Saltmarsh mapping from space: developing methods to track saltmarsh change over time

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EPW conference

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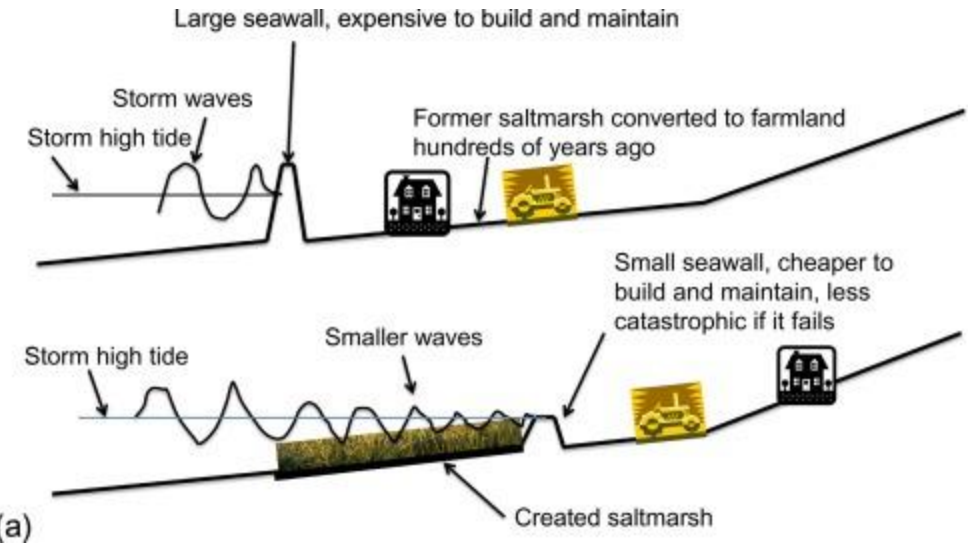
Project outline

- Saltmarshes are important stocks of blue carbon
- Incorporating carbon sequestration in UK saltmarshes into the UK GHG Inventory requires us to know about saltmarsh condition
- We know where managed saltmarshes are but not what condition they are in.



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Roadmap for potential inclusion of saltmarsh habitat in the UKGHGI

Key data gaps:

Activity data

1) Basemap – needed to start reporting

A collation of the available mapping data was started as part of a BEIS rapid review conducted by Burden and Clilverd, 2021.

