

# Evaluation of 2018 drought and effectiveness of adaptation measures in the Netherlands

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## Objective

Extreme dry conditions occurred over the summer of 2018 in the Netherlands, which led to very low groundwater and surface water levels. Especially in the Pleistocene uplands of the Netherlands, the low groundwater levels had a large impact on crop yields and biodiversity in nature areas. In this study we *evaluated the 2018 drought event and investigated possible adaptation measures*.

## Method and data

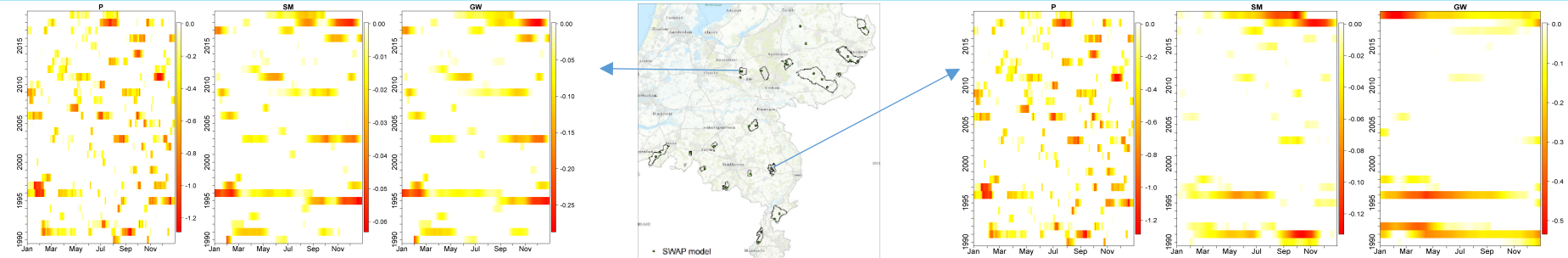
- Focus on propagation of drought
- Agricultural and natural areas
- Standardized indices and variable threshold level method for precipitation, soil moisture and groundwater levels
- Model simulations with agro-hydrological Soil–Water–Atmosphere–Plant (SWAP) model

## Human influence

Possible measures to mitigate drought impacts in the future were simulated with the SWAP model:

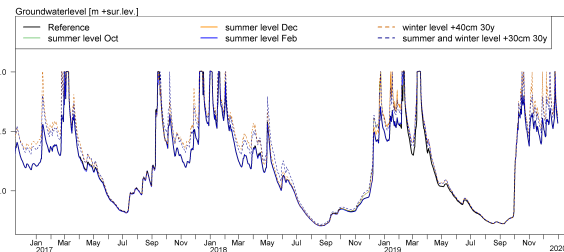
- Increasing height of weirs to reduce discharge
- Reducing groundwater abstractions (decreased drainage flux to deeper groundwater)

Timing of these measures was investigated by including different starting months during the drought and structural measures.

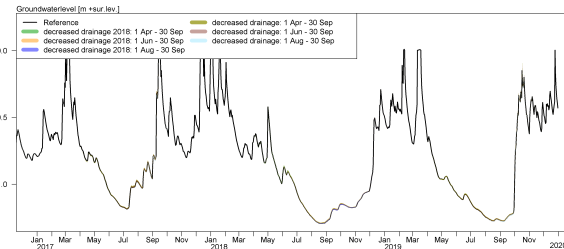


Drought events in precipitation, soil moisture and groundwater levels determined with variable threshold level method for an agricultural area (Lunterse Beek).

Selected catchments across the study region and locations of the SWAP models

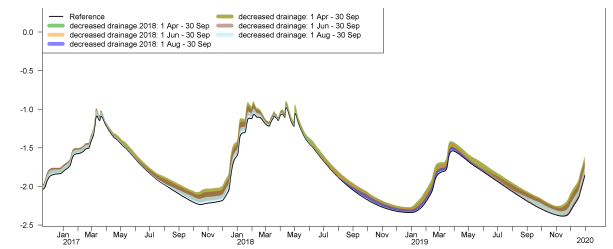
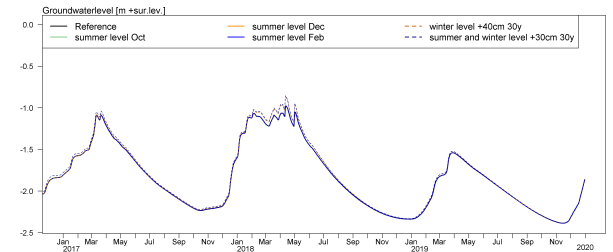


Impact of increase in weir levels (earlier conversion to higher summer level, structural change to winter level and structural higher level year round)



Impact of decreased drainage on the groundwater level for short-term measures (decrease in 2018) and structural change starting in April, June or August

Drought events in precipitation, soil moisture and groundwater levels determined with variable threshold level method for a nature area (Deurnese Peel).



## Main findings

Impact of the 2018 drought event differed across the region. Slow responding catchments were not affected until winter or spring 2019. Effectiveness of the measures depends on the characteristics of the regions; for some regions small changes led to increases in groundwater levels for several months, whereas in other regions effects were lost after a few weeks. In general:

- As expected, decreasing abstractions from groundwater reduced the severity of the hydrological drought. Effect on soil moisture drought was less visible due to deep groundwater levels in most catchments. Earlier reductions had more impact.
- Increasing the level of a weir in ditches, provided water was available to sustain higher water levels, had a relatively small effect on the hydrological drought. Given the lack of water during a drought period, this measure is more effective as a structural change than a short-term measure.

