The East Anglian Fens: Crop Productivity and Climate Vulnerability

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- BA Natural Sciences (2018-2021), three projects:
  - Salt marsh pond chemistry
  - Understanding chemical variations in the Mersey Estuary
  - Environmental controls on wetland methane emissions
- MSci Natural Sciences (2021-2022):
  - Carbon, sulphur and calcium chemistry in sediments of large lakes (Baikal and Kinneret)
- PhD in Earth Sciences:
  - Quantifying production and consumption of greenhouse gases in fenland soils
- Supervisor: Prof. Sasha Turchyn

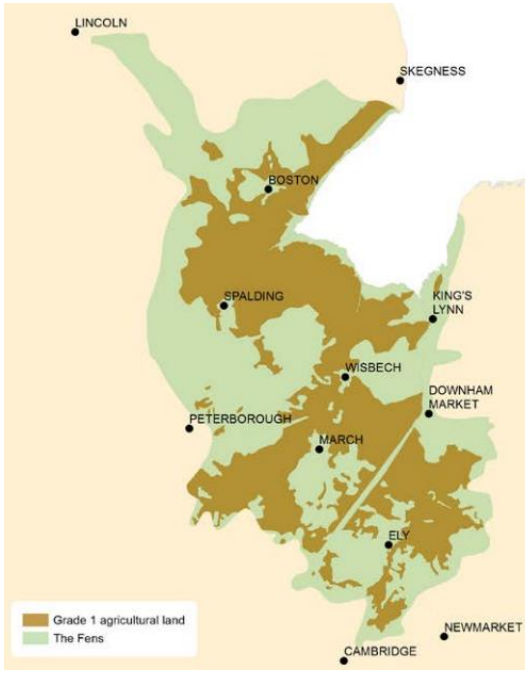
Outline

- Introducing the Fens
- Challenges for fenland agriculture
- Introducing the Centre for Landscape Regeneration
- My research: understanding greenhouse gases in soil
- Some thoughts on the future of fenland agriculture
- Discussion

Water

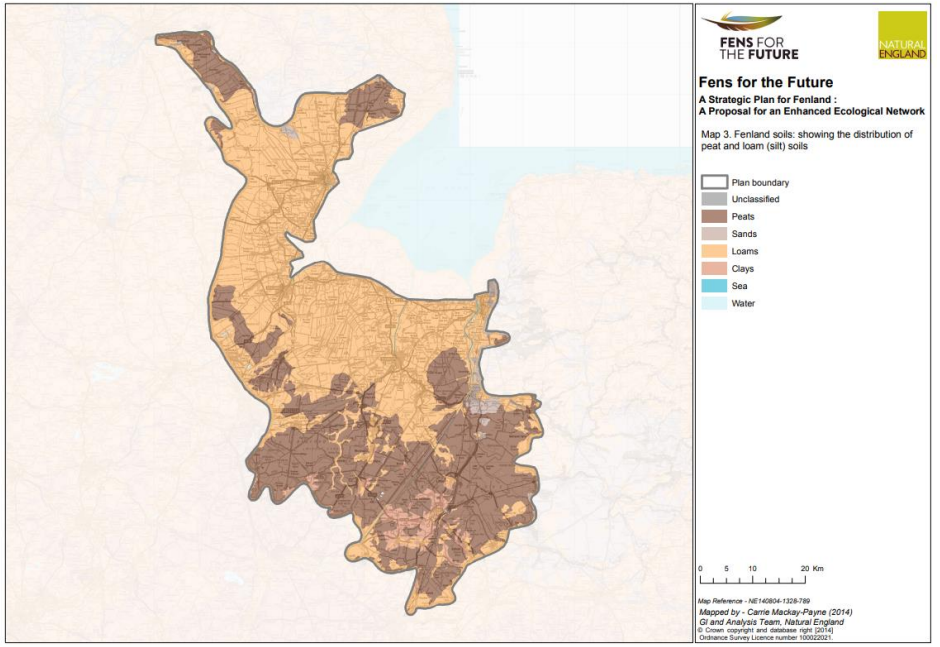
Introducing the Fens

Wikimedia Commons [1]



NFU (2019) [2]

Natural England (2014) [3]



