Including Water Resource Management in JULES

Ilaria Mocciaro

13.08.25

UK Centre for Ecology & Hydrology

Why its Important

The inclusion of Water Resource Management (WRM) in models is of growing importance.

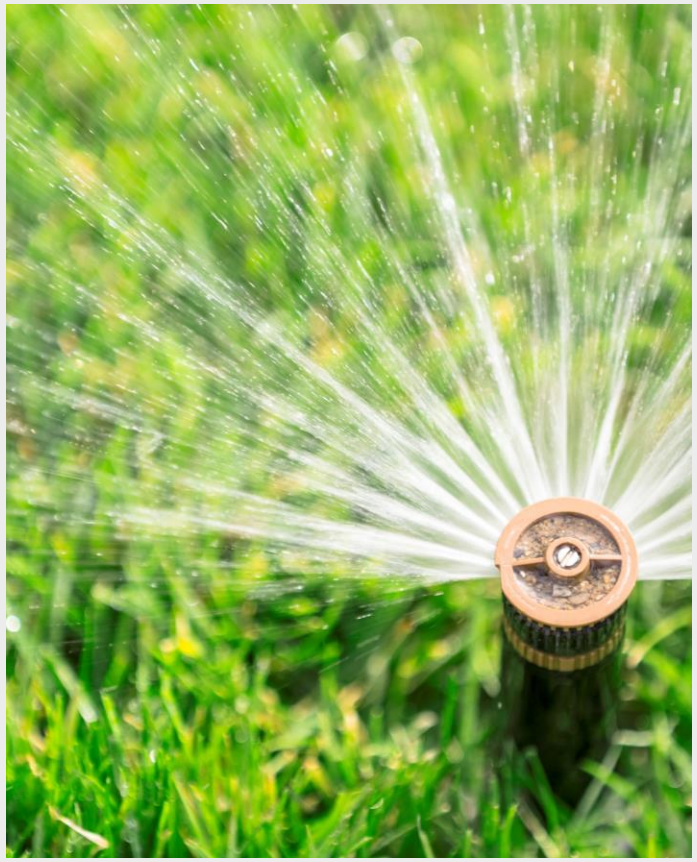
With climate change and population growth, the pressure on freshwater availability is increasing.

Key aspects:

- Return Flows
- Water Transfers
- Managed Reservoirs

- Withdrawals to Meet Water Demand
  - Agriculture
  - Industrial
  - Domestic

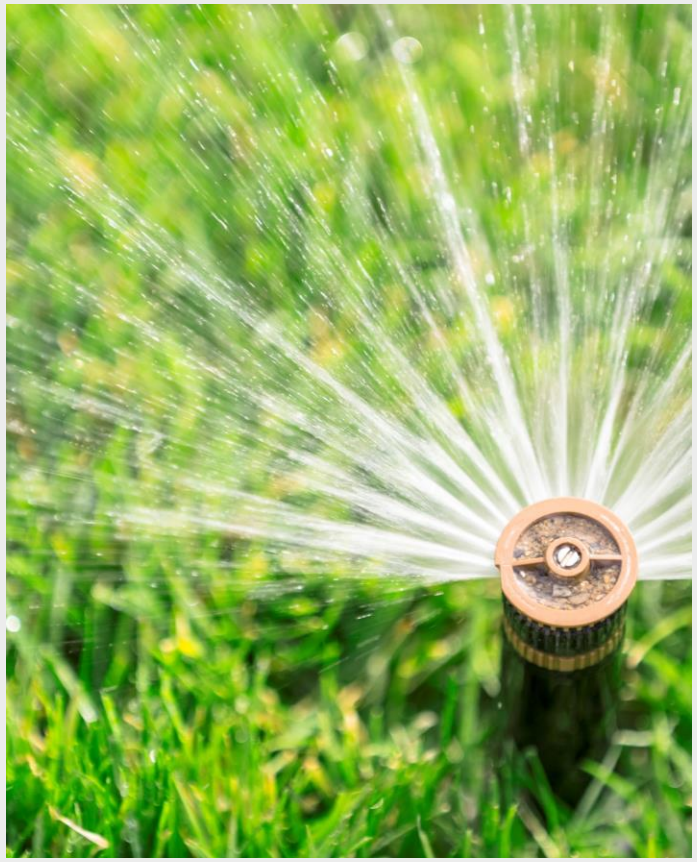
What it Can Do



Including WRM in the JULES model allows for WRM assessment, exploration of anthropogenic influences on hydrology, and improved simulated flow predictions in highly influenced catchments.

