

Modelling

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Sources:

Jacco Hoogewoud (RIZA)

Hilde Passiers(NITG-TNO)

1. Start with conceptual
2. Next schematization
3. Identify the processes
4. For implementation use programme MODFLOW

www.visualWFD.com
conceptuel model catalogue
(under construction)

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Modelling groundwater Bulgaria

- Model for mountains (in a short time the input in the system becomes discernible in surface water)
- River delta?

Use international accepted models!

Parameters
Upper, middle and lower river
Darcy
Parameterization
Boundary conditions
Initial conditions

Scenario's
Assess effects of measures
Assess trends

Water Framework Directive

- **Art. 1. Objective:**
Establishing a framework for the protection of inland surface waters, transitional waters, coastal waters and groundwater
- **Art. 4. Environmental objectives:**
Measures to prevent decline
Protect, improve and recover
- **Annex V. Regulation**

The Changes

- River basin approach
- Boundary crossing river basins
- Obligatory results instead of obligatory effort
- Report to Brussels

The Demands

- Demands w.r.t. status of groundwater (Ann. V):
- Quantitative
 - Waterbalance
 - Surface water
 - Terrestrial ecosystems
 - intrusions
- Qualitative
 - Intrusions
 - Quality standards (threshold values in GWDD and other directives to implement community legislation)
 - Chemical composition (priority substances, a.s.o.)
- In fact nothing new (in The Netherlands) !

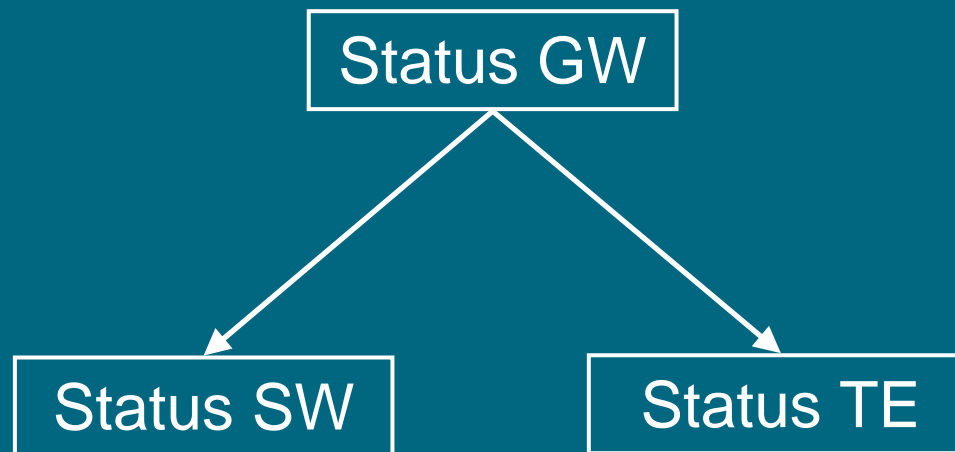
The Task

- What kind of a task takes it along?
- Important to understand the system!
- What **do** we and what **don't** we understand?
- Where are the white spots?

