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Sphagnum mosses on cutover peat: Moss layer structural controls on water exchanges

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The structure of Sphagnum moss communities strongly affect their ability to retain and redistribute water in a peatland ecosystem. This moss structure varies by species, and within species depending on certain abiotic factors (e.g. shade). On cutover bogs mosses that have regenerated, either spontaneously or through managed restoration, may develop a relatively loose structure that can vary significantly from those growing in undisturbed ecosystems. For example, the structure of a 15-20 cm layer of Sphagnum mosses regenerated over a ten-year period at the "restored" Bois-des-Bel peatland (Quebec, Canada) restricts its ability to sequester carbon and control site scale hydrological fluxes, including E and runoff. Further, the loose structure of the mosses also decreases their soil-water retention and unsaturated hydraulic conductivity, reducing their ability to draw water up from the water table (WT) and to sustain evaporation (E) and photosynthesis. Stark structural differences between moss communities and cutover peat in abandoned (or restored) peatlands strongly affects water exchanges between cutover peat and overlying moss. At relatively dry locations (e.g. WT > 20 cm below the interface of cutover peat) the moss is effectively decoupled from the influence of the WT in the cutover substrate, and must rely on the atmospheric or internally redistributed moisture to hydrate the upper (living) layer. Wetter locations where the moss structure is particularly loose may also exhibit limited connectivity.