Many models already include WRM, though we are aiming to implement at a finer resolution (1km x 1km)

What we've included



- Irrigation
- Weighted abstractions
- Environmental flow requirements
- Implicit transfers
- Reservoirs

Catchments

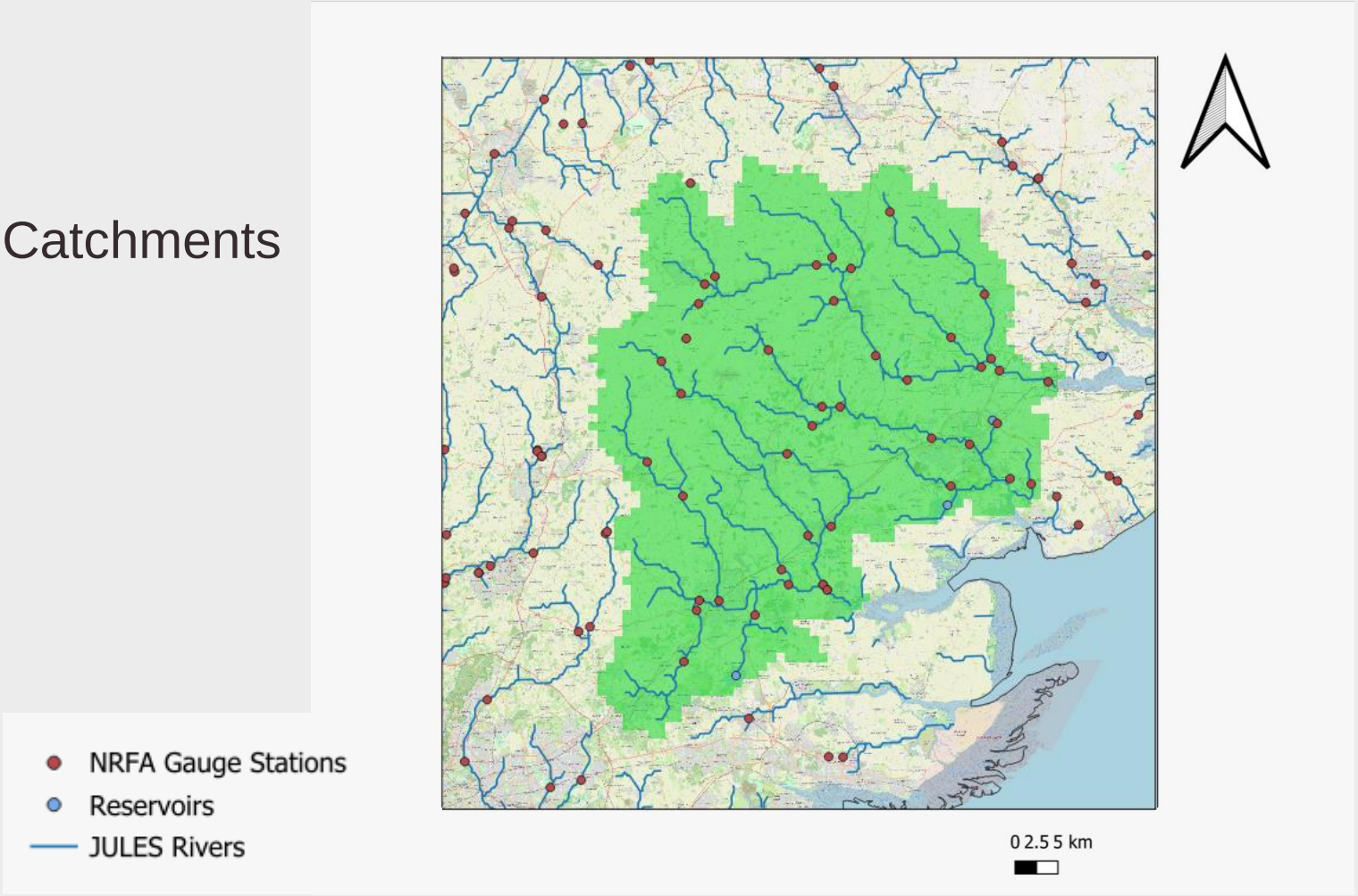
We have been interested in two areas in this project:

- East Anglia (Green)
- Colne Catchment (Pink)

