Towards revising sediment targets for catchment compliance across England and Wales

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Game anglers for fish, people, the environment

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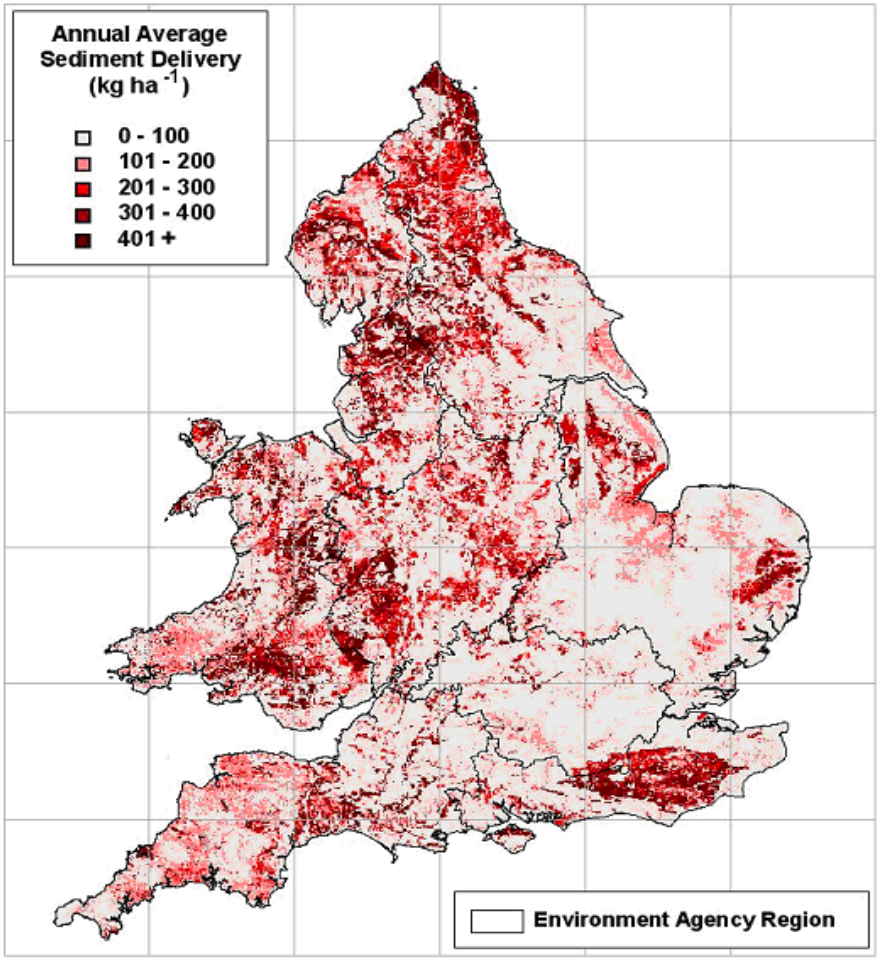
Water Framework Directive

- **Defra required to assess ‘gap’ between current and compliant diffuse pollution losses**
- **commissioned ADAS to assess the ‘gap’ for sediment using the Freshwater Fish Directive (78/659/EC) for compliance**

Agricultural diffuse sediment inputs

- use of PSYCHIC
- national average: ~ 125 kg ha^{-1} yr^{-1}
- national total input to rivers: 1929 kt yr^{-1}



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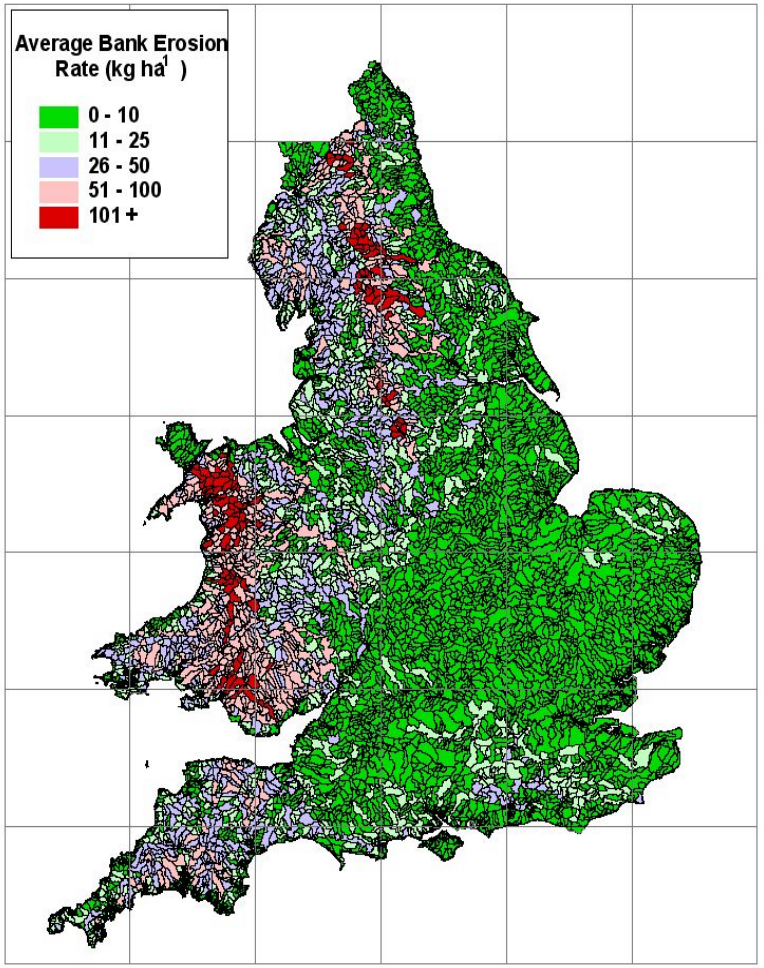
Bank erosion sediment inputs

- **national total input: ~394 kt yr^{-1}**



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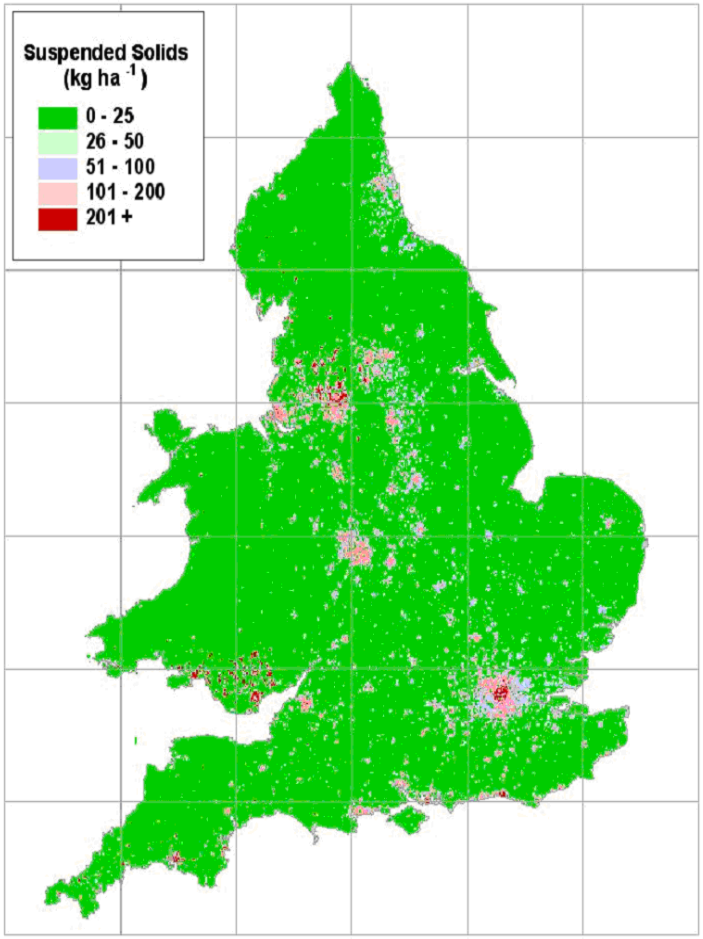
Urban diffuse sediment inputs

