

Ecohydrology of a groundwater-dependent Alder carr

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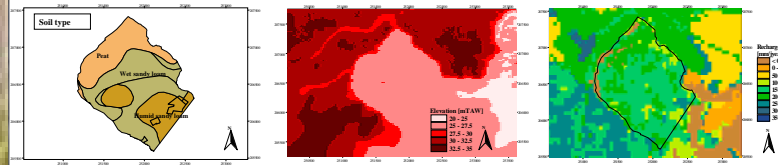
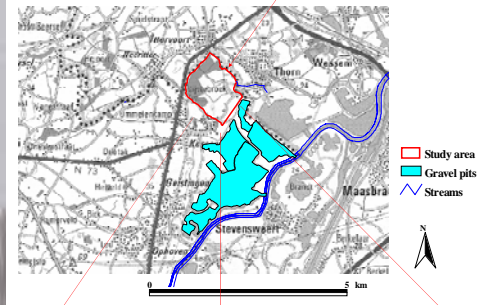
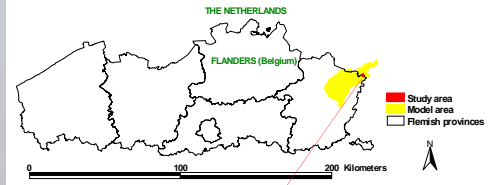
Introduction

The “Living Common Meuse” project aims to restore the natural river processes at the Flemish and Dutch sides of the river Meuse by means of river rehabilitation interventions. These measures will be implemented in 12 locations along a river stretch of ±30 km. This study focuses on the project location *Vijverbroek*, a protected area in an ancient oxbow of the Meuse River with a groundwater-dependent mesotrophic Alder carr. Aim of the study was to investigate the ecohydrological conditions favourable for the presence of Alder carr and the effects of restoration (refillment) of nearby gravel pits on these conditions. Herefor, a groundwater model was set-up with MODFLOW for simulating groundwater heads and discharge zones and discharge intensities. From the mapped vegetation data, groundwater quality analysis, soil nutrient data and the results of the groundwater modelling, the abiotic factors for vegetation development in the area were identified using DCA (Detrended Correspondence Analysis) and CCA (Canonical Correspondence Analysis), and a vegetation prediction modelling was performed.

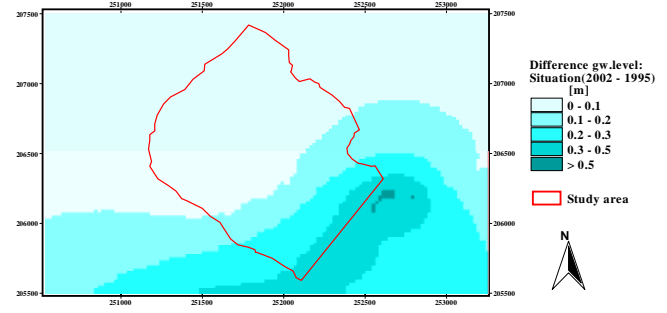
Wet woodland types in Vijverbroek



Eight vegetation types are distinguished, among which intact mesotrophic Alder carr and eutrophic Alder carr. From the variables *groundwater level* (half-year averaged), *groundwater quality*, *soil quality* and *soil texture*, *Mean Lowest Groundwater Level* is the most controlling abiotic variable for vegetation.

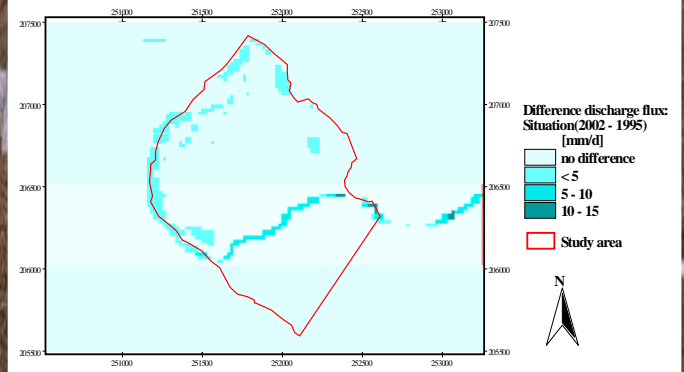


Difference in yearly average groundwater level between the situation before and after refillment of the gravel pits



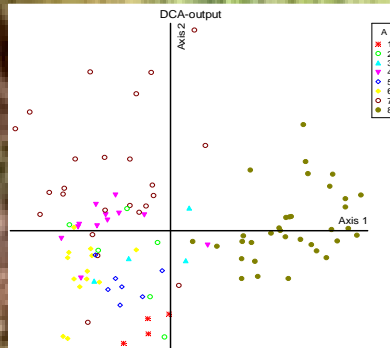
The groundwater model simulates higher groundwater levels for the situation after refillment of the gravel pits.

Difference in discharge area and yearly average discharge intensity between the situation before and after refillment of the gravel pits

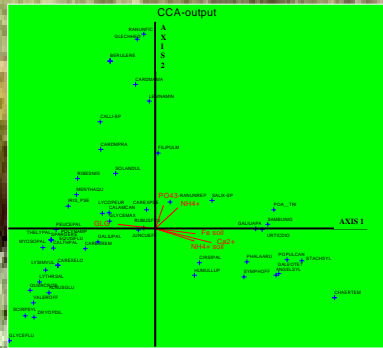


The groundwater model simulates an increase in groundwater discharge area and higher discharge intensities for the situation after refillment of the gravel pits.

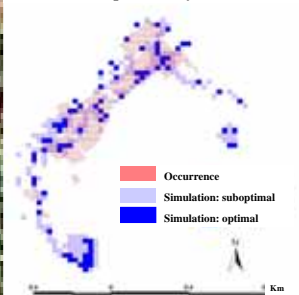
DCA-output



CCA-output



Occurrence and simulation of *Caltha palustris* (year 2002)



Based on the *Mean Summer Groundwater Level*, calculated with the groundwater model, optimal and suboptimal ranges of groundwater dept pro species were delineated. With the aid of these ranges, the impact of management and restoration measures on the vegetation can be investigated.

Conclusions

- In the close vicinity of the gravel pits the effects of gravel exploitation on the groundwater table are significant. Farther away, the effects gradually drop and at the outsides of the ancient meander *Vijverbroek* the impact on the groundwater level is minor.
- The *Mean Summer Groundwater level* is the most controlling abiotic variable for the occurrence of plant species in the *Vijverbroek* area.
- On the longer-term, the refillment of the gravel pits might lead to a shift or expansion of vegetation types or species in the *Vijverbroek* area.
- The methodology presented is useful to obtain ecohydrological insight in wetland areas, to trace the effects of hydrological stresses, to investigate vegetation potentials, etc.