

Ecological functions of streams and rivers severely affected globally

May 17 2022



Credit: Mario Brauns / UFZ

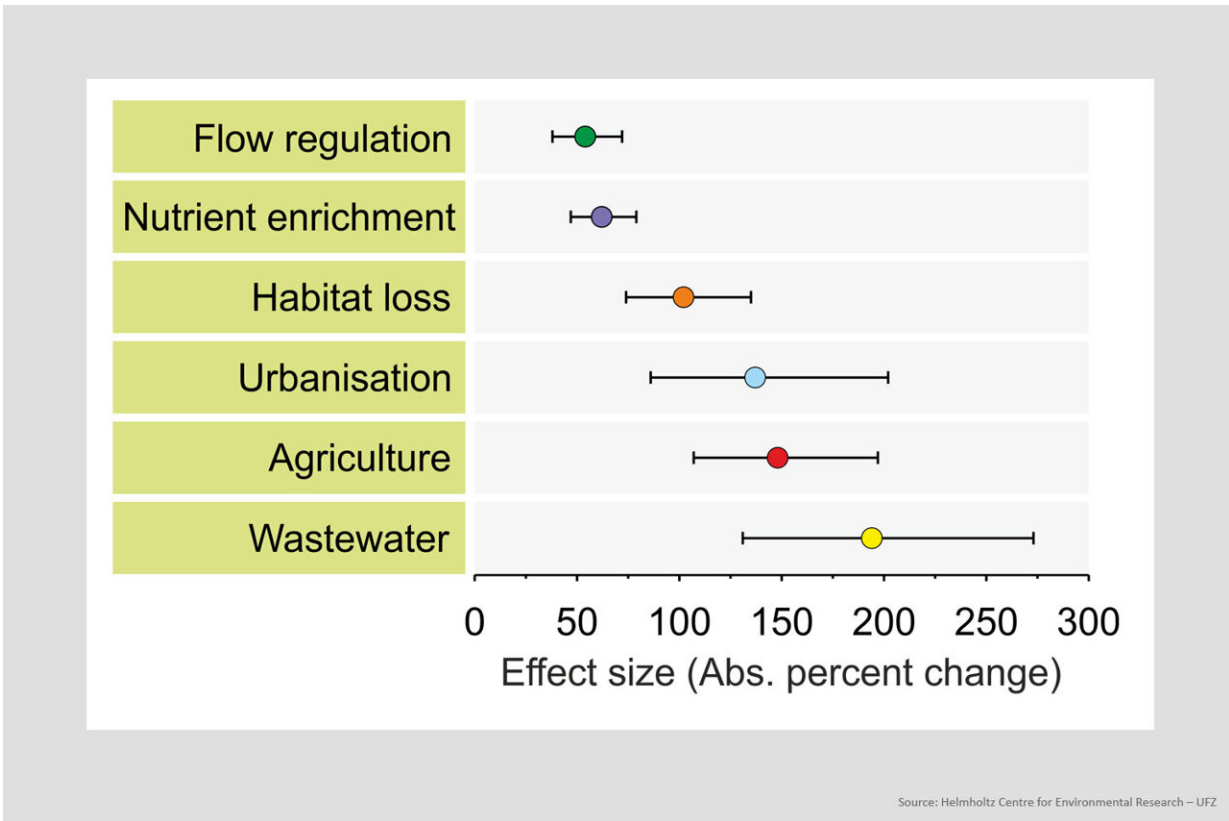
Agriculture, loss of habitat or wastewater effluents—human stressors negatively impact biodiversity in streams and rivers. Very little is known yet about the extent to which their capacity for self-purification and

other essential ecosystem services are also impacted. An international research team lead by the Helmholtz Centre for Environmental Research (UFZ) has synthesized the globally available research on this topic in a meta-analysis recently published in *Global Change Biology*. This study provides new initiatives for improved water management.

Streams and rivers are the lifeblood of our planet, [biodiversity hotspots](#) and essential for human life: They provide drinking water, offer flood protection and are used to irrigate [agricultural areas](#). But humans are impacting freshwaters and their ecological functions through actions such as altering the structure of waterbodies, [agriculture](#) or discharging wastewater. "Of course this leads to a variety of adverse ecological effects," says Dr. Mario Brauns, a scientist at the UFZ Department of River Ecology. "Most studies deal with the effects on biodiversity, but this may only be a part of the problem. Although a loss of biodiversity can be an indicator that freshwaters are affected by human stressors, the question of whether and to what extent its ecological functions suffer remains unanswered."

An essential ecosystem service of [streams](#) and rivers is their natural self-purification service. This can be assessed based on ecological functions such as nutrient retention or leaf litter decomposition. But how do human stressors affect these ecological functions that are essential for the natural self-purification capacity of a river or stream? "In this [meta-analysis](#), we compiled the current status of research on this question," says Brauns. The international research team evaluated the published literature for studies investigating the effects of human stressors on the ecological functions of rivers and streams. "We reviewed the research available worldwide and found a total of 125 studies—which is not much given the global scale," says Brauns. "This again underscores how little research has been done to date in this area. And: The studies found were conducted primarily in Europe or North America. Hardly anything is known to date for Asia or Africa and we see an urgent need for research

and action in these geographical areas."



Wastewater, agriculture and urbanization have the biggest absolute impact on the multifunctionality of streams and rivers. Credit: UFZ

Evaluation of the data revealed that the efficiency at which streams retain nitrates is nearly five times lower for streams draining agriculture catchments than for streams in pristine catchments. "This is surprising," says Brauns and explains: "Rivers and streams affected by agriculture are impacted by high nutrient concentrations and a degraded structure and can no longer adequately fulfill their ecological function and lose a major portion of their purification service." Another important result is the comparative stressor analysis: Which stressors have the greatest

impact across all ecological functions? Wastewater ranks first and is followed by agriculture and urbanization. "These stressors are areas where we must take urgent action," says Brauns. "The ecological functions of rivers and streams are reliable indicators that allow a functional assessment of streams and rivers and implementation of appropriate management strategies, as demonstrated by our study. We advocate for more studies on the ecological functions of streams and rivers, preferably over a broader geographical area. If the [stressors](#) persist in contemporary intensity, we will lose the functional backbone of streams and rivers and ecosystem services essential to humans."

More information: Mario Brauns et al, A global synthesis of human impacts on the multifunctionality of streams and rivers, *Global Change Biology* (2022). [DOI: 10.1111/gcb.16210](https://doi.org/10.1111/gcb.16210)

Provided by Helmholtz Association of German Research Centres

Citation: Ecological functions of streams and rivers severely affected globally (2022, May 17) retrieved 23 April 2024 from <https://phys.org/news/2022-05-ecological-functions-streams-rivers-severely.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.