Catchments

East Anglia

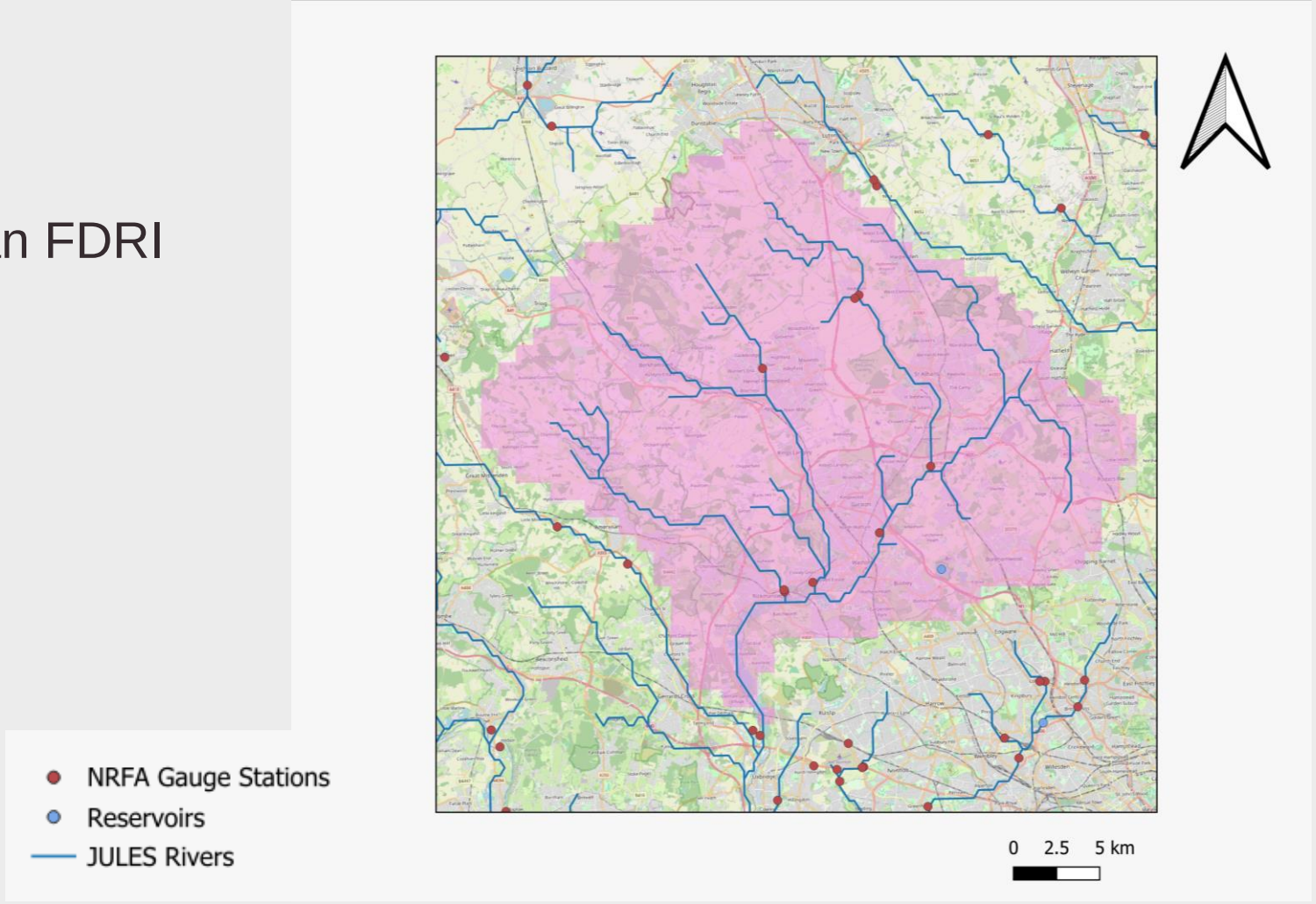
- Blackwater, Colne, and Stour Catchments
- 3 Reservoirs