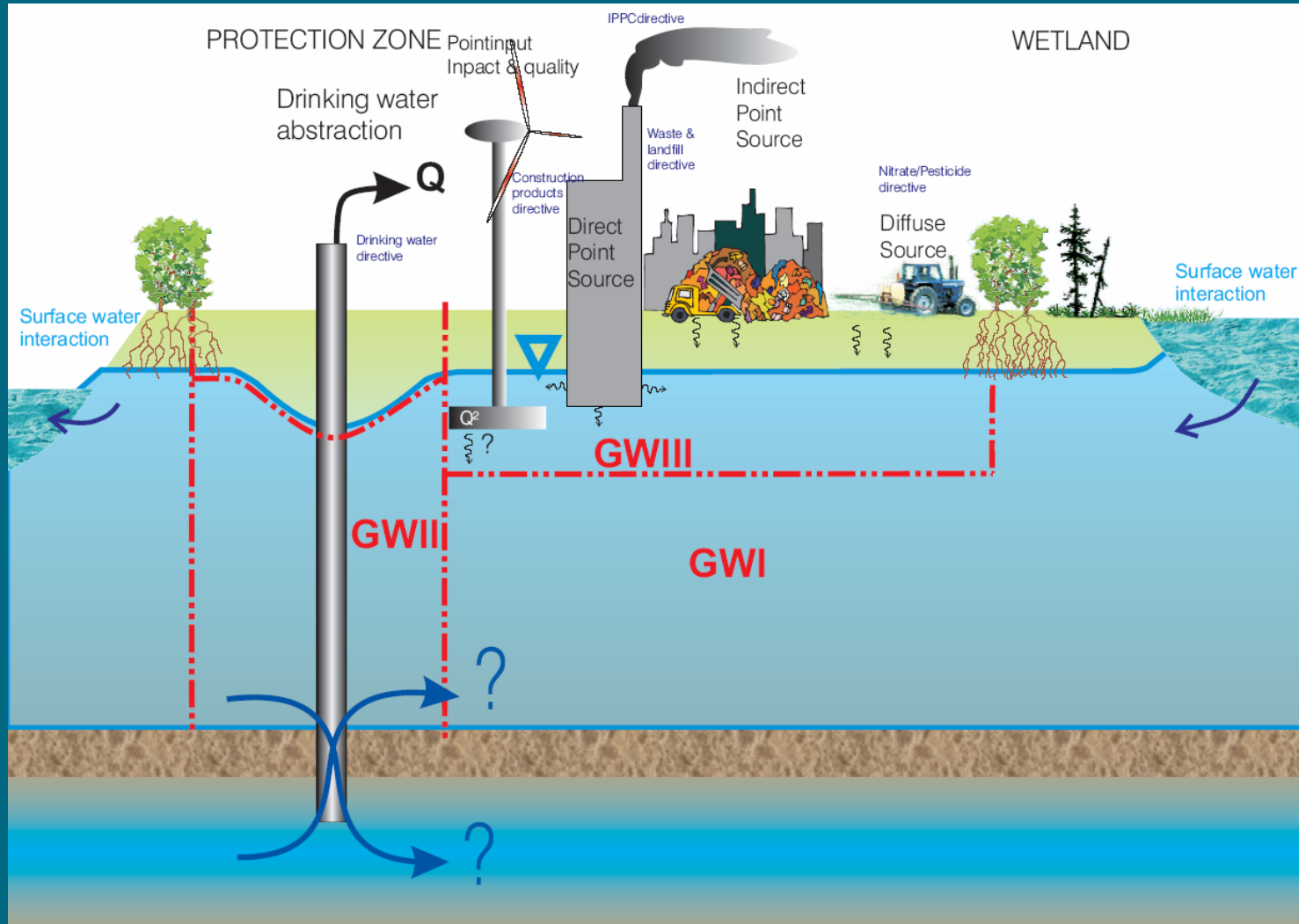
Conceptuel model

- A reproduction of reality in terms of
 - Concepts
 - Relations between concepts
 - Connexion between concepts

