Improvement Programme for England's Natura 2000 Sites (IPENS) – Planning for the Future IPENS008b

SCIMAP Sediment Risk Mapping for Designated Site Catchments

Covers multiple Natura 2000 sites

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Foreword

The **Improvement Programme for England's Natura 2000 sites (IPENS)**, supported by European Union LIFE+ funding, is a new strategic approach to managing England's Natura 2000 sites. It is enabling Natural England, the Environment Agency, and other key partners to plan what, how, where and when they will target their efforts on Natura 2000 sites and areas surrounding them.

As part of the IPENS programme, we are identifying gaps in our knowledge and, where possible, addressing these through a range of evidence projects. The project findings are being used to help develop our Theme Plans and Site Improvement Plans. This report is one of the evidence project studies we commissioned.

Water pollution has been identified as one of the top three issues in all Natura 2000 rivers. It also affects many terrestrial and some marine and coastal Natura 2000 sites.

Diffuse water pollution is the release of potential pollutants from a range of activities that individually may have little or no discernable effect on the water environment, but at the scale of a catchment can have a significant cumulative impact. The sources of diffuse water pollution are varied and include sediment run-off from agricultural land.

Often sites are affected by multiple sources of pollution, and in many cases a better understanding is required of the pollution issue to inform and guide the actions required. Consequently 'research and investigation' is the most frequently identified action where water pollution features as an issue.

This study used the Sensitive Catchment Integrated Modelling Analysis Platform (SCIMAP **www.scimap.org.uk**) to identify potential sediment source areas for the catchments that include Natura 2000 designated sites. It is one of four produced by the IPENS project "Meeting local evidence needs to enable Natura 2000 Diffuse Water Pollution Plan Delivery."

The results have been used by Natural England and others to help develop and implement the Diffuse Water Pollution Theme Plan and will be used to develop and implement individual Diffuse Water Pollution Plans for target catchments.

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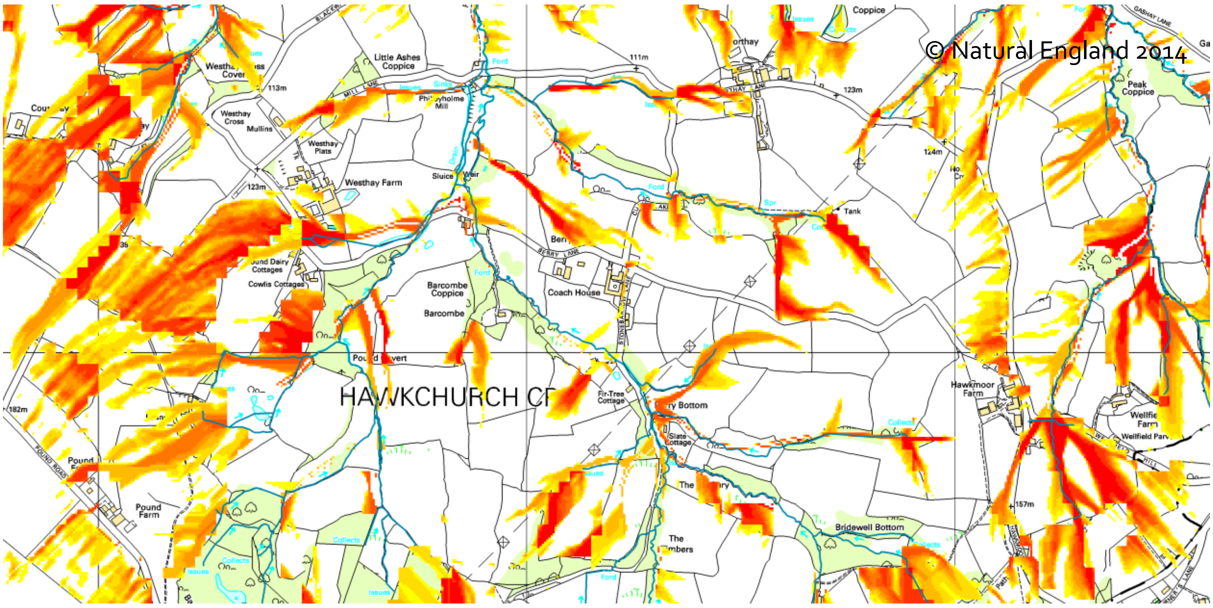

SCIMAP Sediment Risk Mapping for Designated Site Catchments

Westcountry Rivers Ltd

Westcountry Rivers Ltd is the commercial trading subsidiary of the Westcountry Rivers Trust (charity no. 1135007 company no 06545646). All profits generated through the consultancy are covenanted to the Trust to help secure the preservation, protection, development and improvement of the rivers, streams, watercourses and water impoundments in the Westcountry and to advance the education of the public in the management of water.

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Executive Summary

Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) are collectively known as Natura 2000 sites and are protected under European legislation for their important wildlife and habitats. Under the Water Framework Directive these sites are required to be in favourable or improving condition by 2015. Natural England has identified sediment as a pressure effecting 31 of these sites and need further data and evidence to identify and target measures.

Westcountry Rivers Limited (WR Ltd) was commissioned by Natural England to model and map fine sediment erosion risk across these catchments, where diffuse pollution presents a risk to the conservation status of the designated sites. Erosion risk and in-channel sediment concentration risk were modelled using the SCIMAP fine sediment risk model.

The Sensitive Catchment Integrated Modelling Analysis Platform (SCIMAP - www.scimap.org.uk) is a sediment risk assessment model and is used here to identify potential sediment source areas and pathways across the landscape. Spatial evaluation of erosion risk at a catchment scale using SCIMAP allows effective targeting of further on-the-ground investigations and monitoring and also helps to identify priority areas for delivery of catchment management interventions

The SCIMAP model uses a digital elevation model, land-use or land-cover data and rainfall data to give an indication of where the highest risk of sediment erosion occurs in the catchment. This is achieved by (1) identifying locations where, due to land-use, sediment is likely to be available for mobilisation (pollutant source mapping) and (2) combining this information with a map of hydrological connectivity to indicate the likelihood that these pollutants will be mobilised and transported to a receptor (waterbody).

SCIMAP was initially run at 5m resolution using Next Perspectives Digital Terrain Model, Centre for Ecology and Hydrology Landcover Map 2007 and Met Office long term average rainfall data, where large catchments were divided into a series of smaller sub-catchments. The 5m DEM was then resampled at lower resolution and SCIMAP was re-run to generate whole catchment outputs for catchments that had previously been split into smaller sub-catchments to enable the 5m resolution SCIMAP run. The erosion risk and in-channel concentration risk maps generated, contained in the Appendix to this report, provide an invaluable component of evidence to support the on-going development of the Diffuse Water Pollution Action Plans.

1. Introduction

Landscapes have a number of key attributes that determine the availability of sediment and associated pollutants in a particular location and the likelihood of these being mobilised and transferred to a receiving watercourse.

1.1. Soil character and condition

The characteristics and condition of the soil both play a key role in the ability of the land to regulate the movement of water and thus the risk of fine sediment erosion and associated pollutant transfer.

Some soils, such as heavy clay- or peat-based 'stagnogleys', are more susceptible to structural damage such as compaction, caused by intensive cultivation or livestock farming. This increases the risk of erosion or significant surface run-off occurring at their surface.

Other soil types, such as lighter, free-draining 'brown earth' soils, can result in leaching of pollutants as water drains rapidly through the soil profile. In addition, soils with very high levels of organic matter, such as peat, can release large quantities of organic compounds when they are drained or when their structure has become degraded.

1.2. Topography and hydrology

The topography of a catchment / land surface interacts with the soil and the underlying geology to control the movement of water across the landscape. Some of the water falling on the land as rain will be absorbed into the soil from where it can be taken up by plants or filter down to the water table to form groundwater.

When the soil becomes saturated or damaged, or the underlying rock is impermeable, water stops moving vertically through the soil profile and begins to move laterally across the land via surface or sub-surface flow. Once moving through the landscape, water then collects in rills, gullies, drains and ditches, before entering streams and rivers to make its way back to the sea.

In certain areas across the landscape, where there are steep converging slopes or where the land is flat, water will naturally accumulate more than in other areas. In these 'hydrologically connected' or 'wet' areas there is an increased likelihood, particularly during periods of heavy rainfall, that water will run across the surface mobilising soils and associated pollutants that are available on the land surface.

