

The impact of groundwater abstraction and woodland management on a lowland fen and its local community

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Introduction

Fens are a rare and important ecosystem providing clean water and carbon storage, as well as being rich in biodiversity and valuable species. However, as drinking water is in increasing demand, groundwater aquifers are commonly overexploited by water companies which can negatively impact the ecology of the groundwater dependent fen. Afforestation is also a problem for fens caused by, and exacerbating, groundwater decline that can harm fen vegetation.

Study Area

Greywell Fen is a 2 km long, spring fed peatland on the headwaters of the River Whitewater in Hampshire, South England. It is a designated Site of Special Scientific Interest (SSSI), situated above a chalk groundwater aquifer that is used by South East Water (SEW) for drinking water supply. Management of the fen comprises grazing and tree clearance.

Methods

- Extensive water level monitoring throughout fen using boreholes and dipwells.
- Potential evapotranspiration (PET) calculated from MIDAS data² using Penman-Monteith FAO56 method³.
- Fen divided into different management areas, with regards to tree growth and clearance.
- Peat properties measured in each area, including pH, water content, C:N, bulk density, decomposition.

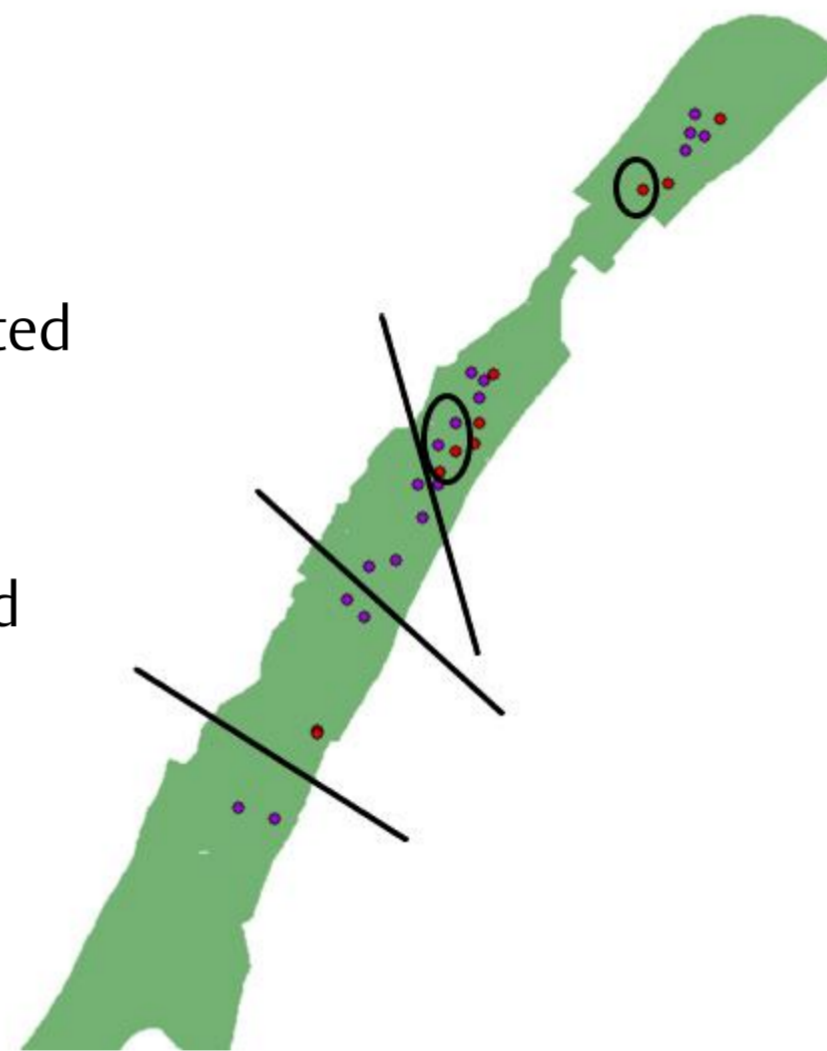


Figure 2. Outline of SSSI showing the location of boreholes and dipwells (red and purple dots), and the different management areas.