Catchments

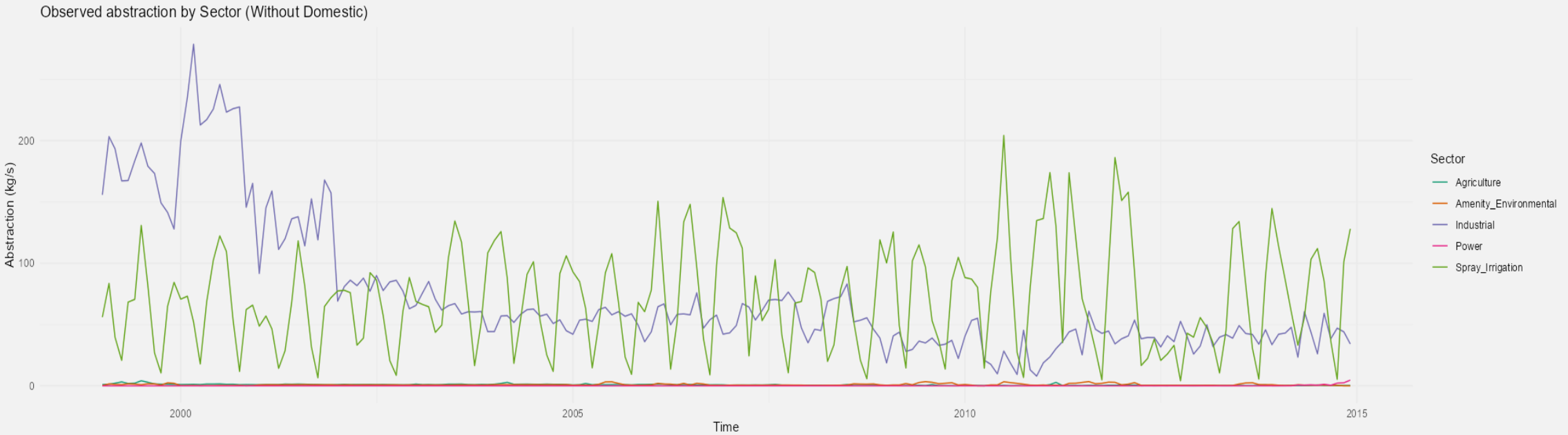
Colne

- Includes the Chess, which is an FDRI catchment
- 1 disconnected reservoir



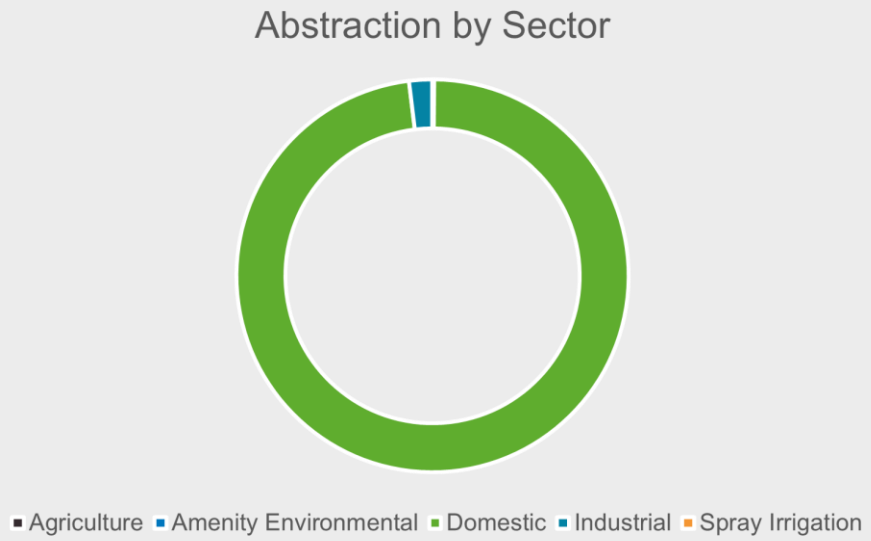
Catchments

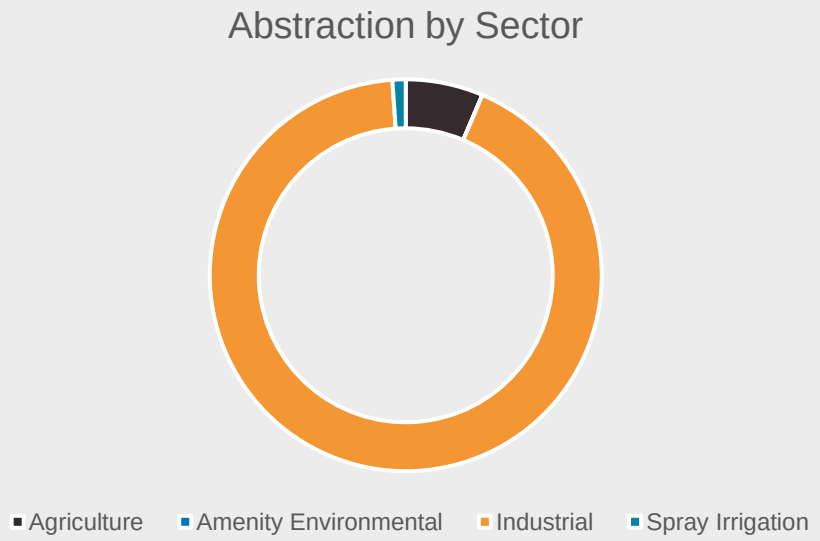
East Anglia abstraction by sector



Catchments

Colne abstraction by sector