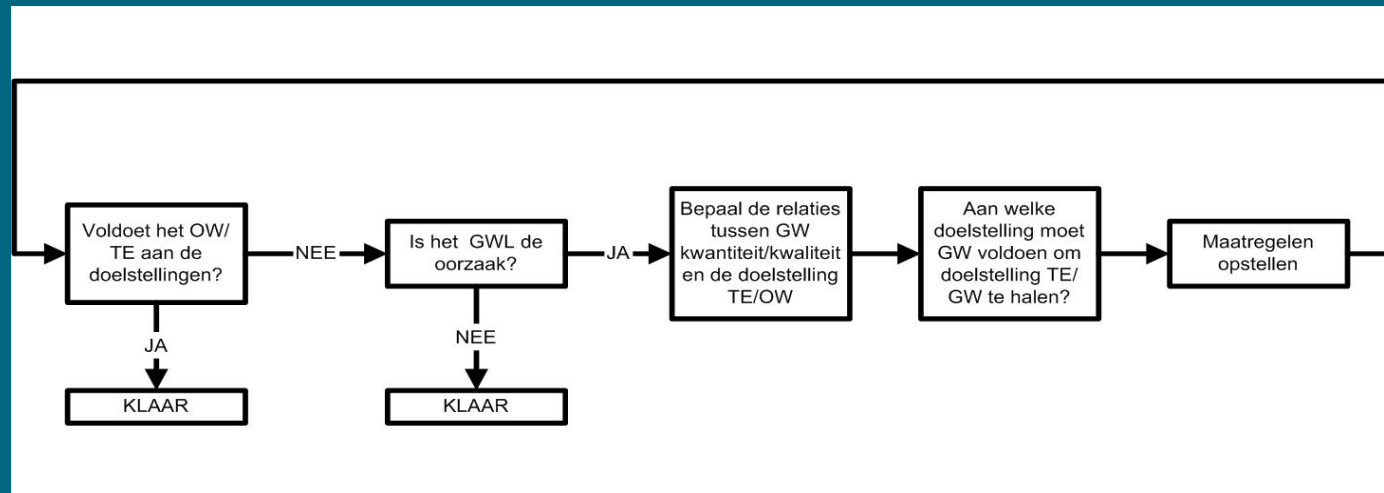
Example:



Conceptuel model geohydrology



Conceptuel model Objectives



Profit & Necessity

- Conceptual models contribute to:
 - Insight into in operation and behaviour of a system
 - Insight into effects of measures
 - Development of a consistent system of concepts
 - Rational arrangement of monitoring networks
 - Handhold to discussions
 - Resource to communication
 - Exceed existing boundaries

Conceptual model

Is a job on its own!!!!!!

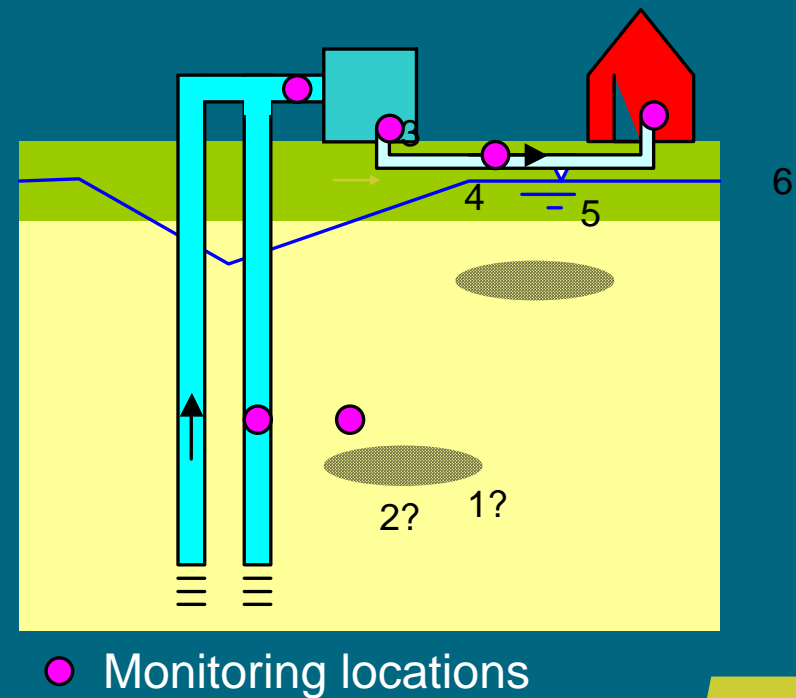
Usage with respect to the WFD

Example Drinking Water Monitoring (monitoring programme Maas)

