

Can the planetary health concept save freshwater biodiversity and ecosystems?



Rivers, wetlands, lakes, and other freshwater ecosystems collectively cover only 1% of the Earth's surface. Yet, these ecosystems support a disproportionately large and vast array of biodiversity. Currently, these ecosystems face many threats, including pollution, habitat alteration, fragmentation, invasive species, over-exploitation, overabstraction, climate change, and other emerging stressors. According to the World Wide Fund for Nature's Living Planet Index, freshwater ecosystems and biodiversity are considered among the most threatened on the planet, with average declines of approximately 83% in the populations of freshwater organisms since 1970.

Such losses are impactful not only from a fundamental biodiversity perspective but also from a human health and wellbeing perspective. Freshwater systems are so crucial to people that more than 50% of human populations live within 3 km of surface fresh waters and only 10% live more than 10 km away.¹ Loss and degradation of freshwater ecosystems directly affect the health and wellbeing of people and communities.² For example, freshwater biodiversity in the form of fisheries provides a key source of micronutrients and fatty acids for some of the most food insecure people on the planet, as well as recreational benefits and many cultural connections, as exemplified by Indigenous ceremony and spirituality. Freshwater biodiversity also supports livelihoods and upholds many regional and even national economies. Inland wetlands disperse floodwaters, recharge groundwater supplies, and remove many harmful pollutants—important functions that are even more crucial as the climate changes and both floods and droughts become more common.

People clearly need and benefit from healthy freshwater ecosystems;² Given the precarious state of these important systems and services, current efforts to address the freshwater biodiversity crisis remain insufficient.³ Planetary health is an emerging framework that aims to secure the state of natural systems within environmental limits that ensure humanity can flourish.⁴ The planetary health concept is tied to the planetary boundaries framework in which various ecological thresholds are identified with the goal of

constraining human activity to within those boundaries (so-called safe operating spaces). Freshwater systems are influenced by some planetary-scale processes like the climate systems and phosphorus and nitrogen cycles. Nonetheless, safe boundaries to guide the conservation and management of freshwater ecosystems need to consider their uneven distribution around the globe, and their ecological and hydrologic limits, which are often site and context dependent.^{5,6} Efforts to down-scale planetary boundaries concepts to the management of freshwater recreational fisheries at the lake scale,⁷ suggest that there are opportunities for rethinking planetary health as a nested cross-scale approach from the planet to the watershed.

Planetary health is now at the forefront of global policy discussions, and it could provide a means for elevating freshwater ecosystem health on that level. In practice, freshwater ecosystem health is usually excluded or overlooked in planetary health discussions, being only considered in terms of water quantity and quality (ie, eutrophication). For example, relatively few (<1%—close to negligible) of the papers published to date in *The Lancet Planetary Health* focus on freshwater ecosystems or biodiversity. This lack of representation is also well aligned with national and international discourse and policy instruments, which have long ignored, forgotten, and undervalued freshwater systems. For example, freshwater ecosystems and biodiversity are rather hidden in the UN Sustainable Development Goals; goal 14 (ie, life below water) is focused on marine systems and goal 6 (ie, water and sanitation for all) makes only cursory mention of freshwater life. Fortunately, freshwater systems were explicitly recognised as distinct from terrestrial and marine systems and in need of bespoke conservation efforts at the December, 2022, Kunming–Montreal Global Biodiversity Convention meeting and the Freshwater Challenge was launched at the March 2023 UN Water Conference to “substantiate, integrate, and accelerate targeted interventions” for freshwater systems at global and national scales.⁸

Hence, the challenge is to ensure that freshwater ecosystems and their biodiversity are neither omitted from global dialogues on planetary health, nor included

in such a way that any targets or recommendations are meaningless for practical conservation and management of the ecosystems and the services they provide. Clearly there are substantial problems with attempting to apply a generic global framework onto freshwater ecosystem integrity and health, which are local issues and are multidimensionally diverse and complex from one place to another. Freshwater ecosystem protection and restoration depend on local and regional efforts, driven by local practitioners⁹ and stewardship efforts by community groups.¹⁰ The planetary health concept can recognise the essential role of local and regional efforts that engage practitioners, communities, rights holders, and other stewards in efforts to protect and restore systems. For example, halting and reversing freshwater biodiversity loss at the watershed scale will yield positive effects throughout surrounding food webs and nutrient cycles (eg, riparian and upland areas, estuaries, and coastal marine systems).

In conclusion, working across spatial and institutional scales provides opportunity for bottom-up and top-down efforts to advance cross-scale coherence in policy and action.¹¹ These integrative actions have a strong chance of truly reversing the freshwater biodiversity crisis for people and the planet. But a crucial part of any large-scale approach to planetary health of freshwater ecosystems includes ensuring that nations and regions have the capacity to conduct their own monitoring at the watershed scale and understand the ecological limits of their basins, so they can define their local safe operating space.⁶ Such monitoring has been lacking for freshwater biodiversity despite their relevance to the Intergovernmental Science–Policy Platform on Biodiversity and Ecosystem Services (IPBES) processes. These assessments would also serve as a baseline for monitoring and understanding the limits needed to identify interventions that will bend the curve for freshwater biodiversity.³ More work is sorely needed on how to implement those concepts and ideas in practice—something that we hope will be the outcome of this Comment. Moreover, we also hope that this

Comment will stimulate additional discourse around the roles of planetary boundaries and health as concepts that can be applied to the freshwater biodiversity crisis.

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*Steven J Cooke, Abigail J Lynch, David Tickner, Robin Abell, Tatenda Dalu, Kathryn J Fiorella, Rajeev Raghavan, Ian J Harrison, Sonja C Jähnig, Derek Vollmer, Steve Carpenter steven.cooke@carleton.ca

Department of Biology and Institute of Environmental and Interdisciplinary Sciences, Carleton University, Ottawa, ON K1S 5B6, Canada (SJC); United States Geological Survey, National Climate Adaptation Science Center, Reston, VA, USA (AJL); World Wide Fund—UK, Living Planet Centre, Woking, UK (DT); The Nature Conservancy, Arlington, VA, USA (RA); Aquatic Systems Research Group, School of Biology and Environmental Sciences, University of Mpumalanga, Nelspruit, South Africa (TD); Department of Public and Ecosystem Health, Cornell University, Ithaca, NY, USA (KJF); Department of Fisheries Resource Management, Kerala University of Fisheries and Ocean Studies, Kochi, India (RR); Moore Center for Science, Conservation International, Arlington, VA, USA (JH); Department Community and Ecosystem Ecology, Leibniz Institute of Freshwater Ecology and Inland Fisheries, Berlin, Germany (SCJ); Geography Department, Humboldt-Universität zu Berlin, Berlin, Germany (SCJ); World Wide Fund—US, Washington, DC, USA (DV); Center for Limnology, University of Wisconsin–Madison, Madison, WI, USA (SC)

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