



Pond hydrology: a significant control on the spatial pattern of soil properties in the Prairie Pothole region of North America

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Our enhanced understanding of the relationship between the spatial pattern of soil properties and landform morphological and positional attributes over the past two decades has greatly advanced our ability to predict and model the distribution of many soil properties. The characteristic feature of the Prairie Pothole region of North America is a very high density of wetlands (potholes) on a range of glacial depositional surfaces. The influence of wetlands on the distribution of soil properties surrounding them is not related to their static morphology (e.g. maximum water storage capacity) or positional attributes (e.g. dispersal area) but is instead determined by the average depth and areal extent of water in the pond during the period of soil formation. This hydrological property determines, for example, the location of small alluvial fans of eroded soils at the rill/pond interface (and hence the position of "overthickened" depositional soils) and the spatial extent of soils that experience significant deposition of water-transported soluble components. The chemical composition of these solute-depositional soils is in turn controlled by the larger hydrological connectedness of the landscape. The prediction of the spatial pattern of many soil properties in these landscapes is therefore inherently related to our ability to predict hydrological processes.