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Mercury in Surface Waters of the Yukon River Basin: Measurements and Environmental Implications

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About 46% of the Yukon River Basin in Alaska is underlain by permafrost, which stores large amounts of mercury. As climate change drives permafrost thaw, this mercury may be released into surrounding ecosystems. One key release pathway is riverbank erosion, which rapidly mobilizes tens of meters of mercury-rich sediment laterally. While much of this sediment is reburied, it is unclear whether the fraction that remains in the water column contributes significantly to downstream dissolved mercury loads. Understanding local-scale mercury release into rivers is critical, particularly for communities that rely on these waterways.

Studies have predicted that ongoing permafrost thaw could increase mercury concentrations in fish by as much as 175%, posing a major risk to Arctic communities that depend on aquatic proteins. Here, we present new measurements of total mercury, methylmercury, and organic carbon from Huslia and Beaver, Alaska located in the Yukon River Basin to assess mercury release and speciation in river waters. Additionally, we use diet simulations to explore how these changes may impact mercury exposure in local communities over time.