- **EMC methodology**
- **national total input: ~147 kt yr^{-1}**



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Point source sediment inputs

- **national total input: ~76 kt yr^{-1}**

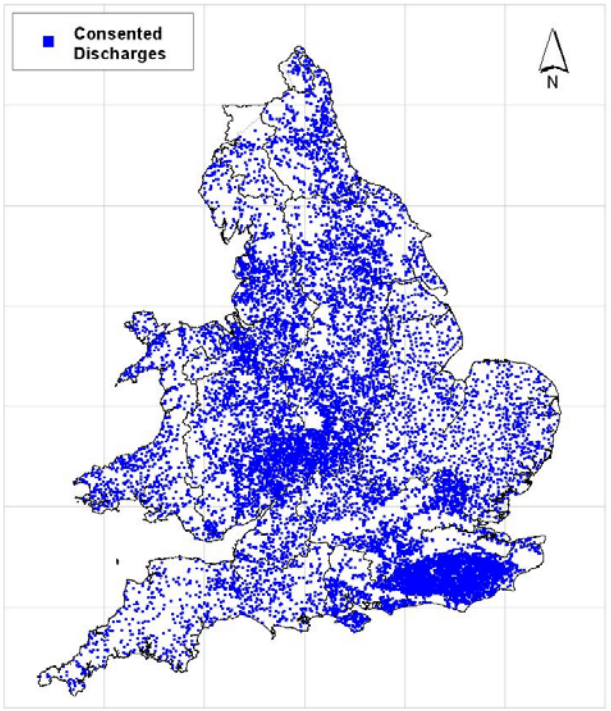

Table 2.2 Estimated sewage effluent discharges (m^3 day^{-1}), volume weighted average consented suspended solids concentration (mg l^{-1}) and total suspended solids load (kg day^{-1}) to fresh waters by Environment Agency region.

Region	Effluent Discharge (m^3 day^{-1})	Percent of Volume for which Consented Concentration Available	Average Concentration (mg l^{-1})	Total Solids Load (kg day^{-1})
Anglian	1,139,454	99.6	77	30,931
Wales	362,950	99.3	68	8,919
Midlands	3,036,487	94.9	44	53,706
North East	1,675,735	99.8	51	32,985
North West	1,801,236	99.9	51	42,944
South West	455,134	68.1	36	7,019
Southern	353,067	99.7	40	5,808
Thames	1,984,356	95.2	30	26,871

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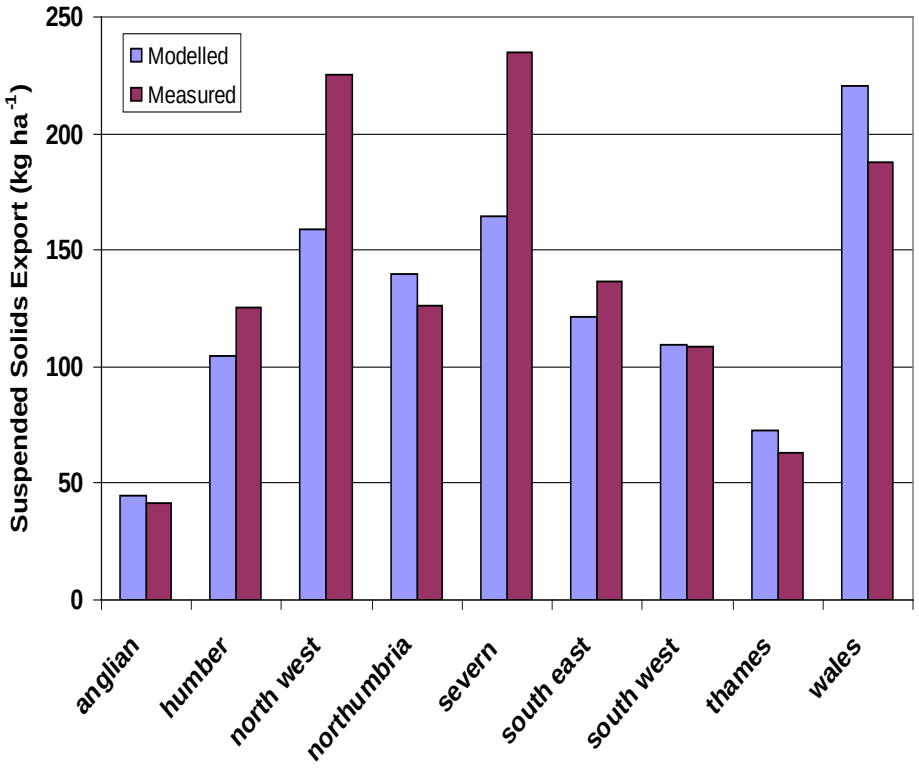
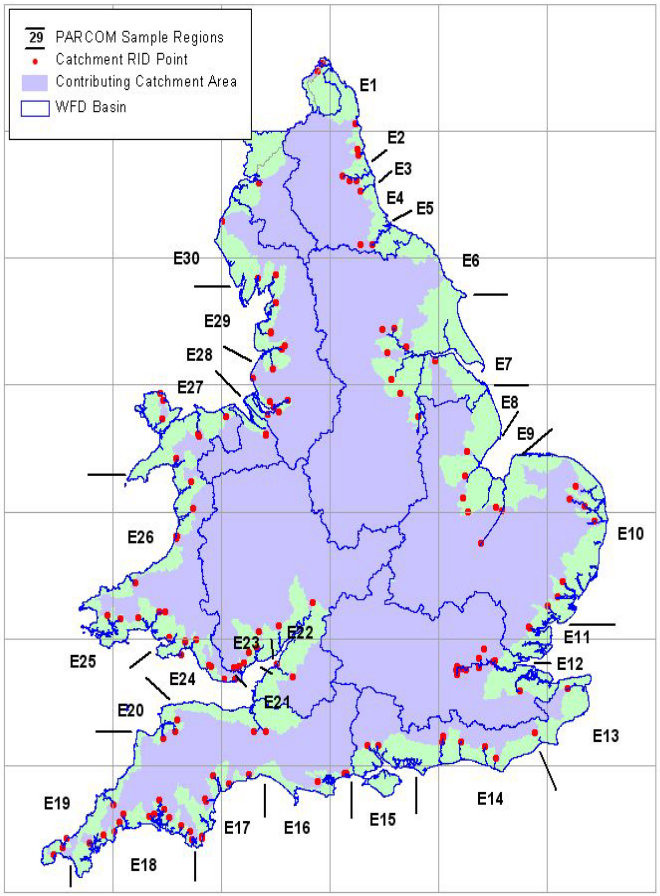
Validation of total sediment loads

