Making Restoration Mainstream

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RRC Annual Conference 2022

RIVER RESTORATION CENTRE ANNUAL WORKSHOP
BRITANNIA HOTEL, MANCHESTER

P R O G R A M M E

DAY 1: 6 April 2000

10.00	Arrival and coffee	
10.40	Welcome and introduction – David Sear, University of Southampton	5 mins

Session 1 - The Tools for Effective River Restoration (10.45-12.30)
Chairman: David Sear, University of Southampton

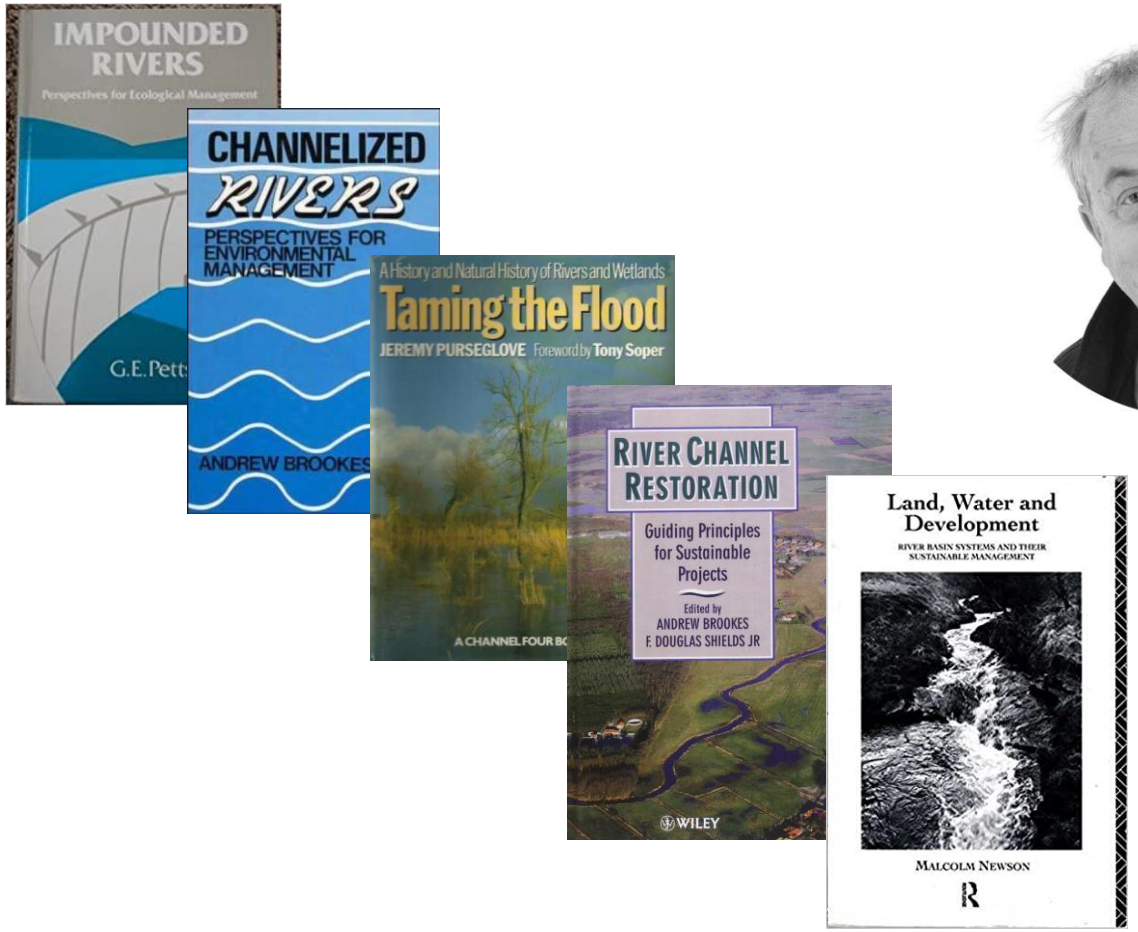
1.	**Mark Diamond (Environment Agency)** Developing tools and strategies for river restoration	20 mins
2.	**Malcolm Newson (University of Newcastle), David Sear (University of Southampton)** Geomorphological procedures and river restoration: science, survey and sustainability	15 mins
3.	**Sylvia Tunstall, Sue Tapsell (Middlesex University), Sally Eden (University of Hull)** Involving the public in urban watercourse restoration and rehabilitation	15 mins
4.	**David Telford (Environment Agency)** River restoration……and now the bad news	15 mins
5.	**Martin Janes (River Restoration Centre)** Sharing experiences, the role of the RRC and its database	15 mins
	DISCUSSION	25 mins