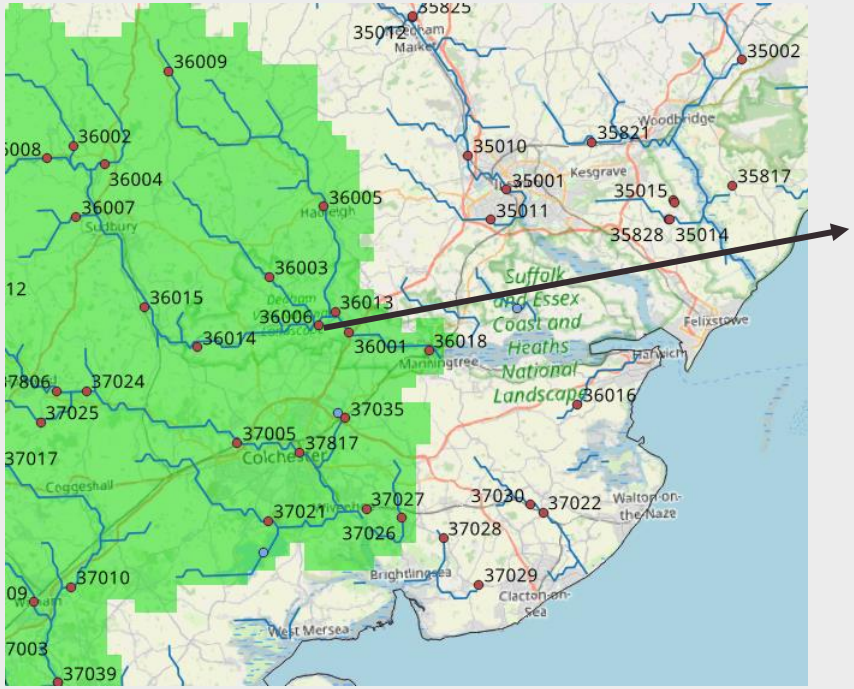


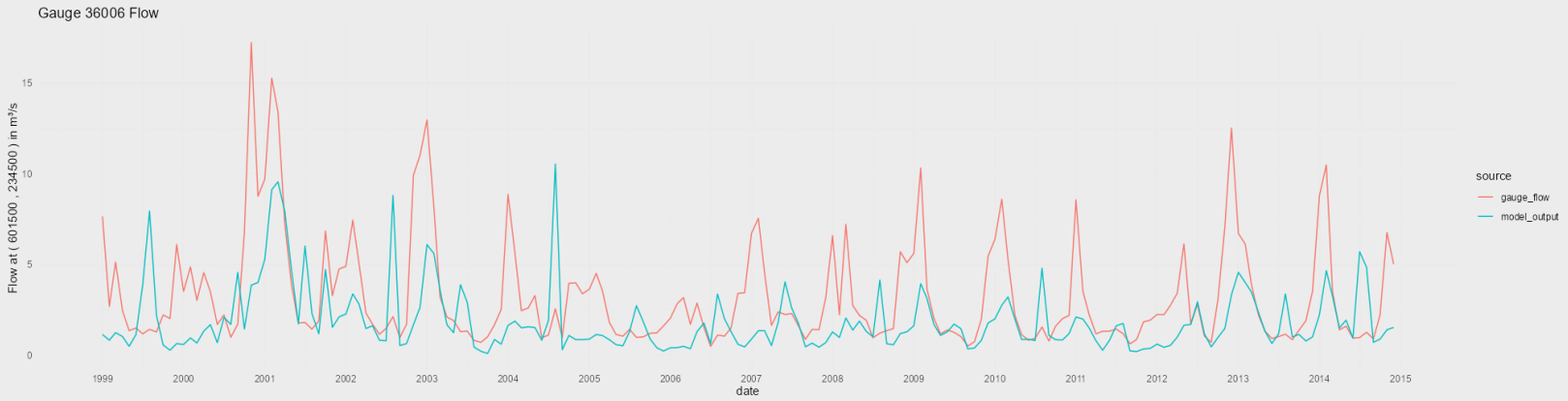
Comparison of model predictions with differing WRM

UK Centre for Ecology & Hydrology

East Anglian

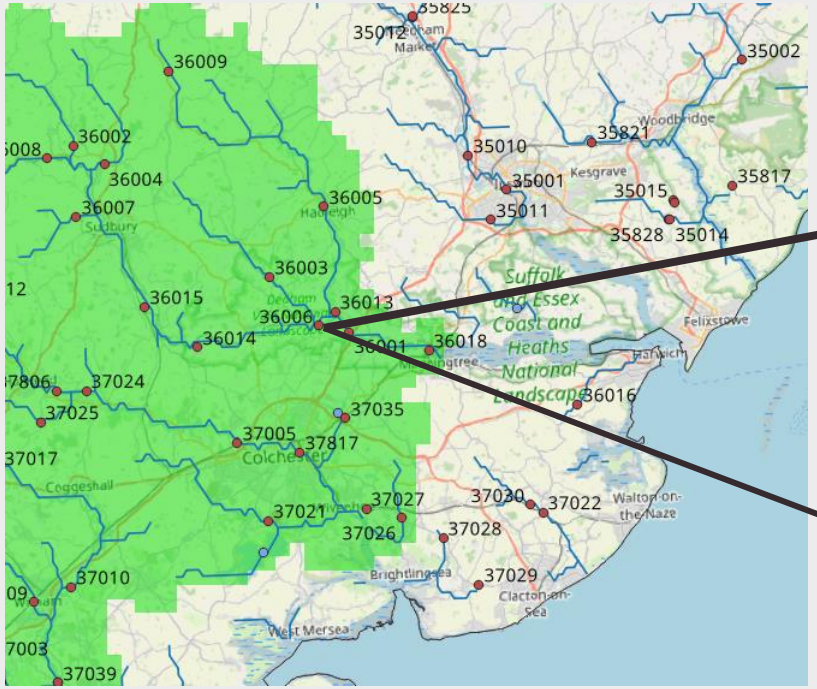
The JULES model in the East Anglian area generally doesn't accurately predict flow

