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Exchange dynamics of a shallow contaminated wetland

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ABSTRACT

Flux pathways are investigated for a wetland system comprised of a river flowing through two shallow forebays and then entering the main basin of a lake. The hydrodynamic exchanges between these three components influence the fate and transport of heavy metals in the system. During non-storm summer flows the river plume, comprised of river water and entrained forebay water, was cooler than the lake surface water and so plunged as it entered the main basin and inserted near the seasonal thermocline. Because the river plume plunged, only a fraction of its metals flux was available to the epilimnion. A return flow into the forebay was always observed immediately above the river inflow, ensuring a predominantly two-layer exchange system. However during days of negative heat flux (surface heating), an additional exchange mechanism existed when the surface waters from the forebay formed a buoyant plume, flowing out into the main basin. This heated outflow produced a significant, but short-lived, arsenic flux from the forebay into the surface waters of the lake.