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In Search for Springs in the Northern Part of the Province Limburg (The Netherlands)

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Introduction

As part of their water management policy the Waterboard Peel and Maasvalley and the Limburg Water Pollution Control Authority started a search for springs. The Province of Limburg supported the project financially. The research is carried out by the Institute for Forestry and Nature Research and the Consultancy Bureau Biopt.

Objectives

The general objective of the research was to locate and typify springs and related water types in the study area. We tried to answer the following questions:

- where are potential spring areas located?
- which of the potential spring areas still comprise actual springs and spring ponds?

General approach

The research is carried out in two steps:

A: A desk study. To locate potential spring areas we used archives, reports, interviews, maps and the distribution of characteristic spring species. Maps were used to locate relevant landscape types, such as ice pushed ridges, cover sand ridges, river 'Meuse' terraces, peat land and pleistocene plateau landscape.

B: An exploring field survey. In this survey general characteristics of the area and some physical variables were described.

Results

The results of the steps are:

A: The location of 159 potential spring areas were indicated on a map. It turned out to be difficult to give an accurate definition of springs to distinguish them from other (semi)-aquatic systems.

B: The 159 potential spring areas were visited. The processing of all characteristics lead to a definition of criteria (see tabel 1 and 2) to distinguish springs form other (semi)-aquatic systems such as seepage areas, marshes and stagnant waters. As result of these criteria and the field observations we located 47 actual springs and spring ponds.

Tab. 1: Criteria to distinguish springs from other aquatic systems.

AQUATIC	SPRING PONDS	SEEPAGE POND	OPEN WATER
surface area	small	larger	indifferent
position in terrain	up a steep slope	at foot of a slight slope	at a lowest point
direction of ground water flow	horizontal	vertical	none
slope of terrain	steep	indifferent	indifferent
discharge	higher	lower	none
discharge per m²	high	low	none
oxygen content	depenendent of discharge + dimensions	dependent on vegetation	dependent on vegetation
ferro precipitation	locally	high spread	none
transparancy	clear	slightly (white) turbid	clear-brown
visible bacteria film	none	sometimes	none
type	limnocrene	seepage pond	open water
number	37	28	33

Tab. 2: Criteria to distinguish springs from other semi-aquatic systems.

SEMI-AQUATIC	SPRING	SEEPAGE	MARSH
position in terrain	up a steep slope	at foot of a slight slope	at a lowest point
permanency	permanent	(semi)permanent	(semi)permanent
direction of ground water flow	horizontal	vertical	
slope of terrain	steep	slight	no
discharge	higher	lower	none
area of discharge	more concentrated	more diffuse	
discharge per m²	higher	lower	none
oxygen content	high	in stagnant water low	low
ferrop precipitation	localy	spread	none
transparancy	clear	slightly (white) turbid	turbid (brown)
visible bacteria film	no	often	often
type	helocrene stream related helocrene akrocrene	seepage marsh stream related seepage marsh	marsh seepage spot seepage in bank
number	10	11	21 24 (dry)

Conclusions

Of the 159 potential spring areas only a small amount (still) comprises actual springs. Further research is needed to typify the springs and to define threats and measures.

Further research

From the conclusions of step A and B the following questions are posed:

- What is the present condition of the springs?
- What is the reference state?
- What are the threats and measures of the springs?
- How can the springs be typified?

In a further research abiotic (physical, chemical) and biotic (macrofauna, vegetation) data will be collected and processed by using multivariate analysis technics.
The results will be presented in schemes of spring types. The interaction between the types will be presented in terms of major variables. These major variables will be related to potential measures.
The results of this further research will be published in one of the next volumes of Crunoecia.

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