With thanks to the following:

Andrew Brookes , Ellen Whol, Matt Kondolf, Joe Wheaton, Malcolm Newson, Colin Thorne, Janine Castro, Peter Downs, **Marc Naura**, Martin Janes and staff at RRC Kirstie Fryirs, Jenny Wheeldon, Mark Lloyd, Lydia Burgess-Gamble, Adrian Collins, Judy England, Hervé Piegay, Richard Jeffries.

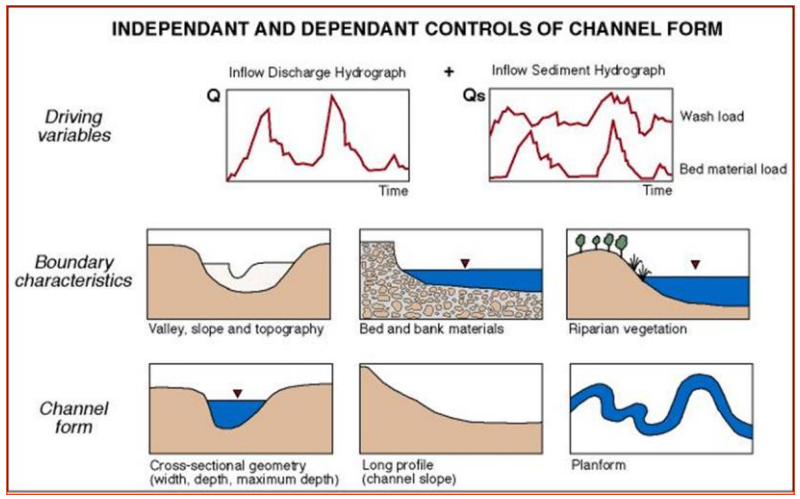
My comments are my own but some do reflect their wider input. Any errors are all mine.

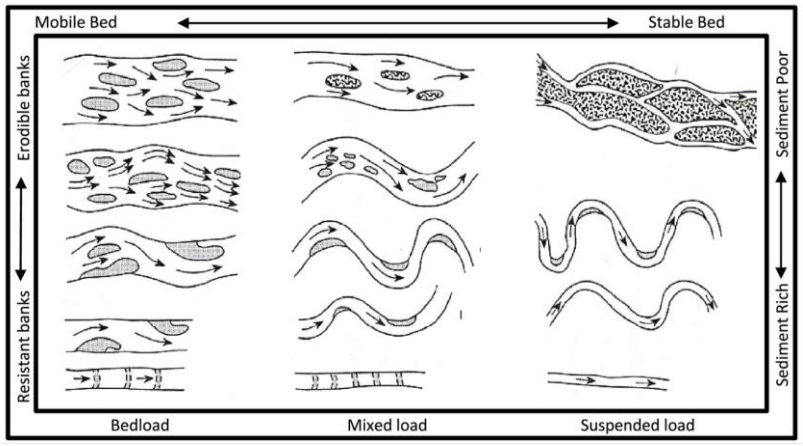
Experience influences our thinking (and biases)?



