

## **Mapping of Wetness Gradients using Hyperspectral Remote Sensing of Phreatophytes.**

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### **Abstract**

At the land surface, groundwater systems appear as infiltration and discharge zones; the latter are relatively wet because of the upward groundwater seepage, while the former are relatively dry. Groundwater systems have a profound influence on valleys, since discharge zones concentrate in topographically low parts of valleys. Hence, groundwater discharge zones offer a high potential for nature values and are often characterized by the occurrence of specific plant species, constant high moisture contents and specific water qualities. Identification and description of those groundwater systems is therefore essential for the management and development of nature values in valley areas.

Current methods for the determination of wetness gradients and groundwater systems in river valleys use either detailed time-consuming fieldwork or data intensive numerical simulation models. Consequently, there is a direct need for repeatable, area covering, mapping possibilities of wetness gradients, and in particular discharge and infiltration zones.

The 21 ha sized study area 'Doode Bemde' is an alluvial floodplain back swamp wetland area, along the River Dijle in Belgium. The area is hydro chemically uniform and has clear, relatively constant wetness gradients with associated differences in vegetation on a small scale, caused by groundwater flow differences. During combined hyperspectral airborne-field campaigns (2002, 2003, 2005) a large set of field data (surface temperature, soil moisture, groundwater levels, vegetation samples) and images (CASI-SWIR/TIR, AHS) was collected.

The main focus of the analysis consists of the statistical comparison of different ground truth maps, as e.g. modelled groundwater level, interpolated soil moisture, map of phreatophytes (De Becker et al., 1999), with the hyperspectral dataset. Secondly, the hyperspectral dataset is used for a classification (SAM classifier) of certain phreatophytes. Common reed (*Phragmites Australis*) showed to be very suitable because of the high abundance at certain locations and a typical spectral signature. This mapping is used to obtain a validation map for modelled discharge zones in the study area.

**Keywords:** Hyperspectral Remote Sensing, Wetness Gradients, Wetland, Phreatophytes, Reed mapping, Hydrological Modelling.