Saltmarsh in time and space

Mike Best, Tegan Consol, Keith McGruer, Tom Newton, Niall Phelan
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Saltmarsh Services

Supporting/intermediate & regulating services:

- Protection from storm, wave and flood
- Water Quality regulation,
- Nutrient cycling
- Carbon sequestration
- Fish spawning / nursery sites,
- Bird habitats,
- Other specialist habitats / species

Cultural services:

- Sense of place, aesthetic,
- Recreation and leisure
- Education

Provisioning services:

- Agriculture (grazing)
- Fish / Shellfisheries
- Artisanal / foraging

Destructive:

- Building, development & reclaimation

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Extent of English Saltmarshes

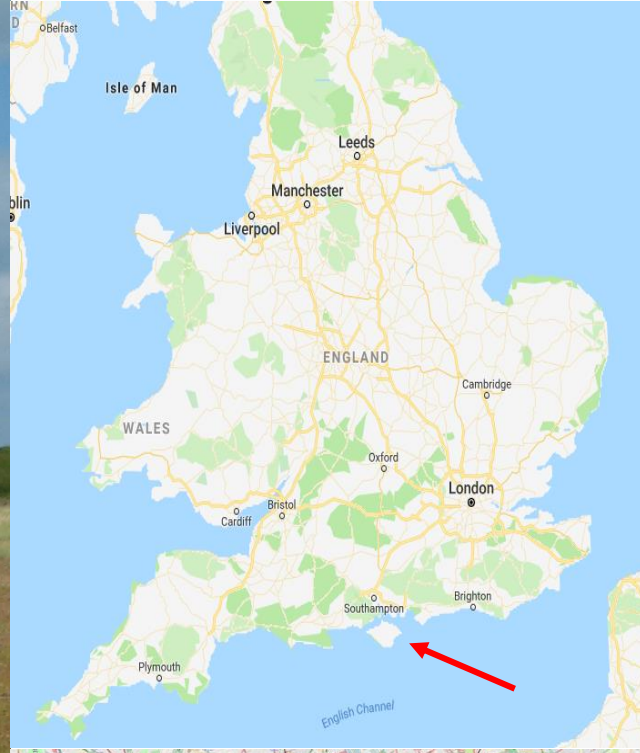
117 English waterbodies with saltmarsh

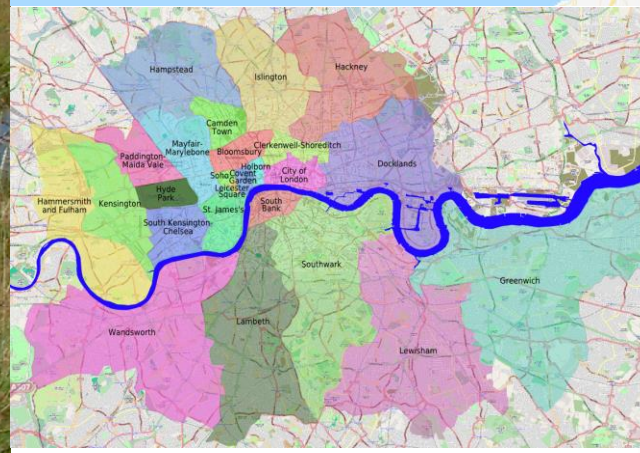
- 35,748 ha
- Max 3,531 ha
- Min 0.13 ha

38 of 49 Surveillance Waterbodies

- 9 Coastal
- 29 Estuarine

Approx. 70% “Heavily Modified”





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Measuring Basic Saltmarsh health

Changes in abundance

Taxonomic & community composition

All disturbance sensitive taxa are present

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Main points for Classification

Historic Loss

Proportion Intertidal

Change in extent

Zones present

Zone Proportions

Diversity

EA_WB_ID	NAME	Status Class							EQR						
		SMAh	SMAi	ΔSMA	Zn/5	ZnMax	Th or T15	FINAL	SMAh	SMAi	ΔSMA	Zn/5	ZnMax	Th or T15	FINAL
GB530905415401	SEVERN LOWER	B	P	H	H	M	H	M	0.08	0.26	1.00	1.00	0.54	0.94	**0.55**
GB530905415402	SEVERN MIDDLE	B	P	H	H	P	H	M	0.14	0.37	1.00	1.00	0.34	0.82	**0.52**
GB530905415403	SEVERN UPPER	B	M	H	H	P	M	M	0.03	0.47	1.00	0.80	0.29	0.58	**0.43**

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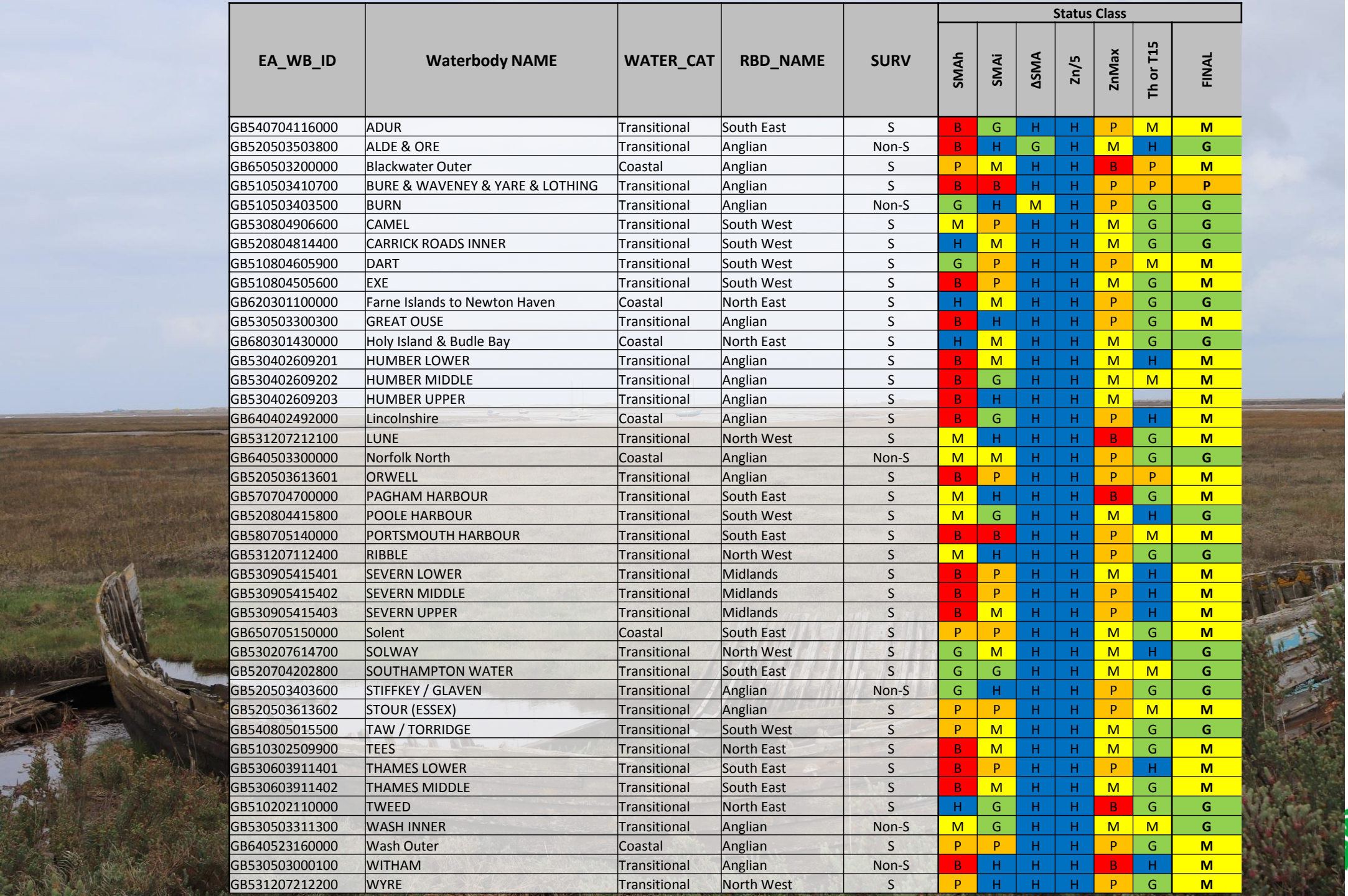

EA_WB_ID	Waterbody NAME	WATER_CAT	RBD_NAME	SURV	Status Class						
					SMAh	SMAi	ΔSMA	Zn/5	ZnMax	Th or T15	FINAL
GB540704116000	ADUR	Transitional	South East	S	B	G	H	H	P	M	**M**
GB520503503800	ALDE & ORE	Transitional	Anglian	Non-S	B	H	G	H	M	H	**G**
GB650503200000	Blackwater Outer	Coastal	Anglian	S	P	M	H	H	B	P	**M**
GB510503410700	BURE & WAVENEY & YARE & LOTHING	Transitional	Anglian	S	B	B	H	H	P	P	**P**
GB510503403500	BURN	Transitional	Anglian	Non-S	G	H	M	H	P	G	**G**
GB530804906600	CAMEL	Transitional	South West	S	M	P	H	H	M	G	**G**
GB520804814400	CARRICK ROADS INNER	Transitional	South West	S	H	M	H	H	M	G	**G**
GB510804605900	DART	Transitional	South West	S	G	P	H	H	P	M	**M**
GB510804505600	EXE	Transitional	South West	S	B	P	H	H	M	G	**M**
GB620301100000	Farne Islands to Newton Haven	Coastal	North East	S	H	M	H	H	P	G	**G**
GB530503300300	GREAT OUSE	Transitional	Anglian	S	B	H	H	H	P	G	**M**
GB680301430000	Holy Island & Budle Bay	Coastal	North East	S	H	M	H	H	M	G	**G**
GB530402609201	HUMBER LOWER	Transitional	Anglian	S	B	M	H	H	M	H	**M**
GB530402609202	HUMBER MIDDLE	Transitional	Anglian	S	B	G	H	H	M	M	**M**
GB530402609203	HUMBER UPPER	Transitional	Anglian	S	B	H	H	H	M		**M**
GB640402492000	Lincolnshire	Coastal	Anglian	S	B	G	H	H	P	H	**M**
GB531207212100	LUNE	Transitional	North West	S	M	H	H	H	B	G	**M**
GB640503300000	Norfolk North	Coastal	Anglian	Non-S	M	M	H	H	P	G	**G**
GB520503613601	ORWELL	Transitional	Anglian	S	B	P	H	H	P	P	**M**
GB570704700000	PAGHAM HARBOUR	Transitional	South East	S	M	H	H	H	B	G	**M**
GB520804415800	POOLE HARBOUR	Transitional	South West	S	M	G	H	H	M	H	**G**
GB580705140000	PORTSMOUTH HARBOUR	Transitional	South East	S	B	B	H	H	P	M	**M**
GB531207112400	RIBBLE	Transitional	North West	S	M	H	H	H	P	G	**G**
GB530905415401	SEVERN LOWER	Transitional	Midlands	S	B	P	H	H	M	H	**M**
GB530905415402	SEVERN MIDDLE	Transitional	Midlands	S	B	P	H	H	P	H	**M**
GB530905415403	SEVERN UPPER	Transitional	Midlands	S	B	M	H	H	P	H	**M**
GB650705150000	Solent	Coastal	South East	S	P	P	H	H	M	G	**M**
GB530207614700	SOLWAY	Transitional	North West	S	G	M	H	H	M	H	**G**
GB520704202800	SOUTHAMPTON WATER	Transitional	South East	S	G	G	H	H	M	M	**G**
GB520503403600	STIFFKEY / GLAVEN	Transitional	Anglian	Non-S	G	H	H	H	P	G	**G**
GB520503613602	STOUR (ESSEX)	Transitional	Anglian	S	P	P	H	H	P	M	**M**
GB540805015500	TAW / TORRIDGE	Transitional	South West	S	P	M	H	H	M	G	**G**
GB510302509900	TEES	Transitional	North East	S	B	M	H	H	M	G	**M**
GB530603911401	THAMES LOWER	Transitional	South East	S	B	P	H	H	P	H	**M**
GB530603911402	THAMES MIDDLE	Transitional	South East	S	B	M	H	H	M	G	**M**
GB510202110000	TWEED	Transitional	North East	S	H	G	H	H	B	G	**G**
GB530503311300	WASH INNER	Transitional	Anglian	Non-S	M	G	H	H	M	M	**G**
GB640523160000	Wash Outer	Coastal	Anglian	S	P	P	H	H	P	G	**M**
GB530503000100	WITHAM	Transitional	Anglian	Non-S	B	H	H	H	B	H	**M**
GB531207212200	WYRE	Transitional	North West	S	P	H	H	H	P	G	**M**

