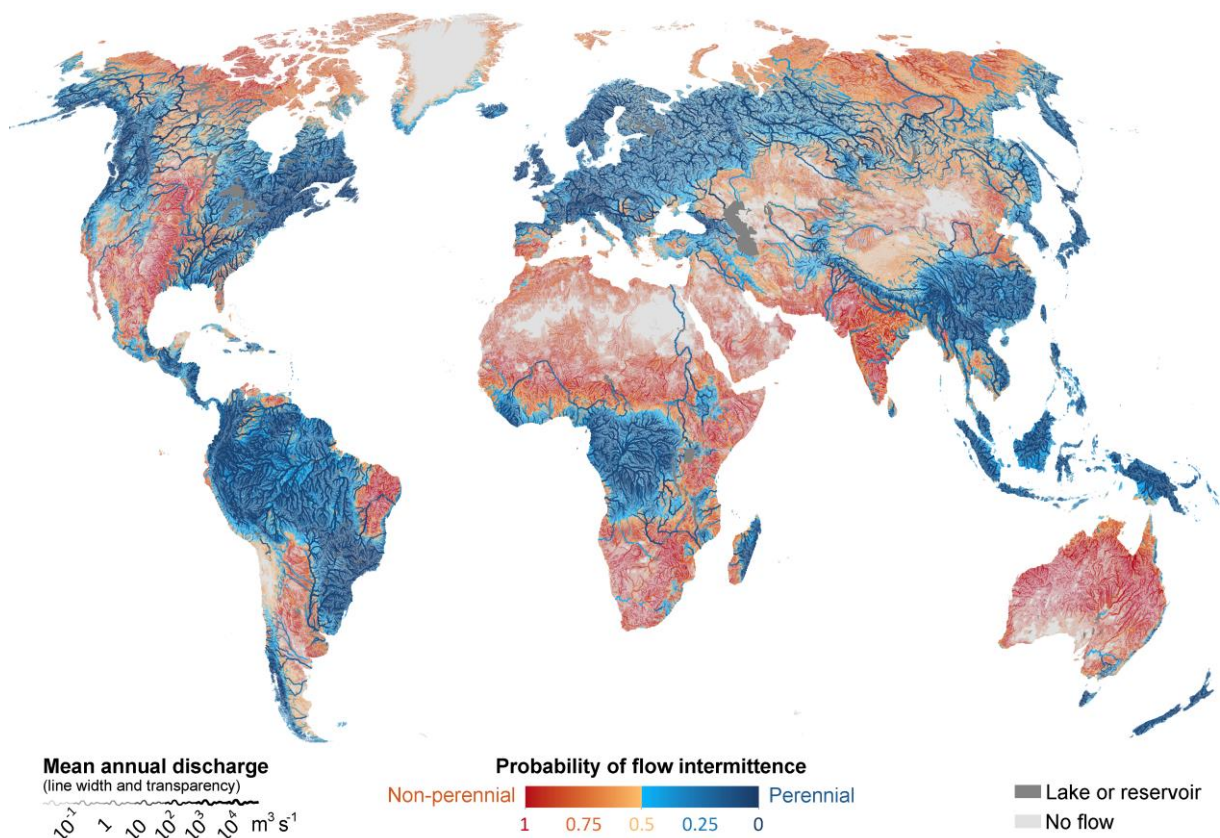


Press release – 17 June 2021

More than half of the world's rivers are non-perennial: researchers mapped them for the first time

A new study of 64 million kilometres of rivers around the world reveals that between 51% and 60% of them stop flowing periodically or dry for part of the year. These findings, published on 16 June 2021 in *Nature*, stem from the first-ever effort to empirically quantify and map the global distribution of non-perennial rivers and streams. This study, conducted by researchers from INRAE and McGill University, aims to strengthen recognition of the prevalence and ecological, and the need for improved management of these unique ecosystems.



