

# Smarte Wasserspeicher – eine Chance für den Wasserkreislauf?

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Water...

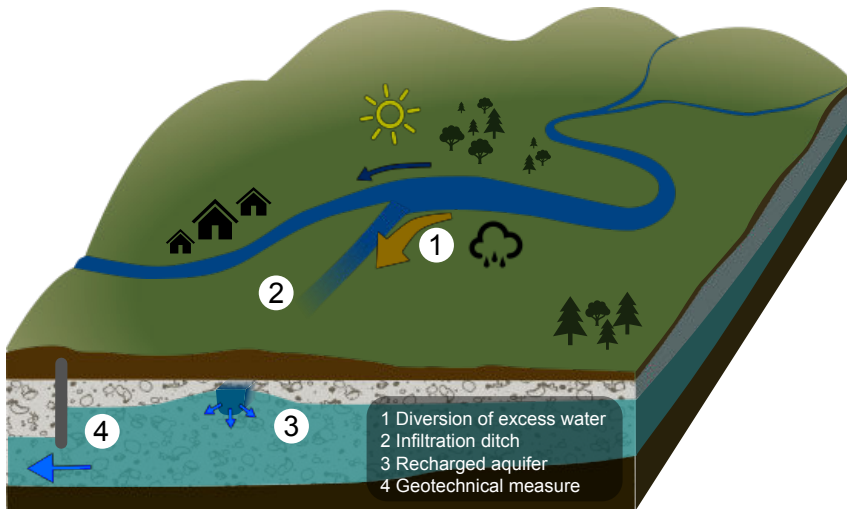


comes



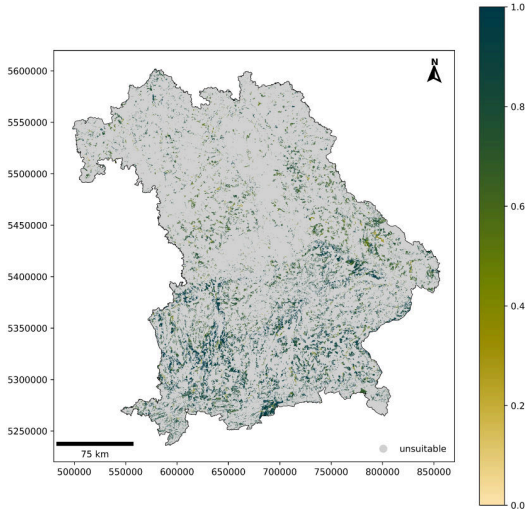
and goes too fast!

# Let's combine flood and drought mitigation



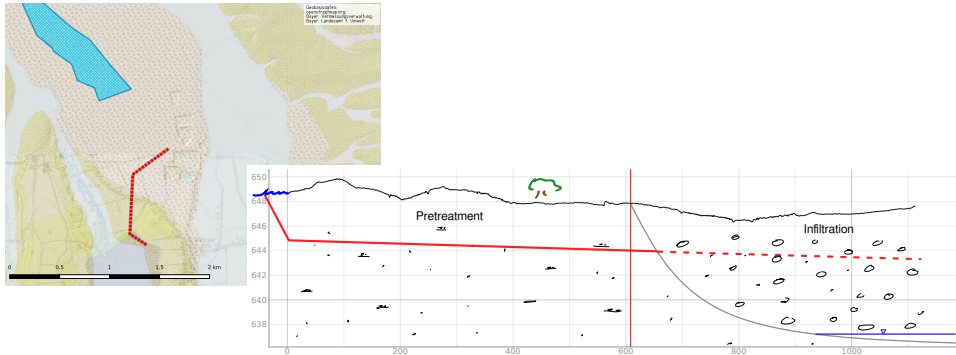
- Buffering of stormwater in aquifers (a variant of Flood-MAR)