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Saltmarsh 2016 WFD Classifications

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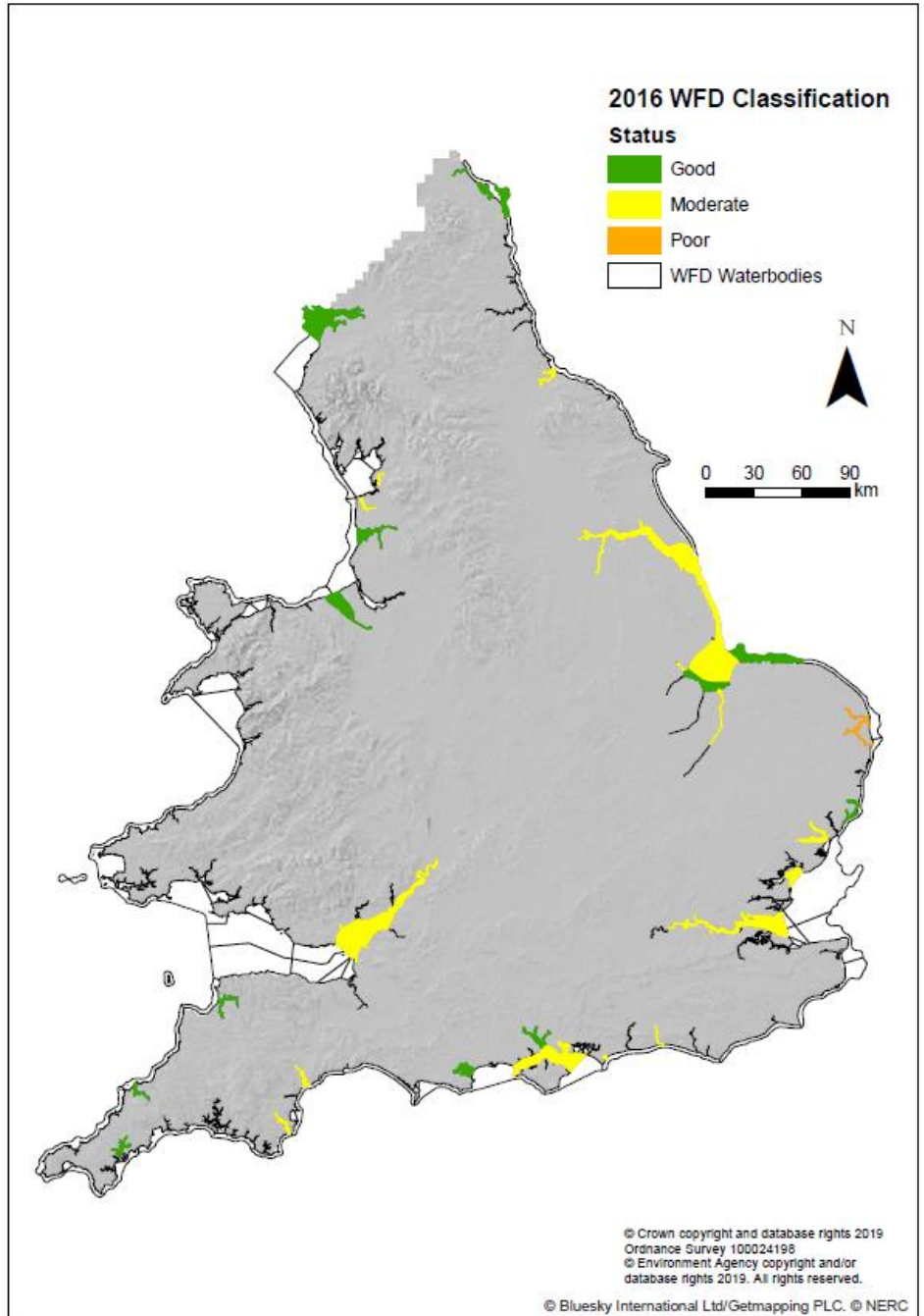

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Losing it – extent loss

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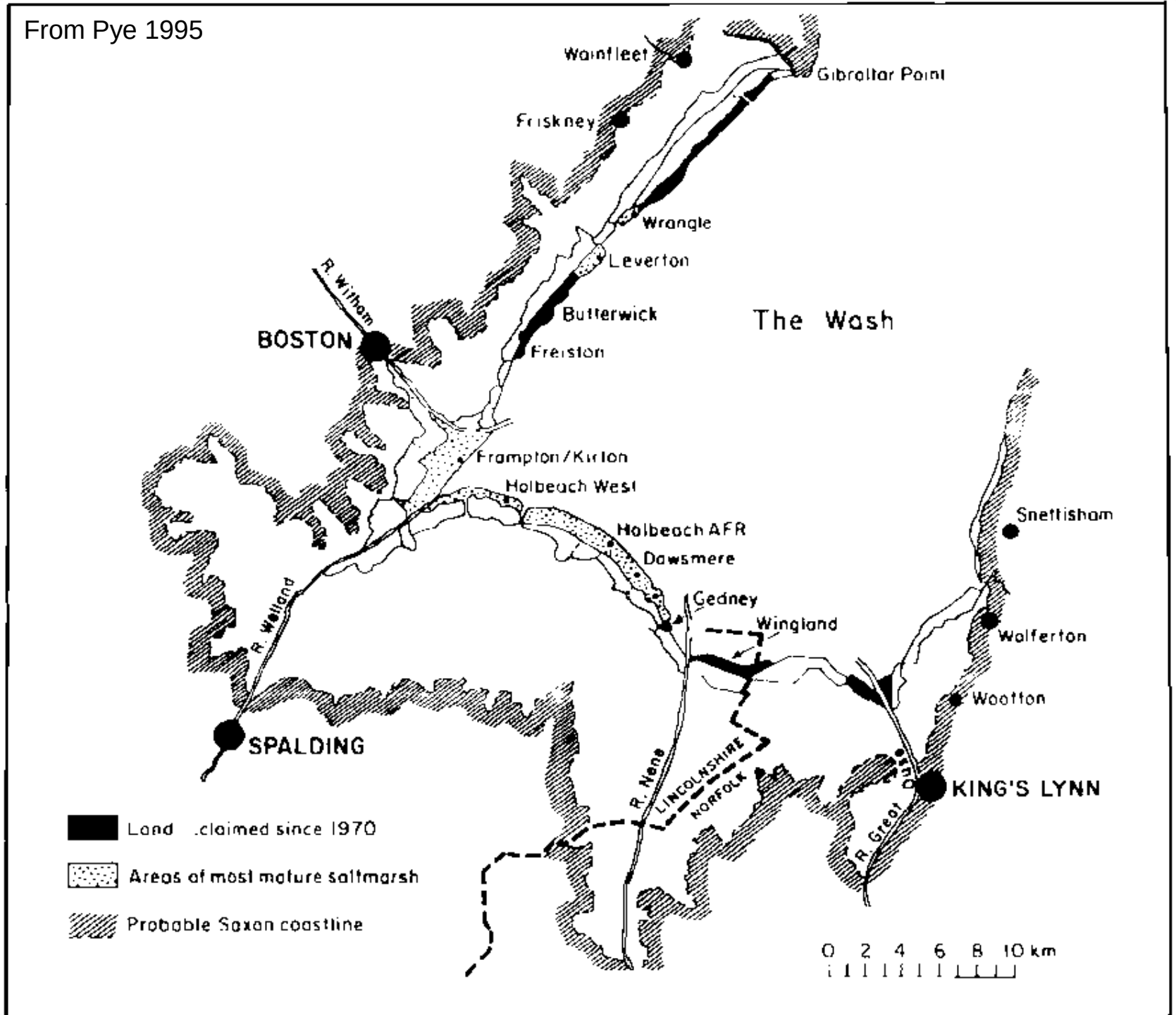
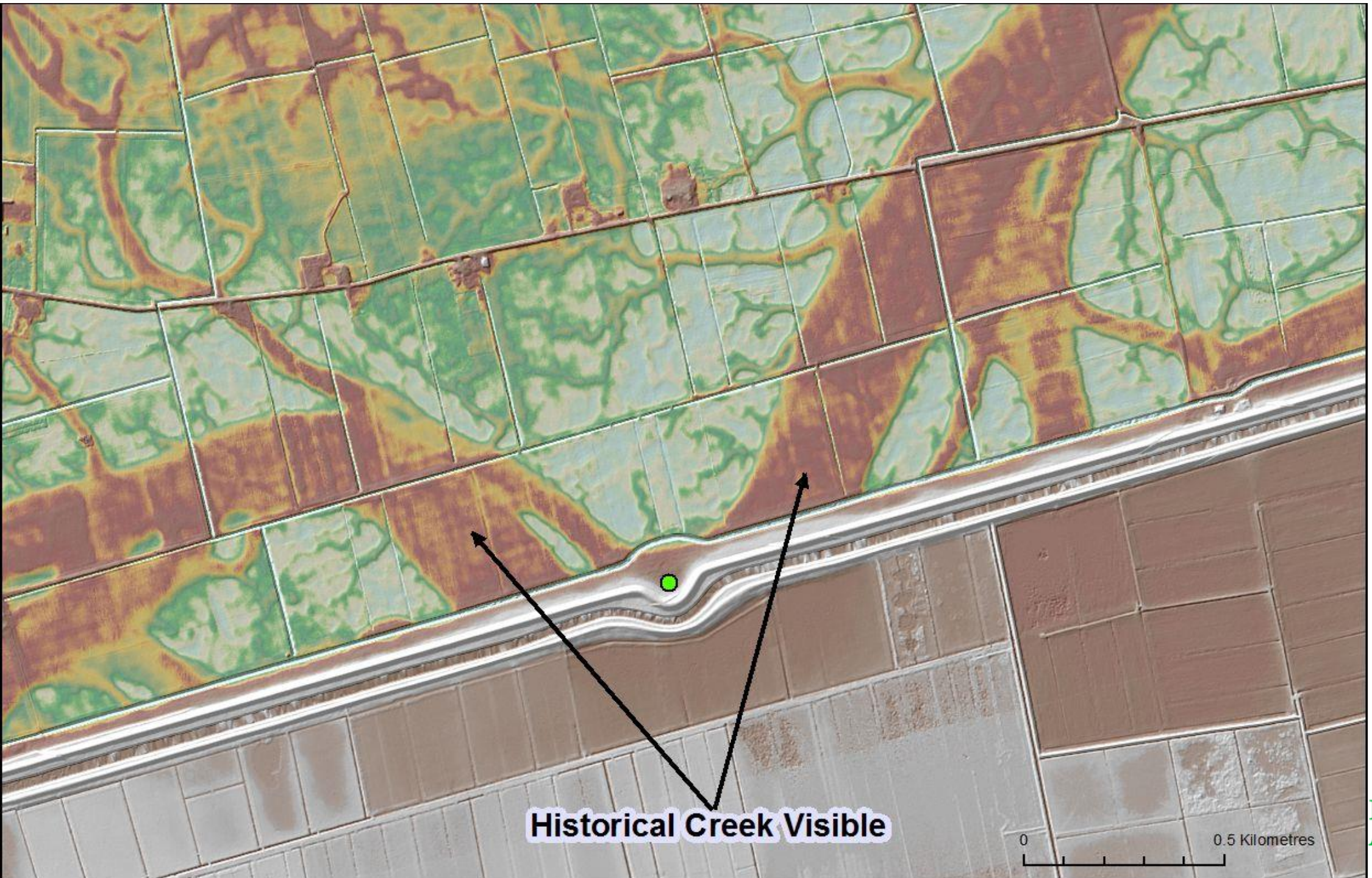
From Pye 1995





