**Effect of restoration on saltmarsh carbon accumulation in Eastern England**

**Supplementary Material**

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**Soil property measurement methods**

All samples were taken from permanently vegetated saltmarsh above 1.5m OD at each restored and natural marsh. Soil cores were air-dried, ground and sieved (2mm mesh size). ). A Jenway 4520 Conductivity meter was used to measure electrical conductivity (mS cm-1) on a 1:2.5 deionised water suspension (Avery and Bascomb, 1974) as a proxy for salinity. Percentage soil C was measured by combustion on a TruSpec CN Analyser (Leco Corp, St Joseph, Michigan). Moisture content was determined from a separate core by measuring weight loss after drying the soil at 105°C overnight, and dry mass divided by core volume to calculate bulk density (BD). Soil carbon content to 30 cm depth was estimated by multiplying BD by %C and depth. Below ground biomass to 30cm was estimated from a separate core by washing off soil, and drying roots at 80oC for 72 hours.

**Further information and explanation of the saltmarsh carbon accumulation model**

Initial saltmarsh %C and the exponential decay constant were fitted in order to minimise the root mean squared error of mean modelled versus observed %C and BD at the three time points represented in the chronosequence (mean number of years since restoration for each group = 17, 61 and 114 years), with each measurement weighted equally. An indication of uncertainty was calculated by using the lowest and highest observations of %C and BD to parameterise the model, rather than the average of field, and natural marsh samples.

It is worth noting that many soil surveys (including past UK surveys) and carbon accounting methods (including the IPCC inventory) often only consider ‘topsoil’ (usually 0-30 cm). This can lead to incomplete or erroneous estimates of carbon stock change in an accumulating saltmarsh system, and therefore to misleading conclusions regarding the CO2 sequestration potential of saltmarsh restoration. Our model specifically aims to account for this problem, which to our knowledge has not been done previously.

**Table S1.** Saltmarsh site further information

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Saltmarsh sampling sites** | **Year of breach** | **Years since breach (to 2011)** | **Grid reference of sampling point** | | | |
| **Natural marsh** | | **Restored marsh** | |
| **Easting** | **Northing** | **Easting** | **Northing** |
| Tollesbury | 1995 | 16 | 595812 | 211637 | 595839 | 211346 |
| Orplands | 1995 | 16 | 597649 | 206062 | 597882 | 206118 |
| Northey\* | 1991 | 20 | 587247 | 205782 | 587598 | 205727 |
| Barrow Hill | 1953 | 58 | 601531 | 214977 | 601649 | 214913 |
| Ferry Lane | 1945 | 66 | 603967 | 221284 | 603929 | 221249 |
| Wallasea Island | 1953 | 58 | 594710 | 195119 | 594439 | 195203 |
| Northey Island\* | 1897 | 114 | 587247 | 205782 | 587806 | 205781 |
| North Fambridge | 1897 | 114 | 584432 | 196717 | 584530 | 196712 |
| Brandy Hole | 1897 | 114 | 583189 | 195629 | 583156 | 195563 |

Note: Northey and Northey Island have the same natural reference marsh

**Table S2.** Field site further information

|  |  |  |
| --- | --- | --- |
| **Field sampling sites** | **Grid reference of sampling point** | |
| **Easting** | **Northing** |
| Barrow Hill Field | 601788 | 214655 |
| Wallasea Island Field | 596072 | 193767 |
| Brandy Hole Field | 582692 | 195559 |
| Tollesbury Field | 595745 | 211539 |

**References**

Avery, B.W., and Bascomb, C.L. 1974. Soil Survey Technical Monograph No.6, Harpenden.