

DRIVERS OF TRENDS IN SUSPENDED SOLIDS FOR SCOTTISH RIVERS

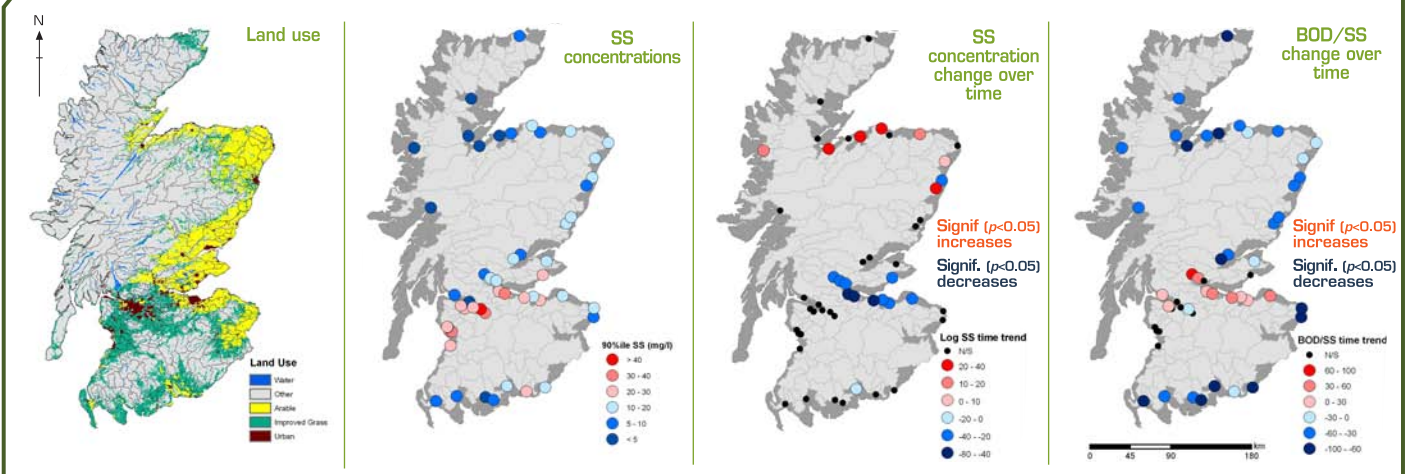
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INTRODUCTION: Urban waste water treatment may have recently changed the nature and amount of suspended solid (SS) inputs to major rivers. However, soil erosion exacerbated by agricultural practice is still an issue. Better knowledge of inter-related changes in land management and climate will help determine mitigation actions to address SS transport and protect soil and water resources.

METHODS: We evaluated SS (>1.2 µm) concentrations and flow (1970's to present, 2-4 weekly resolution) for 54 lowland rivers of the Harmonised Monitoring Scheme (managed in Scotland by SEPA). Temporal variability in log₁₀SS and BOD/SS (qualitative change in SS) was investigated using linear multiple regression models, separating components of: (i) seasonality, (ii) flow-related and (iii) temporal trends. These were related to catchment data of (a) absolute land use areas (Land Cover of Scotland 1988) and (b) agricultural change 1979-2005 (areas of grassland, barley, maincrop potatoes, oats and in head of cattle) digitised from census data (Agricola, Edina; (<http://edina.ac.uk/agcensus/>)).

NATIONAL SS CONCENTRATIONS AND SIGNIFICANT TIME TRENDS IN QUANTITY AND QUALITY



Correlations (*r*) for river SS concentrations, flow response and change in SS over time against land use change and area in 1988

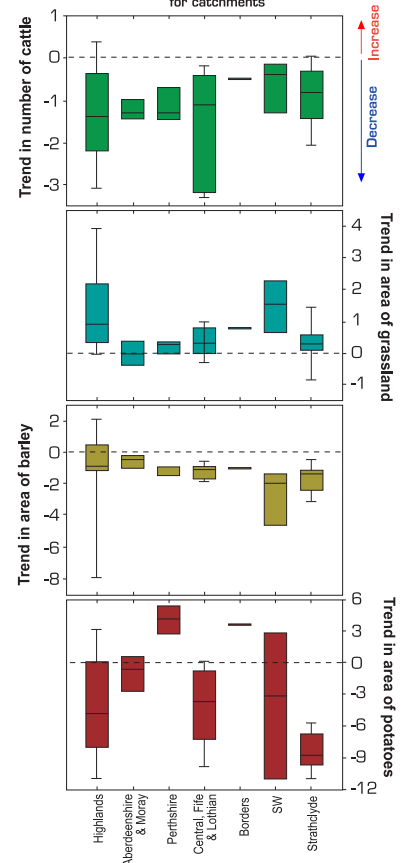
	90thile SS ¹	SS flow factor	SS time trend	BOD / SS time trend
<i>Census data - change 1976-2005</i>				
Change in grassland area	-0.33*	-0.43**	0.28*	-0.34*
Change in potatoes area	ns	ns	0.34*	-0.34*
Change in barley area	ns	ns	ns	ns
Change in oats area	ns	ns	ns	ns
Change in cattle number	ns	ns	ns	ns
<i>Land cover 1988 data</i>				
Arable area ²	ns	0.55***	ns	ns
Bog and peatland area ²	-0.32*	-0.50***	ns	ns
Urban and industrial area ²	0.66***	0.54***	-0.69***	0.64***
Heather moorland area ²	-0.62***	-0.39**	0.40**	-0.30*
Intensive grassland area ²	0.65***	ns	-0.43**	0.30*
Standing freshwater area ²	-0.34*	-0.59***	ns	ns

¹Log transformed data; ²Logit transformed data

Significance levels: ns, **p*<0.05, ***p*<0.01, ****p*<0.001

REGIONAL LAND USE CHANGE

+ve & -ve values of regression slopes of % change against time for catchments



SUMMARY: SS concentrations were related to grazing and urban factors, but responded greatest to discharge in arable and urban areas. Increases in SS over time were mostly significant in the NE, where concentrations were lowest but where river ecosystems may be most sensitive. Reasons may include increasing population, septic tanks and agriculture. SS concentrations (related to BOD; *r*=0.84) were greatest in urbanised central Scotland. Here (particularly for catchments entering the Forth estuary) decreases were positively related to urban area, but proportionally the bioavailable fraction of SS (BOD respiration test) increased and this could have eutrophication implications. Crop areas and heads of cattle generally decreased over the period, only grassland areas increased in all regions. Change over time in grassland and potatoes only weakly correlated positively with change in SS concentrations. Our future work will look more closely at agricultural management changes in river riparian areas.