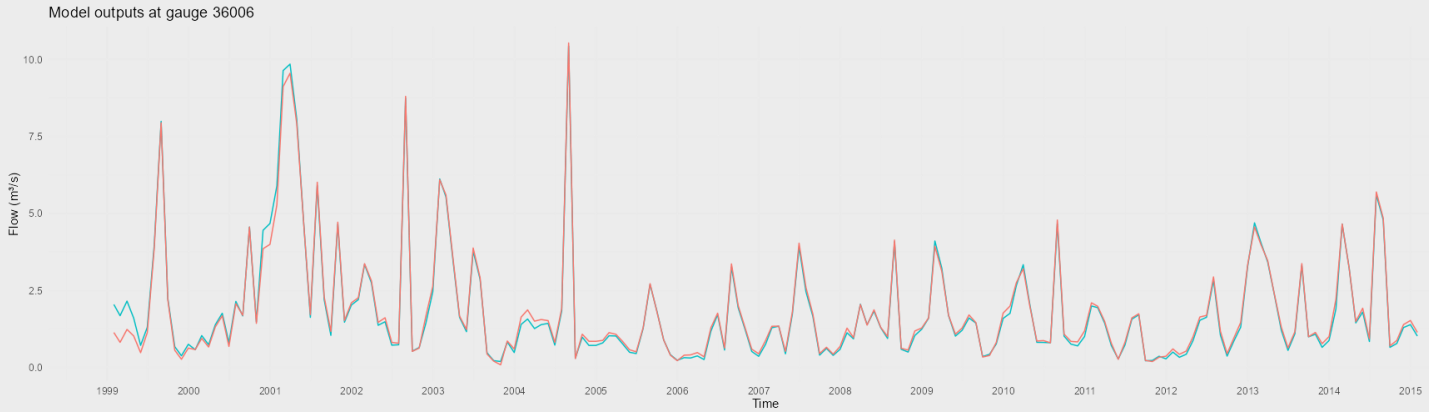


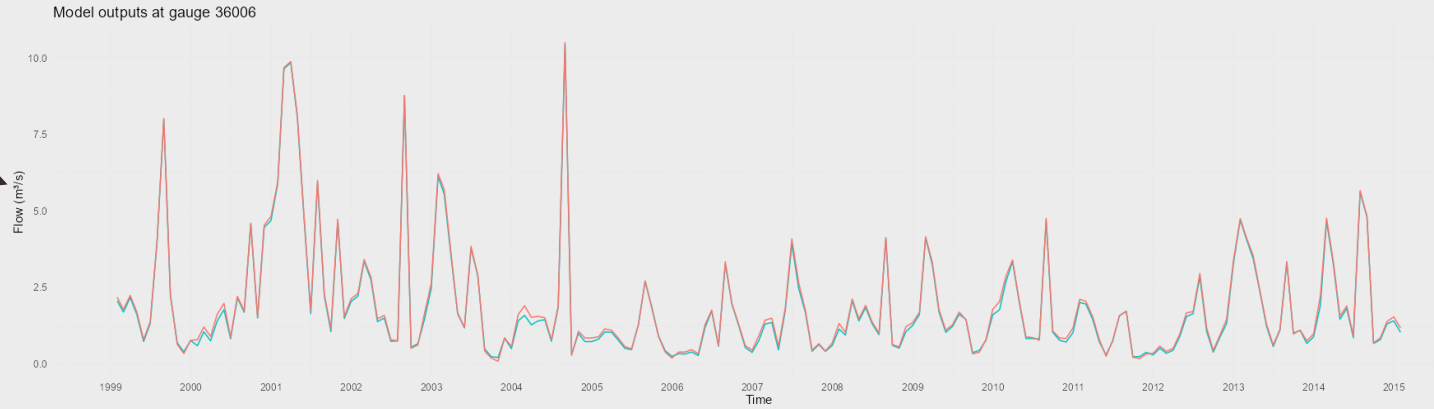


East Anglian

However, introducing some WRM does change predictions



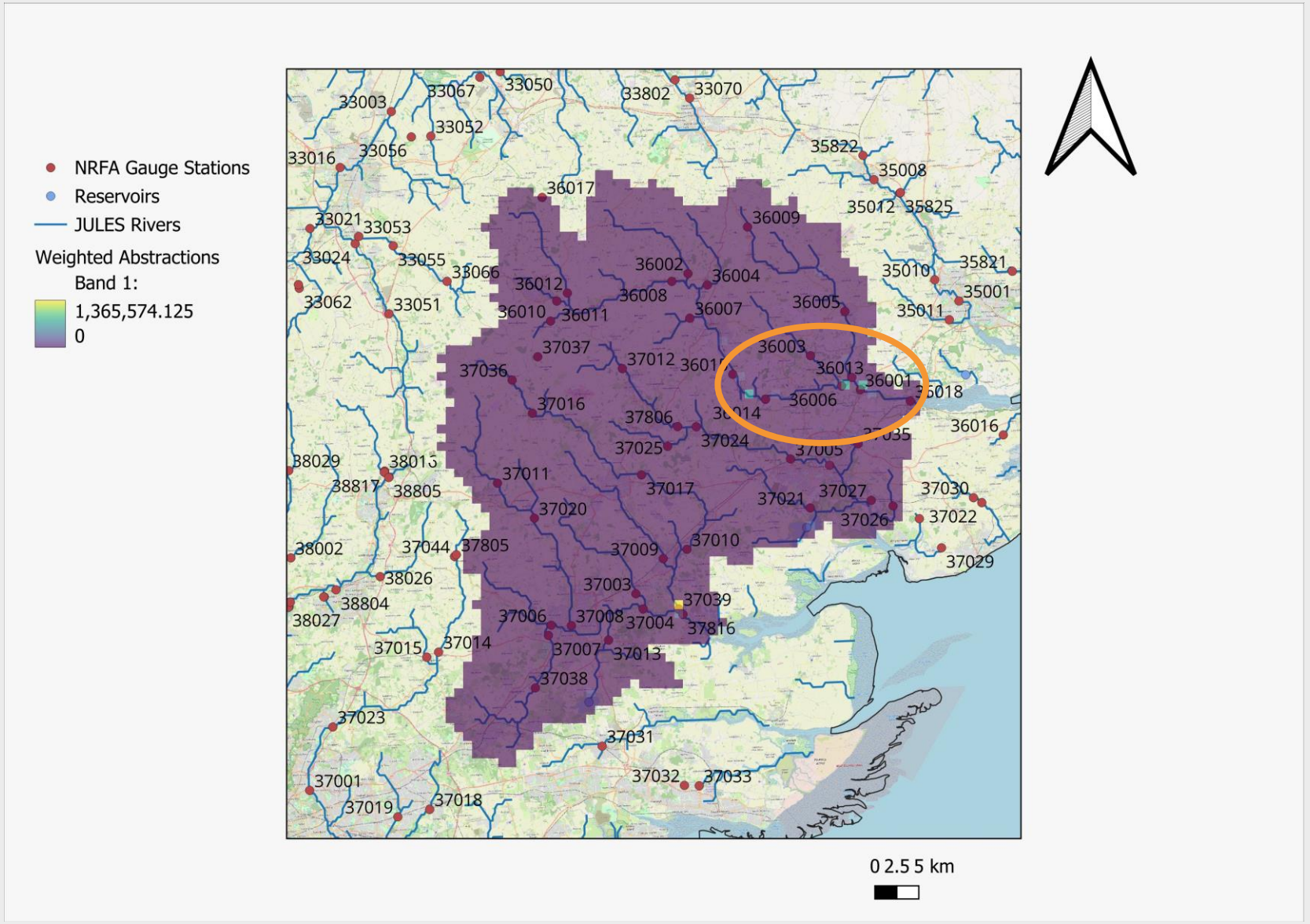




