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A Hydrologist's Guide to Open Science

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To have lasting impact on the scientific community and broader society, hydrologic research must be open, accessible, reusable, and reproducible. With so many different perspectives on and constant evolution of open science approaches and technologies, it can be overwhelming for hydrologists to start down the path towards or grow one's own push for open research. Open hydrology practices are becoming more widely embraced by members of the community and key organizations, yet, technical (e.g., limited coding experience), resource (e.g., open access fees), and social barriers (e.g., fear of being scooped) still exist. These barriers may seem insurmountable without practical suggestions on how to proceed. Here, we propose the Open Hydrology Principles to guide individual and community progress toward open science. To increase accessibility and make the Open Hydrology Principles more tangible and actionable, we also present the Open Hydrology Practical Guidelines. Our aim is to help hydrologists transition from closed, inaccessible, not reusable, and not reproducible ways of conducting scientific work to open hydrology and empower researchers by providing information and resources to equitably grow the openness of hydrological sciences. We provide the first version of a practical open hydrology resource that may evolve with open science infrastructures, workflows, and research experiences. We discuss some of the benefits of open science and common reservations to open science, and how hydrologists can pursue an appropriate level of openness in the presence of barriers. Further, we highlight how the practice of open hydrology can be expanded. The Open Hydrology Principles, Practical Guide, and additional resources reflect our knowledge of the current state of open hydrology and we recognize that recommendations and suggestions will evolve. Therefore, we encourage

hydrologists all over the globe to join the open science conversation by contributing to the living version of this document and sharing open hydrology resources at the community-supported repository at open-hydrology.github.io.