1.3. Land-use and land-cover

The use to which a parcel of land is put can have a significant effect on its ability to regulate the movement of water across it and the likelihood that it will generate pollution in the aquatic environments nearby.

Natural habitats have rougher surfaces with more complex vegetation. They therefore have a relatively low risk of becoming a pollution source as they are more likely to slow the movement of water across the landscape, increase infiltration into the soil and increase the uptake of water by plants.

In contrast to natural habitats, land in agricultural production experiences greater levels of disturbance, whether through cultivation or the actions of livestock. There is therefore greater risk that it will be damaged and become susceptible to erosion, pollutant wash-off or pollutant leaching.

While it is certainly not always the case, the risk of pollution occurring is generally higher where land is in arable crop production or under temporary grassland. This is simply because the presence of bare earth for longer periods and the high intensity of cultivation undertaken on this land results in an increased likelihood that the soil condition may be degraded and pollutant mobilisation may occur.

Land under permanent grassland (pasture) inherently represents a lower pollution risk than arable due to its undisturbed soil and more mature vegetation. However, even this type of land-use can generate significant levels of pollution when its soil surface becomes damaged by high livestock density or when large levels of nutrients or pesticides are applied to improve it.

1.4. Modelling pollution risk

Mathematical models are frequently used as tools to spatially evaluate the interactions between these landscape characteristics in order to make a broad initial pollution risk assessment at a catchment scale. This allows effective targeting of further on-the-ground investigations and monitoring and helps to identify priority areas for delivery of catchment management interventions. Many of these models are process based and attempt to represent the physical processes that drive runoff and pollutant transfer from diffuse agricultural sources to make quantified predictions of loads and to apportion these loads to different spatial or sector sources.

SCIMAP takes a subtly different approach and operates in a risk based framework, identifying relatively high risk areas in the landscape where nutrient and sediment pollutants are most likely to be coming from within the modelled catchment area. It is important to note that SCIMAP can only be used to spatially assess the risk of diffuse pollution originating from natural or agricultural land, and not diffuse pollution from other areas, such as the urban environment, or point sources.

2. SCIMAP

2.1. Overview

The SCIMAP fine sediment risk model was developed through a collaborative project between Durham and Lancaster Universities and has been supported by the UK Natural Environment Research Council, the Eden Rivers Trust, the Department of the Environment, Food and Rural Affairs and the Environment Agency.

SCIMAP uses a digital elevation model, land-use or land-cover data and rainfall data to give an indication of where the highest risk of sediment erosion occurs in the catchment. This is achieved by (1) identifying locations where, due to land-use, sediment is likely to be available for mobilisation (pollutant source mapping) and (2) combining this information with a map of hydrological connectivity to indicate the likelihood that these pollutants will be mobilised and transported to a receptor (waterbody).

2.2. Scientific basis and assumptions

In SCIMAP, the landscape is divided into grid squares for which the elevation, rainfall and land-use data for each individual square is known. For each grid square in the landscape, the probability of flow to its neighbouring grid squares, and ultimately to the river channel network, is evaluated to create a map of hydrological connectivity. This is achieved through the prediction of the spatial pattern of soil moisture and hence the susceptibility of each grid square in the landscape to generate overland flow as the soil becomes saturated.

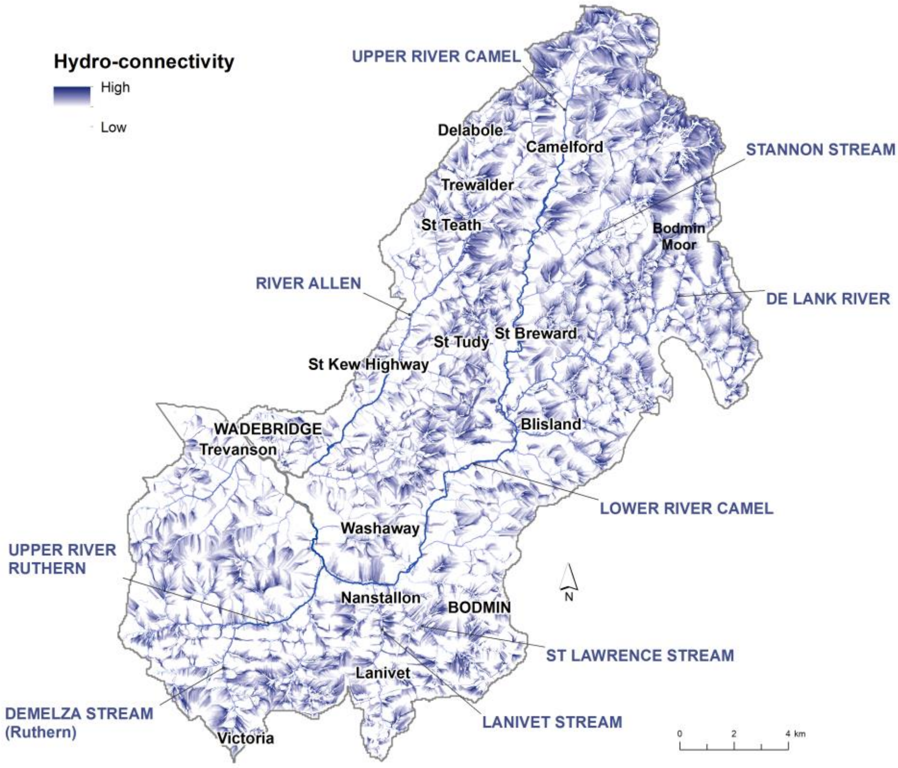

Figure 1: Example map showing hydrological connectivity (Network Index) in the River Camel catchment.

The likelihood of a grid square acting as a source of pollution is evaluated based on the land-cover data. Each land-cover type defined in the data is given a weighted erodability risk value which acts as a proxy for both land-use and land management.

The SCIMAP risk mapping framework then combines hydrological connectivity with erodability to evaluate and map areas in the landscape that are at relatively high risk of erosion and are hydrologically connected to the river channel network.

3. Methodology

3.1. Input data

The following data, licenced via Natural England, was used in the setting up each of the SCIMAP models:

- Next Perspectives, Digital Terrain Model, 5m resolution, licensed to Natural England for PGA, through Next Perspectives™. Permitted use: Natural England core business only.
- Centre for Ecology and Hydrology, Landcover Map 2007 (GB Raster). Based upon LCM2007 © NERC (CEH) (2014). Contains Ordnance Survey data © Crown Copyright 2007 © third party licensors.
- Met Office 5km resolution long term average rainfall data for the UK (open source).

3.2. Data preparation

Target catchments for mapping fine sediment erosion risk were identified by selecting catchments upstream from the 31 designated sites listed by Natural England using the WFD waterbody catchment boundaries. These upstream catchments were, where necessary, split into smaller sub-catchments to enable SCIMAP to run effectively using 5m resolution data. The rainfall, DEM and land-cover data were prepared in ArcMap 10.2 to create individual ASCII datasets at 5m resolution for each catchment or sub-catchment area to be mapped.

a. b. c.

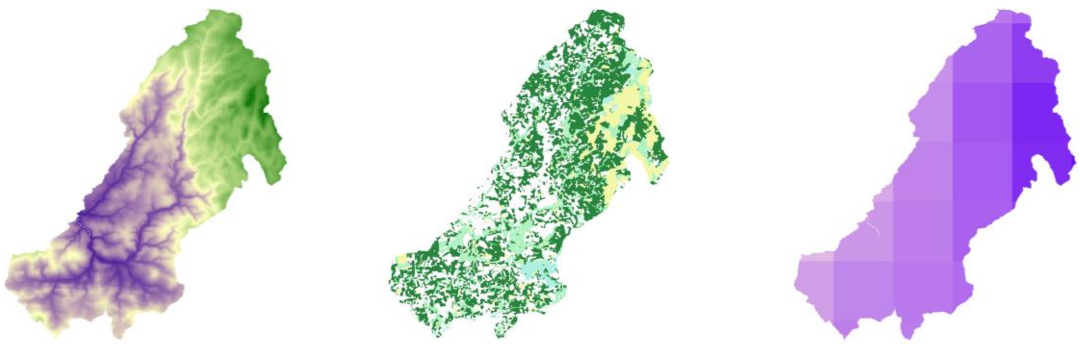

Figure 2: DEM (a), landcover (b) and rainfall data (c) prepared for input into SCIMAP.

