



## **Evaluation of water loss in wetlands due to bush encroachment and evapotranspiration changes**

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Fluctuations of shallow groundwater level caused by evapotranspiration play an important role in the water balance of wetland habitats. In temperate wetlands, traditionally used for agriculture, the vegetation coverage becomes one of the crucial factors impacting shallow groundwater level. Plant coverage evolves as a result of natural and socio-economic pressures. Initially, the overgrowing process results within the mosaic of mown and abandoned meadows, in groups of trees surrounded by a meadow landscape. Those relatively deep rooted “tree isles” function as a pump, which extract shallow groundwater more efficient than surrounding meadow vegetation composed of grasses and sedges. During the day, between dawn and dusk, groundwater level declines due to the evapotranspiration (ET) of the trees. Between dusk and dawn, the locally created cone of groundwater level depression recovers due to lateral inflow from adjacent areas covered with meadow. Therefore, the amount of water available for plants within such a “tree isle” to evapotranspire is significantly higher than in forest ecosystems, where the inflow gradient is not so steep due to the large areal scale of the ET process.

To evaluate the amount of water loss within a “tree isle”, open meadow and forest, an analysis based on the diurnal groundwater fluctuations (DGLF) was performed. High temporal resolution data of groundwater level was analysed for a selected 4-day period for the month of August in 2008, 2009 and 2010. Calculated values of evapotranspiration were verified with the Penman-Monteith method coupled with vegetation ET indexes. Results indicate that within the open meadow and forest water consumption by vegetation calculated with both methods is similar. Within the “tree isle” water consumption by vegetation calculated on the basis of DGLF was approximately 30-50% higher than estimated on basis of the classical method and was max. 10 mm/day.

In light of obtained results, the DGLF analysis appears to be a more direct, robust and precise method of ET evaluation of water consumption by wetland vegetation at micro scale, than the classical method of Penman-Monteith coupled with vegetation indexes. As the DGLF reflects direct in-situ observations, it can be easily applied, even at the scale of a single plant or a group of plants. Results indicate that due to bush encroachment of open areas, water consumption by “tree isles” can be much higher than in neighbouring ecosystems of forest and meadow. Therefore, precise spatial description of bush encroachment, coupled with the DGLF analysis in purpose of quantifying the ET as a water balance parameter, can bring more adequate and robust evaluation of wetland water losses.