# Where?



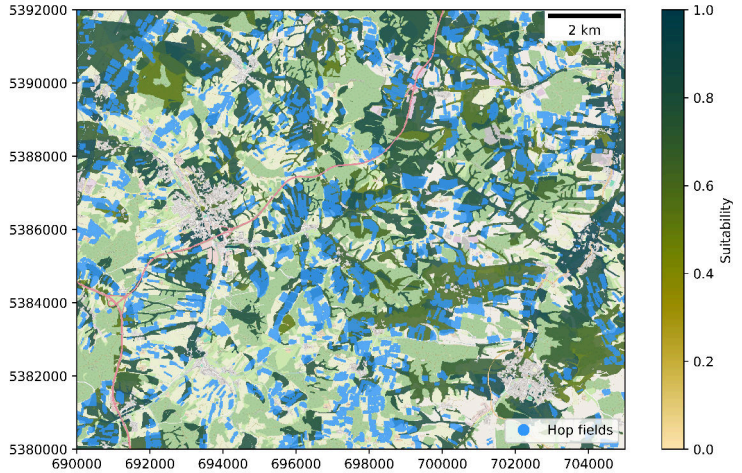
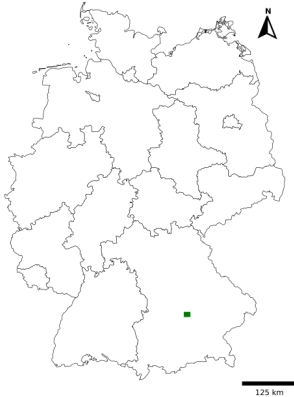
- Definition of specific criteria for sites suitable for co-management of floods and droughts
- Workflow for a reliable, unbiased, transferable, and robust suitability map with publicly available data and Python
- Validation of methodology and criteria with a sensitivity analysis and on-site investigations

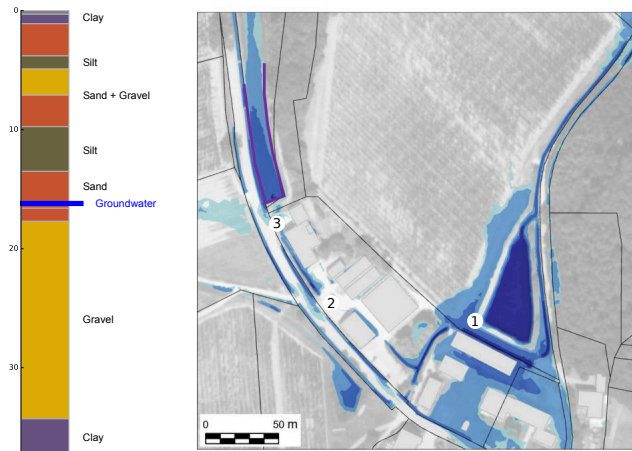
# Large scale storage solution



- Infiltration channel connected to flood retention basin
- First part for pretreatment (removal of fines, contaminants)
- Geotechnical measures to keep/slowly release water in the aquifer