Usage with respect to the WFD

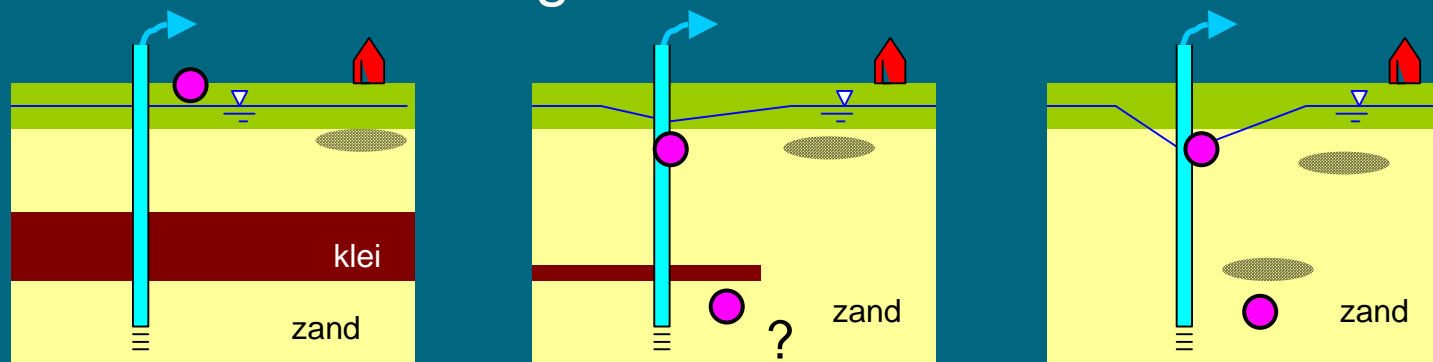
Current monitoring drinking water in The Netherlands

1. In the aquifer in the recharge area
2. Individual pumping wells
3. Mixed water before purifying
4. After purifying
5. In the distribution network
6. Near the tap



Usage with respect to the WFD

- Risk based monitoring
 1. Low risk, raw water
 2. Medium risk, individuel wells
 3. High risk, individuel wells and also in the recharge area

