



## Lakes and reservoirs as regulators of carbon cycling and climate

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**ABSTRACT:** We explore the role of lakes in carbon cycling and global climate, examine the mechanisms influencing carbon pools and transformations in lakes, and discuss how the metabolism of carbon in the inland waters is likely to change in response to climate. Furthermore, we project changes as global climate change in the abundance and spatial distribution of lakes in the biosphere, and we revise the estimate for the global extent of carbon transformation in inland waters. This synthesis demonstrates that the global annual emissions of carbon dioxide from inland waters to the atmosphere are similar in magnitude to the carbon dioxide uptake by the oceans and that the global burial of organic carbon in inland water sediments exceeds organic carbon sequestration on the ocean floor. The role of inland waters in global carbon cycling and climate forcing may be changed by human activities, including construction of impoundments, which accumulate large amounts of carbon in sediments and emit large amounts of methane to the atmosphere. Methane emissions are also expected from lakes on melting permafrost. The synthesis presented here indicates that (1) inland waters constitute a significant component of the global carbon cycle, (2) their contribution to this cycle has significantly changed as a result of human activities, and (3) they will continue to change in response to future climate change causing decreased as well as increased abundance of lakes as well as increases in the number of aquatic impoundments.

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