- use of PARCOM monitoring data





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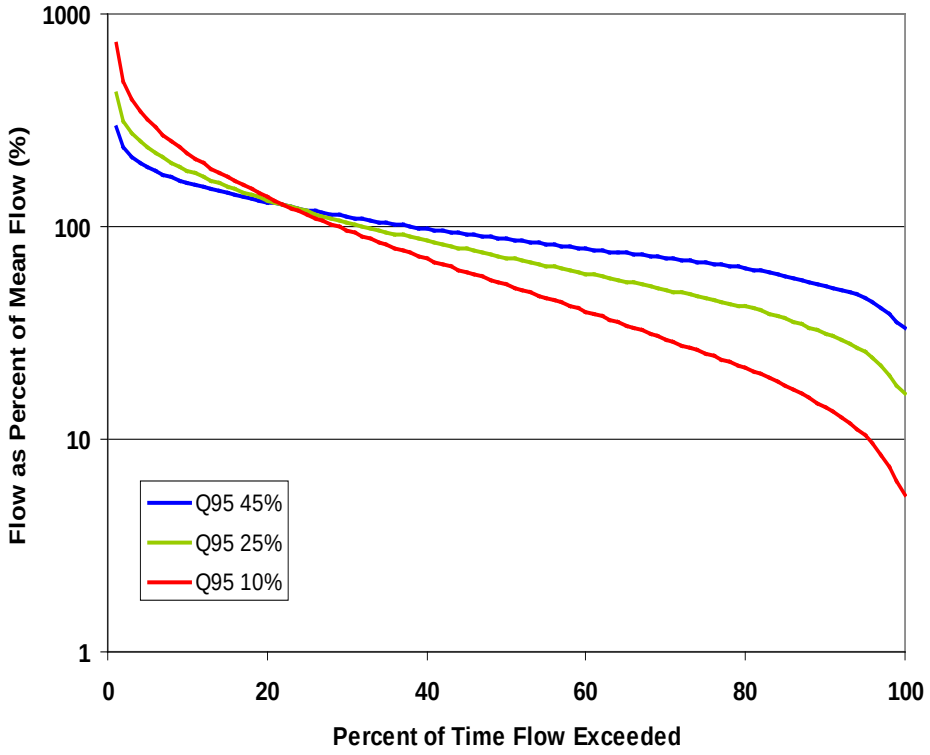
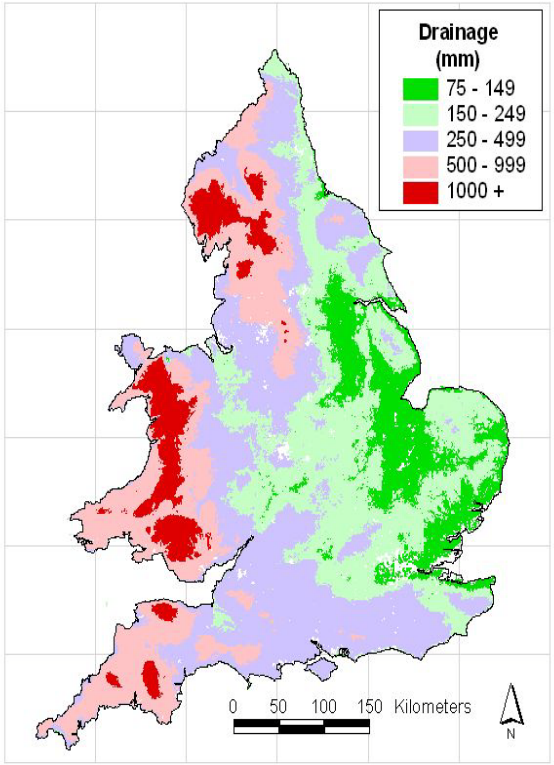
Sediment concentration model

- **flow duration curve model based on soil HOST class**





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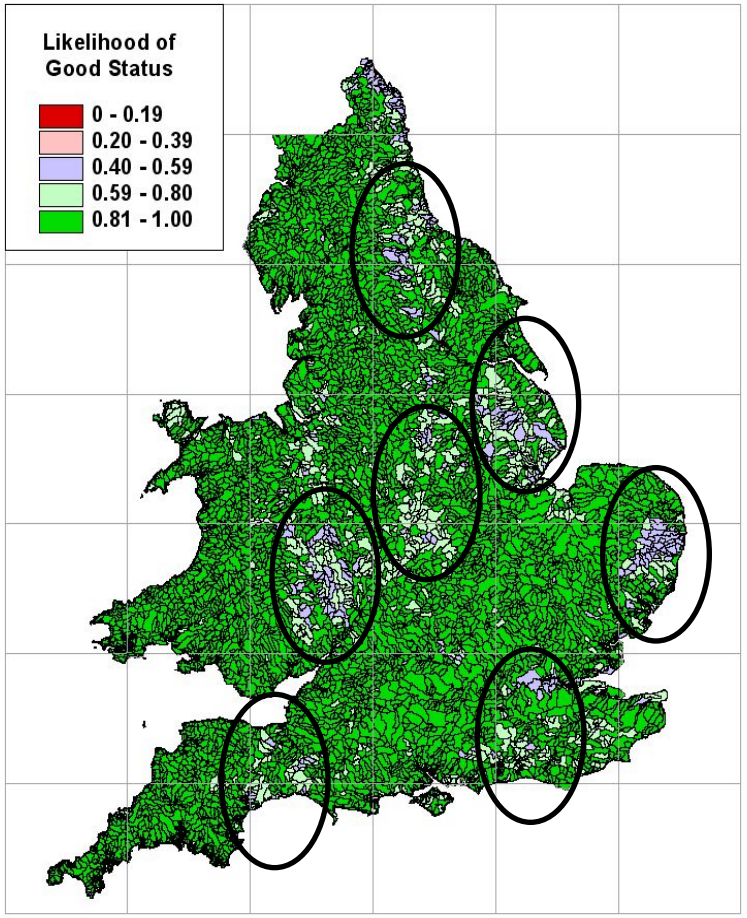
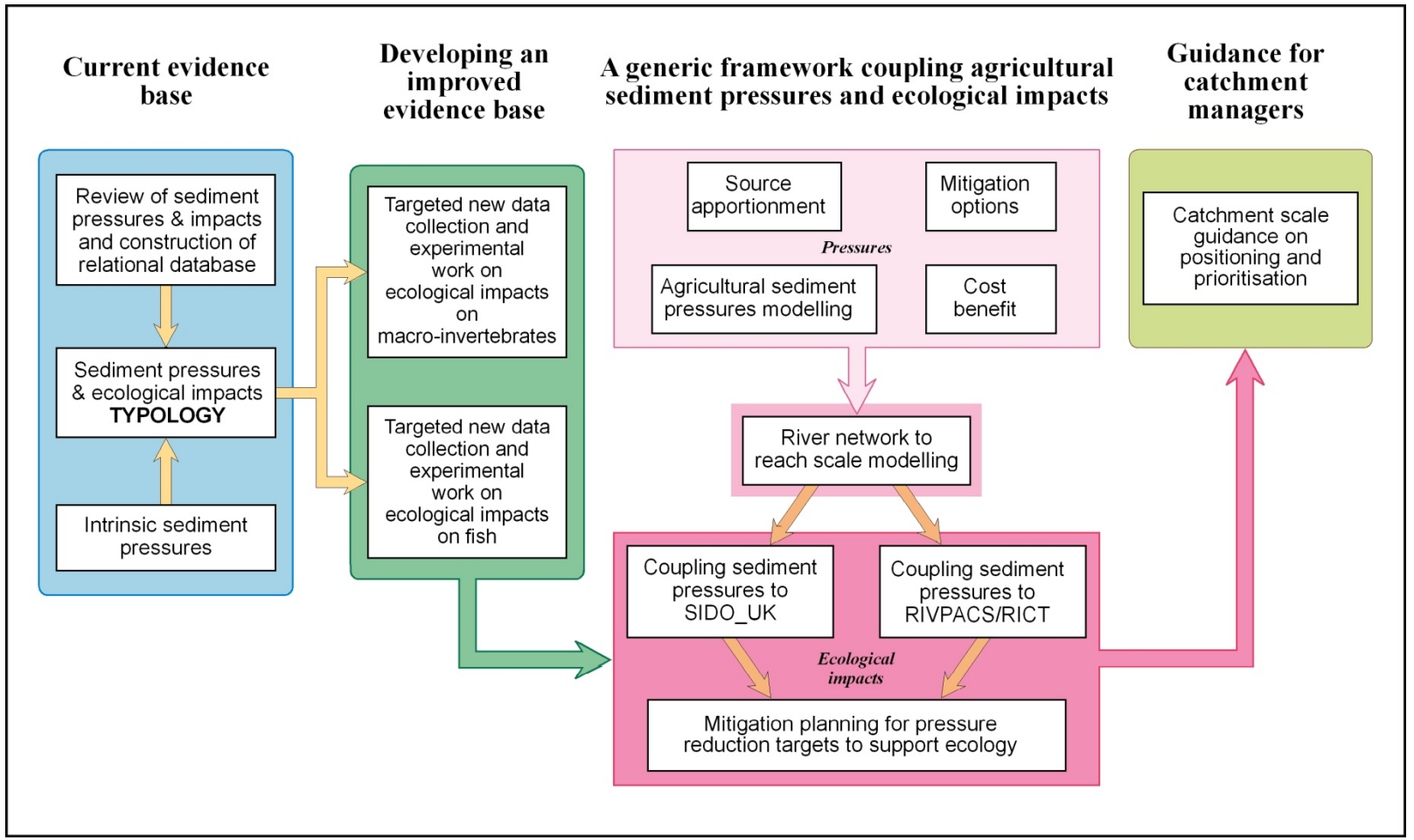
Sediment gap due to agricultural contributions only