- Rivers and catchments are hugely modified
- Take a Catchment approach!
- Understand and work with their processes!
- <u>Understanding rivers means visiting them!</u>
- We can Restore them…

The changing Scientific Landscape of River Restoration



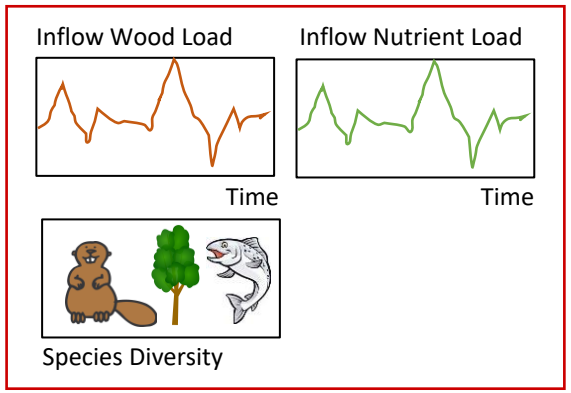


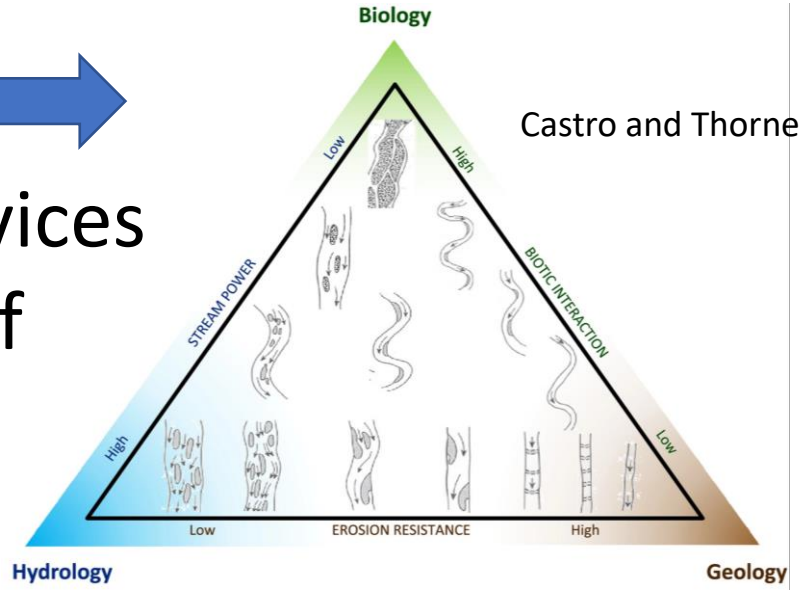
Schumm, Rust etc.