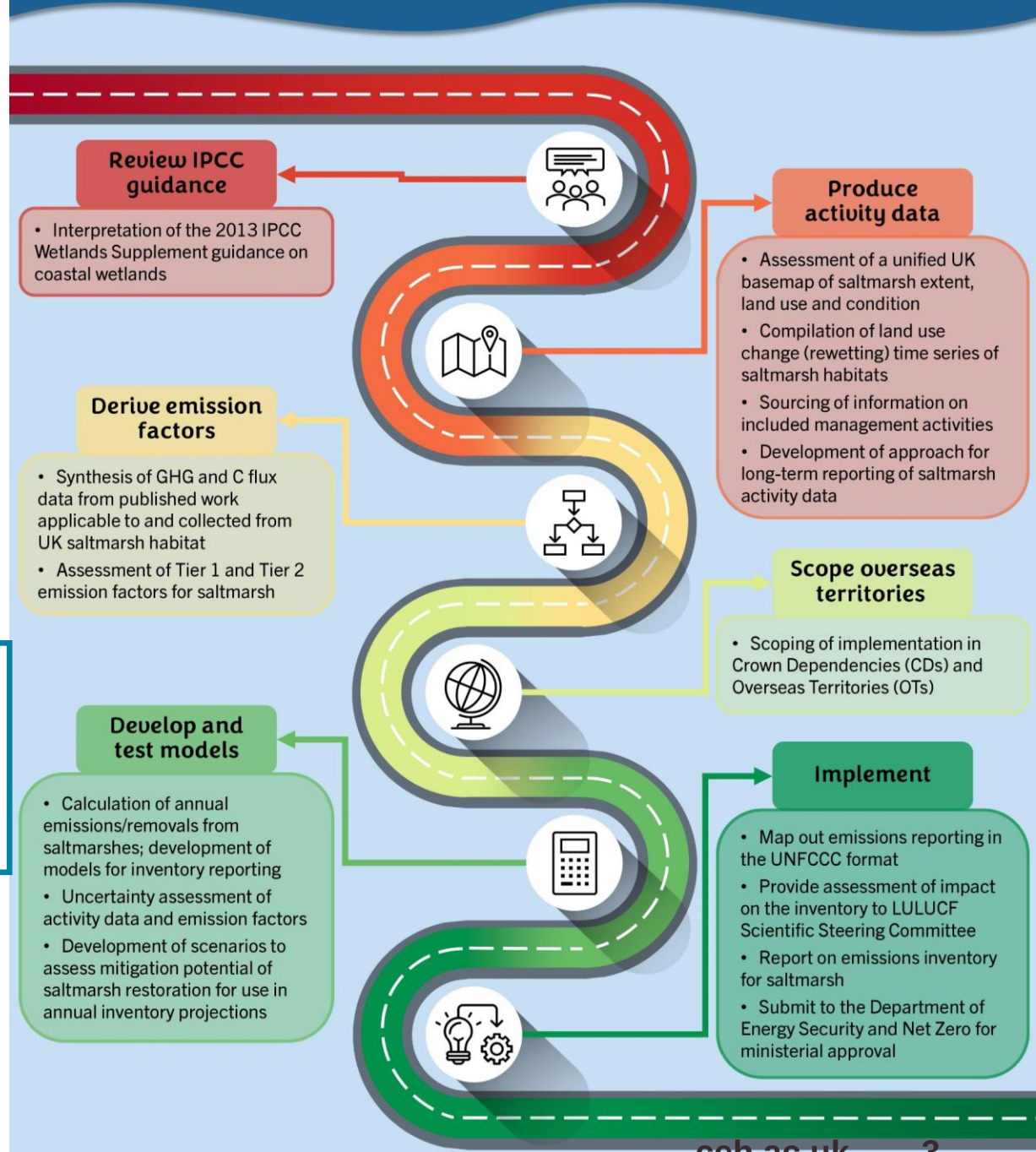
2) Tracking restoration – for long term monitoring of success

UKCEH EO pilot study explored using satellite data to assess vegetation cover changes

Emission Factors

3) Literature review and meta-analysis

Work underway - Defra/EA-funded project to develop a GHG database, a living archive for developing and updating emission factors.