Global distribution of non-perennial rivers and streams, which are found in all climates and on all continents.
Messenger et al. 2021

Rivers and streams are essential for biodiversity, biogeochemical cycles, and human societies. INRAE and McGill University researchers showed that more than half of the 64 million kilometres of rivers and streams that they investigated stop flowing at least one day per year on average. Unlike perennial rivers and streams, whose importance is well recognised, the value and fate of those watercourses that periodically stop flowing tend to be overlooked or ignored.

Unique and valuable ecosystems in all climates and on all continents

Non-perennial rivers and streams are home to a unique diversity of organisms, with many species having adapted to the cyclical absence of water. These ecosystems also play an important role in controlling water quality and are the primary sources of water, food, and livelihood for millions of people.

Drawing on climatic, hydrological, geological, and land use data on the world's river system, this study highlights the presence of non-perennial rivers in all climates and biomes¹ across all continents. Based on preliminary estimates, the study also suggests that more than half the world's population lives in places where the nearest river periodically runs dry.

Many rivers that were once perennial have become intermittent over the past 50 years, including sections of major rivers such as the Nile and Colorado. Due to continued climate change, shifts in land use, and water withdrawal for various uses (agriculture, drinking water, industry and energy, etc.), an increasing proportion of the world's river system is expected to cease flowing seasonally in the coming decades.

Few studies and inadequate management

Non-perennial rivers and streams are often inadequately managed or even excluded from management activities and conservation laws because they are overlooked. This neglect frequently leads to their degradation due to overpumping, pollution, and overfishing.

Until recently, freshwater science has tended to focus on the functioning and conservation of perennial bodies of water. Scientists are only now becoming aware of the importance and rapid degradation of intermittent rivers. As a result, scientific methods, management tools and protocols for monitoring the health of these rivers and streams are still limited or non-existent.

This study's findings call for an update of the fundamental concepts of river science and management, that traditionally assume year-round water flow in rivers and streams, to improve our understanding and management of terrestrial rivers and streams, their biodiversity, and their functional integrity.

By extrapolating the rate of water flow recorded by gauging stations in more than 5,600 rivers around the world, the researchers were able to draw up the first map of non-perennial rivers and streams in the world. This map provides essential baseline information for tracking future changes in flow and for determining and monitoring the roles of these rivers and streams in maintaining global biodiversity as well as water and biochemical cycles.

¹ Biome: a set of ecosystems that characterise a biogeographical area.

Reference

Message, M.L., Lehner, B., Cockburn, C. *et al.* Global prevalence of non-perennial rivers and streams. *Nature* 594, 391–397 (2021). DOI: 10.1038/s41586-021-03565-5

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About INRAE

Created on January 1, 2020, the French National Research Institute for Agriculture, Food, and Environment (INRAE) is a major player in research and innovation. INRAE carries out targeted research and resulted from the merger of INRA and IRSTEA. It is a community of 12,000 people with 268 research, experimental research, and support units located in 18 regional centres throughout France. Internationally, INRAE is among the top research organisations in the agricultural and food sciences, plant and animal sciences, as well as in ecology and environmental science. It is the world's leading research organisation specialising in agriculture, food and the environment. INRAE's goal is to be a key player in the transitions necessary to address major global challenges.

Faced with a growing world population, climate change, resource scarcity, and declining biodiversity, the institute is developing solutions that involve multiperformance agriculture, high-quality food, and the sustainable management of resources and ecosystems.

About McGill University

Founded in Montreal, Quebec, in 1821, McGill University is Canada's top ranked medical doctoral university. McGill is consistently ranked as one of the top universities, both nationally and internationally. It is a world-renowned institution of higher learning with research activities spanning two campuses, 11 faculties, 13 professional schools, 300 programs of study and over 40,000 students, including more than 10,200 graduate students. McGill attracts students from over 150 countries around the world, its 12,800 international students making up 31% of the student body. Over half of McGill students claim a first language other than English, including approximately 19% of our students who say French is their mother tongue.