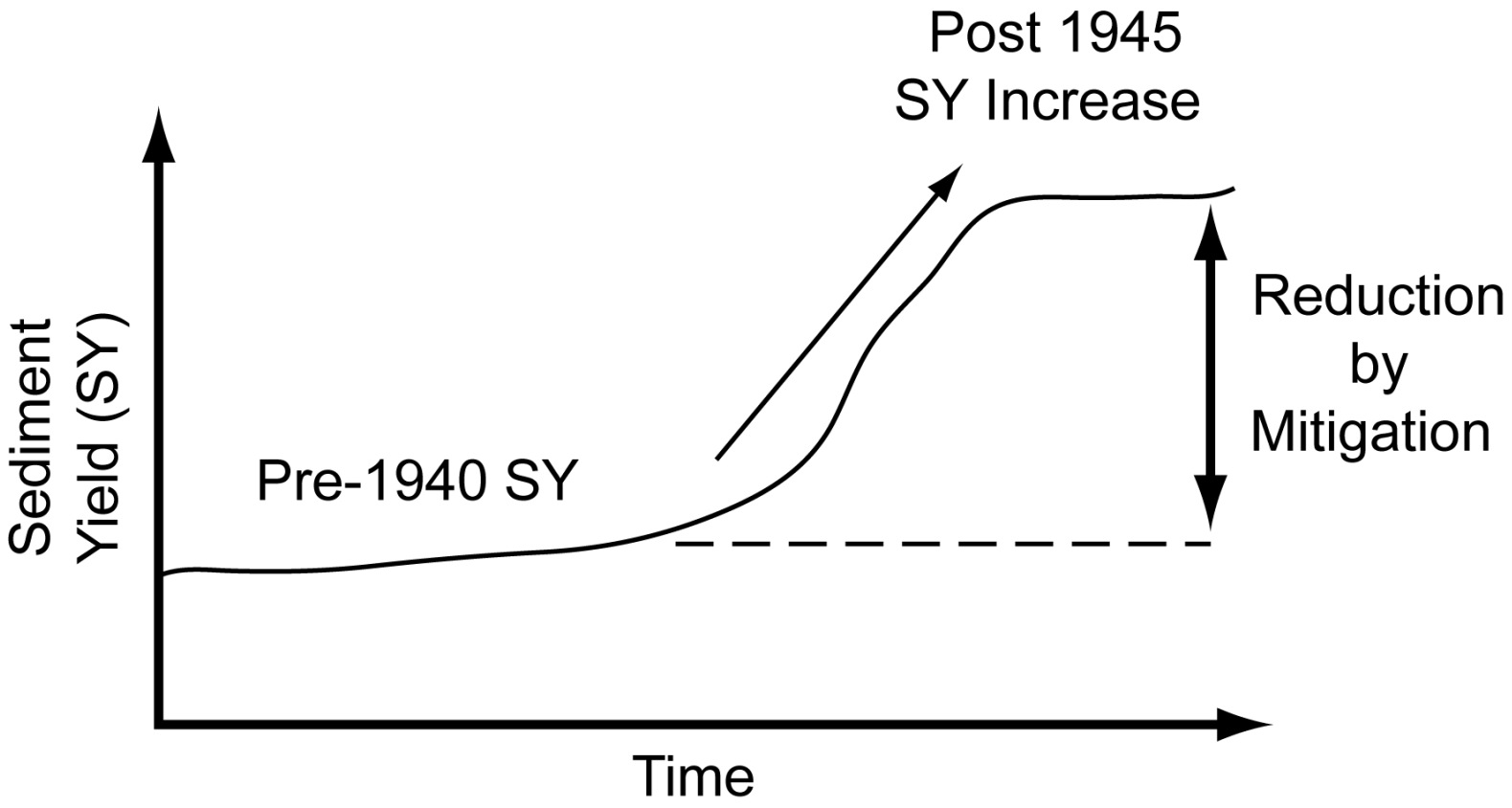


Project structure

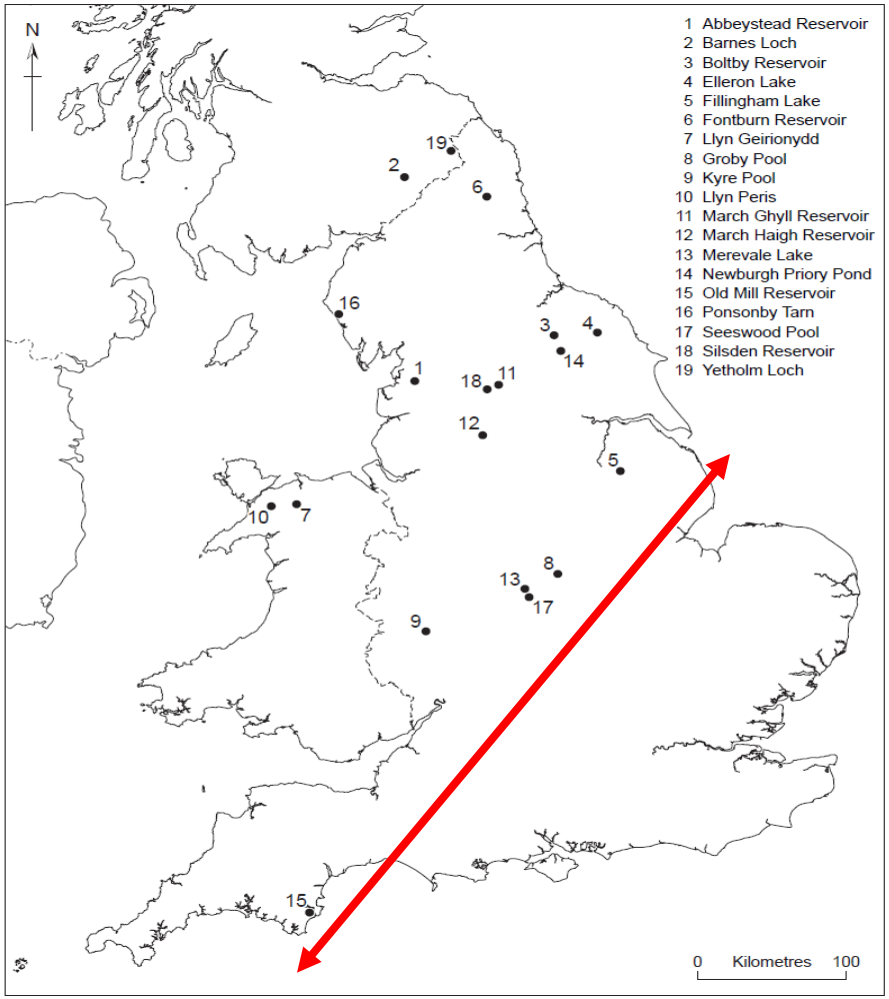


Background sediment pressures

The concept of background sediment pressures



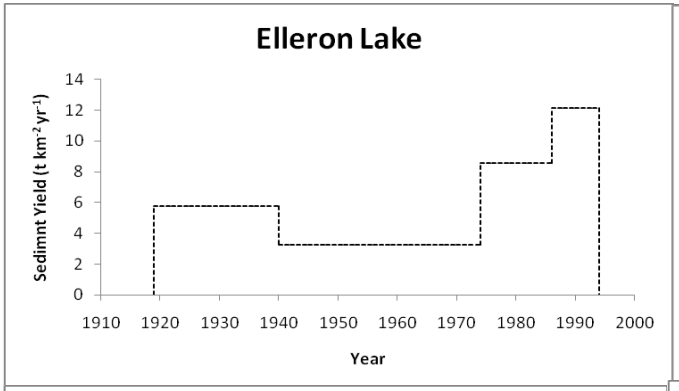
The evidence for background pressures

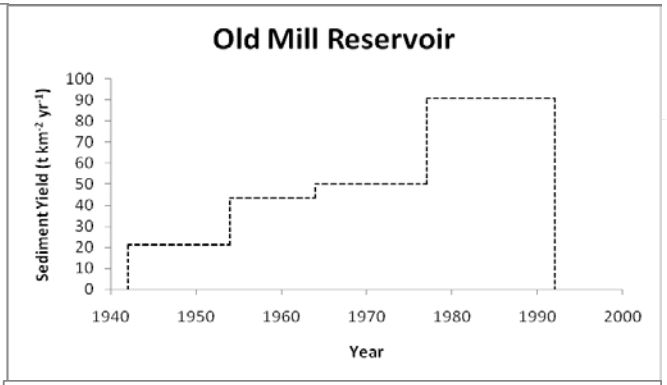


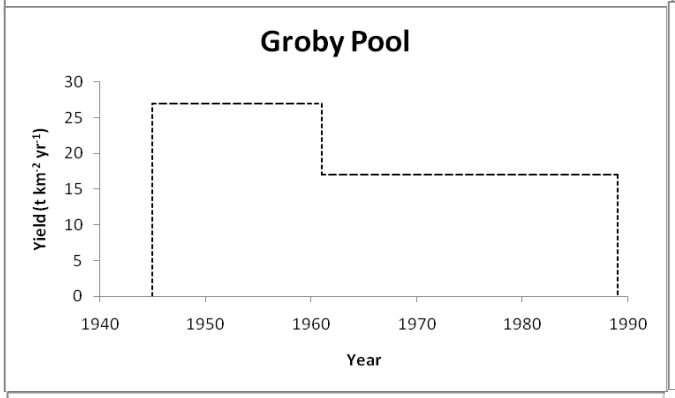
- **sites in England, Wales and the Scottish borders where palaeolimnology has been used to reconstruct sediment yield**

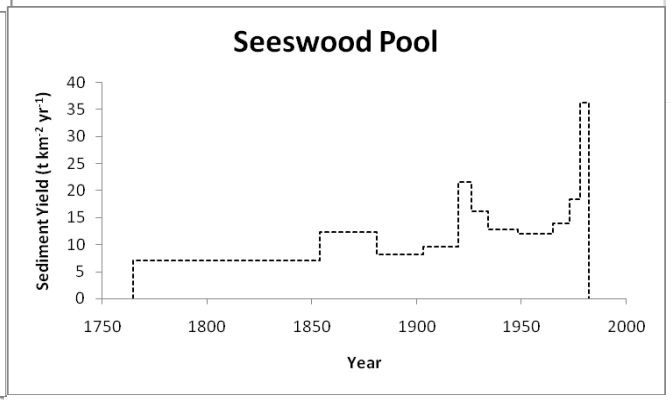
(Note the limited number of sites SE of the red arrow and in Wales)

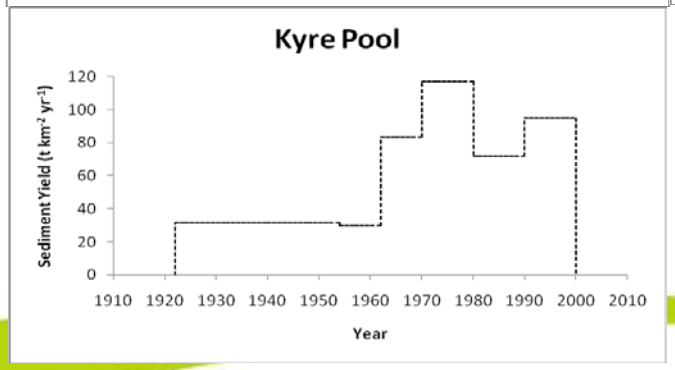
Pasture catchments











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Preliminary estimates of modern background sediment delivery to rivers (MBSDR)

Land use criteria	Target (t km^{-2} yr^{-1})	Maximum (t km^{-2} yr^{-1})
Forested catchments	<5	10
Mixed forest / moorland / Upland rough grazing	<5	10
Upland moorland / Rough grazing	<5	15
Peat	<<50	65
Lowland agriculture (A)	<10	15
Lowland agriculture (B)	<20	35

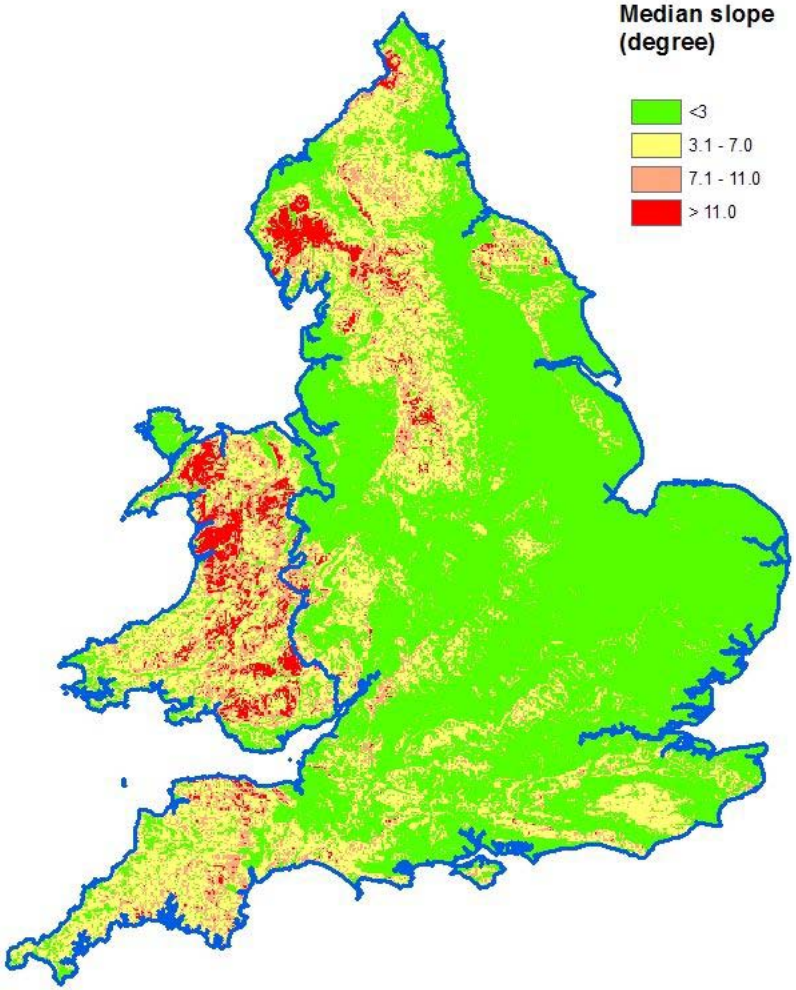