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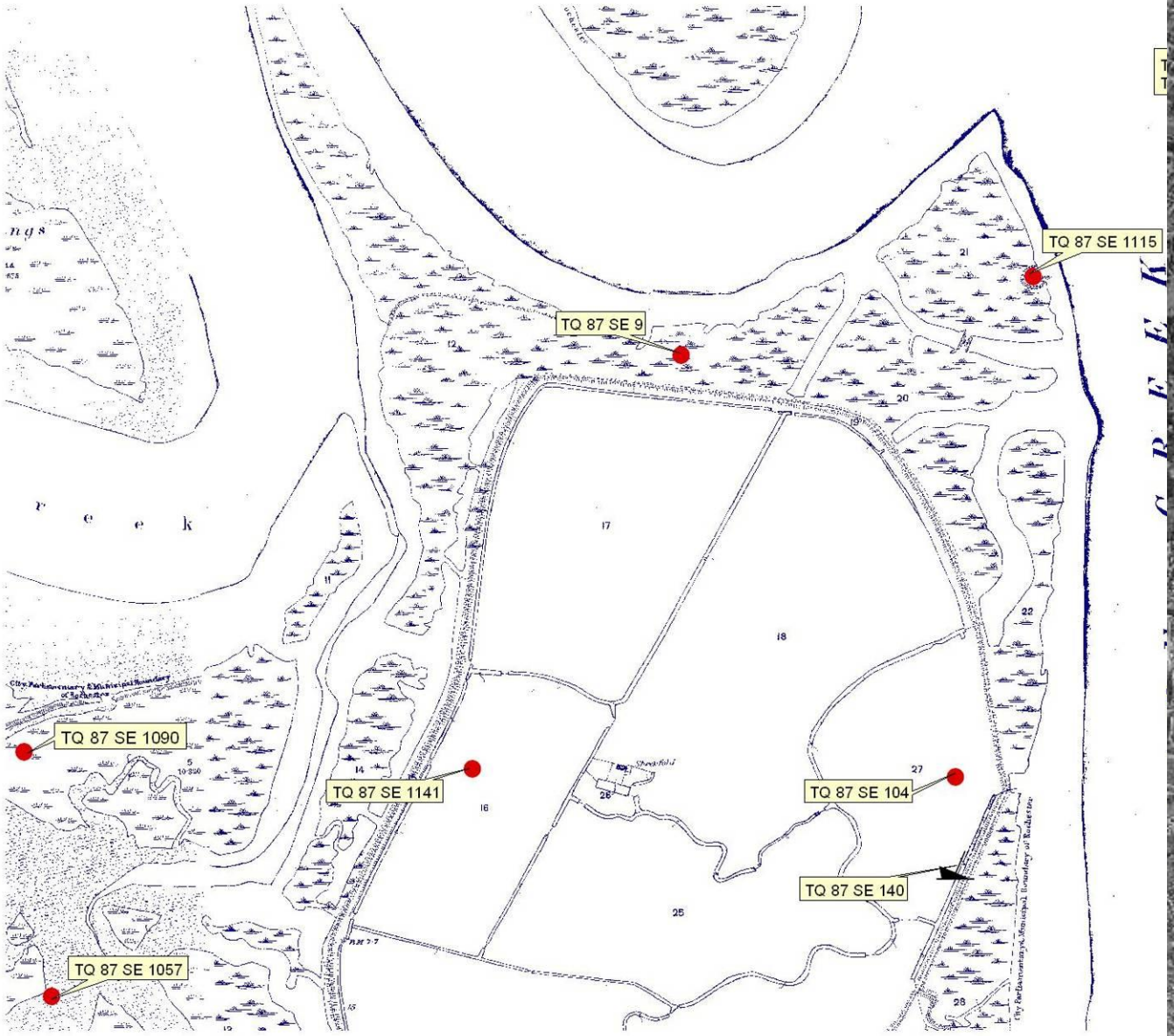
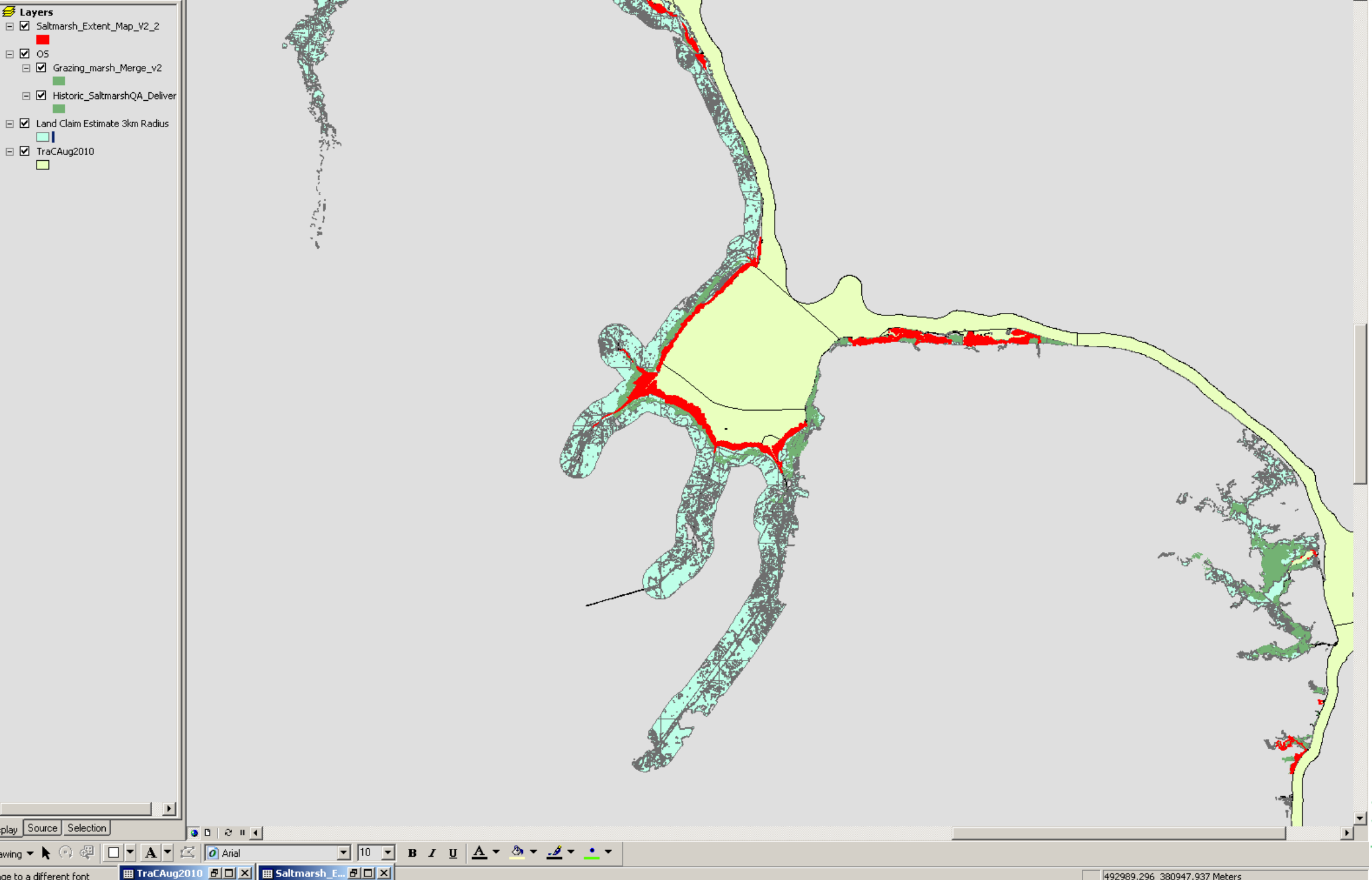
Kent Sites and Monuments Record

Title



200 0

Aerial photograph 1946 © Crown Copyright/MOD. Mosaic created by the Channel Coastal Observatory for the Solent Dynamic Coast Project (2008)



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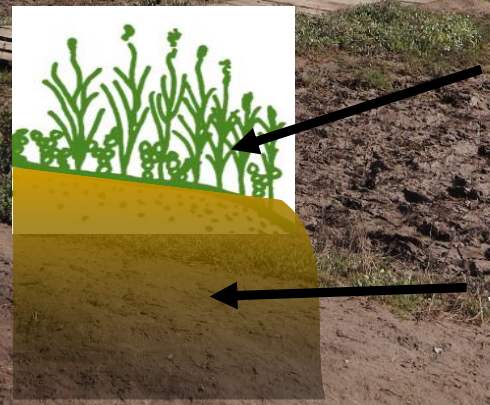
Historic Saltmarsh extent loss and "carbon consequences"

- "Historic" Extent : 215,624 ha
- WFD baseline extent (England): 34,798 ha
- Saltmarsh loss: 180,845 ha
- % Loss: 84%

- Carbon storage potential lost: 6,546,573 t
- Annual carbon fixing potential lost: 939,487 t/yr