3.3. Running SCIMAP

The rainfall, DEM and land-cover ASCII files were imported and pre-processed in preparation for running the SCIMAP model. This involved removing depressions ('sinks') from the DEM to ensure that a flow direction could be found for every pixel in the DEM. This prevents lakes and flat areas from acting as 'consuming' reservoirs of water and ensures water is discharged towards an outlet. At this stage, the land-cover data was allocated risk values using a default set of risk weightings, supplied within the SCIMAP programme specifically for the LCM2007 dataset.

The DEM, landcover and rainfall data were then loaded into the fine sediment risk model to generate a series of outputs, including a hydrological connectivity map (Network Index), a surface risk erosion map (Erosion Risk) and an in-channel sediment concentration risk map (In-Channel Conc.).

3.4. Preparing outputs for interpretation

For each SCIMAP run, the erosion risk and in-channel sediment concentration risk maps were exported from SCIMAP and imported to ArcMap 10.2 for formatting and maps for each modelled area were created. The erosion risk outputs were saved as raster datasets and the in-channel concentration risk outputs as shapefiles.

3.5. Additional whole catchment SCIMAP runs

The 5m DEM data was resampled at lower resolution (either 10m, 15m, 20m or 25m resolution) and additional SCIMAP runs were carried out to provide whole catchment risk assessments for those catchments that were split into smaller sub-catchments for the initial 5m resolution SCIMAP run. Once the DEM data had been resampled at an appropriate resolution for each large catchment, SCIMAP was run using the methodology described above and the results prepared for interpretation.

4. Outputs

The SCIMAP outputs generated are provided on an accompanying hard drive, alongside maps for each modelled area / catchment model and catchment overview maps for the large catchments that were split into smaller sub-catchments.

5. Issues

Across all 31 catchment there were two areas for which it was not possible to effectively run SCIMAP. These were an area of the Ouse Washes and the lower River Dee (England).

There was not enough variability in the DEM data for the very flat, wet areas of the Ouse Washes with the result that SCIMAP was unable to calculate flow accumulation. However, SCIMAP ran effectively for the upstream catchment area and therefore the outputs provided in this report do provide a good indication of areas upstream that are likely to be vulnerable to erosion risk.

It was also not possible to run SCIMAP for the lower River Dee (England) as large areas of the 5m DEM dataset were missing.

6. Guide to the interpretation of outputs

There are several important factors to consider when interpreting the outputs from SCIMAP.

5.1. Symbology

The symbology used when creating SCIMAP output is a key consideration that can greatly facilitate the visual interpretation of the risk maps. In the maps produced for this report, a quantile symbology for the erosion risk was used to display the riskiest 30%, in relative terms, of the landscape for each modelled area. Of this riskiest 30%, red areas denote the highest risk areas (the first decile), orange those of intermediate risk (the second decile) and yellow the areas of lower risk (the third decile).

Figure 3 and 4 show example fine sediment erosion risk maps for the River Mease catchment and a sub-catchment of the River Tweed. The erosion risk map for the River Mease is a good example of a catchment where areas of high surface erosion risk are relatively evenly distributed throughout the catchment. The River Tweed sub-catchment, however shows distinct areas of high erosion risk, located primarily along the steeper sloping headwater streams in the north of the catchment.

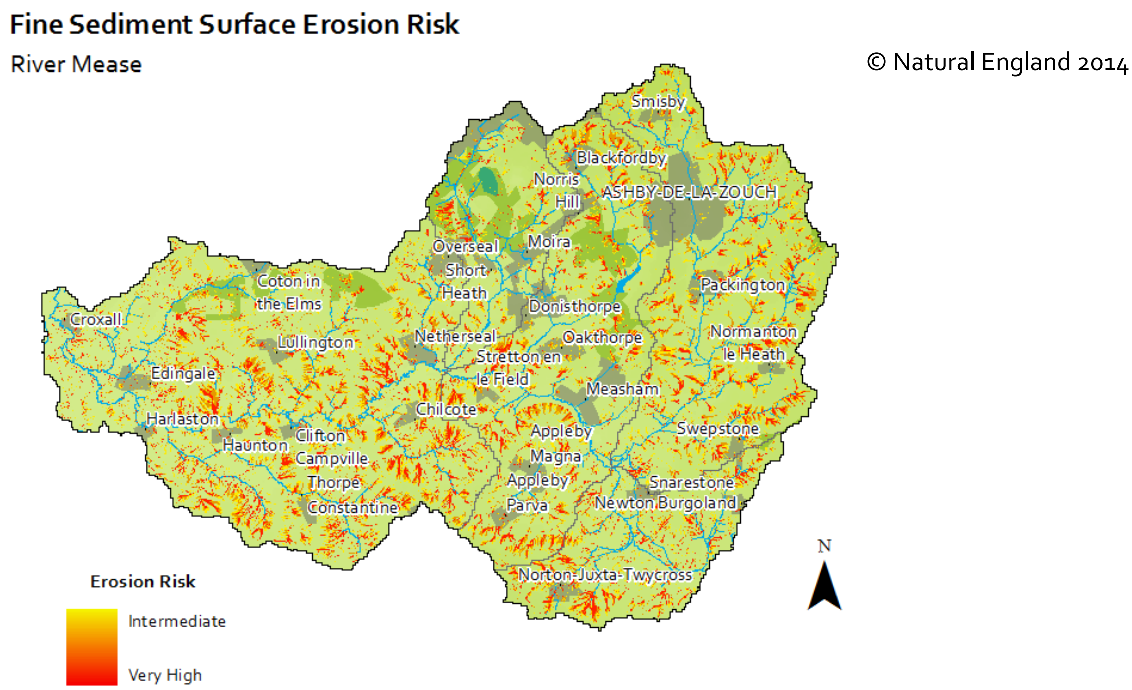

Figure 3: Erosion risk in the River Mease catchment.

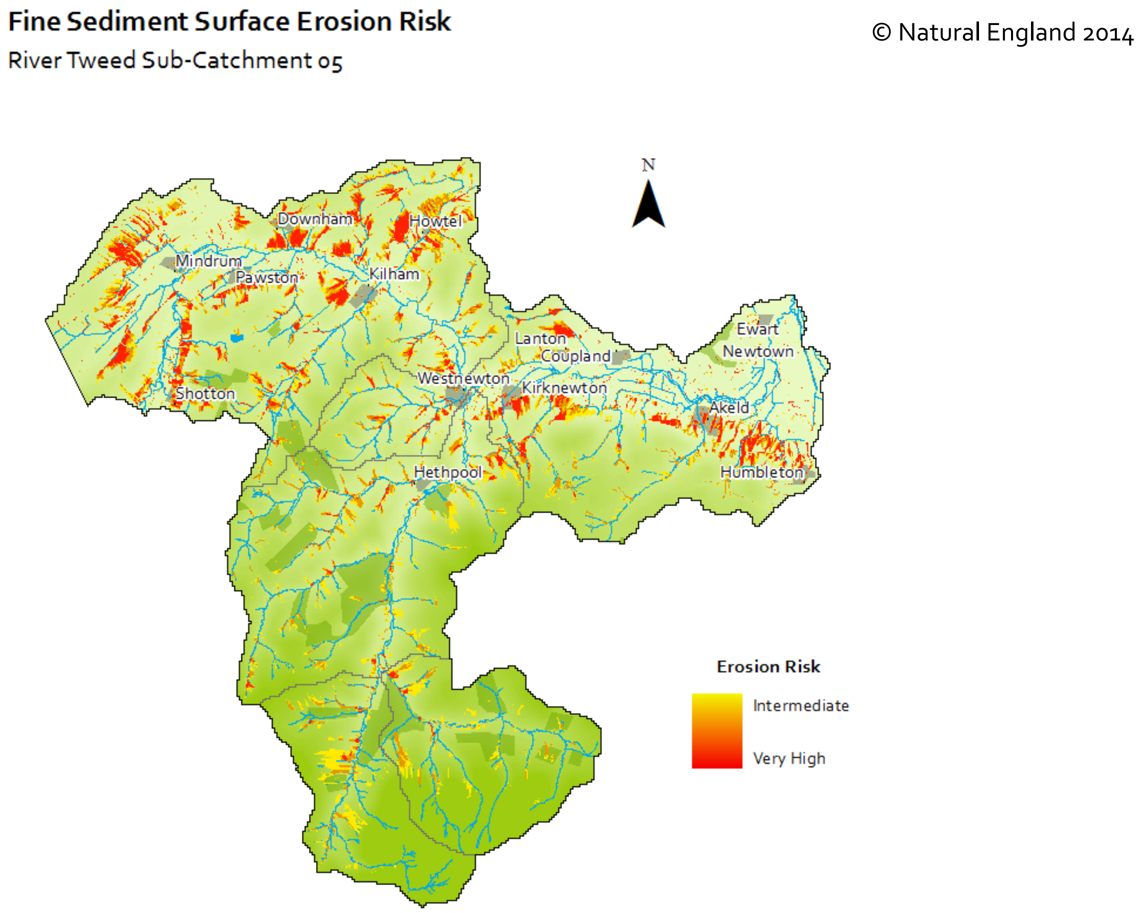

Figure 4: Erosion risk in the River Tweed sub-catchment 01.