# Pilot site



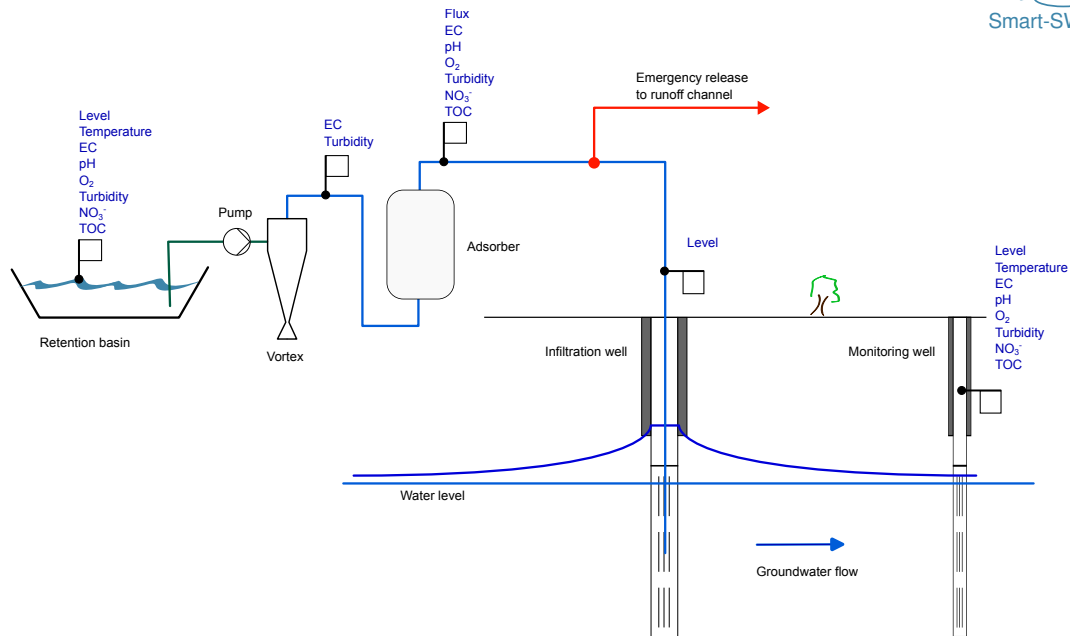


## Implementation

- 1 Outtake  
Monitoring  
Pre-treatment
- 2 Infiltration well
- 3 Monitoring well

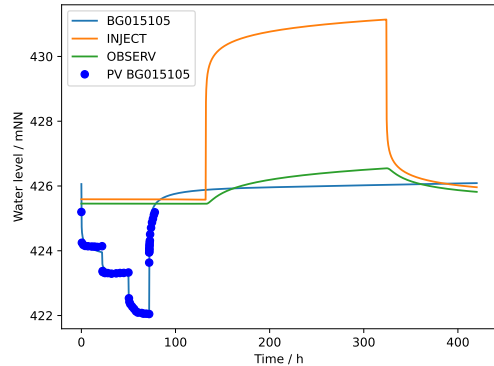
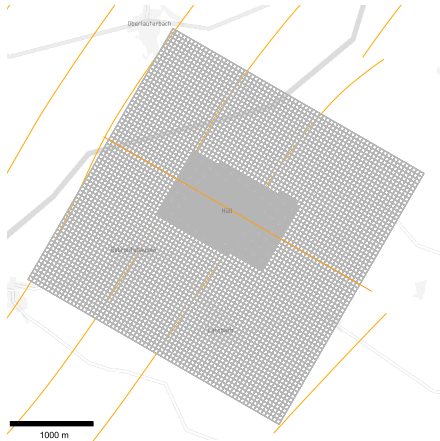
- Fast response of retention basin to rainfall events (catchment 1.3 km<sup>2</sup>, 4 mm/h)
- Tertiary gravel and sand,  $k_f \approx 5 \cdot 10^{-4} - 10^{-3}$  m/s
- Infiltration in groundwater well with storage in upper aquifer

# Technical Design





# Model results



- Modflow 6 / FloPy, 5 layers, unstructured grid
- Calibrated with data from pumping tests
- Infiltration for 192 h @ 25 L/s

# Implementation

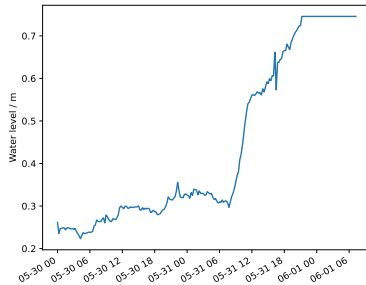


# Water Quality Issues?

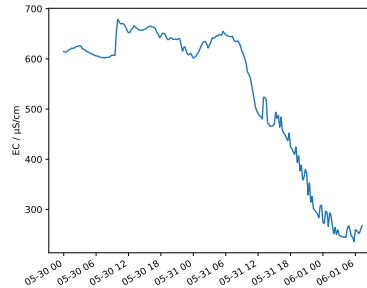


- WFD, Wassergesetz, ...
- but very little data

# Water Quality Issues?



- Water level



- Electrical conductivity



- Surface water  
EC 150  $\mu\text{S}/\text{cm}$   
 $\text{NO}_3^- < \text{LOD}$   
Pesticides  $< \text{LOD}$
- Groundwater  
EC 770  $\mu\text{S}/\text{cm}$   
 $\text{NO}_3^- 70 \text{ mg}/\text{L}$   
Pesticides (some of them long banned...)
- Infiltration  
acceptable acc. to WFD

- Multi-criteria decision analysis identifies many suitable sites for combined flood protection and groundwater recharge
- Technical designs need to be site-specific and specially adapted to flood/stormwater dynamics and aquifer characteristics
- Water quality can be ensured by understanding the dynamics and risks of the watershed (after careful monitoring)
- Is implemented at two sites