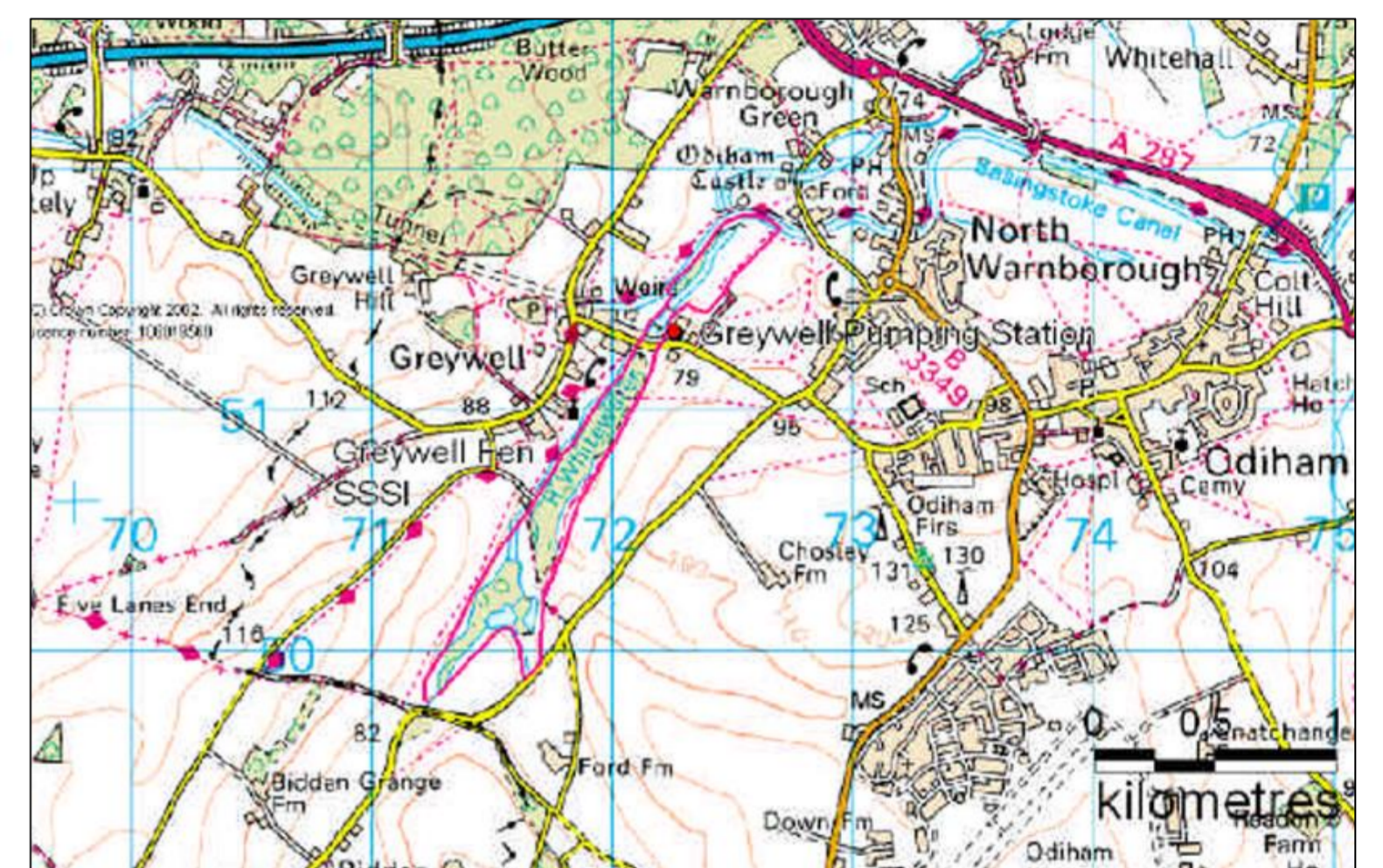


Figure 1. Ordnance Survey map of the area showing the villages of Greywell, North Warnborough and Odiham in North Hampshire, England, with the SSSI outlined in pink. The location of the SEW groundwater pumping station is shown with a red dot¹.

Hydro-ecological Impacts

- Abstraction is not effecting long term water levels.
- Groundwater levels most affected by net rainfall.
- Water levels in the peat are more stable compared to aquifer water levels, which are readily affected by net rainfall and abstraction.
- Presence of trees may be reducing resilience of peat to changing water levels.
- Evidence of increased decomposition in upper levels of peat.
- After tree clearance, fen vegetation is recovering.