The maps illustrating in-channel concentration risk were symbolised using five equal intervals, where green represents the lowest in-channel concentrations, yellow to orange represents intermediate in-channel concentrations and red denotes high in-channel concentration. This means that on some maps, where there are a large number of in-stream points that have a channel concentration that falls within the top fifth of the concentration risk range, proportionally there will be a larger number of red points compared to maps where only a small number of points fall within that concentration risk range. This gives a good indication of the distribution of relative risk of high, intermediate and low sediment concentrations in-channel across the catchment / modelled area.

The maps below illustrate SCIMAP in-channel sediment concentration risk outputs for the River Mease and a sub-catchment of the River Test. For most reaches of the River Mease, in-channel concentration risk is low to intermediate, with relatively few red stretches. This means that there are relatively few reaches where in-channel sediment concentration risk falls within the highest fifth of the concentration range for the River Mease. In contrast, in-channel concentration risk for the River Test in sub-catchment 05 is intermediate to high, meaning that there are relatively few reaches that fall within the lowest fifth of the concentration range for this catchment.

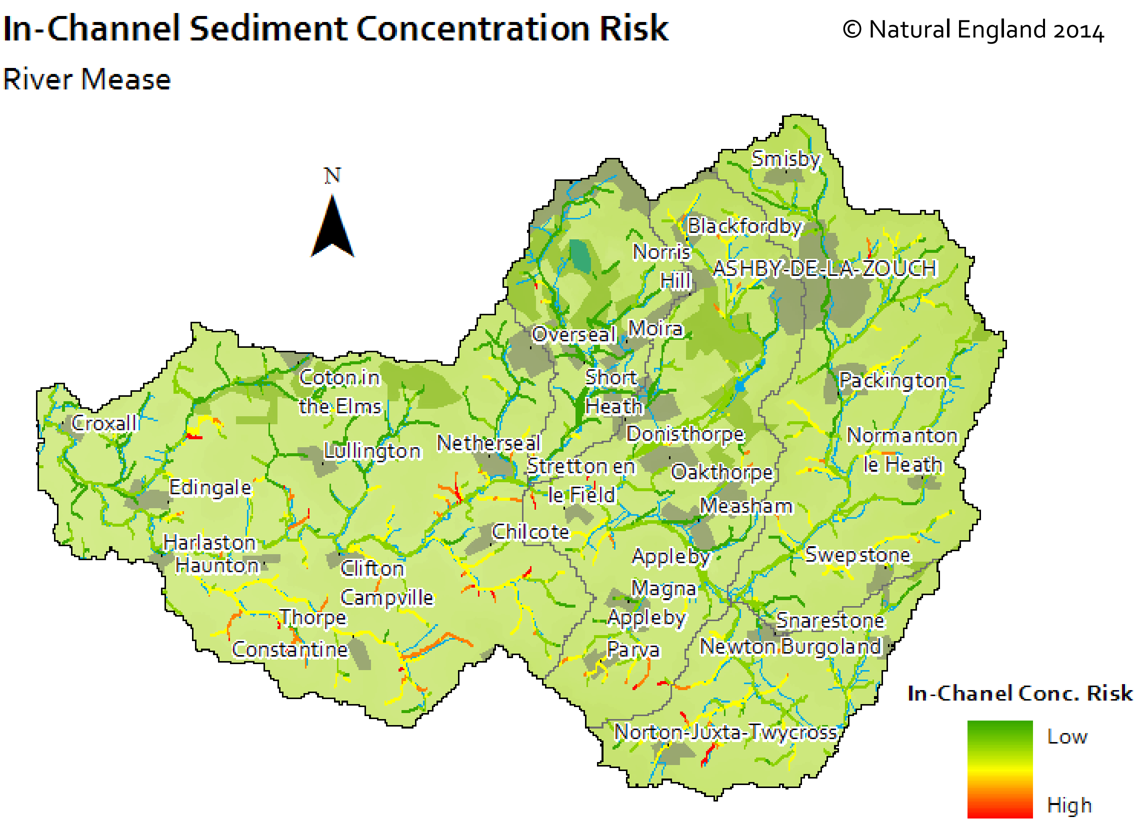

Figure 5: The risk in-channel sediment concentration risk in the River Mease is largely low to intermediate throughout the catchment.

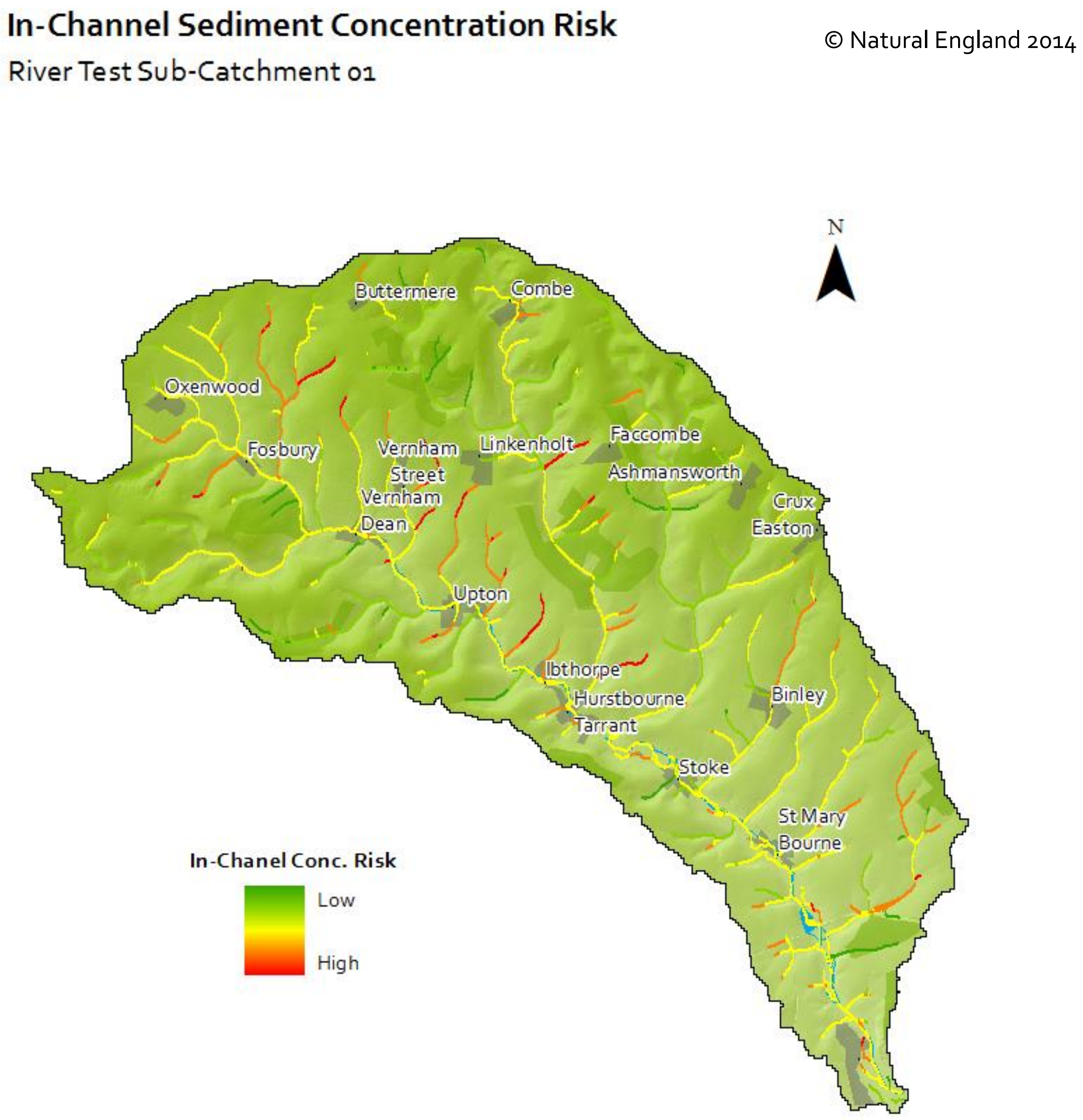

Figure 6: In-channel sediment concentration risk falls largely within the intermediate to high risk range throughout the River Test in sub-catchment 05.

