Evaluating groundwater-surface water interactions at a large permanently flooded wetland in the Canadian prairies

Alanna E. Felske, Edwin E. Cey, and Masaki Hayashi
Department of Geoscience, University of Calgary, Calgary, AB, Canada

ABSTRACT
The goal of this study was to examine the role a permanently flooded wetland plays in local and regional groundwater cycling in the Alberta prairies. Low permeability glacial till sediments underlie most of the prairies and poor drainage development results in the formation of permanent and seasonal ponds across the landscape. At a prairie grassland site in southern Alberta, the hydrology of a permanently flooded wetland and dynamics of its interaction with the surrounding landscape were investigated. The wetland is situated upon a veneer of glacial till (approx. 4-16 m in thickness) overlying 30m of interbedded fluvial sandstone and mudstone of the Paleocene Paskapoo Formation. We used hydraulic, thermal and chemical methods to assess the water budget of the wetland as well as evaluate interactions with shallow groundwater in the till and potential exchange with deeper regional groundwater flow systems. Results indicate that groundwater fluxes between the wetland and surrounding uplands occur on a local scale, with snowmelt infiltration forcing fluxes during spring and riparian evapotranspiration demand driving local fluxes in summer. Analysis revealed that the water cycled through the wetland does not contribute to groundwater recharge on a regional scale, but plays a vital role in sustaining the local habitat necessary for migratory and endangered bird species. Compared to ephemeral ponds present at the site, which show evidence of contributing to groundwater recharge during spring melt events, permanent ponds in the prairies may play a different hydrologic role from seasonal ponds when it comes to their contribution to regional flow systems and groundwater recharge. This research will provide an improved understanding of the contribution of prairie wetlands to the regional groundwater system.

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