Spatial datasets

- **CEH land cover map (LCM2000)**

widespread BH	LCM Target Level-1	Code	LCM subclasses Level-2
22. Inshore sublittoral	Sea / Estuary	22.1	Sea / Estuary
13. Standing water/canals	Water (inland)	13.1	Water (inland)
20. Littoral rock	Littoral rock and sediment	20.1	Littoral rock
21. Littoral sediment		21.1	Littoral sediment
		21.2	Saltmarsh
18. Supra-littoral rock	Supra-littoral rock and sediment	18.1	Supra-littoral rock
19. Supra-littoral sediment		19.1	Supra-littoral sediment
12. Bog	Bog	12.1	Bog
10. Dwarf shrub heath	Dwarf shrub heath	10.1	Dwarf shrub heath
		10.2	Open shrub heath
15. Montane habitats	Montane habitats	15.1	Montane habitats
1. Broad-leaved, mixed and yew woodland	Broad-leaved / mixed woodland	1.1	Broad-leaved / mixed woodland
2. Coniferous woodland	Coniferous woodland	2.1	Coniferous woodland
4. Arable & horticulture	Arable and horticulture	4.1	Cereals
		4.2	Horticulture / non-cereal or unknown
		4.3	Not annual crop
5. Improved grassland	Improved grassland	5.1	Improved grassland
	Abandoned and derelict	5.2	Setaside grass