5.2. The River Blackwater in focus

The example maps on the following pages show SCIMAP outputs at 5m resolution for the Blackwater River catchment, a sub-catchment of the River Axe. Figure 6 shows outputs for the whole sub-catchment while Figure 7 shows outputs for the central area of the sub-catchment, in focus. The outputs are overlaid on Ordnance Survey 10k basemaps, to enable visualisation of the outputs in relation to features in the landscape such as field boundaries, roads and woodlands.

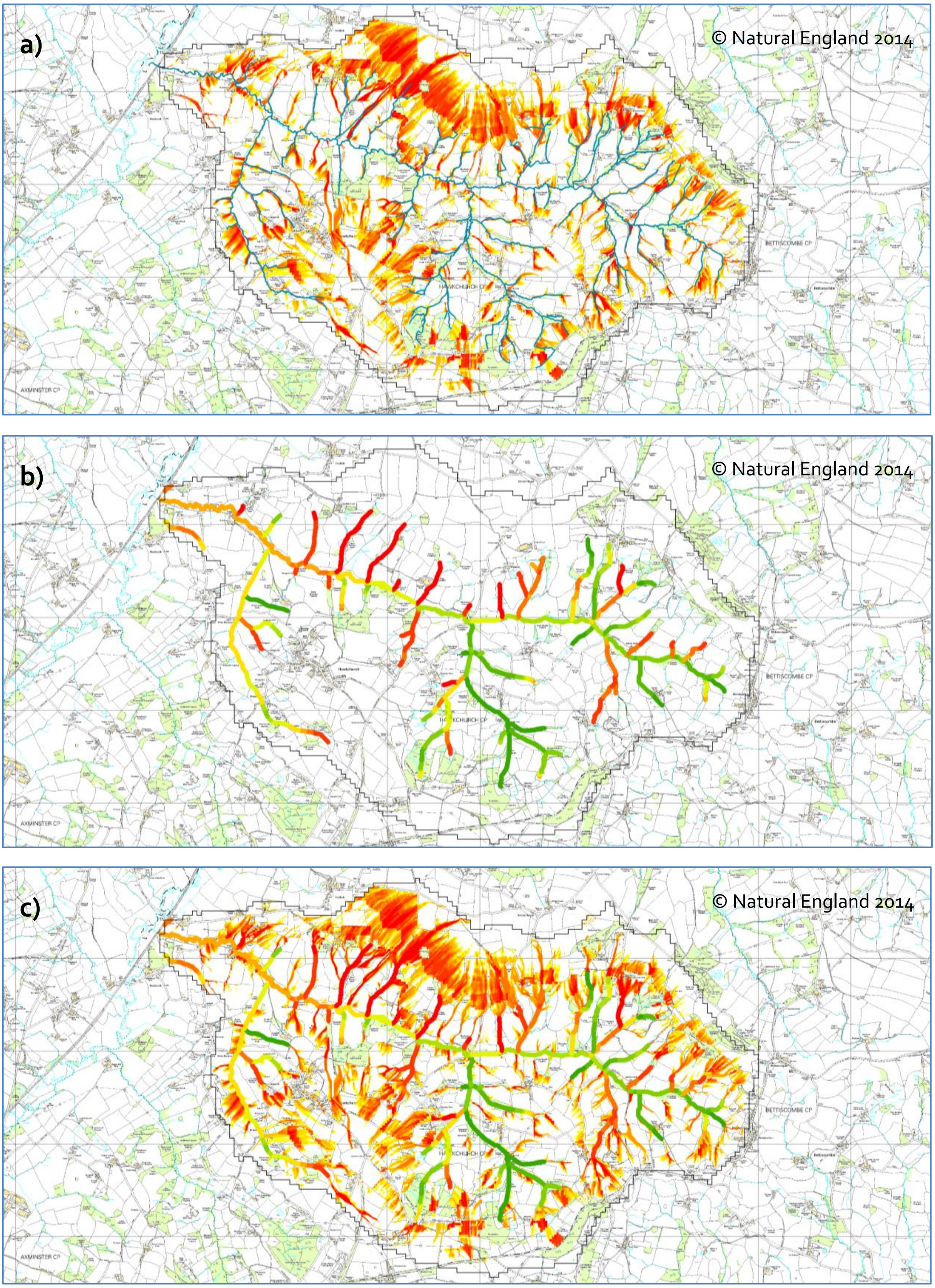

Figure 7: Maps of the Blackwater River catchment illustrating fine sediment erosion risk (a), in-channel sediment concentration risk (b) and both erosion risk and in-channel concentration risk (c).