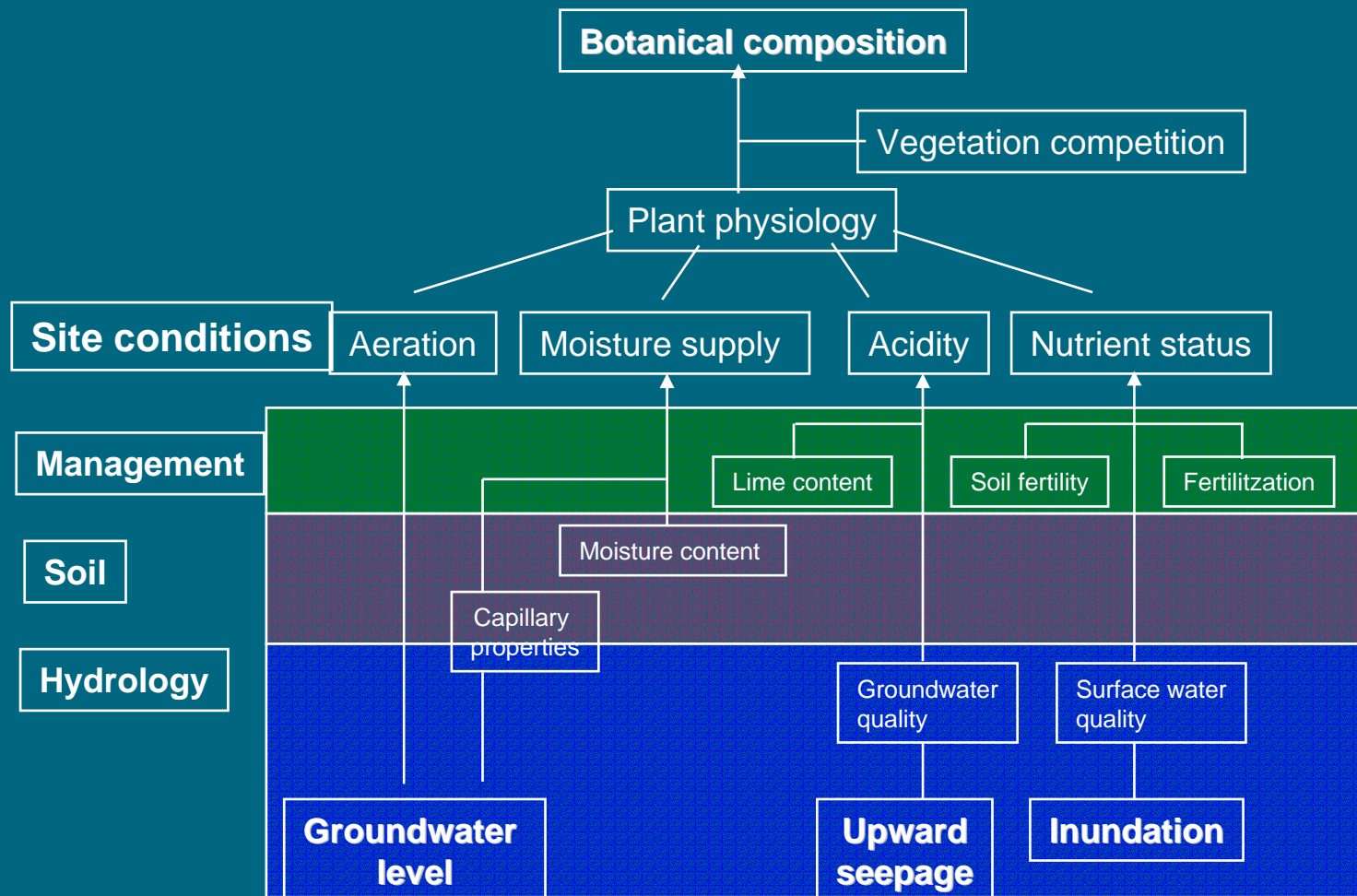


Usage with respect to the WFD

Example

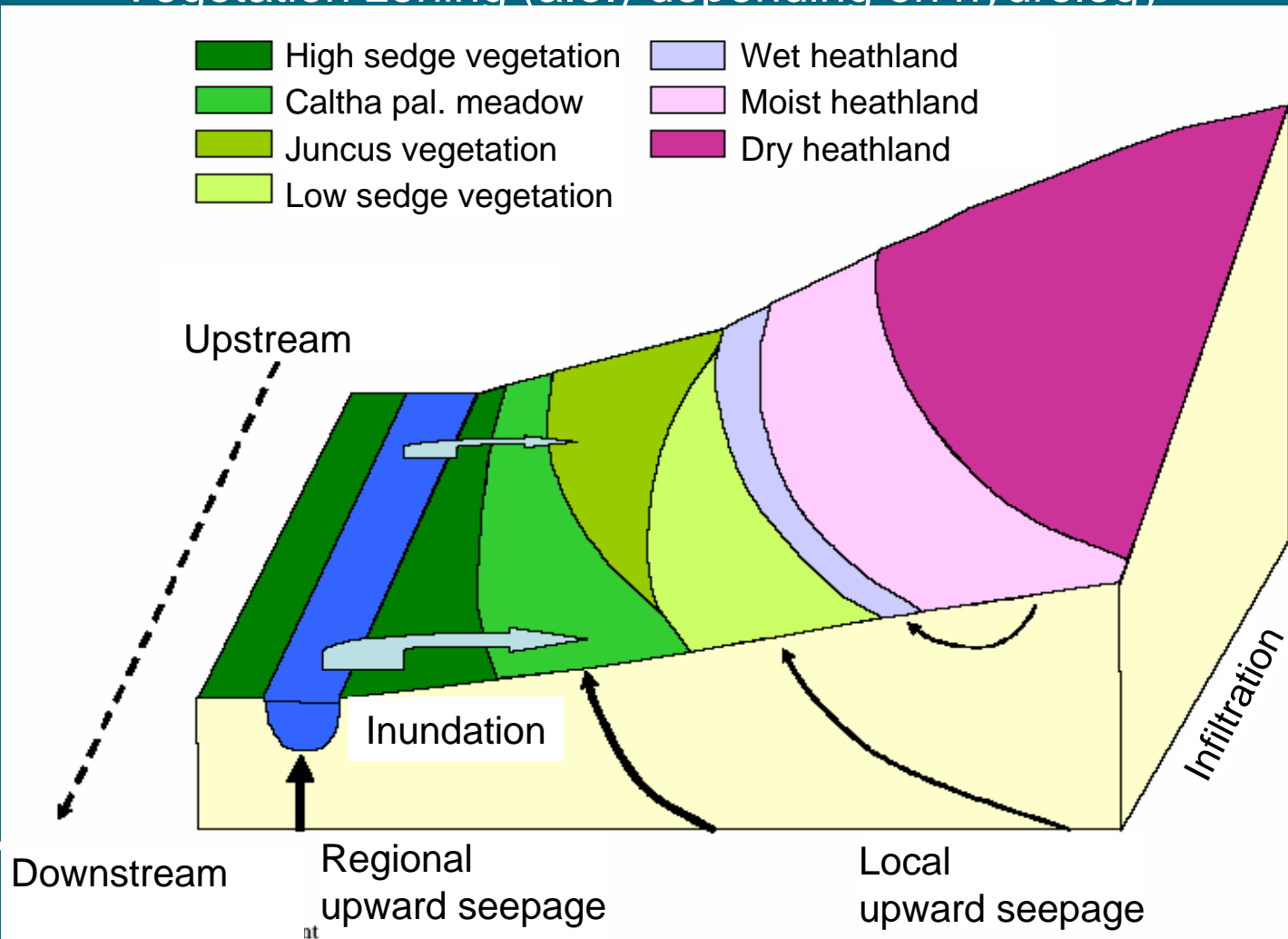
**Monitoring van groundwater dependent
Terrestrial ecosystems
(monitoring programme nature Brabant province)**