Morphology, Inorganic Sediments, Alluvial rivers and dynamic stability

Processes & Connectivity

Ecosystems & Services
New Tools – rise of Geospatial Data



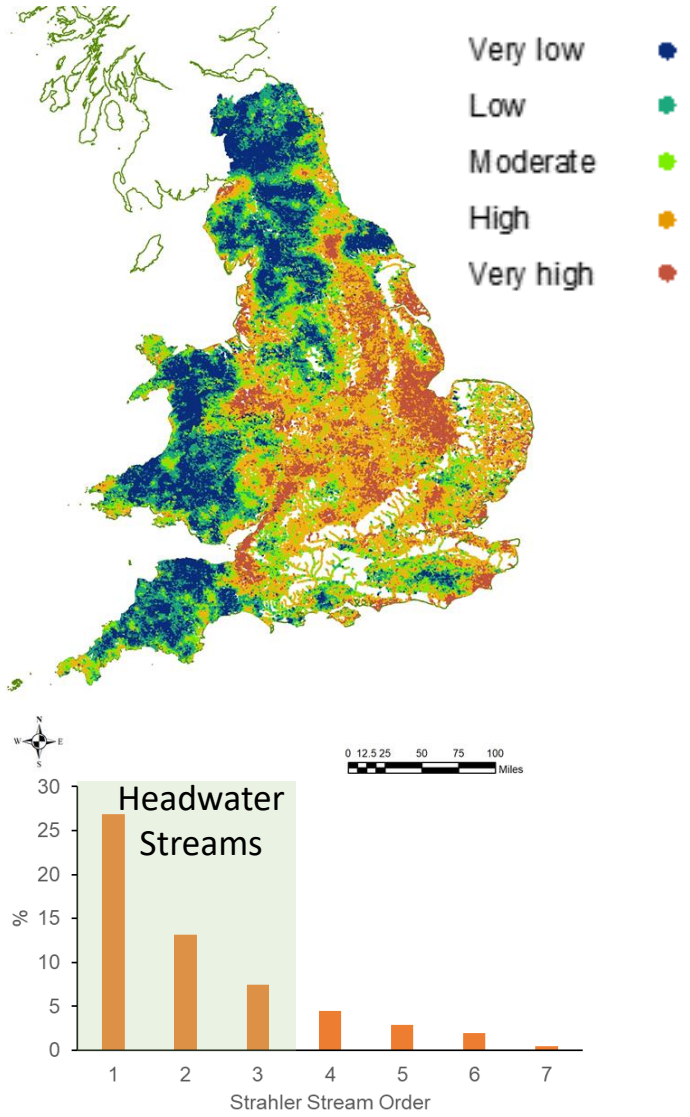


Castro and Thorne (2019)

Inorganic + Organic sediments, Wider range of channel types, Dynamic rivers, ecosystems with services

Measuring the need for River Restoration.

Morphological Damage & Disconnection from Floodplain



57% of the River network (98,000 km) in top 2 highest damage categories.

47% in non-main river **headwater** streams.

UK Parliament

Committees

UK Parliament > Business > Committees > Environmental Audit Committee > Water Quality in Rivers > Inquiry

'Chemical cocktail' of sewage, slurry and plastic polluting English rivers puts public health and nature at risk

13 January 2022

Poor water quality in English rivers is a result of chronic underinvestment and multiple failures in monitoring, governance and enforcement, the Environmental Audit Committee warns

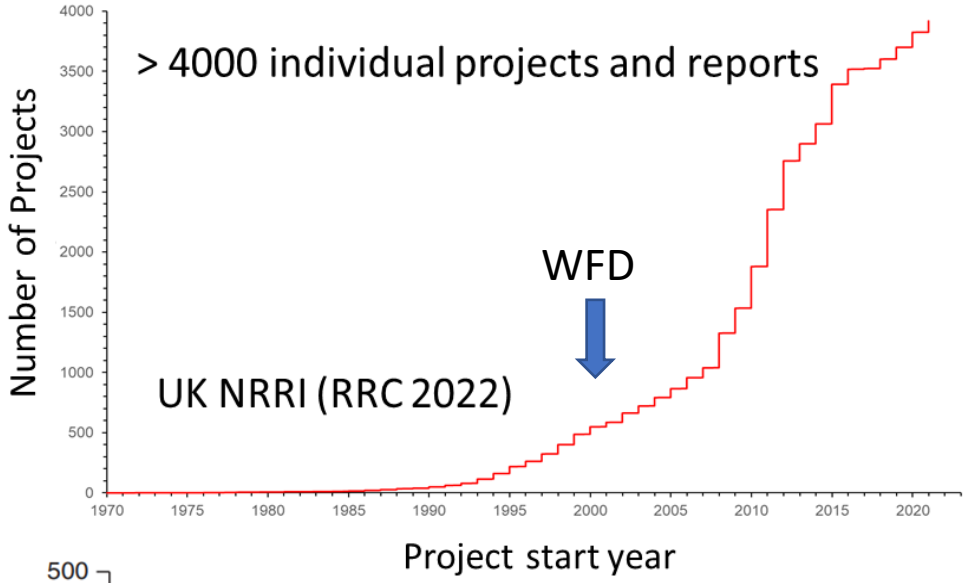
65% Floodplains have been modified mainly for agriculture