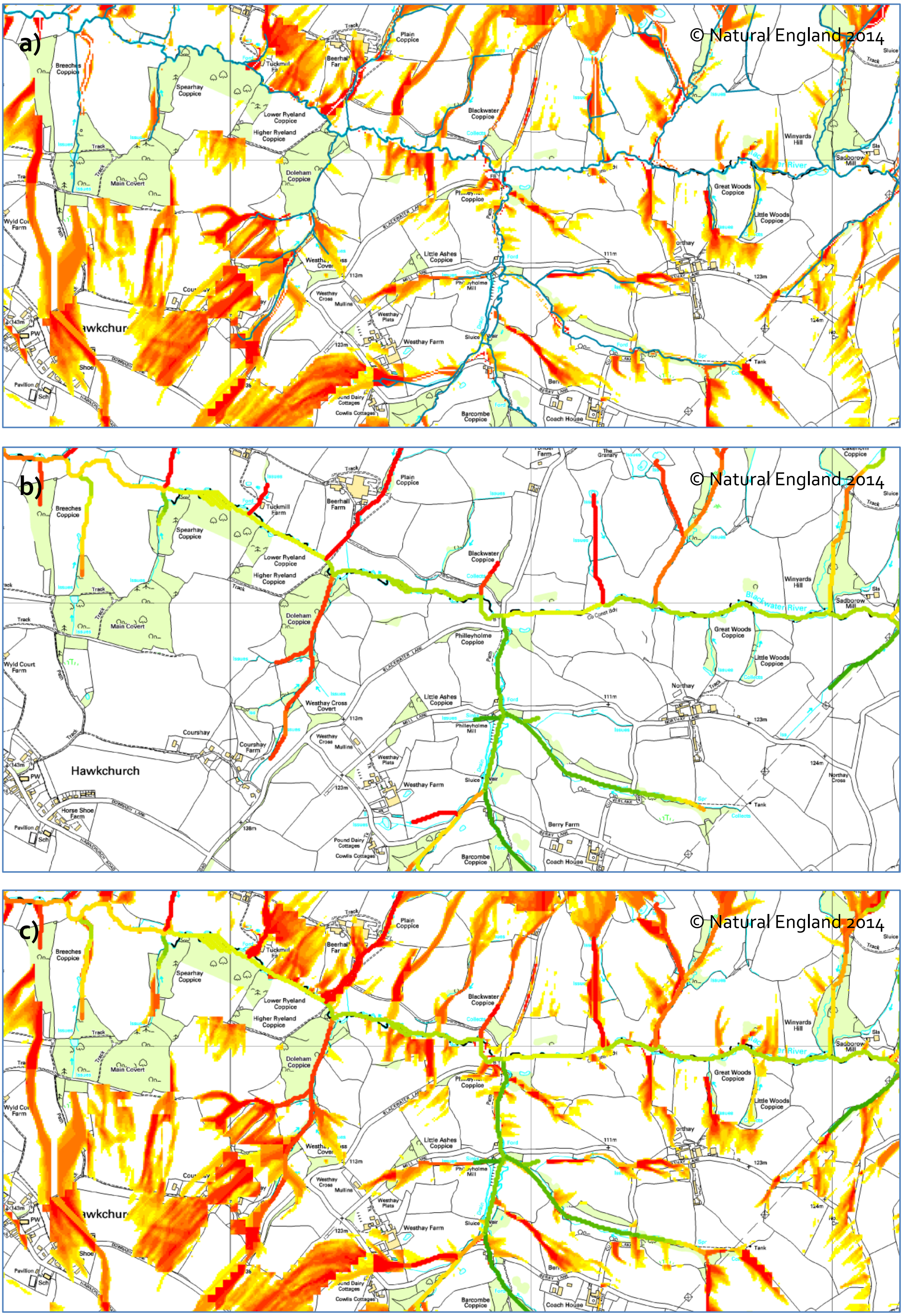

Figure 8: Maps showing an area of the Blackwater River catchment in focus, illustrating fine sediment erosion risk (a), in-channel sediment concentration risk (b) and both erosion risk and in-channel concentration risk (c).

5.3. Comparison between catchments

SCIMAP is unable to run for the larger catchment areas using the high resolution (5m) data. This necessitates dividing the larger upstream catchments into a number of small sub-catchment units. It is important to note that each run of SCIMAP models relative erosion risk and in-channel concentrations within the defined catchment area, where riskiness is scored between 0 and 1. The results are therefore not directly comparable between different catchments or sub-catchments.

Where particularly large catchments have been divided into a number of smaller sub-catchments, SCIMAP was run using coarser resolution DEM data. This enabled erosion risk and in-channel concentration risk to be modelled across much larger areas, giving a wider catchment overview. This overview complements the finer resolution erosion risk maps based on the 5m DEM data which are able to pick out the influence of topographical features that influence the hydrological connectivity.

7. Conclusion

Morphology, land-use and hydrological connectivity across a landscape all influence the risk of erosion and the subsequent mobilisation and transfer of fine sediments from the land surface to sensitive receiving waters.

The maps provided in this report, generated using the SCIMAP fine sediment risk modelling framework, provide a robust and consistent assessment of potential sediment sources and elevated in-channel sediment concentrations in catchment upstream of SAC where elevated sediment loads and or concentrations is having a deleterious impact on the conservation status. These outputs will provide a useful resource to help target advice and mitigation to higher risk areas and thus support delivery of measures to reduce loads deliver to, and thus in-stream concentrations in, designated sites and provide valuable data and evidence to inform the diffuse pollution action plans.

8. Appendix

8.1. Inventory of SCIMAP outputs

Folder Number	Folder Name	SSSI Name	Catchment Code	File Name	File Type	Resolution (metres)
01	Ant Broads and Marshes	Ant Broads and Marshes	An	AnChanConc	Shapefile	5
				AnEroRisk	Ascii	5
				AnNetInd	Ascii	5
02	Aqualate Mere	Aqualate Mere	Aq	AqChanConc	Shapefile	5
				AqEroRisk	Ascii	5
				AqNetInd	Ascii	5
03	Avon Valley	Avon Valley	Av1	AvChanConc	Shapefile	5
				AvEroRisk	Ascii	5
				AvNetInd	Ascii	5
			Av2	Av2ChanConc	Shapefile	5
				Av2EroRisk	Ascii	5
				Av2NetInd	Ascii	5
			Av3	Av3ChanConc	Shapefile	5
				Av3EroRisk	Ascii	5
				Av3NetInd	Ascii	5
			Av4	Av4ChanConc	Shapefile	5
				Av4EroRisk	Ascii	5
				Av4NetInd	Ascii	5
			Av5	Av5ChanConc	Shapefile	5
				Av5EroRisk	Ascii	5
				Av5NetInd	Ascii	5
			Av6	Av6ChanConc	Shapefile	5
				Av6EroRisk	Ascii	5
				Av6NetInd	Ascii	5
			Av7	Av7ChanConc	Shapefile	5
				Av7EroRisk	Ascii	5
				Av7NetInd	Ascii	5
			Av8	Av8ChanConc	Shapefile	5
				Av8EroRisk	Ascii	5
				Av8NetInd	Ascii	5
			Av9	Av9ChanConc	Shapefile	5
				Av9EroRisk	Ascii	5
				Av9NetInd	Ascii	5
			Av10	Av10ChanConc	Shapefile	5
				Av10EroRisk	Ascii	5
				Av10NetInd	Ascii	5
			Av11	Av11ChanConc	Shapefile	5
				Av11EroRisk	Ascii	5
				Av11NetInd	Ascii	5
			Av12	Av12ChanConc	Shapefile	5
				Av12EroRisk	Ascii	5
				Av12NetInd	Ascii	5

Folder Number	Folder Name	SSSI Name	Catchment Code	File Name	File Type	Resolution (metres)
			Av13	Av13ChanConc	Shapefile	5
				Av13EroRisk	Ascii	5
				Av13NetInd	Ascii	5
			Av14	Av14ChanConc	Shapefile	5
				Av14EroRisk	Ascii	5
				Av14NetInd	Ascii	5
			Av15	Av15ChanConc	Shapefile	5
				Av15EroRisk	Ascii	5
				Av15NetInd	Ascii	5
			Av16	Av16ChanConc	Shapefile	5
				Av16EroRisk	Ascii	5
				Av16NetInd	Ascii	5
03	Avon Valley 20m	Avon Valley	Av	Av16ChanConc	Shapefile	20
				Av16EroRisk	Ascii	20
				Av16NetInd	Ascii	20
04	Barnby Broad and Marshes	Barnby Broad and Marshes	Ba1	Ba1ChanConc	Shapefile	5
				Ba1EroRisk	Ascii	5
				Ba1NetInd	Ascii	5
			Ba2	Ba2ChanConc	Shapefile	5
				Ba2EroRisk	Ascii	5
				Ba2NetInd	Ascii	5
			Ba3	Ba3ChanConc	Shapefile	5
				Ba3EroRisk	Ascii	5
				Ba3NetInd	Ascii	5
			Ba4	Ba4ChanConc	Shapefile	5
				Ba4EroRisk	Ascii	5
				Ba4NetInd	Ascii	5
04	Barnby Broad and Marshes 10m	Barnby Broad and Marshes	Ba	BaChanConc	Shapefile	10
				BaEroRisk	Ascii	10
				BaNetInd	Ascii	10
05 & 20	Bassenthwaite Lake, River Derwent and Tribs	Bassenthwaite Lake River Derwent and Tributaries	RDeTr01	RDeTr01ChanConc	Shapefile	5
				RDeTr01EroRisk	Ascii	5
				RDeTr01NetInd	Ascii	5
			RDeTr02	RDeTr02ChanConc	Shapefile	5
				RDeTr02EroRisk	Ascii	5
				RDeTr02NetInd	Ascii	5
			RDeTr03	RDeTr03ChanConc	Shapefile	5
				RDeTr03EroRisk	Ascii	5
				RDeTr03NetInd	Ascii	5
			RDeTr04	RDeTr04ChanConc	Shapefile	5
				RDeTr04EroRisk	Ascii	5
				RDeTr04NetInd	Ascii	5
			RDeTr05	RDeTr05ChanConc	Shapefile	5
				RDeTr05EroRisk	Ascii	5
				RDeTr05NetInd	Ascii	5