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Environment Agency

UK Centre for Ecology & Hydrology

Project areas

5 areas of managed realignment around the UK

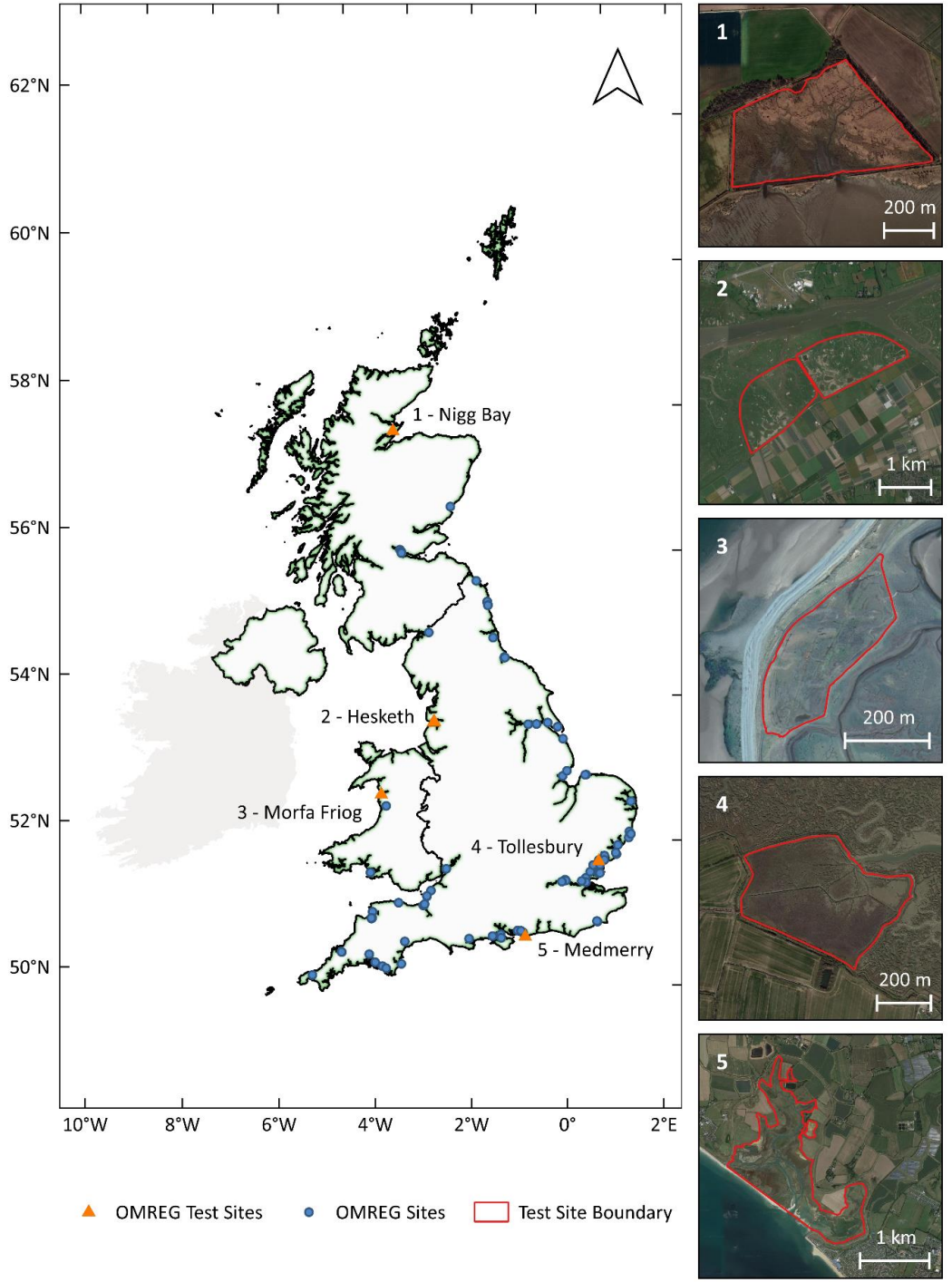
Hesketh Out Marsh

Tollesbury

Medmerry

Morfa Friog

Nigg Bay



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Saltmarsh vegetation succession

label	Description
Water	Open water
Sediment	Bare sediment
Pioneer marsh	Low growing annual vegetation
Low Marsh	Perennial vegetation
Upper Marsh	More diverse sward, perennial

Pre flooding

Year 0

Year 2

Year 3.5

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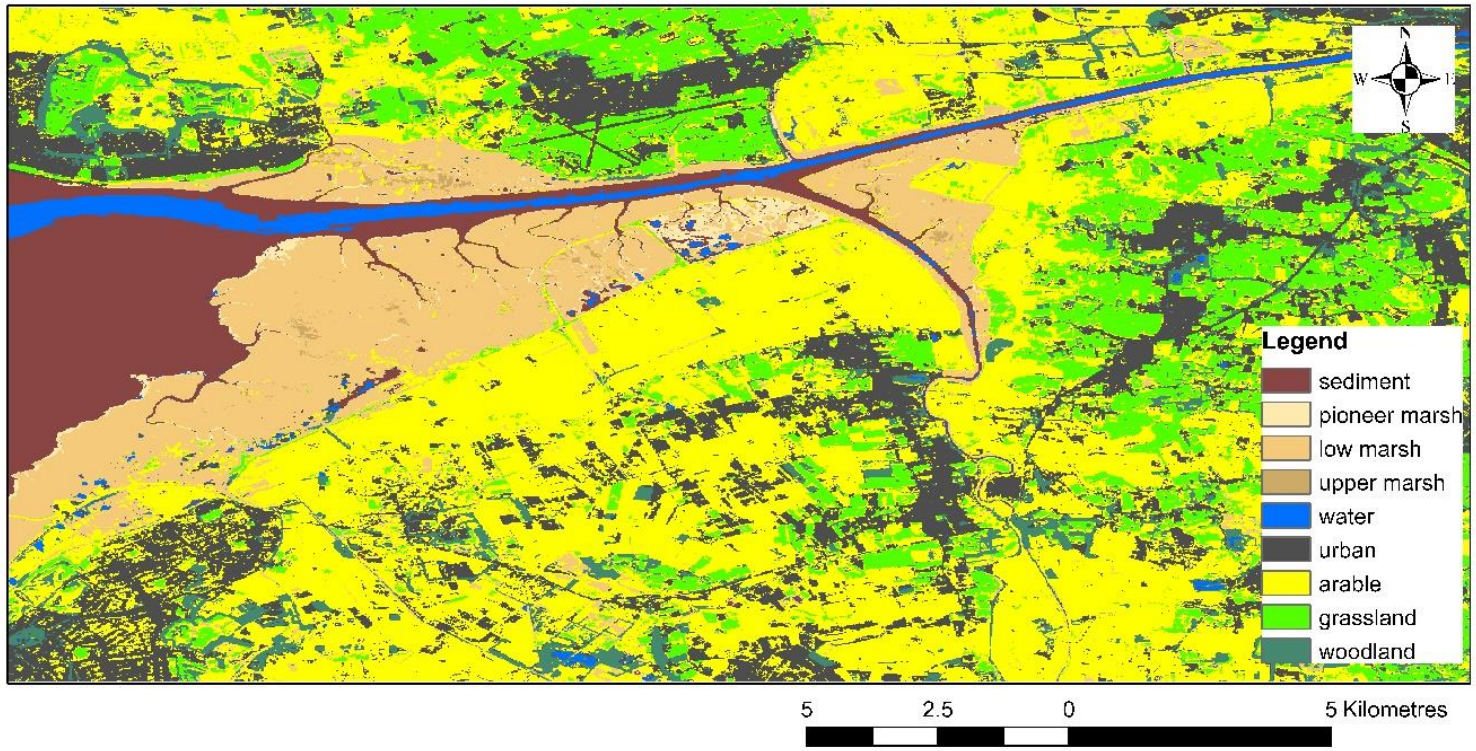
Methods