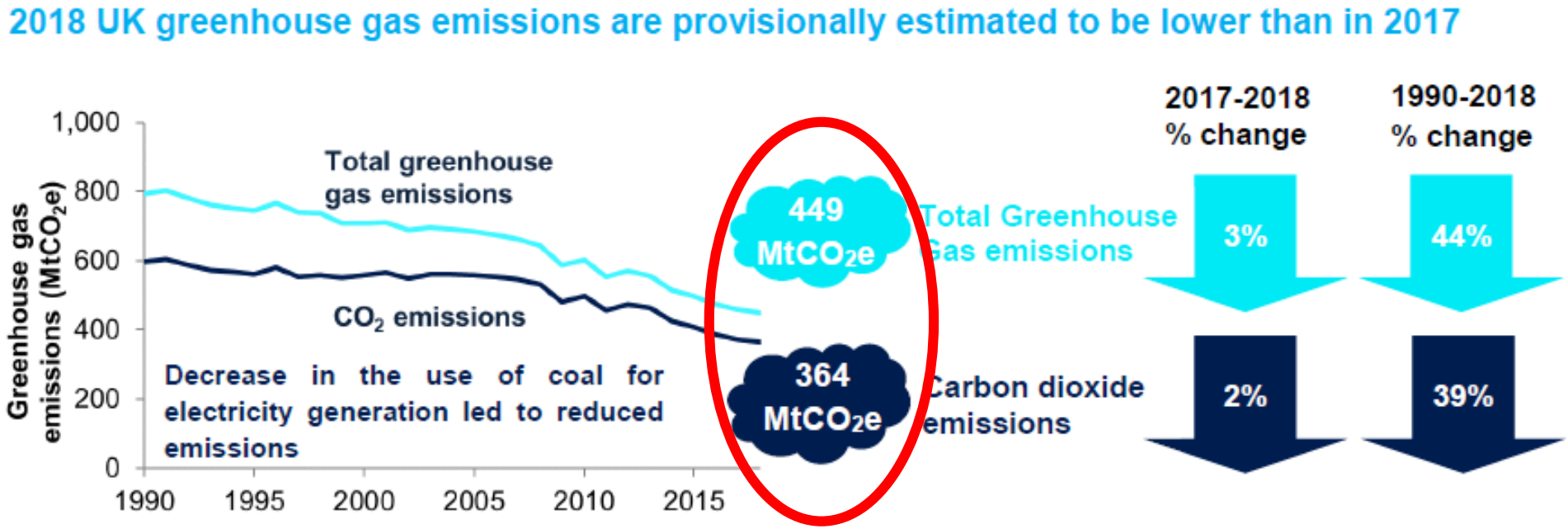
Fix up to 5 tonnes C / ha / Yr.
Beaumont et al 2014

Stores average 36 tonnes C / ha.
Skov et al 2016

Environment Agency

Historic Saltmarsh extent loss and "carbon consequences"

- Carbon storage potential lost: 6,546,573 t
- Annual carbon fixing potential lost: 939,487 t/yr
- ≈ 7 Mt
- ≈ 2% of UK 2018 emissions



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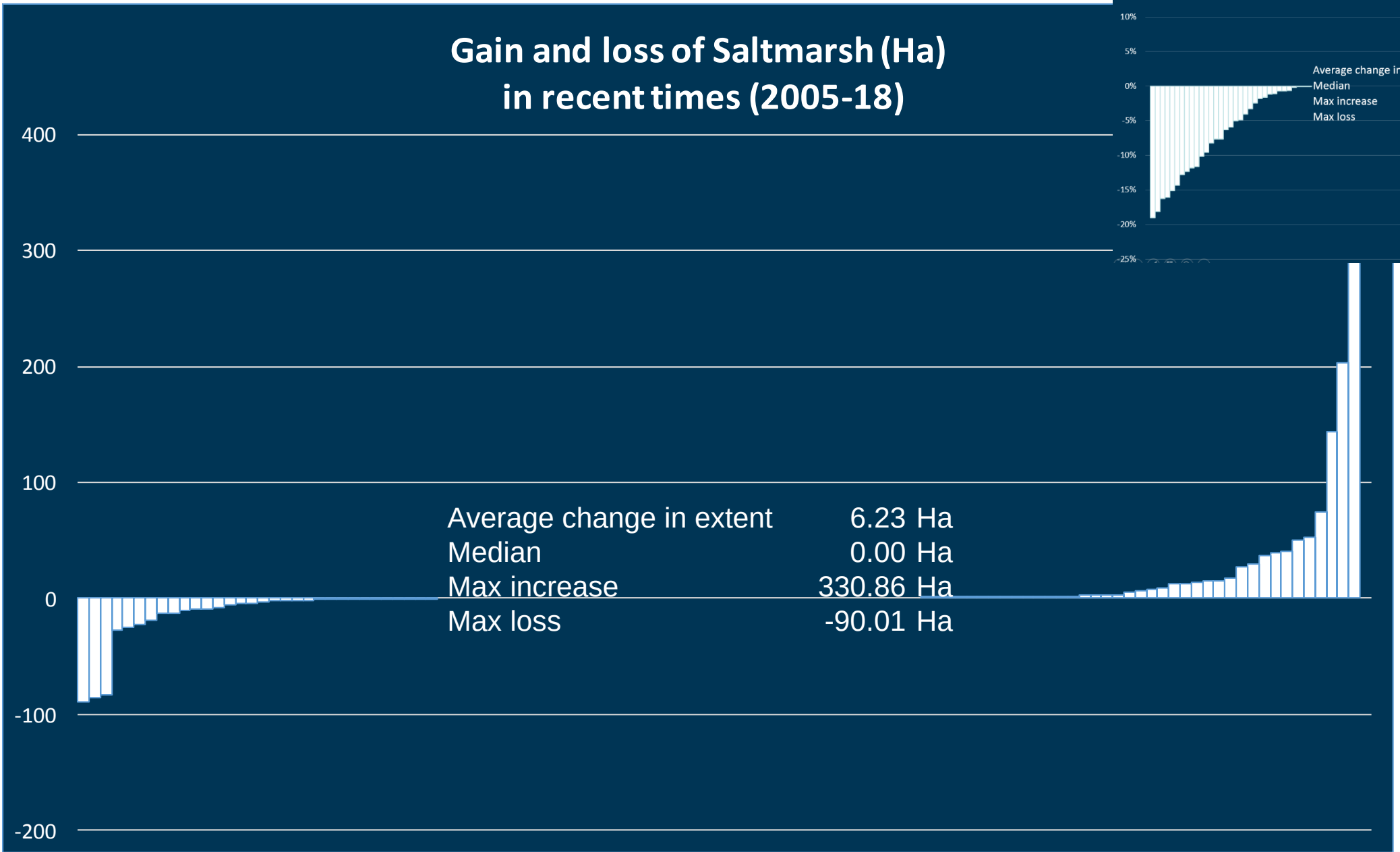
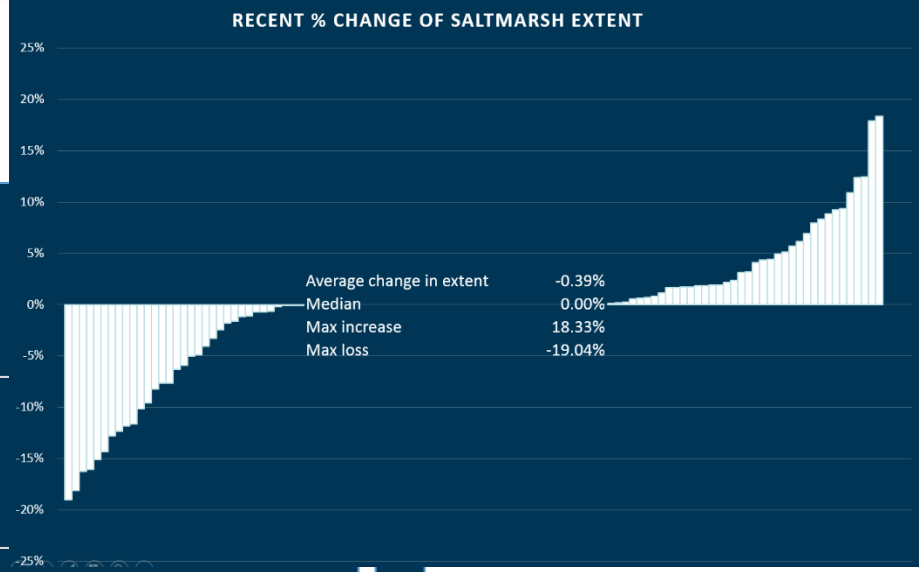
Recent Changes





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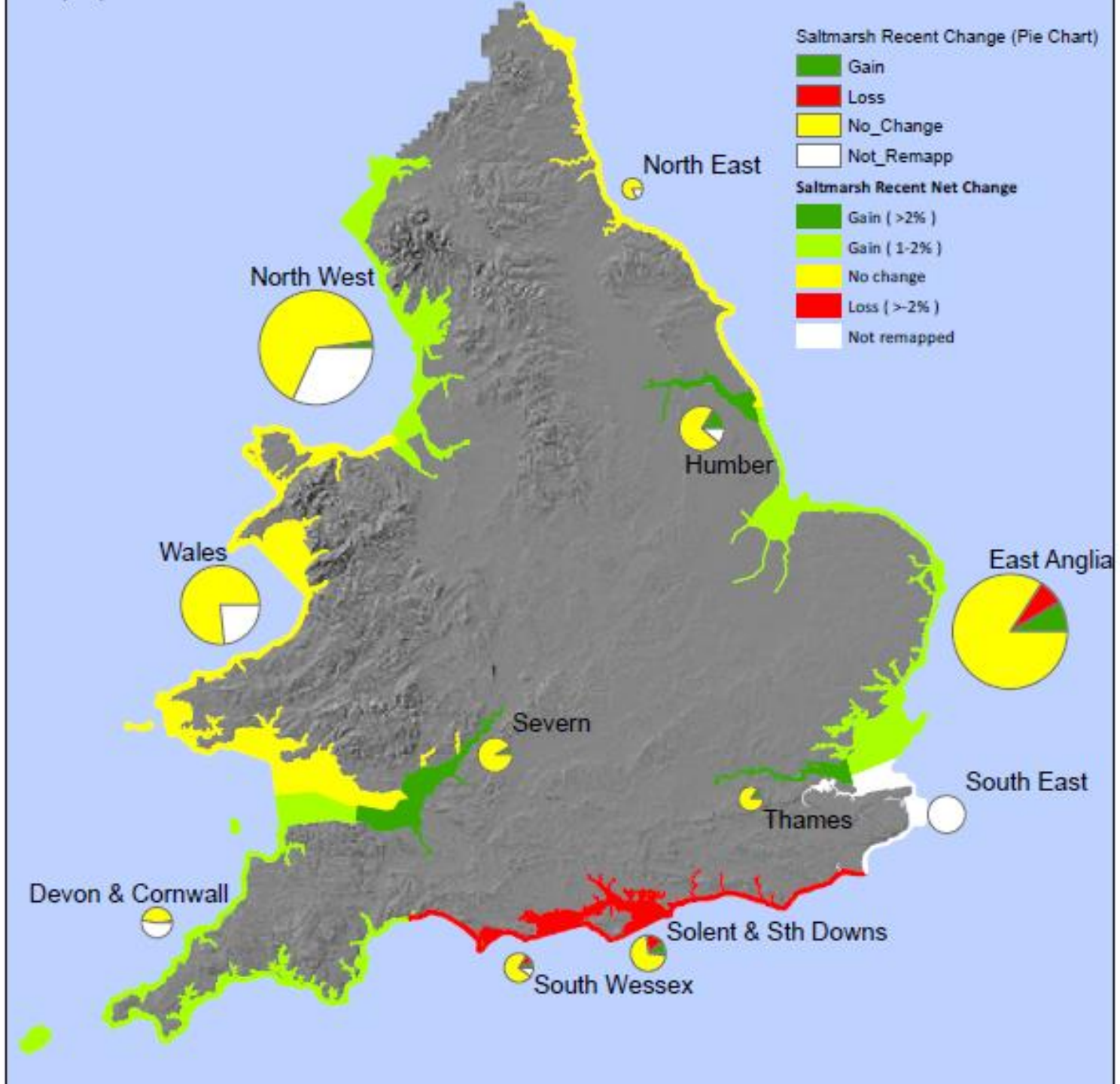
Gains and losses

- Recent (2006/9-11/16)
- Habitat Compensation Program (HCP)
  - (+ Wales)
- Circle size ∝ area