Folder Number	Folder Name	SSSI Name	Catchment Code	File Name	File Type	Resolution (metres)
05 & 20	Bassenthwaite Lake, River Derwent and Tribs 15m	Bassenthwaite Lake River Derwent and Tributaries	BaRDe	BaRDeChanConc	Shapefile	15
				BaRDeEroRisk	Ascii	15
				BaRDeNetInd	Ascii	15
06	Bure Broads and Marshes	Bure Broads and Marshes	Bu1	Bu1ChanConc	Shapefile	5
				Bu1EroRisk	Ascii	5
				Bu1NetInd	Ascii	5
			Bu2	Bu2ChanConc	Shapefile	5
				Bu2EroRisk	Ascii	5
				Bu2NetInd	Ascii	5
			Bu3	Bu3ChanConc	Shapefile	5
				Bu3EroRisk	Ascii	5
				Bu3NetInd	Ascii	5
06	Bure Broads and Marshes 10m	Bure Broads and Marshes	Bu	BuChanConc	Shapefile	10
				BuEroRisk	Ascii	10
				BuNetInd	Ascii	10
07	Chesil and Fleet	Chesil and Fleet	Ch	ChChanConc	Shapefile	5
				ChEroRisk	Ascii	5
				ChNetInd	Ascii	5
08	Hawes Water	Hawes Water	Ha	HaChanConc	Shapefile	5
				HaEroRisk	Ascii	5
				HaNetInd	Ascii	5
09	Hornsea Mere	Hornsea Mere	Ho	HoChanConc	Shapefile	5
				HoEroRisk	Ascii	5
				HoNetInd	Ascii	5
10	Leighton Moss	Leighton Moss	Le	LeChanConc	Shapefile	5
				LeEroRisk	Ascii	5
				LeNetInd	Ascii	5
11 & 28	River Tweed, Till and Lower Tweed and Whiteadder	River Tweed, Till Catchment Lower Tweed and Whiteadder	LoTw1	LoTw1ChanConc	Shapefile	5
				LoTw1EroRisk	Ascii	5
				LoTw1NetInd	Ascii	5
			LoTw2	LoTw2ChanConc	Shapefile	5
				LoTw2EroRisk	Ascii	5
				LoTw2NetInd	Ascii	5
			LoTw3	LoTw3ChanConc	Shapefile	5
				LoTw3EroRisk	Ascii	5
				LoTw3NetInd	Ascii	5
			RTwTi1	RTwTi1ChanConc	Shapefile	5
				RTwTi1NetInd	Ascii	5
				RTwTi1ChanConc	Ascii	5
			RTwTi2	RTwTi2ChanConc	Shapefile	5
				RTwTi2NetInd	Ascii	5
				RTwTi2ChanConc	Ascii	5
			RTwTi3	RTwTi3ChanConc	Shapefile	5
				RTwTi3NetInd	Ascii	5
				RTwTi3ChanConc	Ascii	5

Folder Number	Folder Name	SSSI Name	Catchment Code	File Name	File Type	Resolution (metres)
			RTwTi4	RTwTi4ChanConc	Shapefile	5
				RTwTi4NetInd	Ascii	5
				RTwTi4ChanConc	Ascii	5
			RTwTi5	RTwTi5ChanConc	Shapefile	5
				RTwTi5NetInd	Ascii	5
				RTwTi5ChanConc	Ascii	5
11 & 28	River Tweed, Till and Lower Tweed and Whiteadder 15m	River Tweed, Till Catchment Lower Tweed and Whiteadder	RTw	RTwChanConc	Shapefile	15
				RTwEroRisk	Ascii	15
				RTwNetInd	Ascii	15
12	Marazion Marsh	Marazion Marsh	Ma	MaChanConc	Shapefile	5
				MaEroRisk	Ascii	5
				MaNetInd	Ascii	5
13 & 14	Portholme and Ouse Washes	Portholme Ouse Washes	Ou1	Ou1ChanConc	Shapefile	5
				Ou1EroRisk	Ascii	5
				Ou1NetInd	Ascii	5
			Ou2	Ou2ChanConc	Shapefile	5
				Ou2EroRisk	Ascii	5
				Ou2NetInd	Ascii	5
			Ou3	Ou3ChanConc	Shapefile	5
				Ou3EroRisk	Ascii	5
				Ou3NetInd	Ascii	5
			Ou4	Ou4ChanConc	Shapefile	5
				Ou4EroRisk	Ascii	5
				Ou4NetInd	Ascii	5
			Ou5	Ou5ChanConc	Shapefile	5
				Ou5EroRisk	Ascii	5
				Ou5NetInd	Ascii	5
			Ou6	Ou6ChanConc	Shapefile	5
				Ou6EroRisk	Ascii	5
				Ou6NetInd	Ascii	5
			Ou7	Ou7ChanConc	Shapefile	5
				Ou7EroRisk	Ascii	5
				Ou7NetInd	Ascii	5
			Ou8	Ou8ChanConc	Shapefile	5
				Ou8EroRisk	Ascii	5
				Ou8NetInd	Ascii	5
			Ou9	Ou9ChanConc	Shapefile	5
				Ou9EroRisk	Ascii	5
				Ou9NetInd	Ascii	5
			Ou10	Ou10ChanConc	Shapefile	5
				Ou10EroRisk	Ascii	5
				Ou10NetInd	Ascii	5
			Ou11	Ou11ChanConc	Shapefile	5
				Ou11EroRisk	Ascii	5
				Ou11NetInd	Ascii	5

Folder Number	Folder Name	SSSI Name	Catchment Code	File Name	File Type	Resolution (metres)
			Ou12	Ou12ChanConc	Shapefile	5
				Ou12EroRisk	Ascii	5
				Ou12NetInd	Ascii	5
			Ou13	Ou13ChanConc	Shapefile	5
				Ou13EroRisk	Ascii	5
				Ou13NetInd	Ascii	5
			Ou14	Ou14ChanConc	Shapefile	5
				Ou14EroRisk	Ascii	5
				Ou14NetInd	Ascii	5
			Ou15	Ou15ChanConc	Shapefile	5
				Ou15EroRisk	Ascii	5
				Ou15NetInd	Ascii	5
			Ou16	Ou16ChanConc	Shapefile	5
				Ou16EroRisk	Ascii	5
				Ou16NetInd	Ascii	5
			Ou17	Ou17ChanConc	Shapefile	5
				Ou17EroRisk	Ascii	5
				Ou17NetInd	Ascii	5
			Ou18	Ou18ChanConc	Shapefile	5
				Ou18EroRisk	Ascii	5
				Ou18NetInd	Ascii	5
			Ou19	Ou19ChanConc	Shapefile	5
				Ou19EroRisk	Ascii	5
				Ou19NetInd	Ascii	5
			Ou20	Ou20ChanConc	Shapefile	5
				Ou20EroRisk	Ascii	5
				Ou20NetInd	Ascii	5
			Ou21	Ou21ChanConc	Shapefile	5
				Ou21EroRisk	Ascii	5
				Ou21NetInd	Ascii	5
			Ou22	Ou22ChanConc	Shapefile	5
				Ou22EroRisk	Ascii	5
				Ou22NetInd	Ascii	5
			Ou23	Ou23ChanConc	Shapefile	5
				Ou23EroRisk	Ascii	5
				Ou23NetInd	Ascii	5
			Ou24	Ou24ChanConc	Shapefile	5
				Ou24EroRisk	Ascii	5
				Ou24NetInd	Ascii	5
			Ou25	Ou25ChanConc	Shapefile	5
				Ou25EroRisk	Ascii	5
				Ou25NetInd	Ascii	5
			Ou26	Ou26ChanConc	Shapefile	5
				Ou26EroRisk	Ascii	5
				Ou26NetInd	Ascii	5