Ground observations from 2020 used to develop a training dataset

Monthly median NDVI data calculated from Sentinel 2 data between 2018 and 2022 downloaded from Google Earth Engine

Random Forest Classification used to classify 2020 data

Random Forest model used to predict saltmarsh condition between 2018 and 2022



Earth Observation - NDVI

NDVI (normalised difference vegetation index) is a measure of “greenness”.

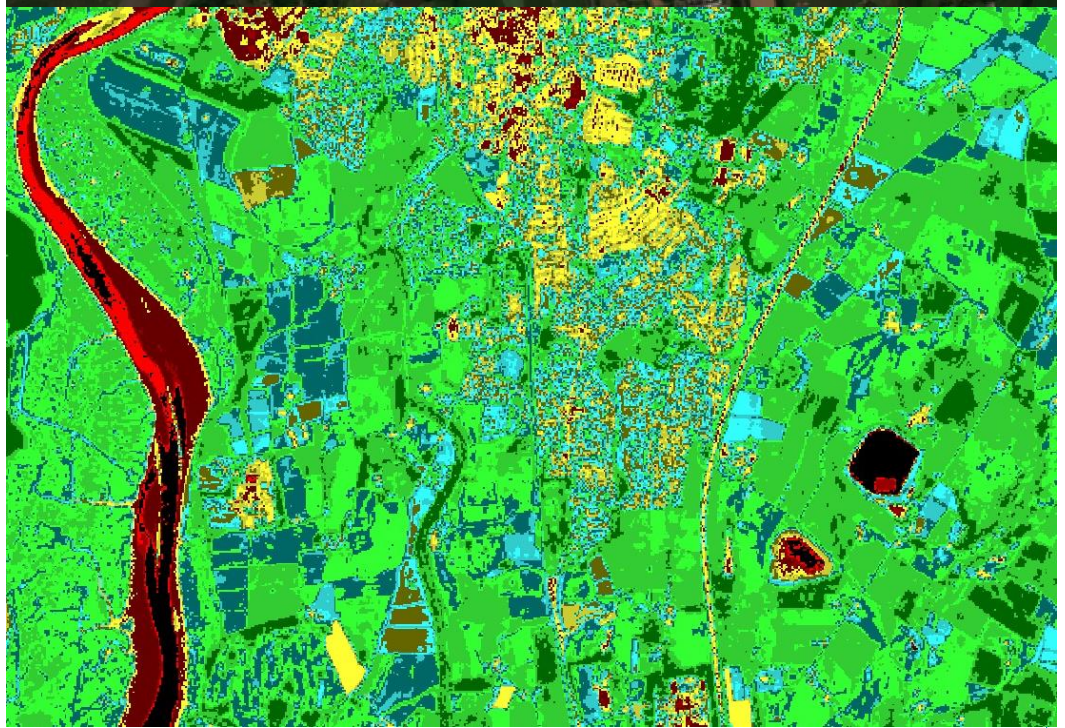
Calculated as:

$$\mathrm{NDVI} = \frac{(\mathrm{NIR} - \mathrm{Red})}{(\mathrm{NIR} + \mathrm{Red})}$$