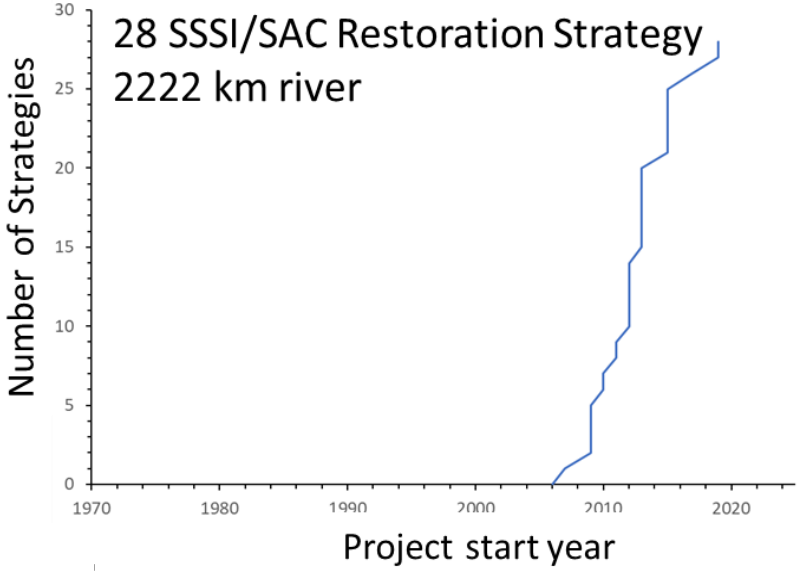
9% lost to urbanisation

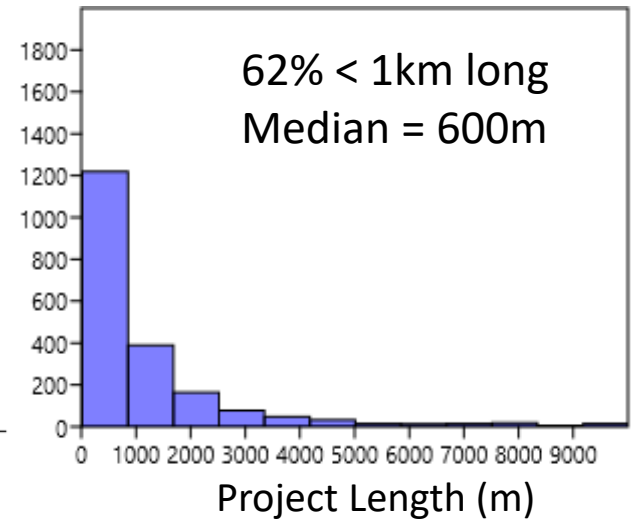
6.5% Now wooded or wetland.

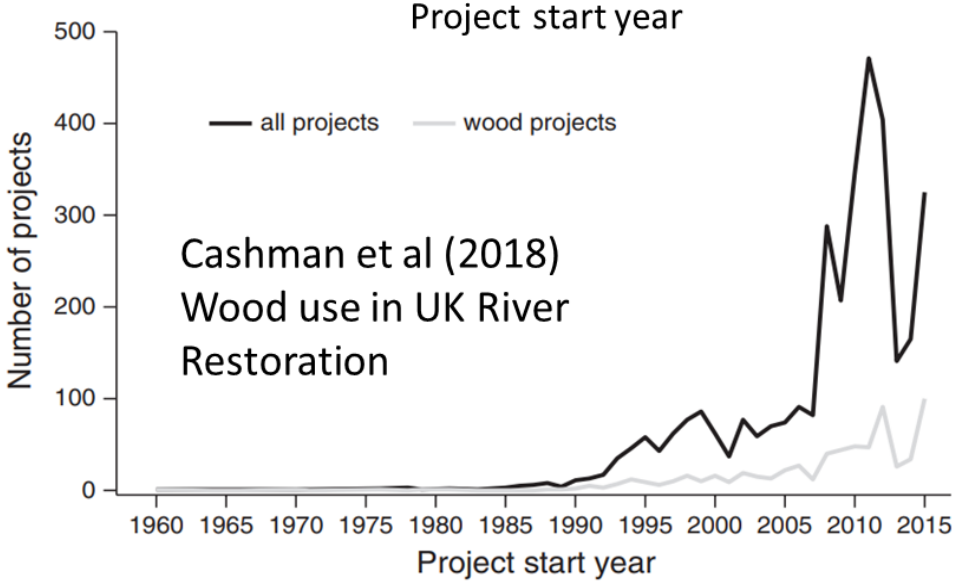
Entwhistle and Heritage (2017)