Saltmarsh zones

Zones	Principal species	Other species	NVC	IHS
1. Pioneer	Salicornia	Suaeda ,Puccinellia, Halimione, Limonium, Aster, Arthrocnemum, zostera noltii	SM7, SM8, SM9	LS311 LS312 LS313 LS31Z
2. Spartina	Spartina	Algae, Puccinellia	SM4, SM5, SM6	LS321 LS32Z
3. Mid-low marsh				
Low	Puccinellia	Salicornia, Suaeda, Aster, Spartina	SM10, SM11, SM12, SM13	LS331 LS332
Mid	Halimione	Puccinellia, Juncus maritimus, Suaeda, Triglochin, Plantago, Glaux	SM14, SM15	LS333 LS3363
Upper mid	Festuca (with other sp.)	Plantago, Triglochin, Juncus gerardii, Agrostis, Glaux, Armeria, Limonium, Artemisia, Halimione, Puccinallia, Juncus maritimus, Suaeda vera, Frankenia, Spergularia, Salicornia	SM16, SM17, SM21, SM22, SM23	LS3361
4. High marsh	Elytrigia, Agrostis without Puccinellia, Festuca meadows without Puccinellia, Juncus maritimus without Puccinellia, Bolboshoenus	Juncus gerardii, Triglochin, Plantago, Oenanthe, Trifolium, Glaux, Blysmus, Inula, Atriplex prostrata, Halimione, Suaeda vera, Elymus repens, Potentilla, very small amounts of Puccinellia	SM18, SM19, SM20, SM24, SM25, SM26, SM27, SM28, S21	LS3362 LS37 EM13
5. Phragmites	Phragmites		S4d	EM11

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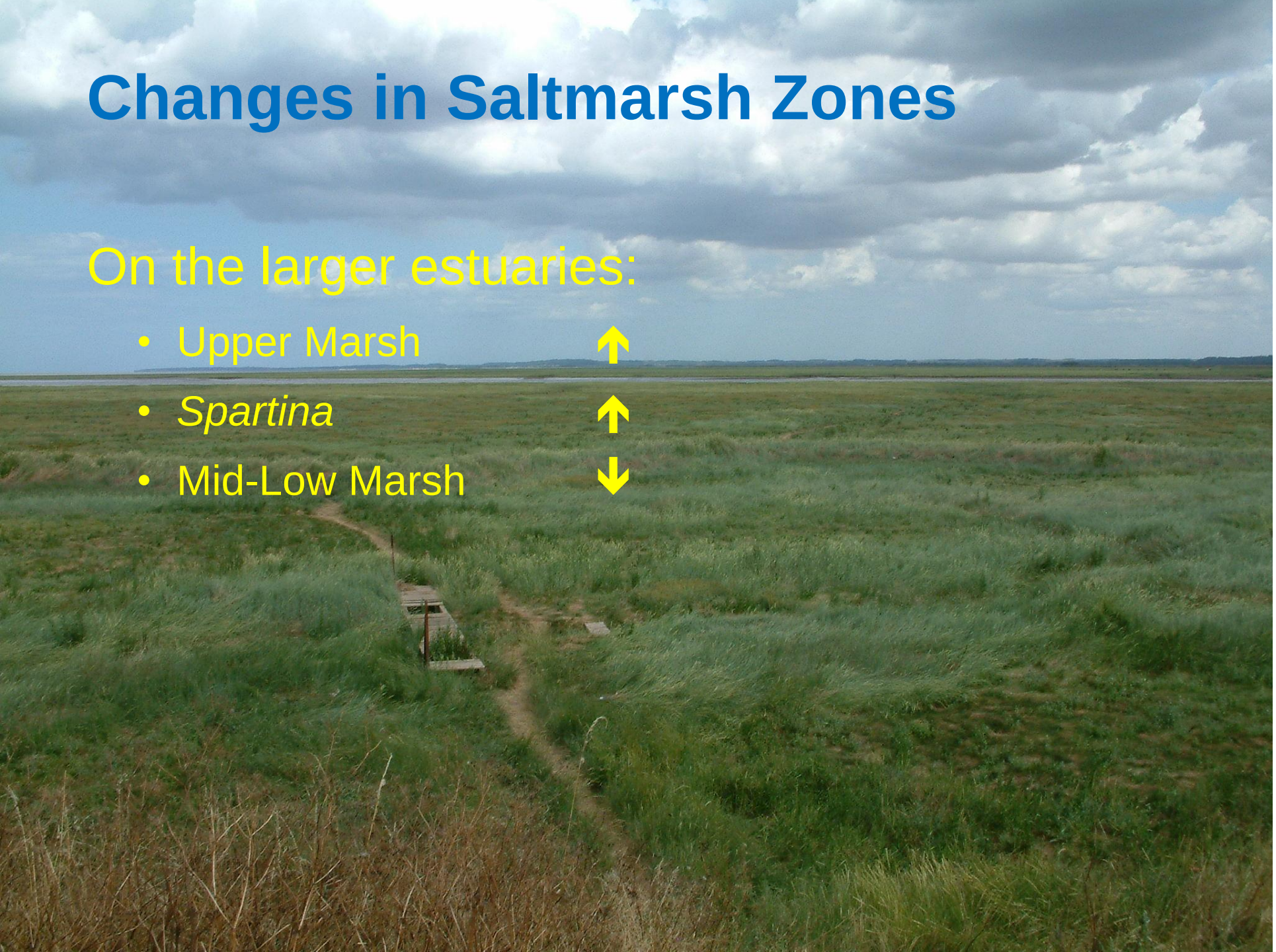
Changes in Saltmarsh Zones



On the larger estuaries:

- Upper Marsh ↑
- *Spartina* ↑
- Mid-Low Marsh ↓

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Under Pressure

Risk assessment quantified main pressures:

- Land Claim
- Shoreline reinforcement
- Dredging
- ~~Flow regime / sediment supply changes~~
- ~~Grazing~~

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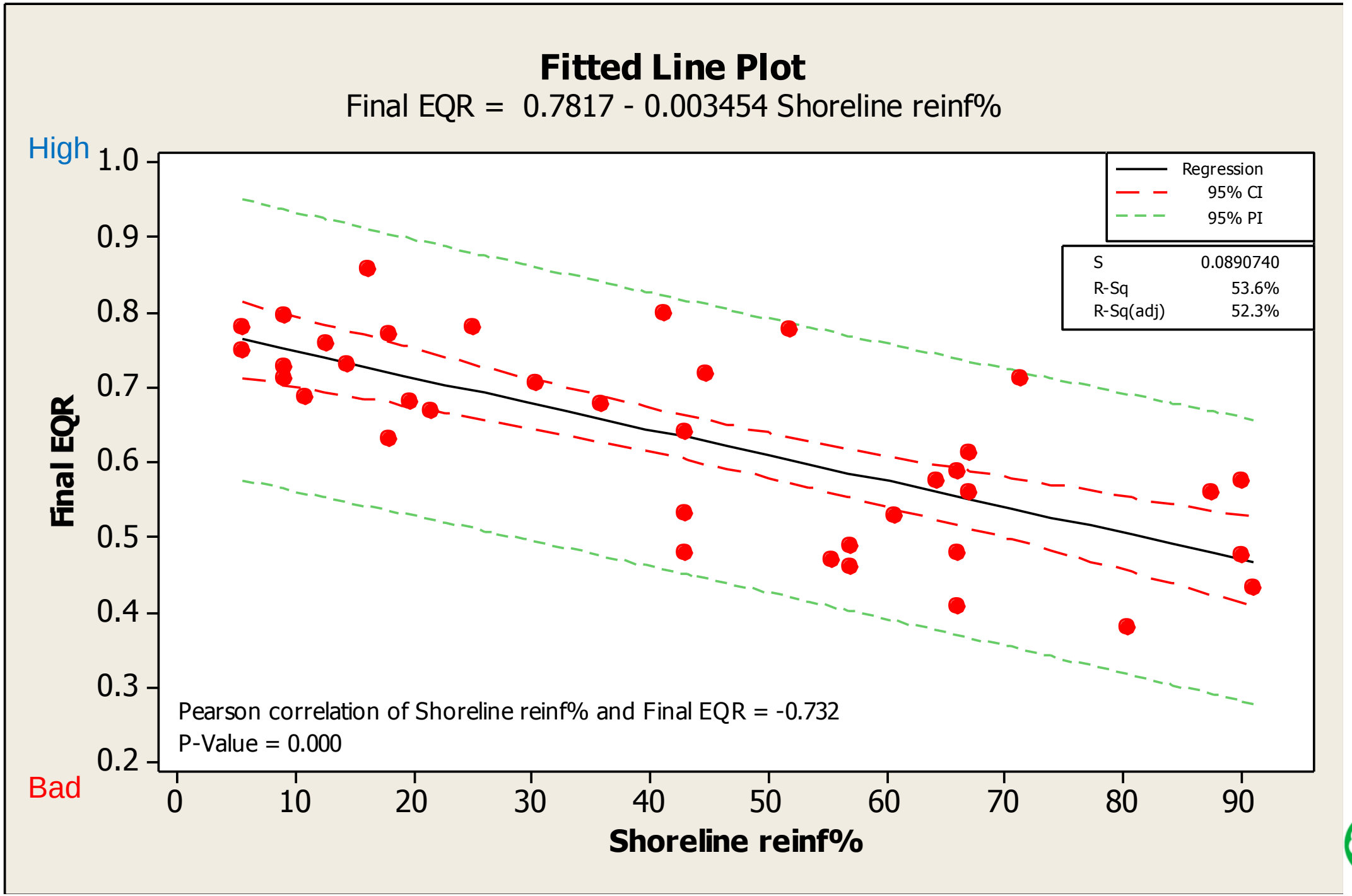

