



Potentials and limitations in the water management of wetlands

Ottfried Dietrich, Ute Appel, Marcus Fahle, and Joerg Steidl

Leibniz-Centre for Agricultural Landscape Research (ZALF), Institute of Landscape Hydrology, Muencheberg, Germany
(odietrich@zalf.de)

In Northeast Germany most wetlands were drained to enable agricultural land use during the last centuries. But, since their groundwater levels still remain near the surface, their hydrological behavior differs clearly from sites with deep groundwater levels. The existing ditch and weir systems permit the control of the water levels in ditches and polder sites. The system can be used for drainage, e.g. when precipitation exceeds evapotranspiration, or to provide the polder sites with water in times of water balance deficit. The target water levels depend on the type and intensity of the land use, which also can have a non-agricultural focus, e.g. rewetting of fen sites. The control of the groundwater levels influences the water balance components like inflow, outflow, evapotranspiration and water storage of the wetland areas. The relationships between these parameters are complex, making their experimental quantification, appraisal or modeling difficult. On the other hand the knowledge of the complex interactions can provide opportunities for an improvement of the water regime of the wetlands or the development of adaptation options to compensate the influence of climate change or other impacts.

A lysimeter station with 4 weighable groundwater lysimeters is used to investigate the relationships between the groundwater level and the water balance components in the Spreewald wetland since 2010. The station has the possibility to control the groundwater level for each lysimeter individually using a groundwater level measured at a gauge nearby or a predefined time series. All important water balance components are measured with high temporal resolution. Different options of groundwater control were simulated and compared concerning their effects. The results of the years 2010 to 2012 show clearly the possibilities and also the limitations that the control of the water levels has on the different components. The findings reveal different water use of the vegetation in dependence on the groundwater level below surface and the effects of higher target water levels in spring on the development of the groundwater level in early summer. In dry periods the plants use mainly water from the groundwater via the capillary fringe and only to a certain degree from the soil water storage when groundwater levels are not lower than 50 cm below surface. If the groundwater levels are slightly deeper (100 cm b.s.l.), the plants mainly use water from the water storage of the upper soil layer. Altogether the results underline the complex reaction of the water balance components on changes of the groundwater level.