



## **Analysis and Rehabilitation of a Groundwater-Dependent Ecosystem in Belgium**

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Over the last 15 years the groundwater table below a military area near Houthalen-Helchteren in the North-East of Belgium has been lowered by a network of drainage canals to improve on-site military operability and to intensify nearby agriculture. Dewatering has led to a gradual deterioration of the local ecosystem that includes wet and dry heathland, transition mires and depression bogs. These subsystems make the area ecologically valuable and it has been inscribed in the NATURA 2000 network (BE2200030), which requires ecosystem conservation according to the Habitats Directive (92/43/EEC). In 2009, the military and the Nature and Forest Administration agreed on setting up a management plan that focuses on the restoration of the highly groundwater-dependent ecosystem.

The studied area is located on the Campine Plateau about 70-80 m above sea level and covers an area of roughly 2200 ha. The local unconfined aquifer has a thickness of about 200 m and consists of several layers of Quaternary and Tertiary sands and fine gravels with varying glauconite content and occasional local clay lenses.

To analyze the impact of changes in landuse and groundwater table on the ecosystem a multilayer transient groundwater model of the area has been set-up in MODFLOW 2005. Model input was created combining geological and hydrogeological data from regional groundwater models with local time-series of water level observations, groundwater abstraction data and recharge estimates from the WetSpass model. Model calibration was done using UCODE-2005 and observed and modeled results were compared and found to be in good agreement. Sensitivity analysis showed hydraulic conductivity as the most sensitive parameter. Model output comprised a series of water level maps over the entire modeling period (1990-2010). These time series maps were summarized in indicator maps as 'average lowest groundwater level', 'average spring groundwater level' and 'average highest groundwater level', which were then used as input for the ecological model NICHE VLAANDEREN that helps to analyze future ecosystem development. A scenario analysis considering a varying drainage network density was conducted to find an optimal solution taking into account ecosystem necessities as well as military needs.