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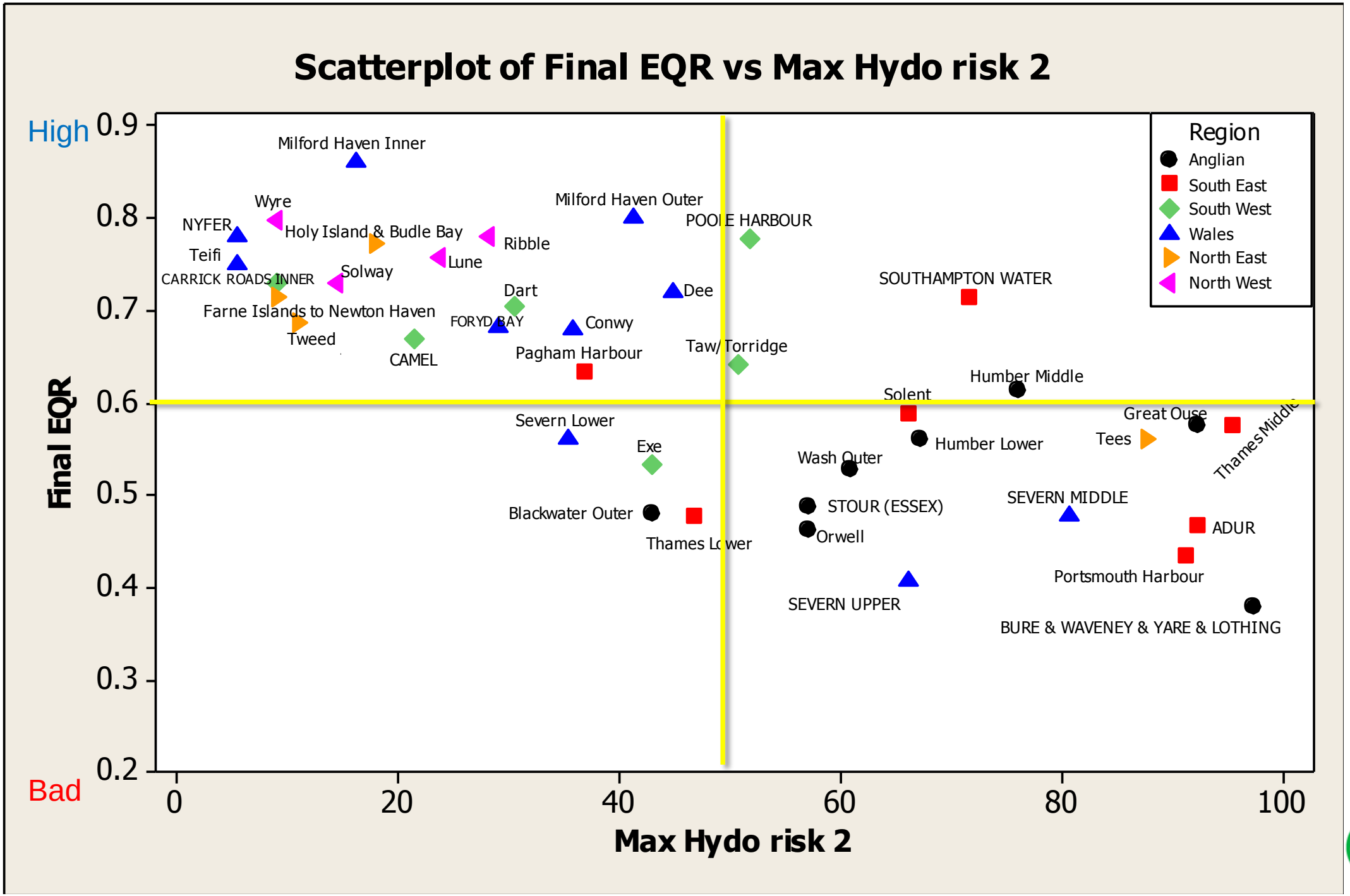

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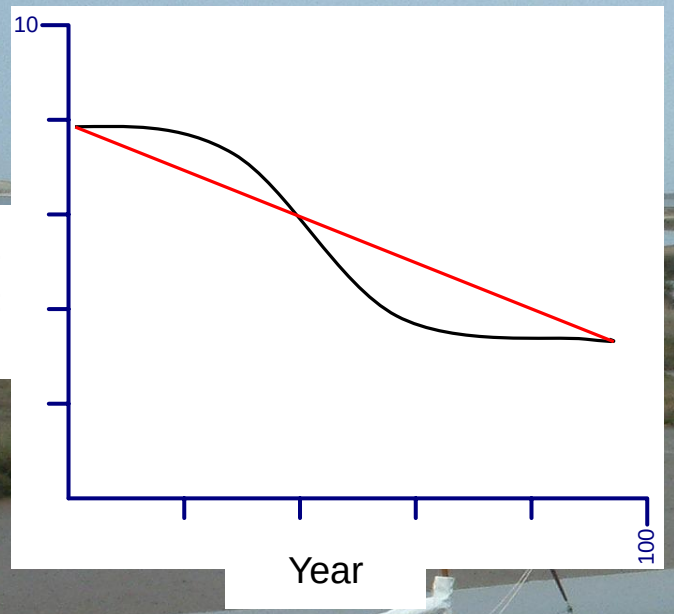
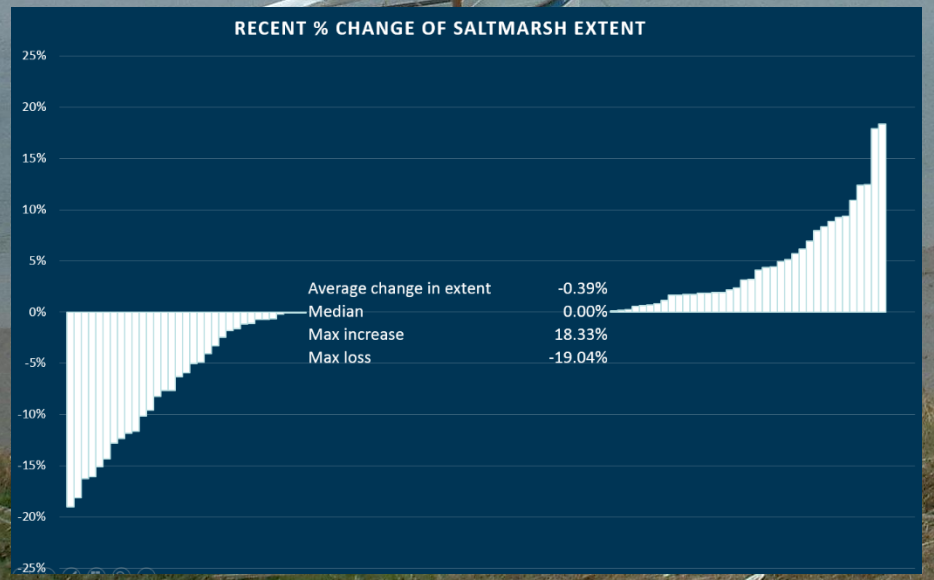
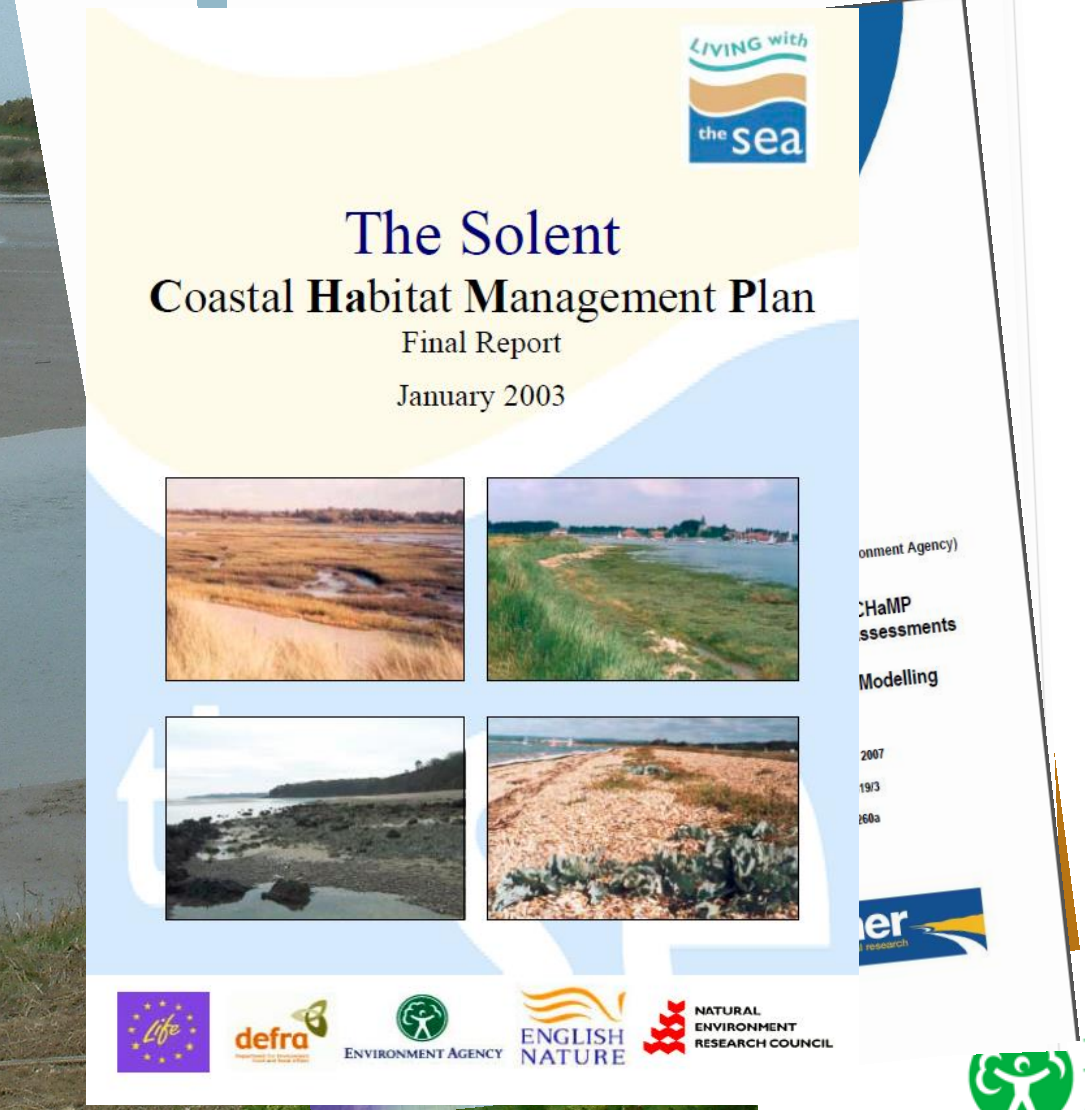
Guessing losses: SMP & CHaMPs







