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# CRITICAL SOIL MOISTURE VALUES AS OBJECTIVE CRITERIA FOR MANAGING LAS TABLAS DE DAIMIEL NATIONAL PARK DURING DROUGHTS

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## Abstract

Many threats to wetlands in semiarid regions during drying periods – invasive plants development, combustibility of organic soils, nutrient redistribution or soil physical disruption – are **controlled by the soil water content**.

A methodological approach based on **Soil-Water-Atmosphere-Plant (SWAP) model** for soil moisture modelling and simulation has been tested and applied in the anthropized Mediterranean semiarid wetland area of Las Tablas de Daimiel National Park in central Spain.

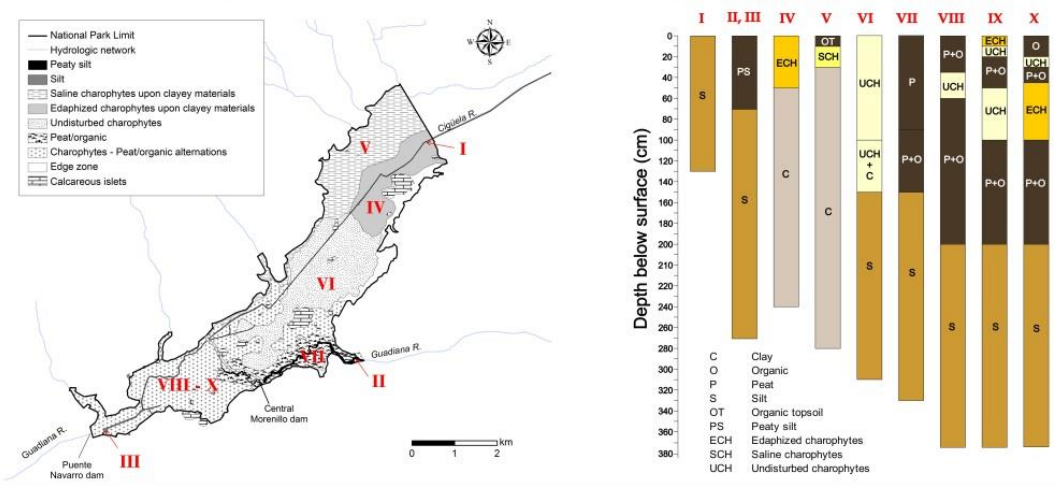
Several vadose zone water flow **models** have been successfully calibrated **for the different soil units** identified by using, as main input data, experimental values of soil physical and hydraulic characteristics, soil moisture measurements, vegetation growth parameters and climatic records.

Soil moisture threshold values for **peat combustibility** (0.22 ± 0.02 v/v) and for **invasive reed overgrowth** on charophyte (0.51 ± 0.05 v/v) and peat (0.30 ± 0.03 v/v) soil types have been estimated.

**Simulations of a typical 2-year drainage scenario** in the region indicated that critical soil moisture conditions for reed overgrowth are attained 9-10 months after flooding ceased and that peat areas colonised by reed plants become combustible by the end of the simulated period.

Decision-makers can use the calibrated models to **predict the evolution of soil moisture** under different climatic and management scenarios in order to choose the most **efficient management** options for preventing that soil moisture reaches critical values.

## Soil funtional types (SFT) in Las Tablas de Daimiel National Park




## Critical soil moisture values

| REED GROWHT | WATER CONTENT (% of field capacity) | CRITICAL SOIL MOISTURE* (v/v, ±10%) |
|---|---|---|
| Optimal | 96 % | **0.51** ± 0.05 |
| Normal | 67 % | **0.36** ± 0.04 |
| Deficient | 56 % | **0.30** ± 0.03 |
| Mortality threshold | 25 % | **0.13** ± 0.01 |

*Undisturbed charophytes. θ (field capacity) = 0.53 v/v.

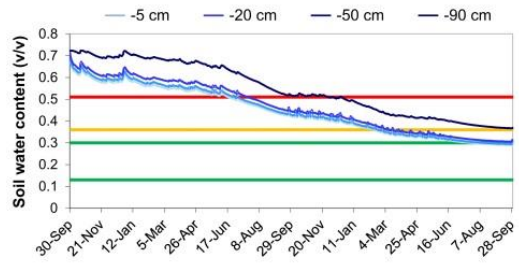
| PEAT COMBUSTION | WATER CONTENT (w/w on dry basis) | CRITICAL SOIL MOISTURE* (v/v, ±10%) |
|---|---|---|
| Non-combustible | > 1.25 | |
| Combustible | < 1.25 | **0.22** ± 0.02 |
| 50 % ignition probability | < 0.60 | **0.11** ± 0.01 |

*Peat. Bulk density = 0.18 g cm$^{-3}$.

## Drainage scenario simulations using SWAP model

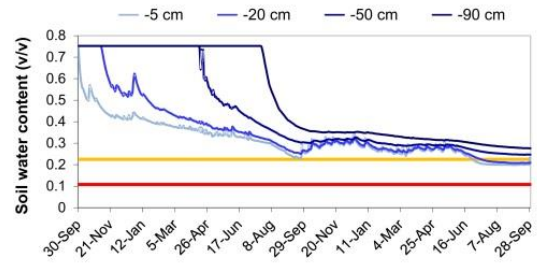
### Invasive reed overgrowth risk

Soil profile VI. Plant cover: reed.

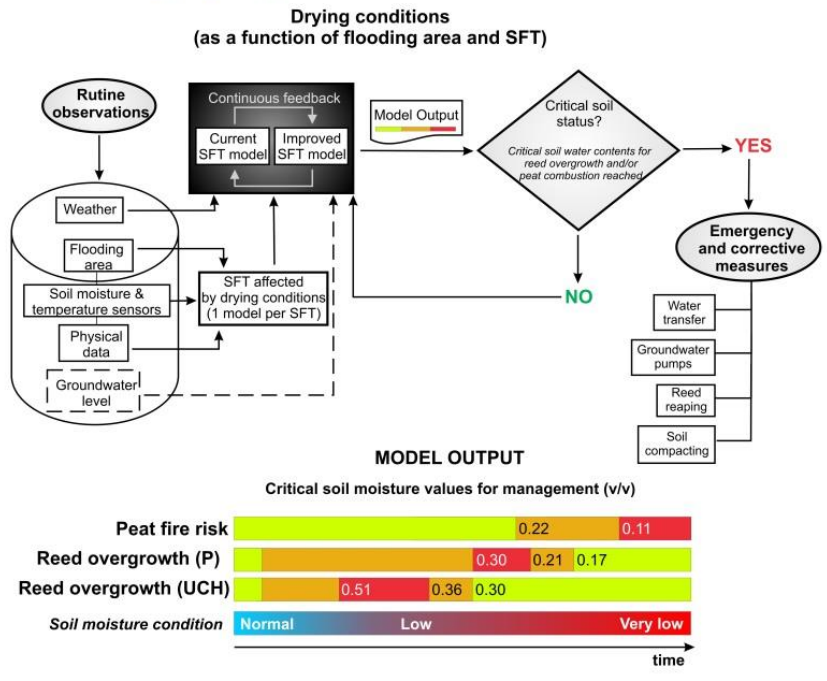



### Peat combustion risk

Soil profile VII. Plant cover: reed. Macropore module.




## Wetland managing support tool based on soil moisture modelling

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## Acknowlegements

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