East Anglian

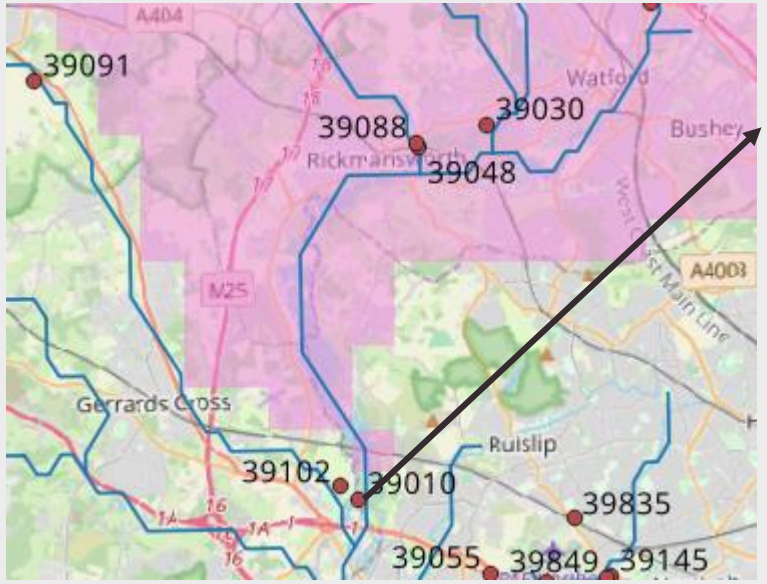
Why might this be?

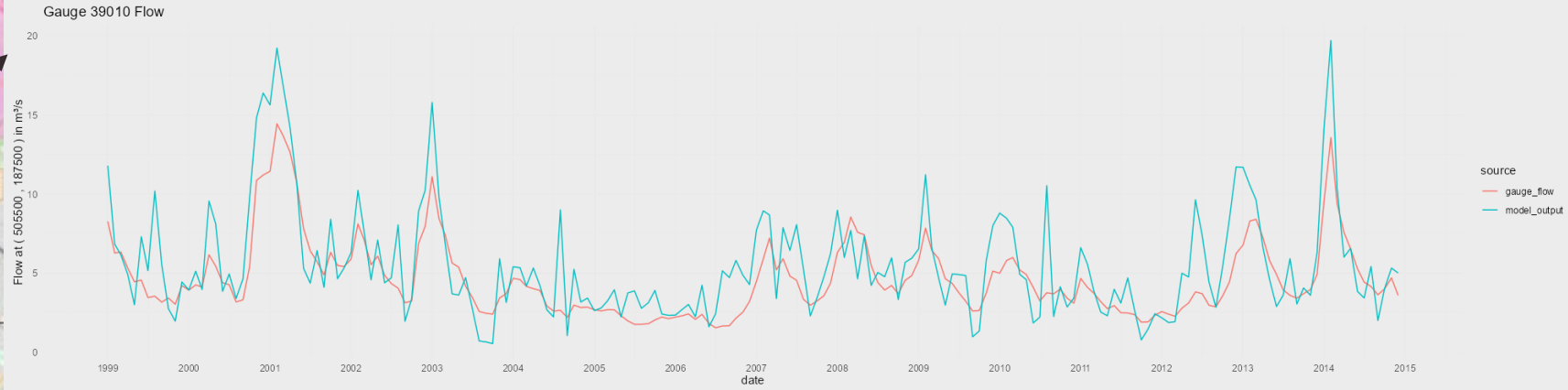
- Implicit transfers on grid cell
- Abstraction – return flows