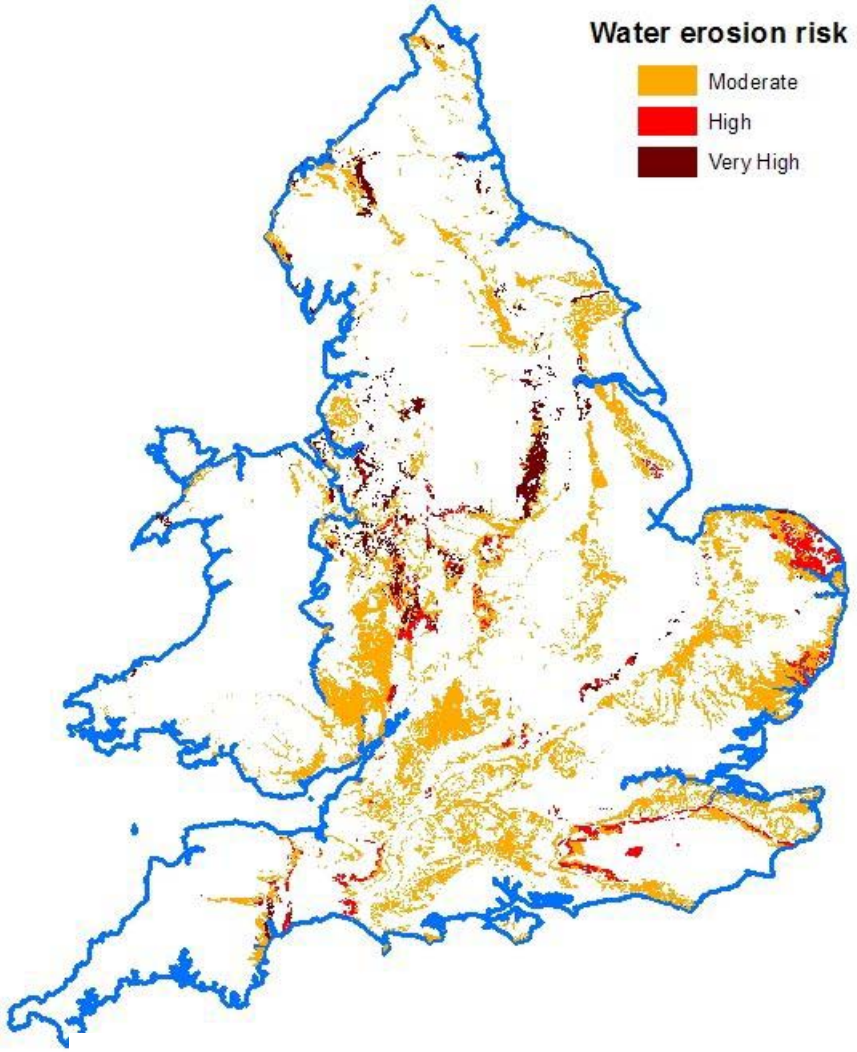
Spatial datasets

- **slope derived from 50 m DEM**

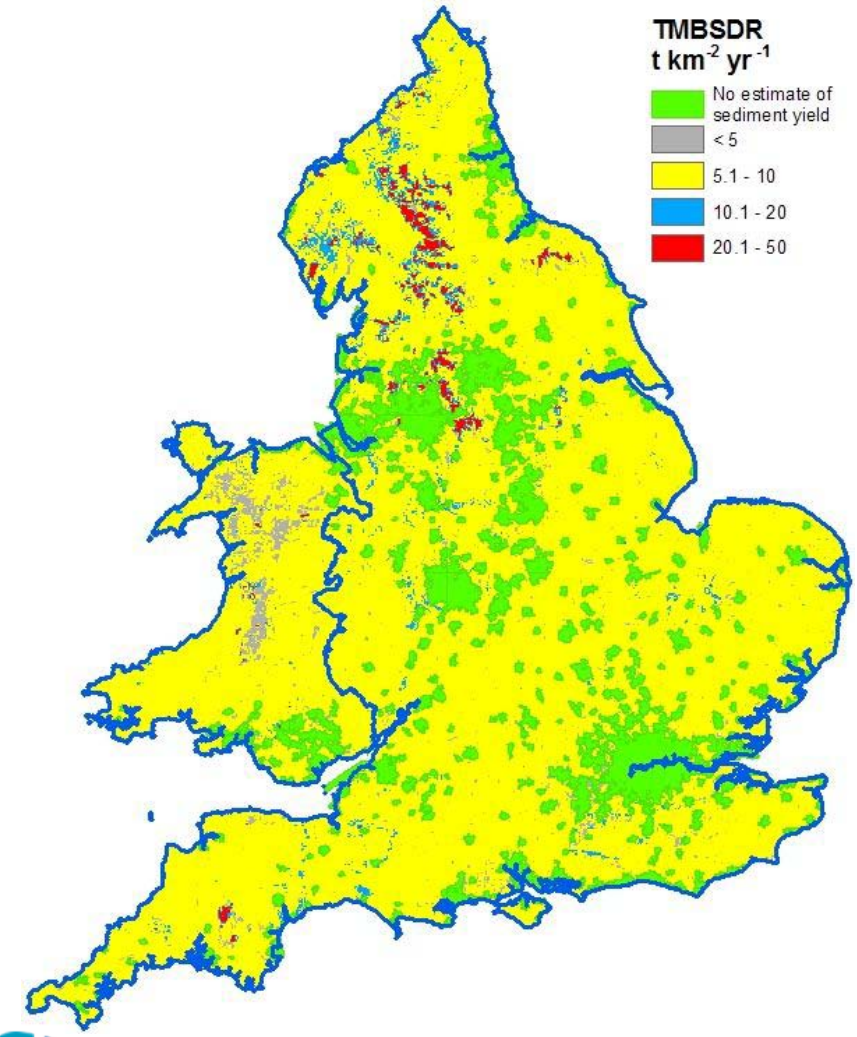


Spatial datasets

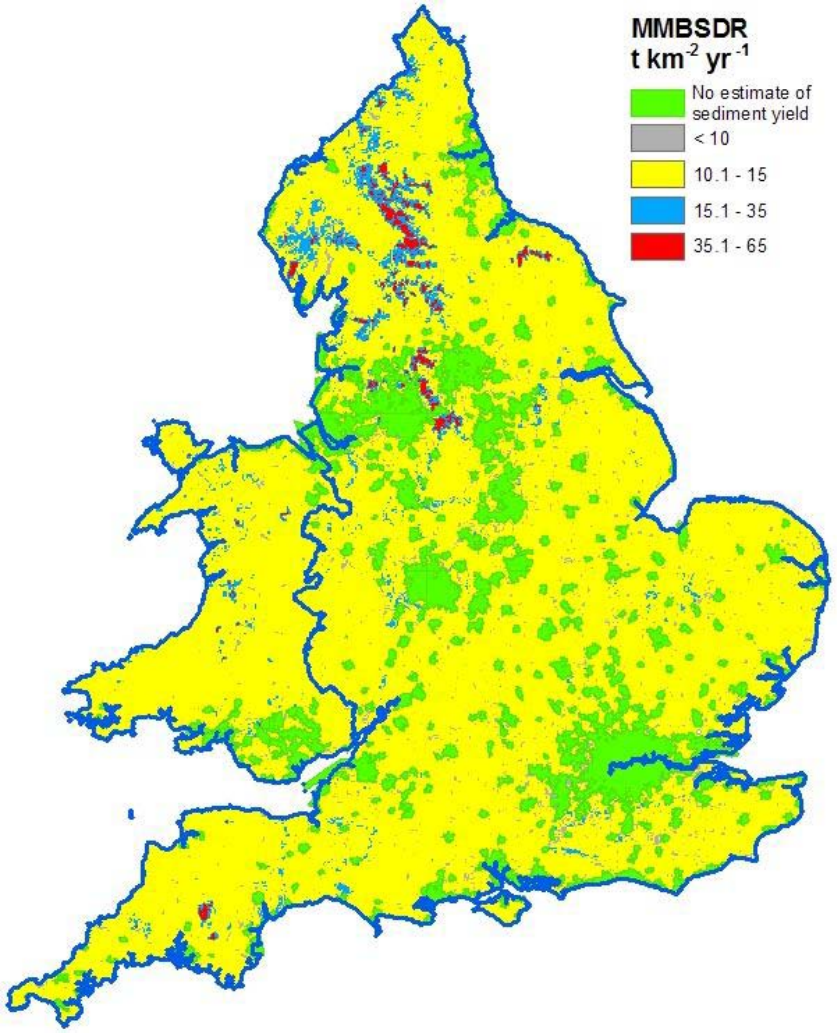
- **water erosion risk based on national soil map (NSRI)**