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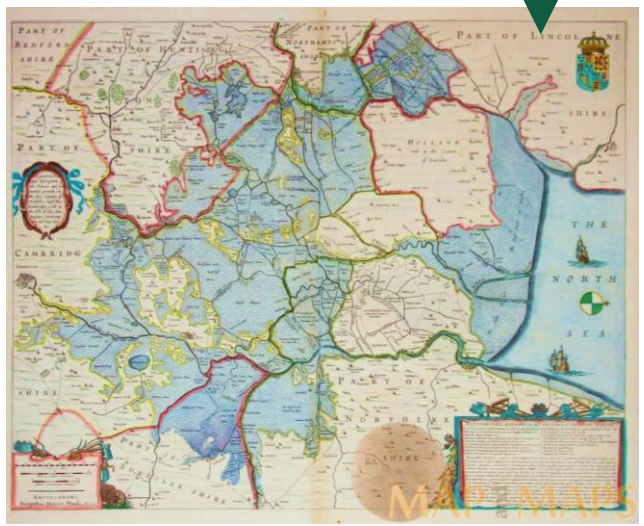

Map&Maps [6]

Ely Museum [8]

Ely Museum [8]

Fens for the Future [7]

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1500 1600 1700 1800 1885 1900 2000 2013

Wildlife Trust [9]

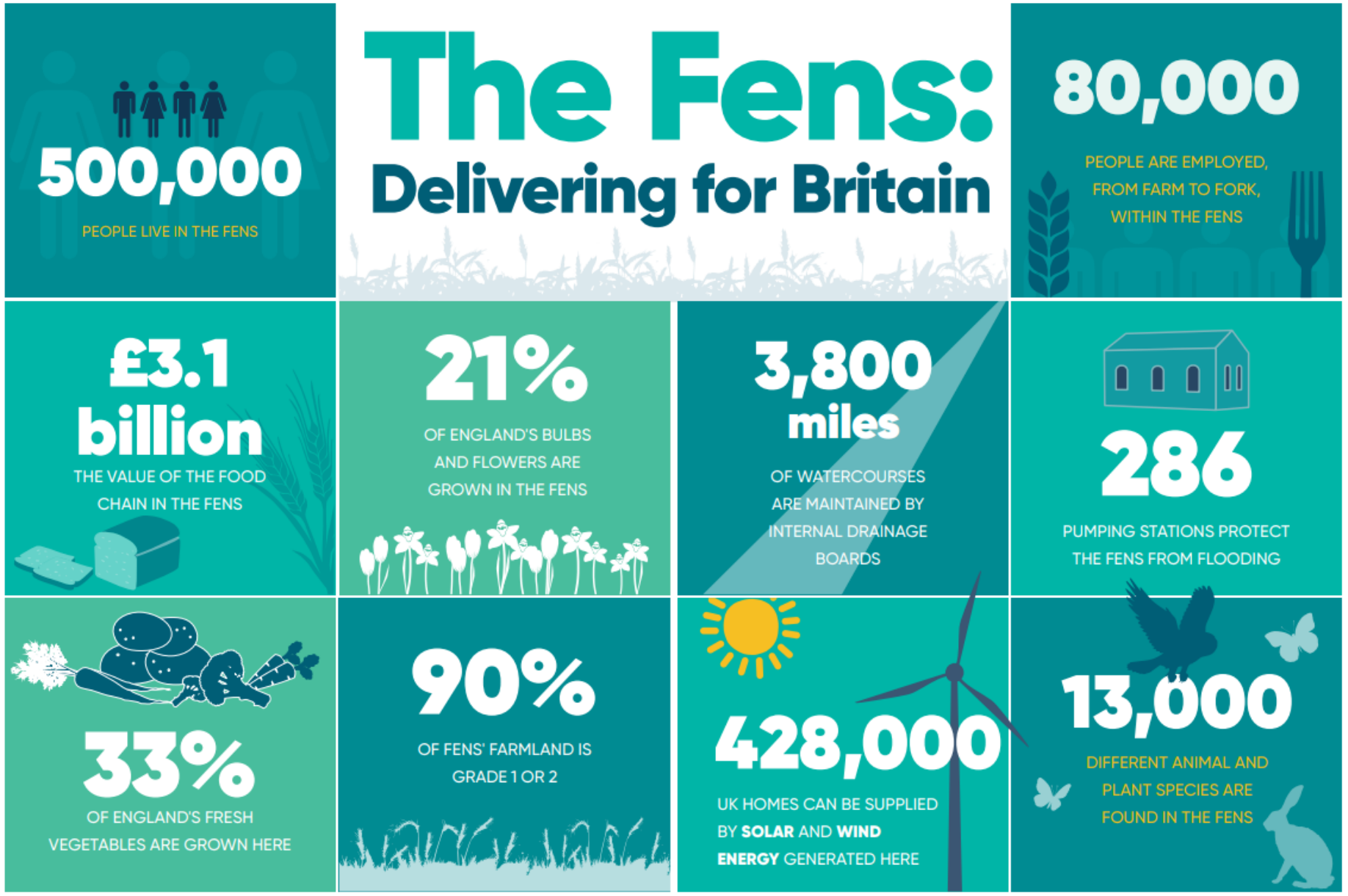
Geograph [10]