Colne

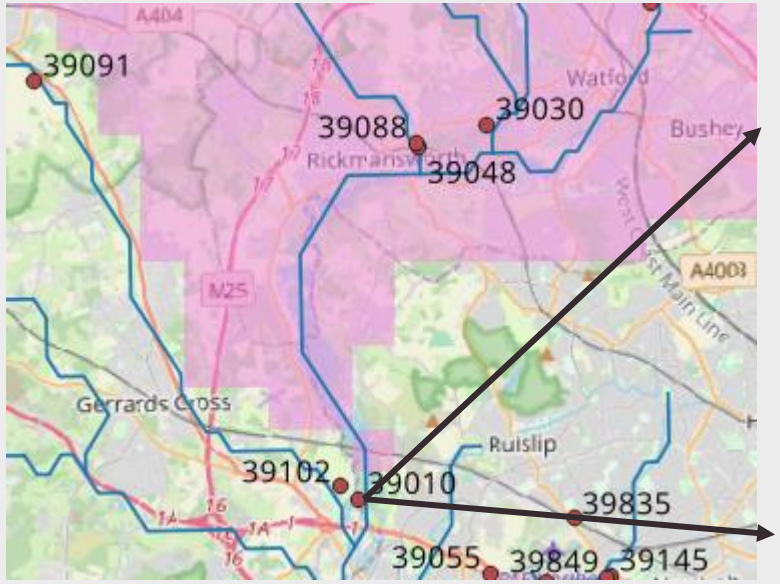
The JULES model in the Colne catchment generally predicts flow better





Colne

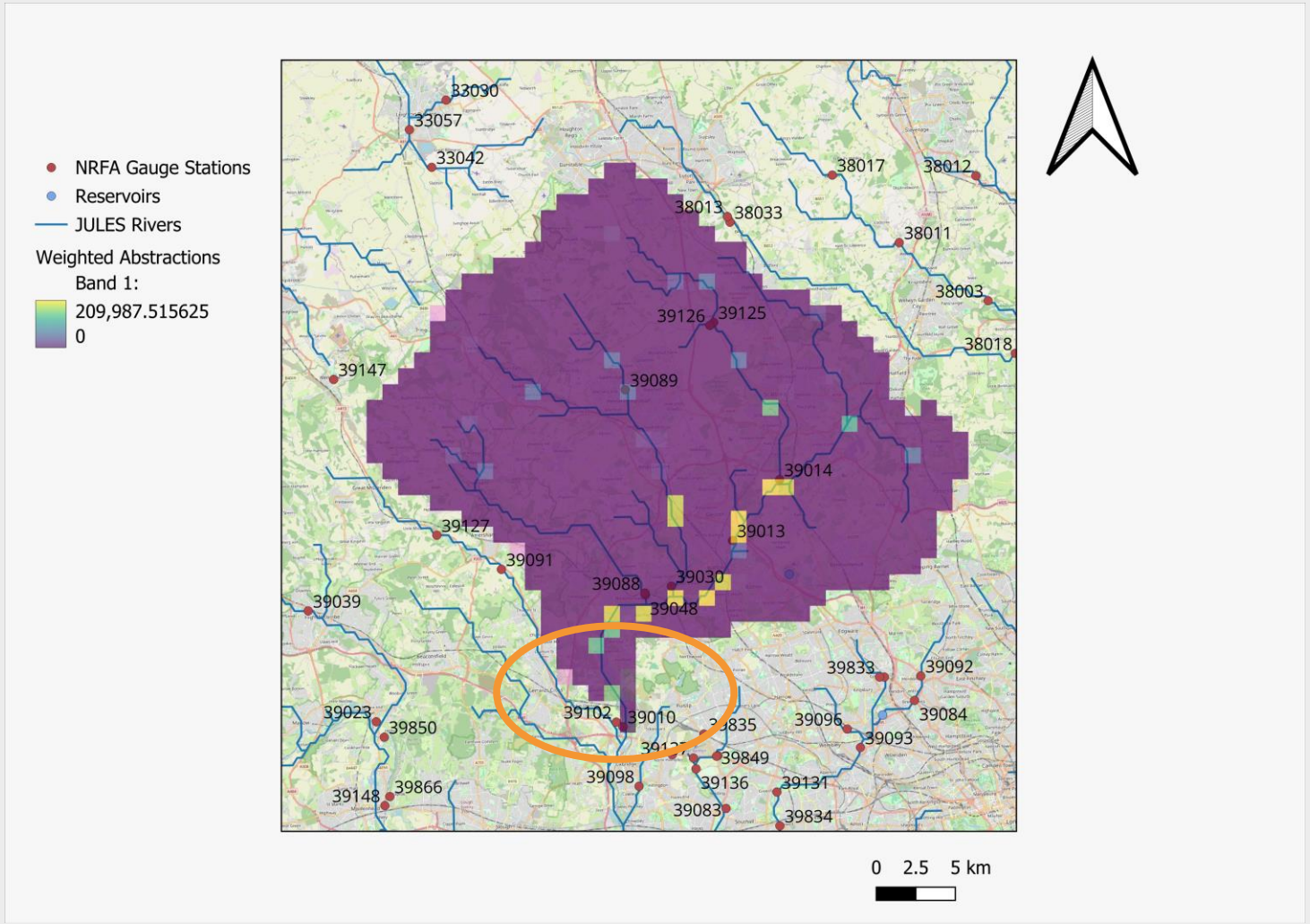
Introducing WRM changes predictions slightly



Colne

Why might this be?

- Abstractions
- Though less impact by implicit transfers



Challenges/Next Steps

- Predictive ability of JULES in East Anglian region
  - Look at more catchments
- Some locations where implicit transfers seem to increase flow more than others
  - Look more into why this may be by looking at upstream cells
- No strong influence from reservoirs
  - Look into catchments with larger and more impactful reservoirs

Thank you

Thanks to my supervisors Helen Baron, Virginie Keller, and Amber Reynolds

UK Centre for Ecology & Hydrology