< 0 values suggest water

~ 0 values suggest bare ground

> 0.5 suggest thick vegetation



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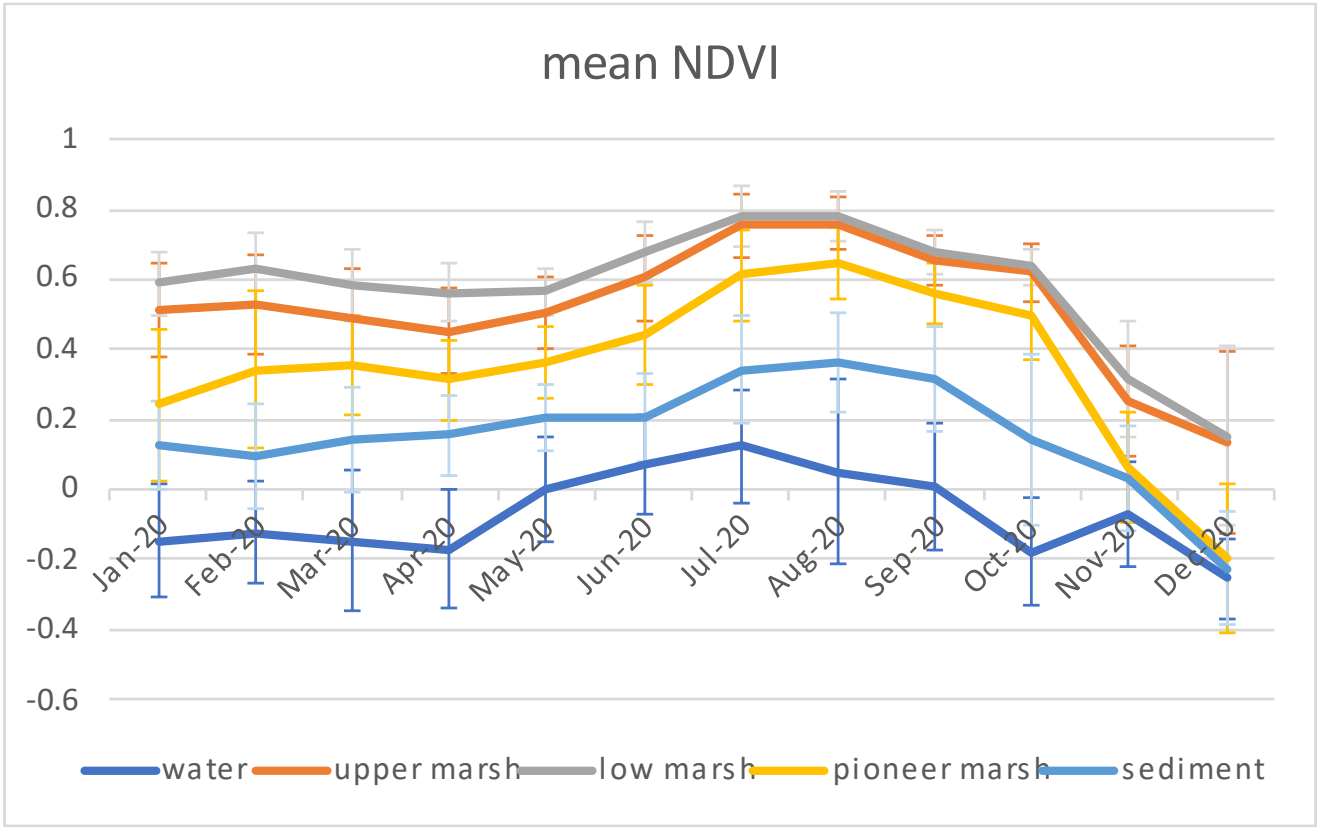
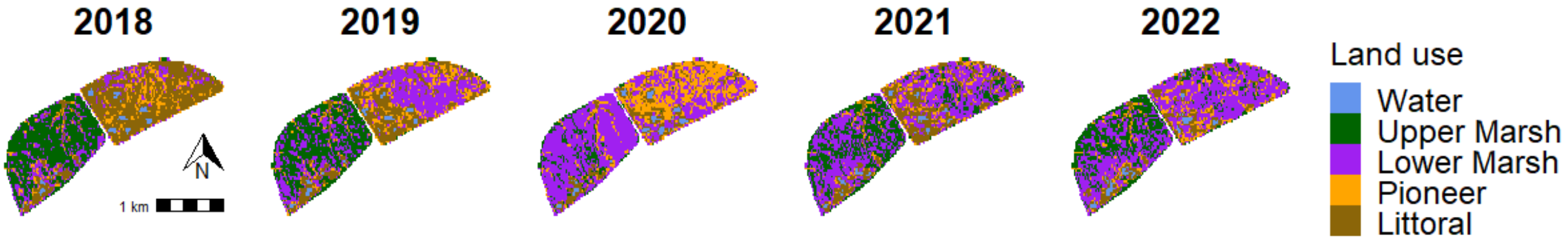