East Anglia
In Business [11]

Introducing the Fens

RGS [5]

Geograph (2013) [4]


500,000
PEOPLE LIVE IN THE FENS
The Fens:
Delivering for Britain
80,000
PEOPLE ARE EMPLOYED, FROM FARM TO FORK, WITHIN THE FENS
£3.1 billion
THE VALUE OF THE FOOD CHAIN IN THE FENS
21%
OF ENGLAND'S BULBS AND FLOWERS ARE GROWN IN THE FENS
3,800 miles
OF WATERCOURSES ARE MAINTAINED BY INTERNAL DRAINAGE BOARDS
286
PUMPING STATIONS PROTECT THE FENS FROM FLOODING
33%
OF ENGLAND'S FRESH VEGETABLES ARE GROWN HERE
90%
OF FENS' FARMLAND IS GRADE 1 OR 2
428,000
UK HOMES CAN BE SUPPLIED BY SOLAR AND WIND ENERGY GENERATED HERE
13,000
DIFFERENT ANIMAL AND PLANT SPECIES ARE FOUND IN THE FENS

NFU (2019) [2]

Challenges for fenland agriculture

Sea level rise & flooding

NOAA [12]

Drought

BBC (2022) [13]

Soil degradation: Erosion and greenhouse gas emissions

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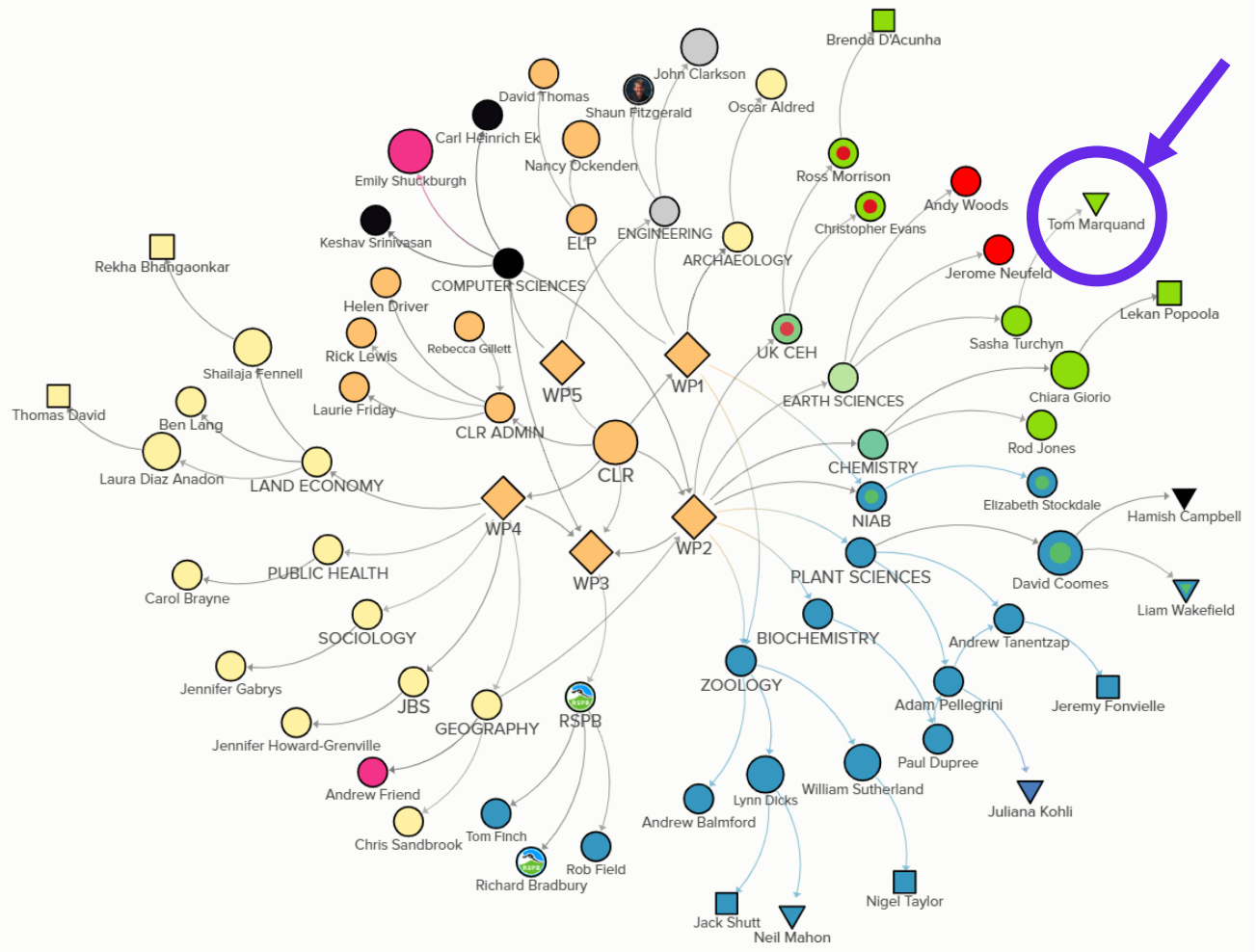

Legend

- Biodiversity
- Social Sciences
- greenhouse gases
- co-ordination
- hydrology
- Climate
- computing

Directors: Prof. Emily Shuckburgh & Prof. David Coomes

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UK Centre for Ecology & Hydrology