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Climate Change Risks

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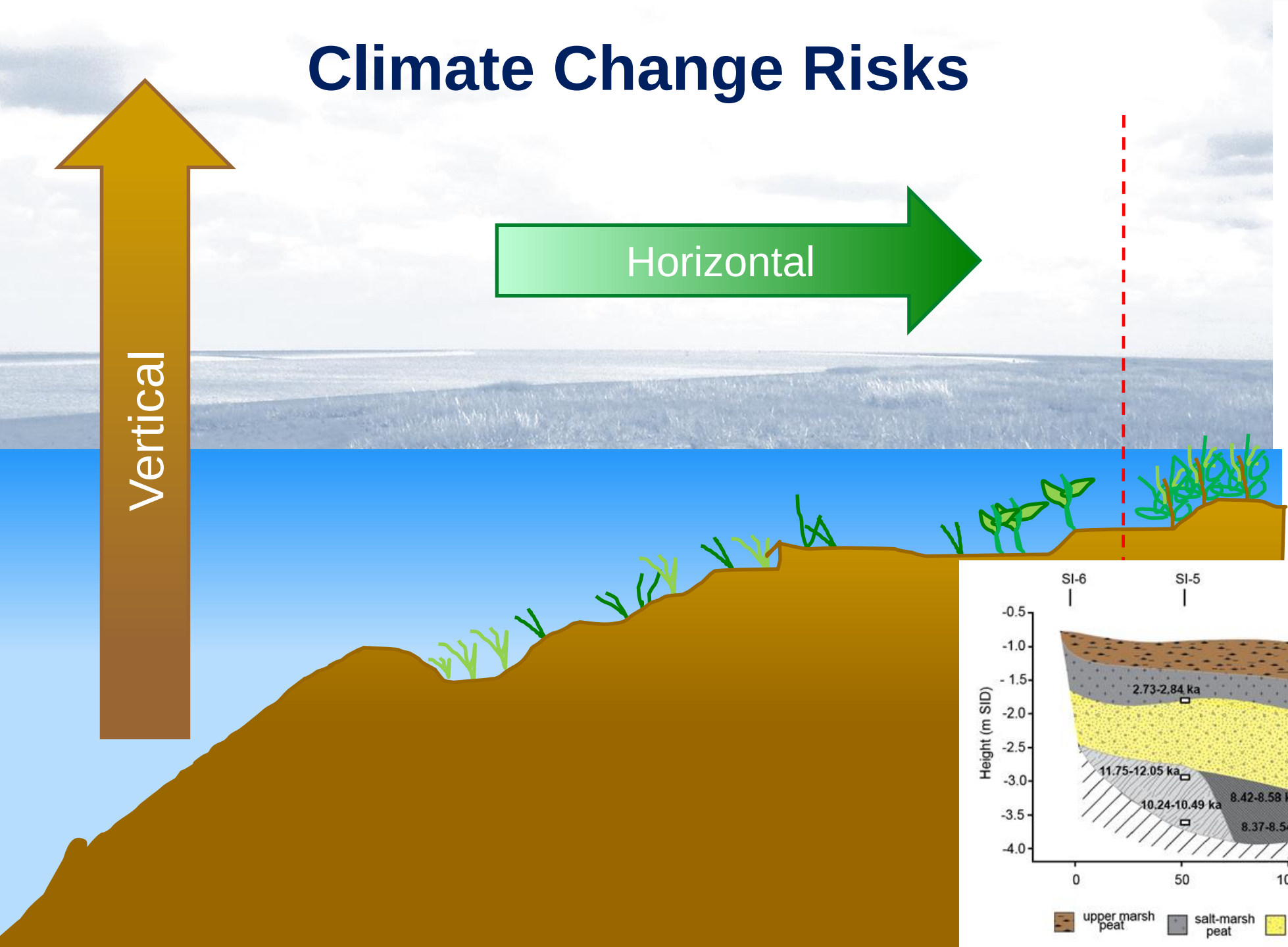
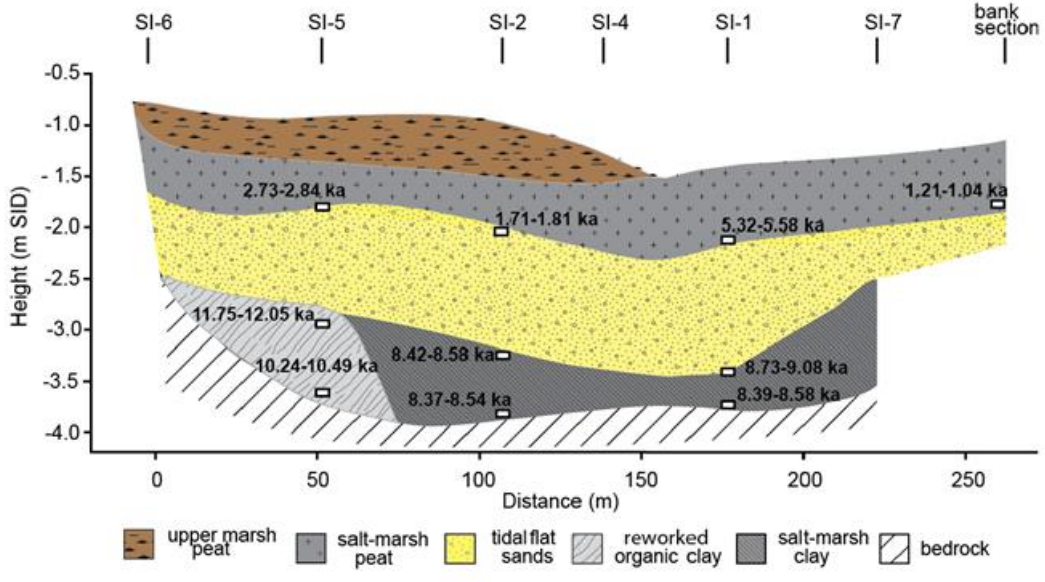
Climate Change Risks

Vertical

Horizontal





What are the risks?

- **Vertical risks**
  - Relative Sea Level Rise (RSL)
    - Land level changes
    - Climate related changes
    - Sediment supply
    - Tidal range
- **Horizontal risks**
  - Coastal squeeze
    - “Accommodation space”
  - Erosion
    - Sheer stress
    - Sediment supply
    - Tidal range

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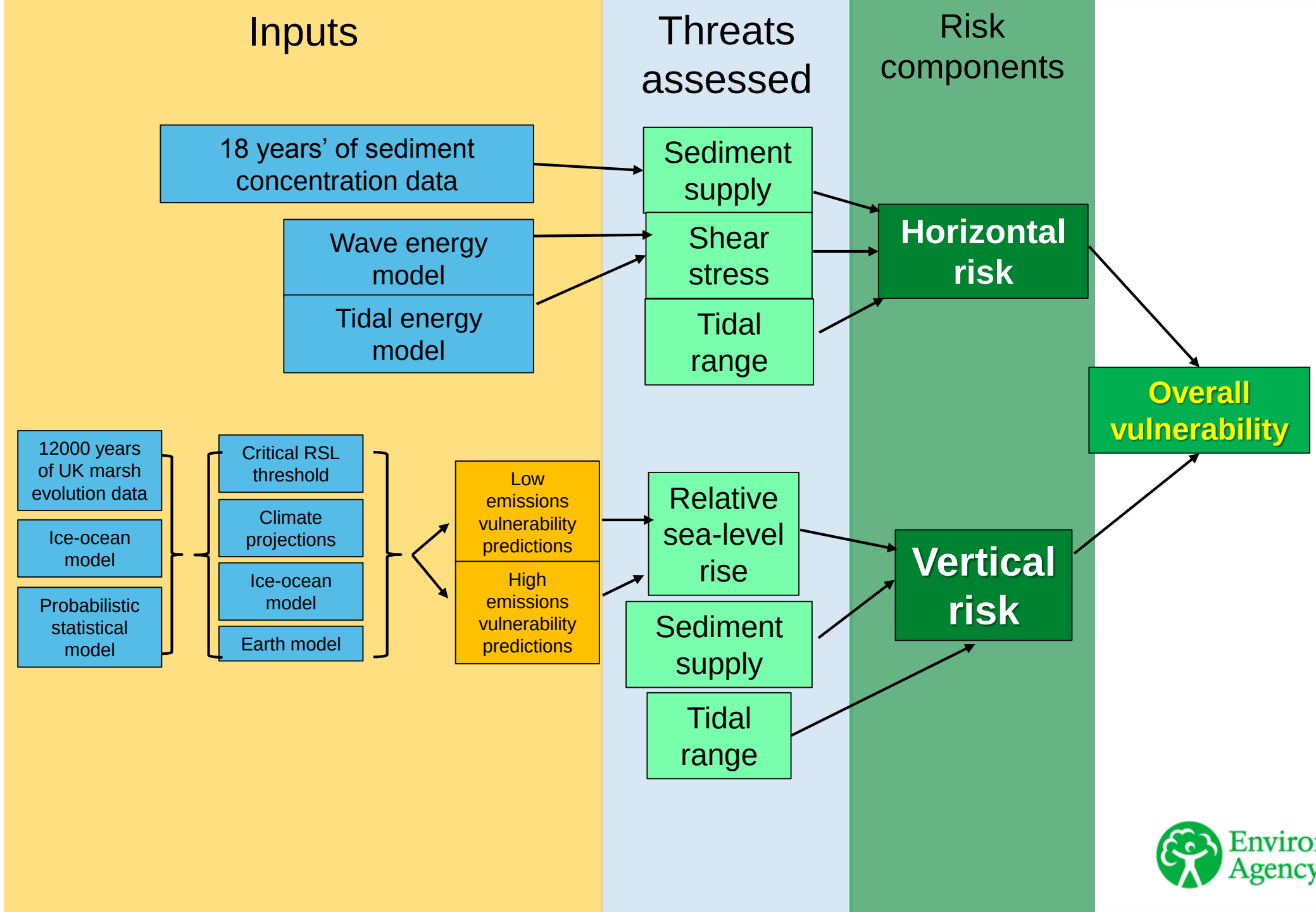

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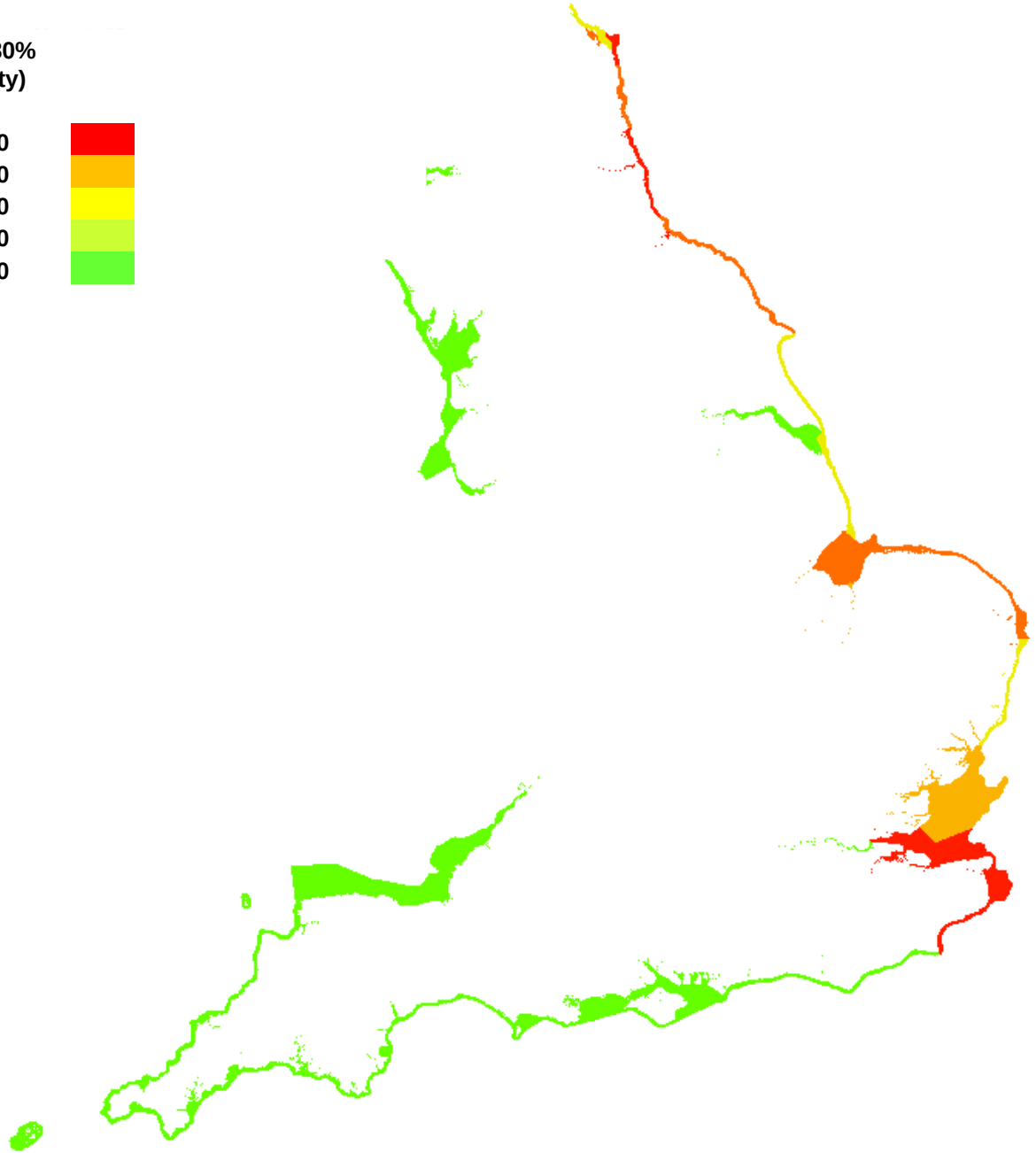
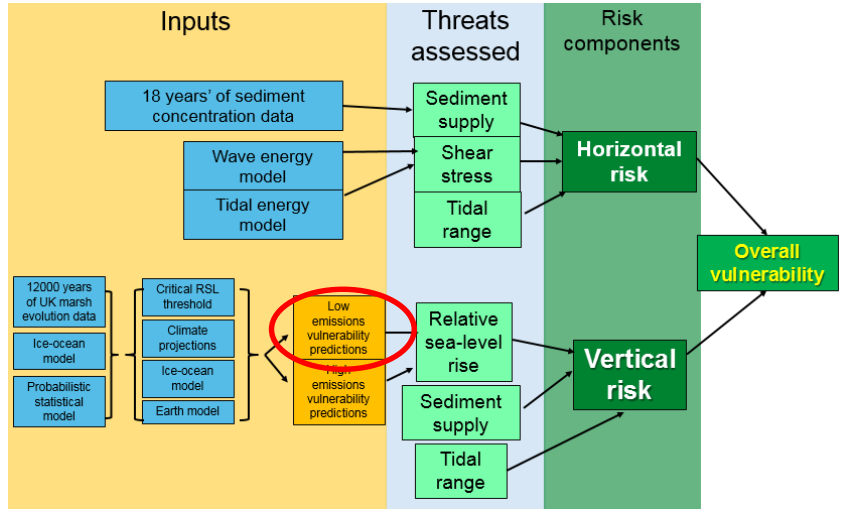
Predicted year of saltmarsh inability to keep pace with relative sea level (accretion) under low emissions scenario (RCP 2.6)