Usage with respect to the WFD



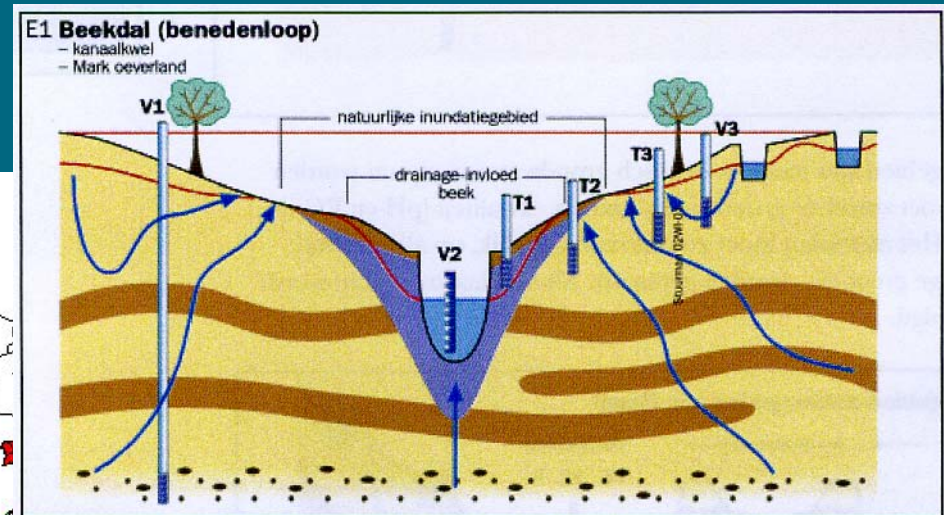
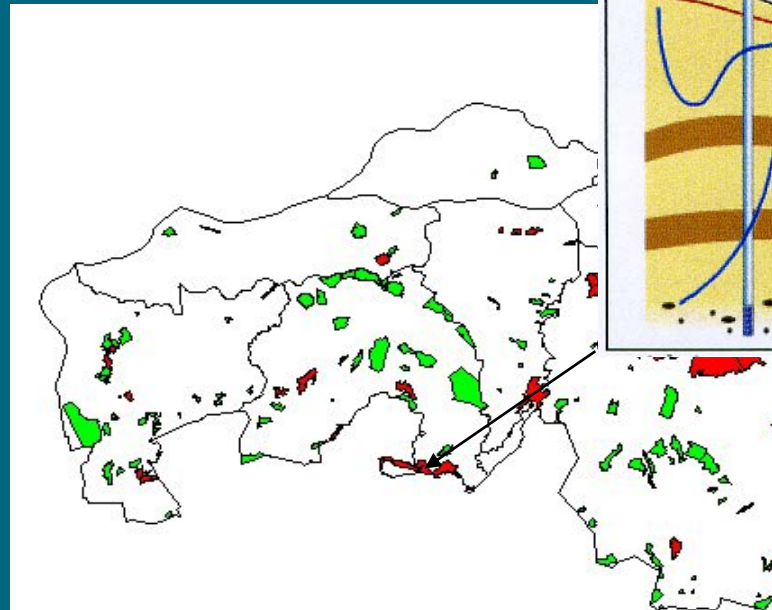
Usage with respect to the WFD