ENDANGERED LANDSCAPES PROGRAMME

love every drop anglianwater

Environment Agency

FENLAND SOIL
SUSTAINABILITY | OPPORTUNITY | INNOVATION | LEARNING

WRE
WATER RESOURCES EAST

NIAB

NFU

Food, Farming & Countryside Commission

FENS BIOSPHERE

Department for Environment Food & Rural Affairs

CAMBRIDGESHIRE & PETERBOROUGH COMBINED AUTHORITY

WWF

NATURALLY G'S FRESH

Wildlife Trust for Beds, Cambs & Northants

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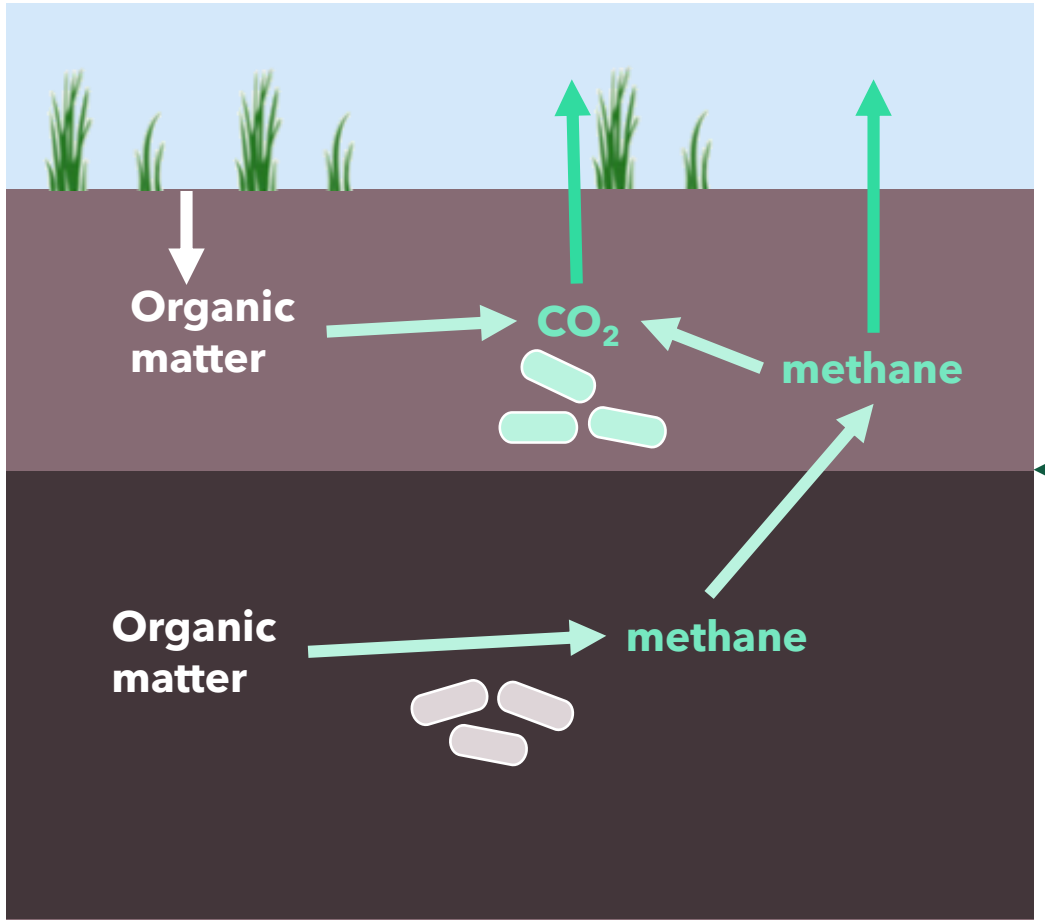
Understanding greenhouse gases in soil



air

soil

water table

waterlogged soil

CO_2 and methane are import **greenhouse gases**

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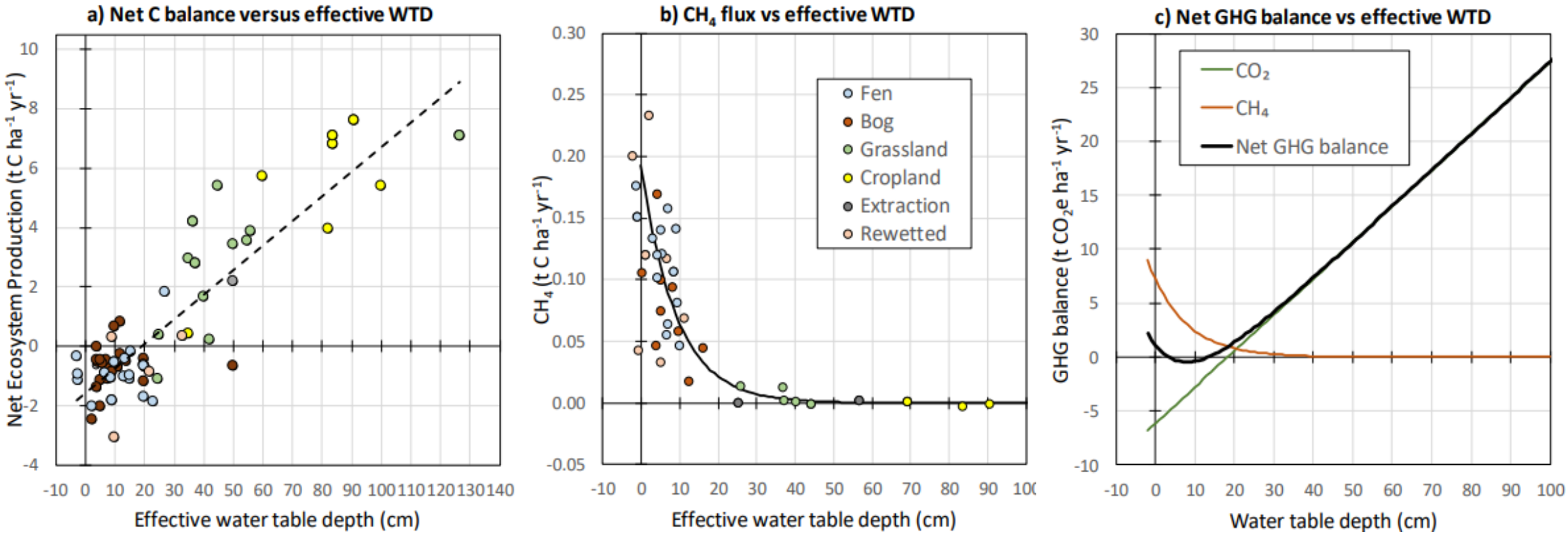