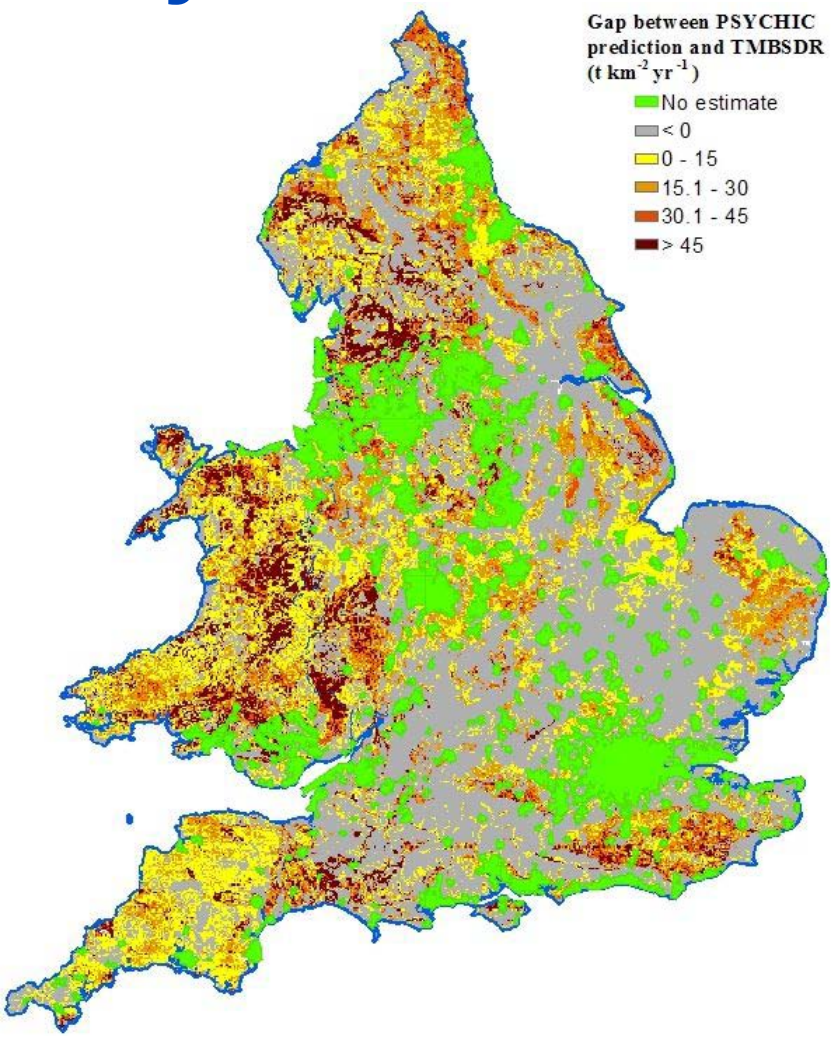
TMBSDRs across England and Wales

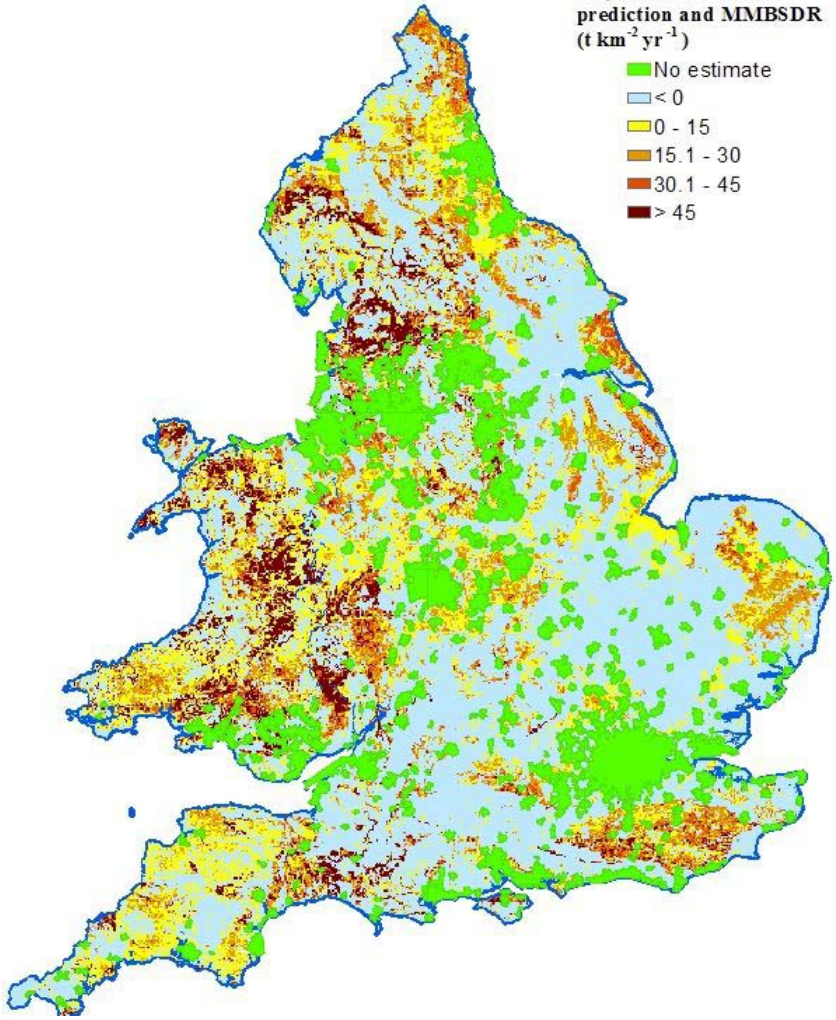


MMBSDRs across England and Wales



Psychic 2004 and MBSDRs





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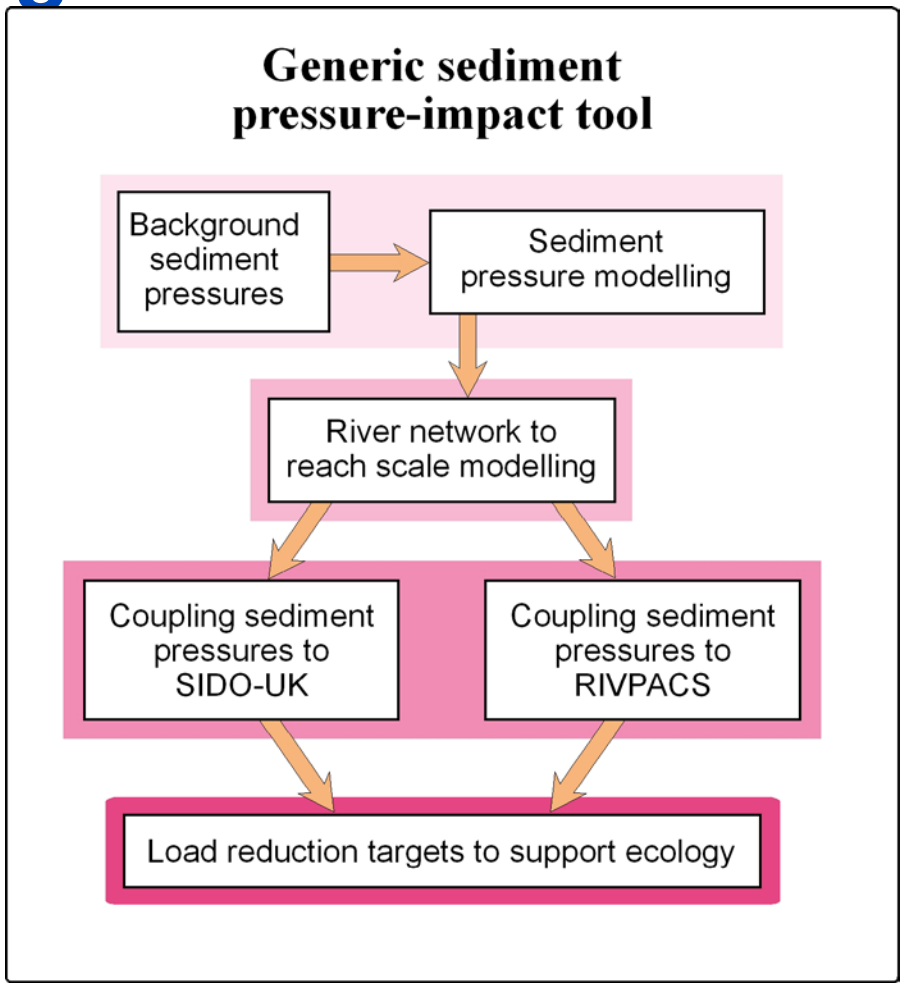
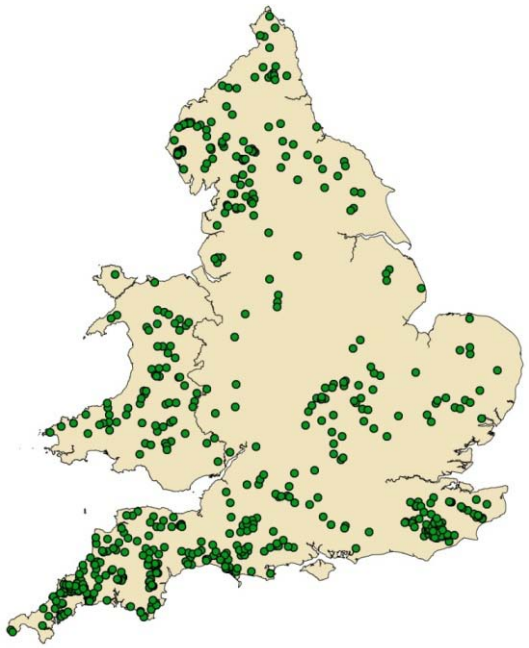
Revising estimates of good ecological status for sediment



Macroinvertebrate survey

- **sampling of 230 sites across a range of river types and across a gradient of sediment pressure**
- **sites are free from STW and urban area inputs, are upstream of lakes/reservoirs, and have sediment inputs predominantly from agricultural sources (from PSYCHIC model outputs)**



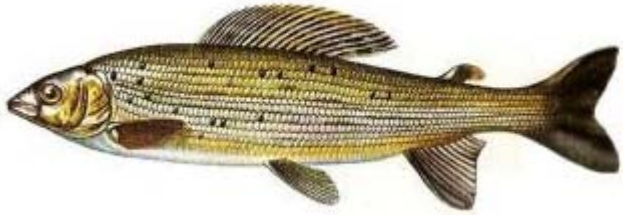
Macroinvertebrate index

- use of sediment intolerant and tolerant taxa to identify a sediment stress index for estimating load reductions for GES

Intollerant taxa