- Vegetation zonation (a.o.) depending on hydrology



Usage with respect to the WFD

- Example monitoring brooksystem.

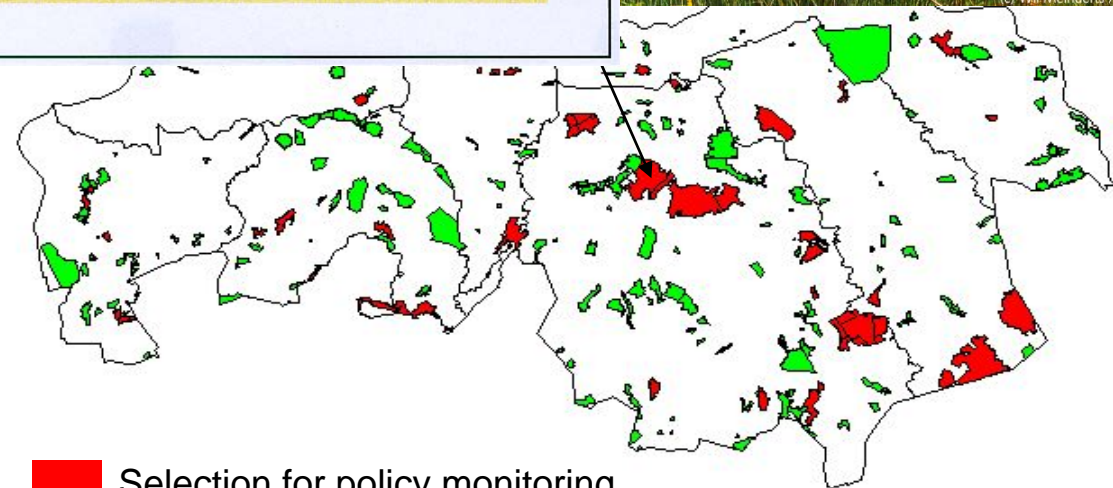
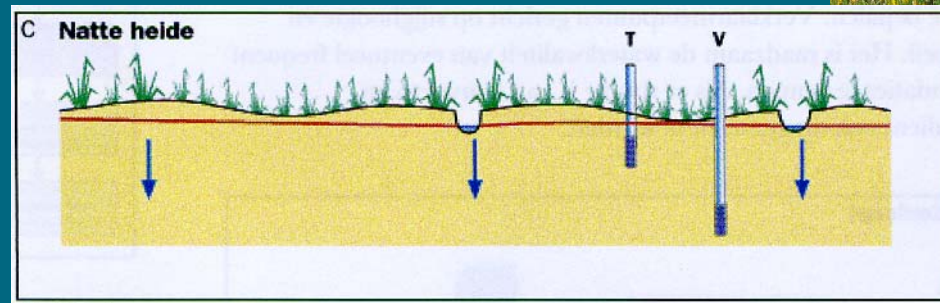


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- Selection for policy monitoring
- Other areas

Usage with respect to the WFD

- Example monitoring
- Wet heather



■ Selection for policy monitoring
■ Other areas

Knowledge gaps

- Interaction ground water and surface water
- Groundwater quality vs. Surface water quality
- Effects of measures
- Ecological effects

Some statements:

1. Conceptual model is a useful tool within the WFD for:
 - Ground and surface water objectives
 - Measures
 - Monitoring network
2. Conceptuel models are used too few
3. Missing knowledge to make a good conceptual model:
 - E.g. interaction ground water – surface water.