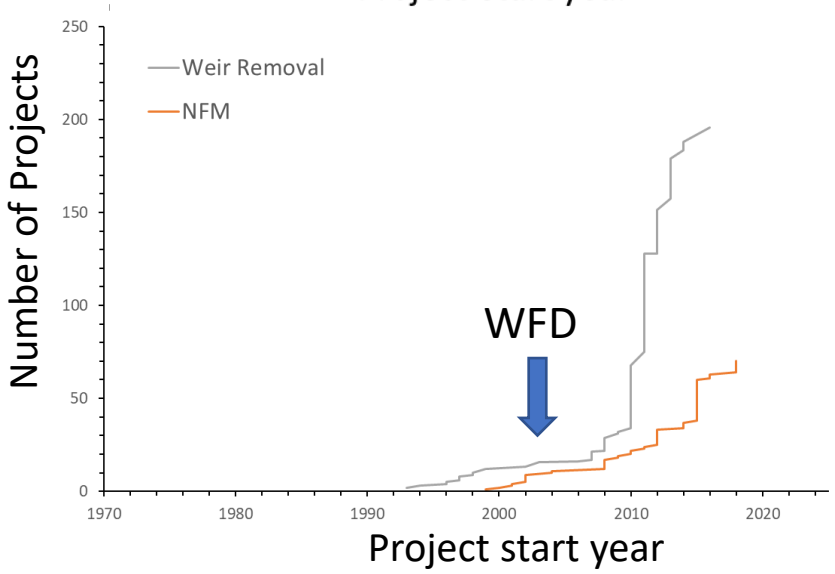
UK River Restoration: What have we achieved?



