



Ecohydrology by thinking outside the bog: Shifting paradigms in an era of shifting peatland ecosystems

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Large shifts in vegetation distributions are occurring worldwide and at unprecedented rates. The most extreme of these regime shifts are expected to occur at ecosystem boundaries of both semi-arid and semi-humid landscapes. Despite extensive hydrological research on the interactions between water and semi-arid ecosystems, research in peatlands on the wet end of ecosystem continuum has been “bogged down” (pun fully intended) by the traditional conceptual models (paradigms?) of peatland hydrology and ecology. The consequences of this “thinking” are large given that northern peatlands provide important global and regional ecosystem services (carbon storage, water storage, and biodiversity). This is especially true because peatlands face increases in the severity, areal extent, and frequency of climate-mediated (e.g., wildfire, drought) and land-use change (e.g., drainage, flooding, and mining) disturbances placing the future security of these critical ecosystem services in doubt. We use the word doubt because while numerical modelling studies predict peatland regime shifts and the demise of global peat stocks, there is growing evidence that peatlands are self-regulating ecosystems dominated by negative ecohydrological feedbacks that stabilize the aforementioned ecosystem services through high ecosystem resilience to disturbance. This raises several important hydrological questions? “Is there field evidence of peatland regime shifts? If so, what are the potential impacts of these shifts on water resources and watershed management? If not, are researchers actually looking in the right places (or times)? In this presentation we explore the need for a “thinking outside the bog” in order to understand the ecohydrological consequences of transformative landscape change caused by peatland regime shifts. With reference to over two decades of field research, recent advances with our Peatland Hydrological Impacts model and recent research examining primary peat formation, we argue for a move to a resilience framework within a holistic ecohydrological conceptual model (or paradigm?) as a scientific approach to examine, mitigate and manage peatland ecosystems and watersheds in an era of regime shifts.