Tollerant taxa

Sediment impacts on fish



- use of SIDO_UK
- sediment impacts on DO

availability to incubating progeny

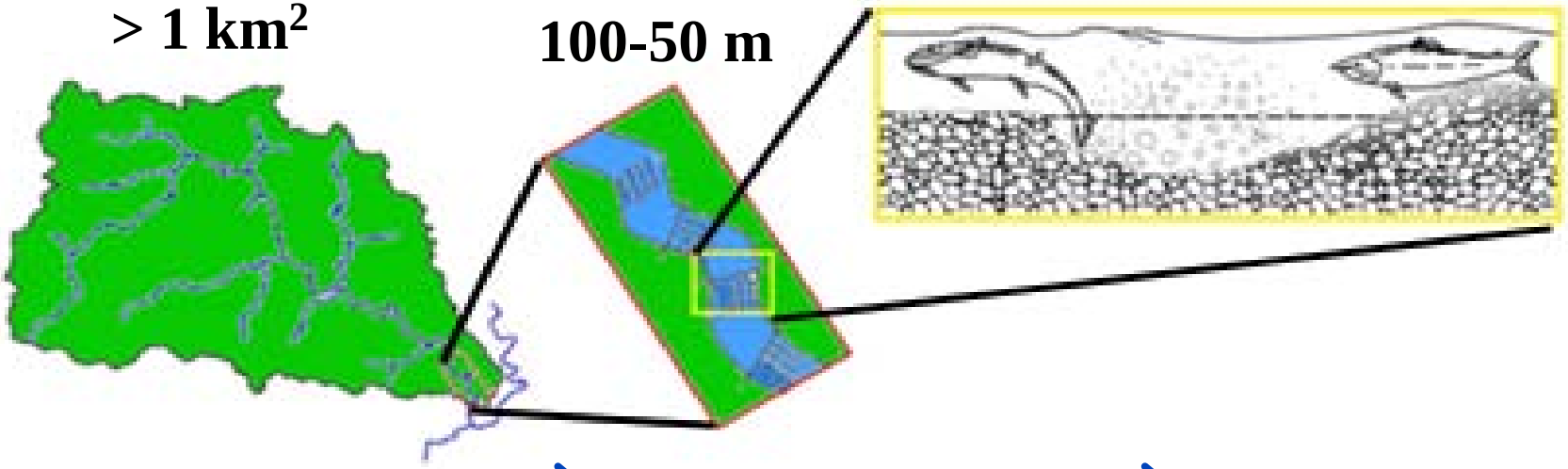
Catchment

> 1 km²

Reach

100-50 m

Redd < 1 m



Psychic → **Routing** → **SIDO-UK**

Use of the modelling toolkit

- catchment-specific revised sediment targets
- implications for meeting revised targets of
  - mitigation programmes
  - climate change projections for 2020, 2030, 2050, 2080

Establish cover crops in the autumn
Early harvesting and establishment of crops in the autumn
Cultivate land for crops in spring rather than autumn
Adopt reduced cultivation systems
Cultivate compacted tillage soils
Cultivate and drill across the slope
Leave autumn seedbeds rough
Manage over-winter tramlines
Establish in-field grass buffer strips
Establish riparian buffer strips
Re-site gateways away from high-risk areas