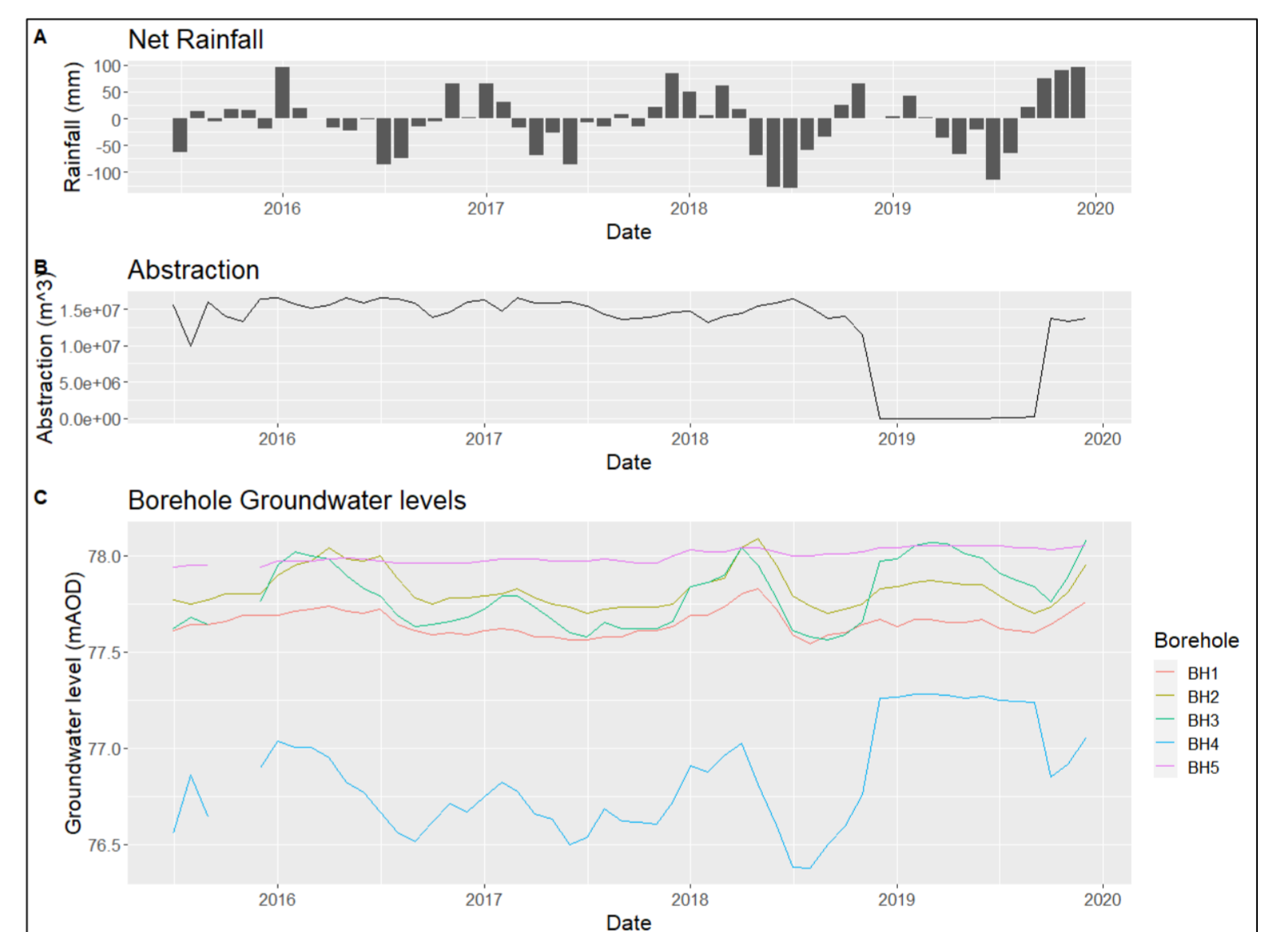


Figure 3. A comparison of **A)** net rainfall (mm), **B)** abstraction volumes (m³) and **C)** groundwater levels at the five boreholes (metres above datum) from 2015 – 2019.

Community Impacts

- As well as SEW, Greywell Fen encompasses many stakeholders who regularly use the fen for walks, exploration, and access to fishing.
- Local residents, members of the fishing club, and environmentalists take active interest in the fen management.
- Recent vegetation changes enables clearer views.
- Reduction in trees cause more weed and algal growth in river.
- Cessation of groundwater abstractions raises concerns of flooding.