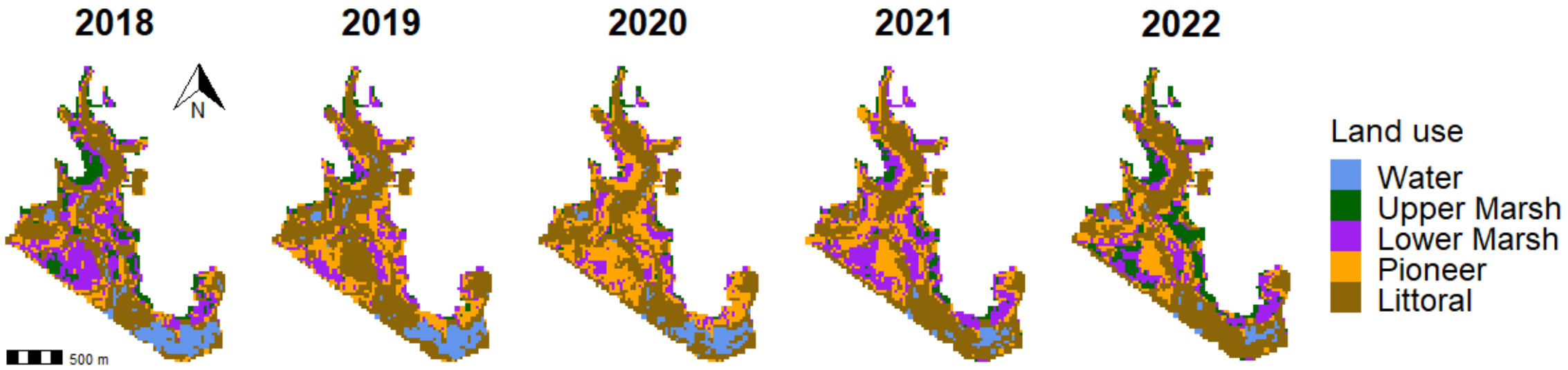
Results


2018
2019
2020
2021
2022
N
1 km
Land use
Water
Upper Marsh
Lower Marsh
Pioneer
Littoral


Riverview Motorcycle


Riverview Motorcycle

Results


2018
2019
2020
2021
2022
N
500 m
Land use
Water
Upper Marsh
Lower Marsh
Pioneer
Littoral

Results

High accuracy at differentiating vegetated, bare and inundated locations at each site.

Main issue is the flooding of low-lying sites meaning that areas are artificially recorded as open water.

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Conclusions

We can use simple spectral metrics to quantify saltmarsh vegetation coverage at sites around the UK.

Upscaling of this methodology to all saltmarsh habitats across the whole of the UK would fill-in a key data gap that would enable reporting of saltmarshes in the UK Greenhouse Gas Inventory.

Further work is needed to fully separate low and upper marsh categories and to determine any differences between natural and managed realignment sites.

Diolch / thank you

For more information
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