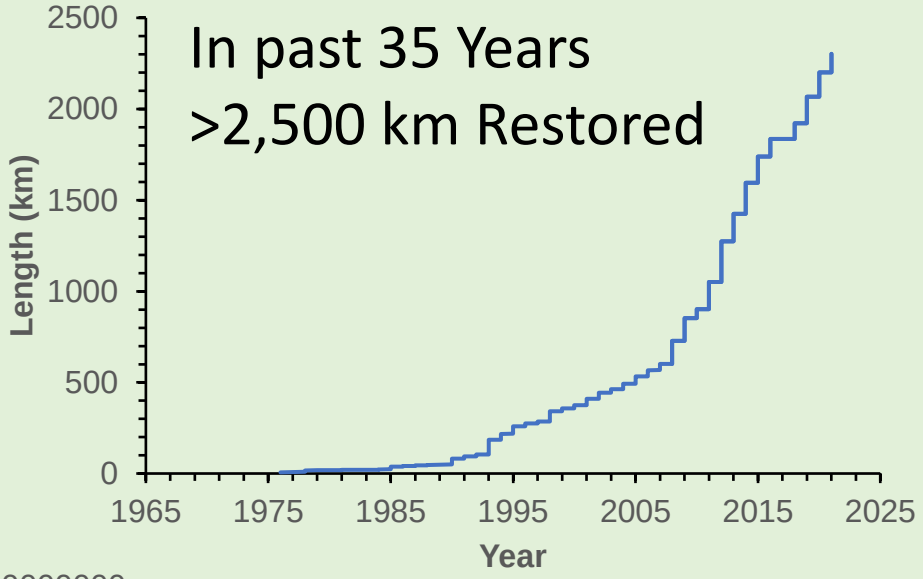


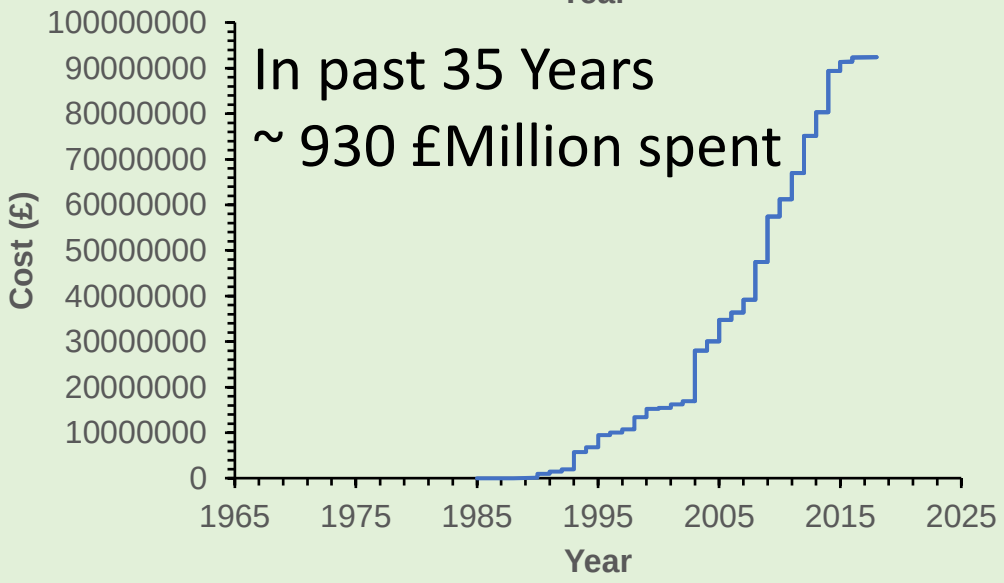


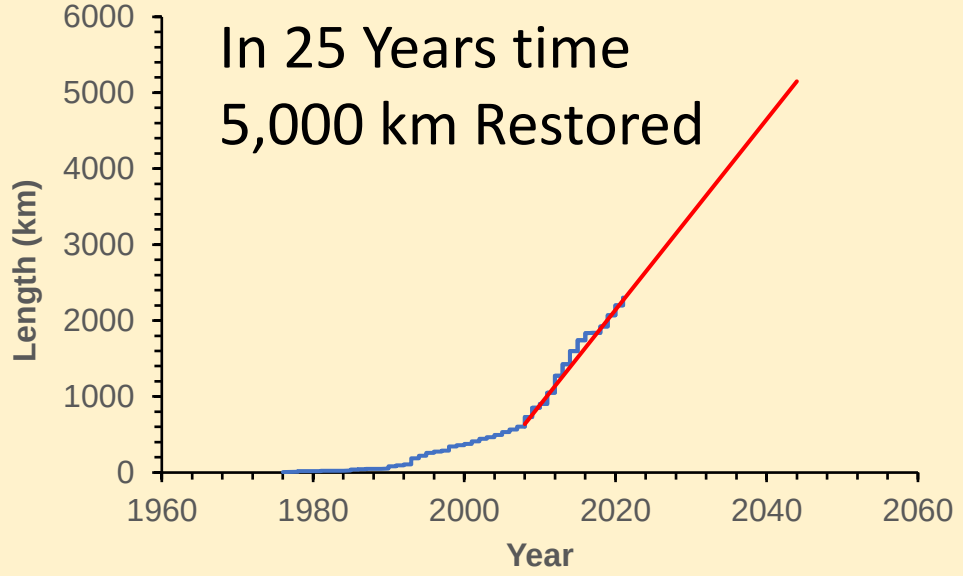




UK River Restoration: What have we achieved? (NRRI)







<u>Note:</u>

Does NOT include De-culverting, Weir removal, Fish passes, Case studies or Strategies, Bank erosion control.

Summing it up…….

Length of Physically damaged and disconnected River Network = +100,000km

Rate of Restoration = c.125 km/year ~800 years to complete
(a different planet by then!).

Cost of Restoration = c.25,000 - 80,000 £/km 3 - 8 £Billion to complete.

However you calculate it, our current techniques are expensive, small scale, and we do not really know if they are delivering what we say they will!

We need to do something very differently if we're to convince society to Mainstream it

What might “Different” look like? The view from the community….

- **Make Restoration Relevant to Key Global and Societal Challenges**
  - Climate Change, Biodiversity Crisis, Human and Ecosystem Health & Wellbeing

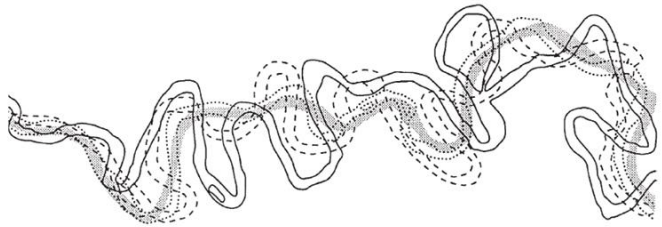
- **Scale Up, Scale out and (Dis)Connect**
  - Think Catchment!
  - Bigger and more complex is better for biota and society
  - Funding (More and sustainable)
  - Scale down energy used to do it! – Work with Natural Processes.