Mulholland et al. (2020) [14]

The future of fenland agriculture

Low water table
High CO_2 emissions
Low methane emissions

High water table
Low CO_2 emissions
High methane emissions

Dominant farming practices on drained land

Managed variable water table

Wet grassland grazing
(+methane from grazers)

Paludiculture

Nature reserve

Other concerns: profitability/subsidies, job opportunities, climate resilience, productivity, biodiversity

Plus: flood defences, new reservoirs, addition flood water storage, new green industries (?)

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Summary

- The Fens are an important landscape scientifically, economically and for UK food production
- The Fens are at risk from the effects of climate change and also contribute to UK greenhouse gas emissions
- The Centre for Landscape Regeneration will attempt to answer challenging questions about the future management of the Fens
- Greenhouse gas emissions are highly dependent on water table depth
- Future agricultural practices which involve raising the water table may help to reduce the fens greenhouse gas emissions
- **Water**

Thank you for listening!

Keep in touch

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CLR: www.clr.conservation.cam.ac.uk

Citations

[1] **Wikimedia Commons**, accessed 10/11/2022, URL=https://upload.wikimedia.org/wikipedia/commons/thumb/3/3e/Map_of_the_Fens.svg/1062px-Map_of_the_Fens.svg.png

[2] **NFU East Anglia, 2018**, *'Delivering for Britain: Food and farming in the fens'*, URL=https://www.nfuonline.com/archive?treeid=117727

[3] **Natural England, 2014**, *'Fens for the Future: Map 3: Fenland soils…'*, mapped by Carrie Mackay-Payne, URL=https://www.fensforthefuture.org.uk/admin/resources/map-3-silt-fens-28soils29fensforthefuture.pdf

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[6] **Map & Maps**, *'The Fens Fennes and surrounded grounds Old map Janssonius 1638'*, accessed 11/11/2022, URL=https://mapandmaps.com/en/archived-maps/4601-the-fens-england-old-map-fennes-and-surrounded-grounds-janssonius-hondius-1638.html

[7] **Fens for the future**, *'The Fens'*, accessed 11/11/2022, URL=https://www.fensforthefuture.org.uk/the-fens/

[8] **Ely Museum, 2020**, *'How were the fens drained? Who drained the fens?'*, accessed 11/11/2022, URL=http://www.elymuseum.org.uk/wp-content/uploads/2020/06/Drainage-who-drained-the-fens-1.pdf

[9] **Wildlife Trust**, *'A brief history of the Great Fen'*, accessed 11/11/2022, URL=https://www.greatfen.org.uk/about-great-fen/heritage/brief-history-great-fen

[10] **Geograph, 2013**, image by Richard Humphrey, accessed 11/11/2022, URL=https://www.geograph.org.uk/photo/3544594

[11] **East Anglia in Business**, *'A thriving future for the Fens'*, accessed 11/11/2022, URL=https://eastangliainbusiness.co.uk/a-thriving-future-for-the-fens/

[12] **NOAA**, *'Sea Level Rise Viewer'*, accessed 11/11/2022, URL=https://coast.noaa.gov/digitalcoast/tools/slr.html

[13] **BBC, 2022**, *'Anglian Water says 'we must be more robust towards drought''*, accessed 11/11/2022, URL=https://www.bbc.co.uk/news/uk-england-cambridgeshire-62181202

[14] **Barry Mulholland, Islam Abdel-Aziz, Richard Lindsay, Niall McNamara, … , Chris Evens, 2020**, *'Literature Review: Defra Project SP1218An assessment of the potential for paludiculture in England and Wales'*, accessed 11/11/2022, URL=https://lowlandpeat.ceh.ac.uk/sites/default/files/2022-07/Defra-LP2-paludiculture-report-April-2020.pdf