Folder Number	Folder Name	SSSI Name	Catchment Code	File Name	File Type	Resolution (metres)
13 & 14	Portholme and Ouse Washes 25m	Portholme Ouse Washes	Ou	OuChanConc	Shapefile	25
				OuEroRisk	Ascii	25
				OuNetInd	Ascii	25
15	River Axe	River Axe	RAx1	RAx1ChanConc	Shapefile	5
				RAx1EroRisk	Ascii	5
				RAx1NetInd	Ascii	5
			RAx2	RAx2ChanConc	Shapefile	5
				RAx2EroRisk	Ascii	5
				RAx2NetInd	Ascii	5
			RAx3	RAx3ChanConc	Shapefile	5
				RAx3EroRisk	Ascii	5
				RAx3NetInd	Ascii	5
15	River Axe 10m	River Axe	RAx	RAxChanConc	Shapefile	10
				RAxEroRisk	Ascii	10
				RAxNetInd	Ascii	10
16	River Beult	River Beult	RBe01	RBe01ChanConc	Shapefile	5
				RBe01EroRisk	Ascii	5
				RBe01NetInd	Ascii	5
			RBe02	RBe02ChanConc	Shapefile	5
				RBe02EroRisk	Ascii	5
				RBe02NetInd	Ascii	5
16	River Beult 10m	River Beult	RBe	RBeChanConc	Shapefile	10
				RBeEroRisk	Ascii	10
				RBeNetInd	Ascii	10
17	River Camel Valley and Tribs	River Camel Valley and Tributaries	RCa1	RCa1ChanConc	Shapefile	5
				RCa1EroRisk	Ascii	5
				RCa1NetInd	Ascii	5
			RCa2	RCa2ChanConc	Shapefile	5
				RCa2EroRisk	Ascii	5
				RCa2NetInd	Ascii	5
			RCa3	RCa3ChanConc	Shapefile	5
				RCa3EroRisk	Ascii	5
				RCa3NetInd	Ascii	5
17	River Camel Valley and Tribs 10m	River Camel Valley and Tributaries	RCa	RCaChanConc	Shapefile	10
				RCaEroRisk	Ascii	10
				RCaNetInd	Ascii	10
19	River Derwent	River Derwent	RDer01	RDer01ChanConc	Shapefile	5
				RDer01EroRisk	Ascii	5
				RDer01NetInd	Ascii	5
			RDer02	RDer02ChanConc	Shapefile	5
				RDer02EroRisk	Ascii	5
				RDer02NetInd	Ascii	5
			RDer03	RDer03ChanConc	Shapefile	5
				RDer03EroRisk	Ascii	5
				RDer03NetInd	Ascii	5

Folder Number	Folder Name	SSSI Name	Catchment Code	File Name	File Type	Resolution (metres)
			RDer04	RDer04ChanConc	Shapefile	5
				RDer04EroRisk	Ascii	5
				RDer04NetInd	Ascii	5
			RDer05	RDer05ChanConc	Shapefile	5
				RDer05EroRisk	Ascii	5
				RDer05NetInd	Ascii	5
			RDer06	RDer06ChanConc	Shapefile	5
				RDer06EroRisk	Ascii	5
				RDer06NetInd	Ascii	5
			RDer07	RDer07ChanConc	Shapefile	5
				RDer07EroRisk	Ascii	5
				RDer07NetInd	Ascii	5
			RDer08	RDer08ChanConc	Shapefile	5
				RDer08EroRisk	Ascii	5
				RDer08NetInd	Ascii	5
			RDer09	RDer09ChanConc	Shapefile	5
				RDer09EroRisk	Ascii	5
				RDer09NetInd	Ascii	5
			RDer10	RDer10ChanConc	Shapefile	5
				RDer10EroRisk	Ascii	5
				RDer10NetInd	Ascii	5
			RDer11	RDer11ChanConc	Shapefile	5
				RDer11EroRisk	Ascii	5
				RDer11NetInd	Ascii	5
			RDer12	RDer12ChanConc	Shapefile	5
				RDer12EroRisk	Ascii	5
				RDer12NetInd	Ascii	5
19	River Derwent 20m	River Derwent	RDer	RDerChanConc	Shapefile	20
				RDerEroRisk	Ascii	20
				RDerNetInd	Ascii	20
21	River Itchen	River Itchen	RIt1	RIt1ChanConc	Shapefile	5
				RIt1EroRisk	Ascii	5
				RIt1NetInd	Ascii	5
			RIt2	RIt2ChanConc	Shapefile	5
				RIt2EroRisk	Ascii	5
				RIt2NetInd	Ascii	5
21	River Itchen 10m	River Itchen	RIt	RItChanConc	Shapefile	10
				RItEroRisk	Ascii	10
				RItNetInd	Ascii	10
22	River Kent and Tributaries	River Kent and Tributaries	RKe	RKeChanConc	Shapefile	5
				RKeEroRisk	Ascii	5
				RKeNetInd	Ascii	5
23	River Lambourn	River Lambourn	RLa	RLaChanConc	Shapefile	5
				RLaEroRisk	Ascii	5
				RLaNetInd	Ascii	5

Folder Number	Folder Name	SSSI Name	Catchment Code	File Name	File Type	Resolution (metres)
24	River Lugg	River Lugg	RLu01	RLu01ChanConc	Shapefile	5
				RLu01EroRisk	Ascii	5
				RLu01NetInd	Ascii	5
			RLu02	RLu02ChanConc	Shapefile	5
				RLu02EroRisk	Ascii	5
				RLu02NetInd	Ascii	5
			RLu03	RLu03ChanConc	Shapefile	5
				RLu03EroRisk	Ascii	5
				RLu03NetInd	Ascii	5
			RLu04	RLu04ChanConc	Shapefile	5
				RLu04EroRisk	Ascii	5
				RLu04NetInd	Ascii	5
			RLu05	RLu05ChanConc	Shapefile	5
				RLu05EroRisk	Ascii	5
				RLu05NetInd	Ascii	5
			RLu06	RLu06ChanConc	Shapefile	5
				RLu06EroRisk	Ascii	5
				RLu06NetInd	Ascii	5
			RLu07	RLu07ChanConc	Shapefile	5
				RLu07EroRisk	Ascii	5
				RLu07NetInd	Ascii	5
24	River Lugg 15m	River Lugg	RLu	RLuChanConc	Shapefile	15
				RLuEroRisk	Ascii	15
				RLuNetInd	Ascii	15
25	River Mease	River Mease	RMe	RMeChanConc	Shapefile	5
				RMeEroRisk	Ascii	5
				RMeNetInd	Ascii	5
26	River Nar	River Nar	RNa	RNaChanConc	Shapefile	5
				RNaEroRisk	Ascii	5
				RNaNetInd	Ascii	5
27	River Test	River Test	RTe1	RTe1ChanConc	Shapefile	5
				RTe1NetInd	Ascii	5
				RTe1ChanConc	Ascii	5
			RTe2	RTe2ChanConc	Shapefile	5
				RTe2NetInd	Ascii	5
				RTe2ChanConc	Ascii	5
			RTe3	RTe3ChanConc	Shapefile	5
				RTe3NetInd	Ascii	5
				RTe3ChanConc	Ascii	5
			RTe4	RTe4ChanConc	Shapefile	5
				RTe4NetInd	Ascii	5
				RTe4ChanConc	Ascii	5
			RTe5	RTe5ChanConc	Shapefile	5
				RTe5NetInd	Ascii	5
				RTe5ChanConc	Ascii	5

Folder Number	Folder Name	SSSI Name	Catchment Code	File Name	File Type	Resolution (metres)
			RTe6	RTe6ChanConc	Shapefile	5
				RTe6NetInd	Ascii	5
				RTe6ChanConc	Ascii	5
			RTe7	RTe7ChanConc	Shapefile	5
				RTe7NetInd	Ascii	5
				RTe7ChanConc	Ascii	5
27	River Test 15m	River Test	RTe	RTeChanConc	Shapefile	15
				RTeNetInd	Ascii	15
				RTeChanConc	Ascii	15
29	The Mere, Mere	The Mere, Mere	Mer	MerChanConc	Shapefile	5
				MerNetInd	Ascii	5
				MerChanConc	Ascii	5
30	Trinity Broads	Trinity Broads	Tr	TrChanConc	Shapefile	5
				TrNetInd	Ascii	5
				TrChanConc	Ascii	5
31	Upper Thurne Broads and Marshes	Upper Thurne Broads and Marshes	UpTh	UpThChanConc	Shapefile	5
				UpThNetInd	Ascii	5
				UpThChanConc	Ascii	5

Further information & contacts

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Russell is a Chartered Scientist and Environmentalist and Consultancy Director for Westcountry Rivers Ltd. Russell has over 12 years' experience in catchment management/planning and environmental monitoring working in the public and private sector and has considerable experience in directing and managing diverse multi-discipline projects. Russell has been involved in the application and development of farm, catchment to national scale models and decision support tools since the late 1990's in both research and consultancy. His experience in integrated catchment modelling is complemented by his experience in monitoring and his detailed understanding of the relationship between temporally and spatially variable catchment processes.

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Nick is an applied ecologist and conservation biologist with 8 years of experience using spatial techniques to inform conservation strategy development and catchment management. He provides data, mapping & modelling support for all Trust projects and coordinates and manages a number of large-scale monitoring programmes currently being undertaken by the Trust.

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