



How does wetland loss affect sub(surface) hydrology of wetland-dominated watersheds?

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Wetland loss alters the hydrology of wetland-dominated watersheds in poorly understood ways. Knowledge on the effects of wetland loss on watershed-scale hydrologic responses is critically required to provide scientific support for the optimal design of wetland restoration/protection strategies in order to promote the hydrologic resilience of watersheds. To track the effects of wetland loss on watershed hydrologic responses, we (1) designed a subsurface-surface physically-based hydrologic model that simulates the timing and pathways of hydrologic connectivity of wetlands to local and regional surface water bodies, and (2) coupled this model with LiDaR-based wetland inventories over a 50-year period during which substantial wetland loss occurred, within two wetland-dominated watersheds in the prairie pothole region of North America. We found that wetland loss leads to a contraction of groundwater contributing areas to local surface waters, which increases the risk of drought of the local surface waters, but leads to an expansion of groundwater contributing areas to the regional surface water bodies with an increase in the age and amount of baseflow discharging into the regional surface water bodies. We also found that wetland loss increased stream peakflow during the period of the precipitation events that led to major flooding in the watersheds and downstream cities, with wetlands closer to the main stream network playing a disproportionately important role in reducing the risk of flood of regional surface water bodies. These findings provide important information for watershed managers that can help to prioritize wetland restoration efforts for flood or drought risk mitigation.