Year (> 80% Probability)

2100
2120
2140
2180
2200





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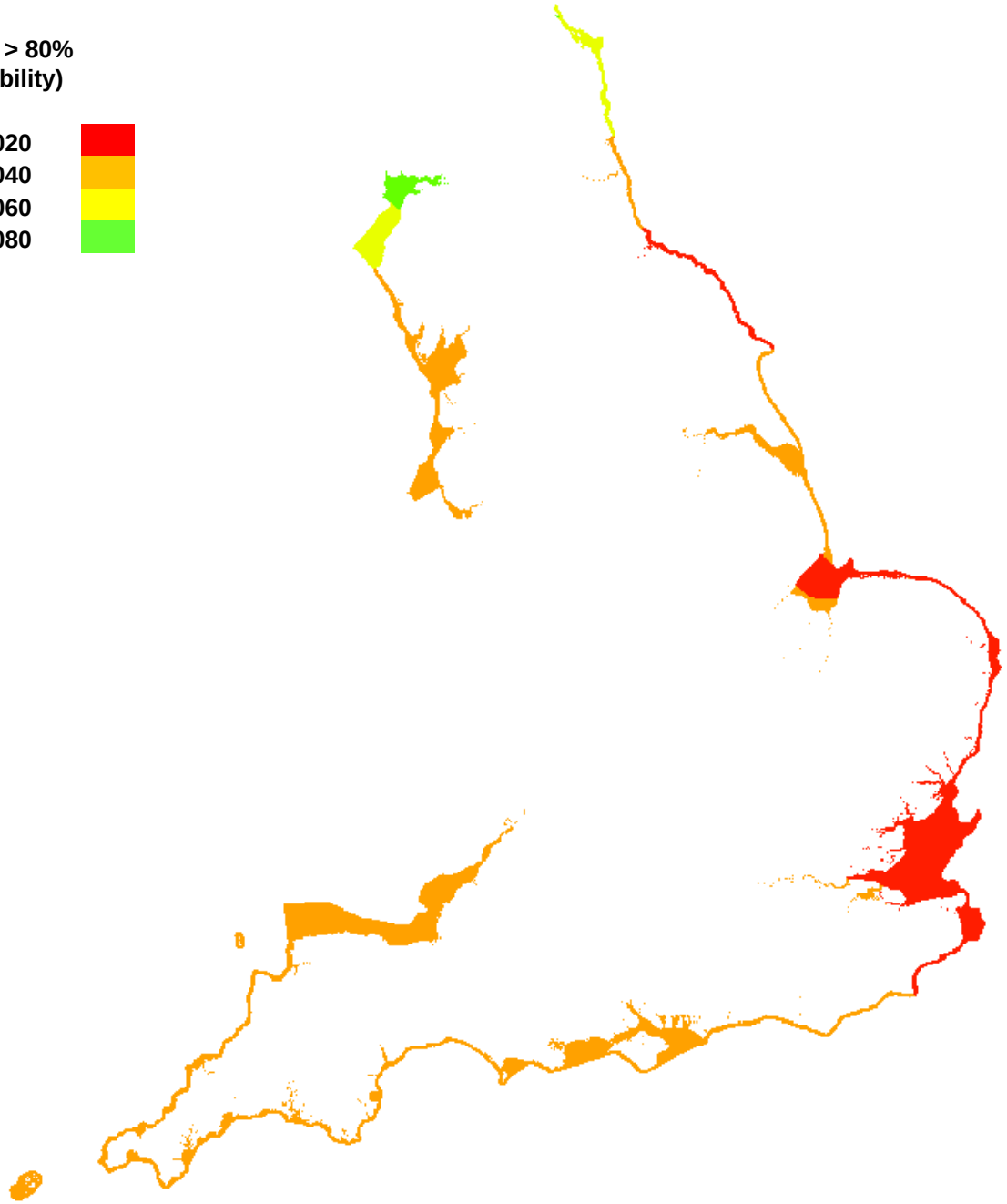
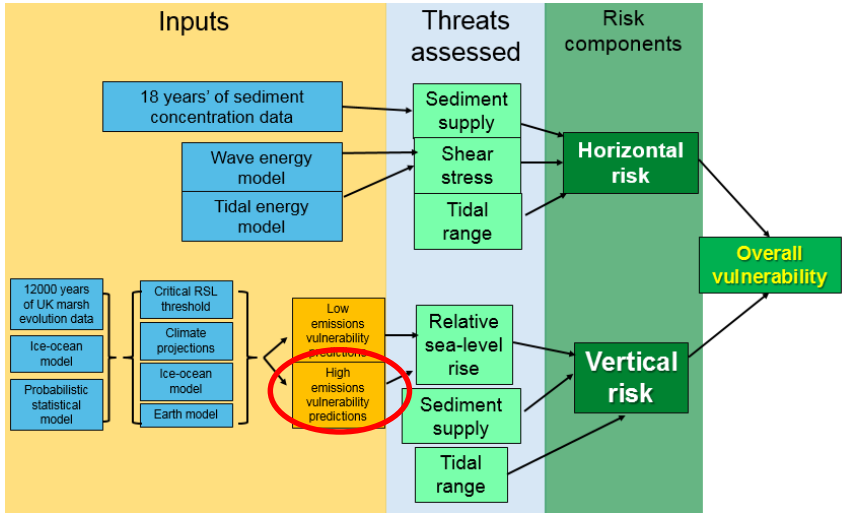
Predicted year of saltmarsh inability to keep pace with relative sea level (accretion) under high emissions scenario (RCP8.5)

Year (> 80% Probability)

- 2020
- 2040
- 2060
- 2080





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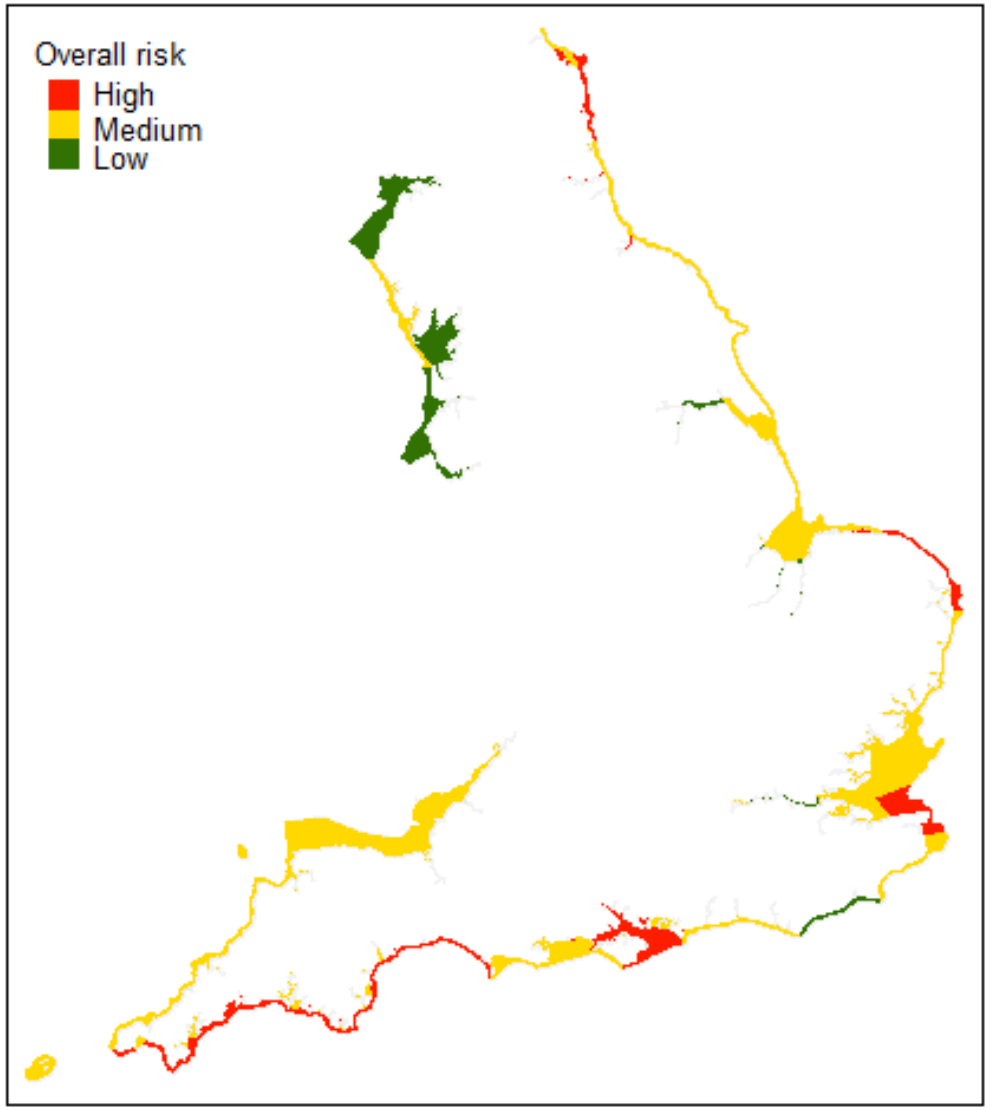
Saltmarsh vulnerability

HCP Area	Risk		
	Vertical	Horizontal	Overall
North East	High	Medium	High
Humber	Medium	Medium	Medium
East Anglia	High	Medium	Medium
Thames	High	Medium	Medium
South East	High	Medium	Medium
Solent & Sth Downs	High	Medium	High
South Wessex	High	Medium	Medium
Devon & Cornwall	High	Medium	High
Severn	Medium	Medium	Medium
North West	Medium	Low	Low



Environment Agency

Thank you

Mike Best, Tegan Consol, Keith McGruer,
Tom Newton, Niall Phelan
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