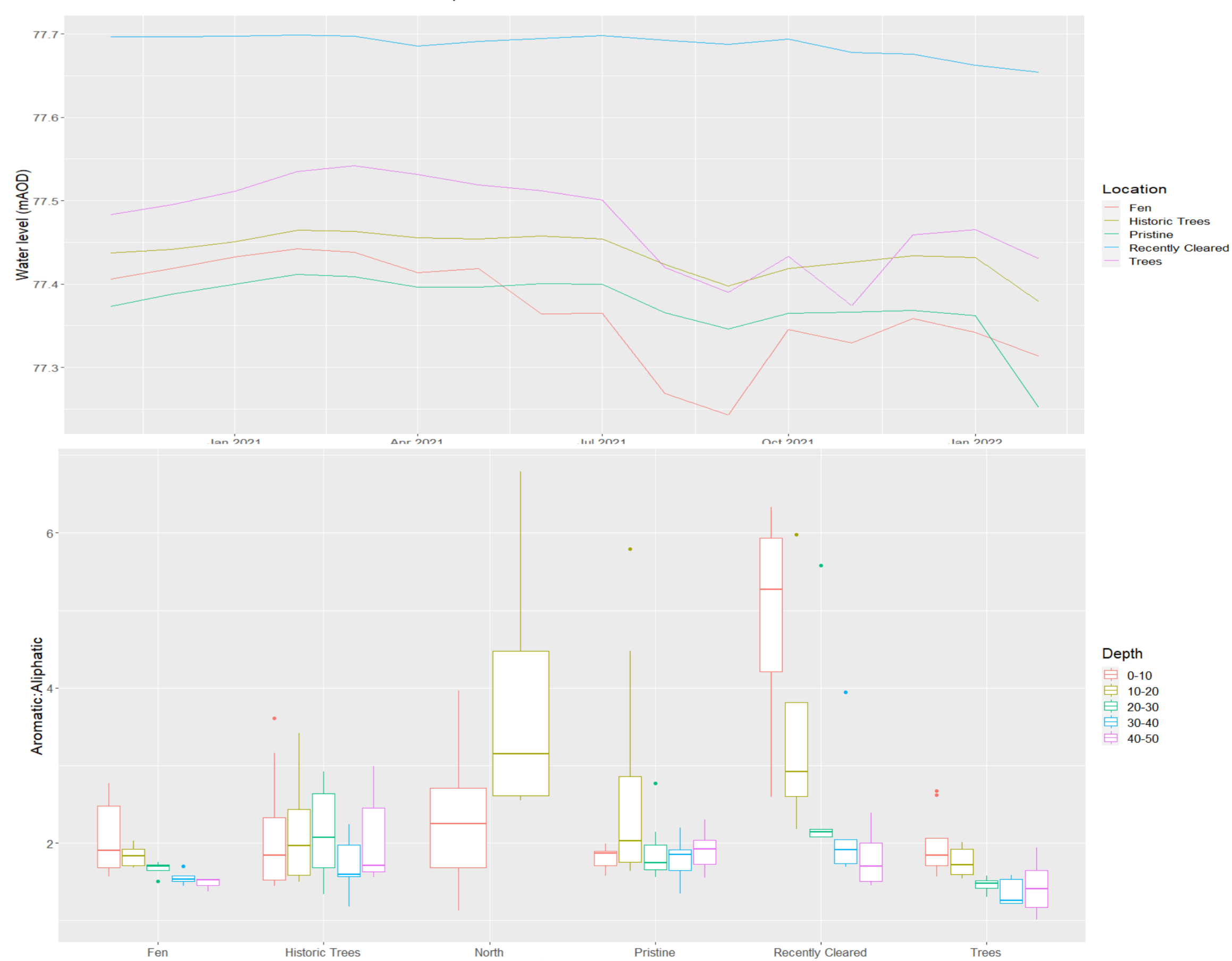


Figure 4. **A)** Peat water levels (metres above ordnance datum) in different management areas of Greywell Fen, **B)** Relative decomposition as measured using aromatic:aliphatic functional group ratios in IR spectra in different management areas and at different depths (cm)

References

1. South East Water (2006) *WHITEWATER ENVIRONMENTAL STUDIES AMP4 RSA PROGRAMME INCEPTION REPORT*.
2. Met Office (2012) *Met Office Integrated Data Archive System (MIDAS) Land and Marine Surface Stations Data (1853-current)*
3. Allen et al. (1998) *Crop evapotranspiration - Guidelines for computing crop water requirements - FAO Irrigation and drainage paper 56*.

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