- **Integrate People, Policies and Programmes**
  - Education and Co-production
  - Link Land & Water Policy and Programmes and simplify number of Initiatives.

- **Move away from restoring to the past towards the concept of the ‘Working (Messy) River’ that delivers societal and ecological benefits.**

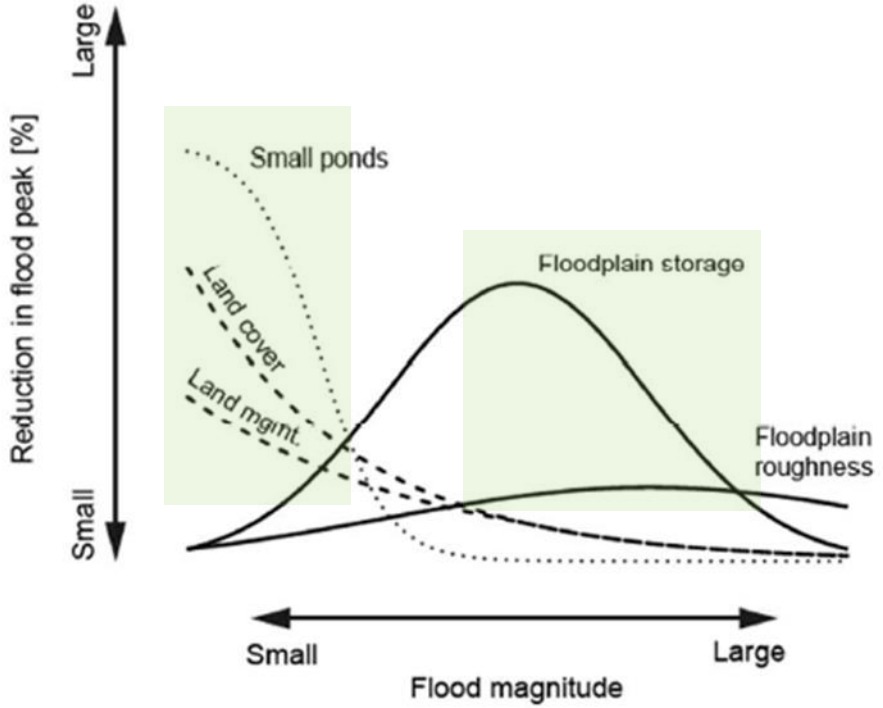
Making River Restoration Relevant: Climate Change and River Restoration

- River networks adjust in Flood Rich periods
  So give them room to do it!



- Stream Temperatures
  Riparian Trees and Shrubs do the best job and they're cheap!

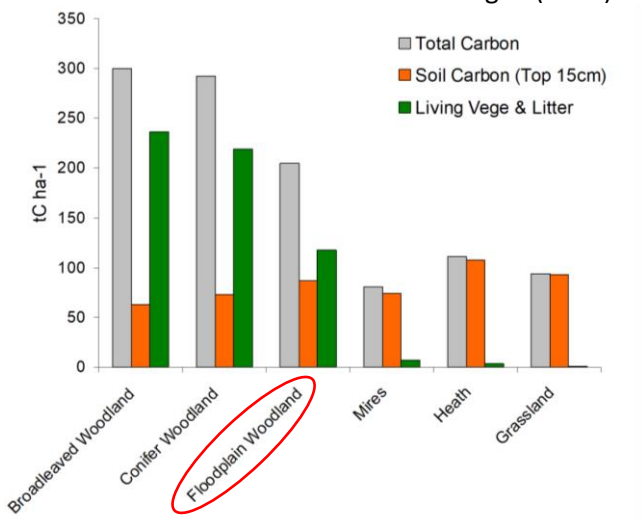
- Catchments with disconnected drainage systems, carbon rich uncompacted soils + "messy" complex Rivers with connected floodplains deliver the largest NFM benefits

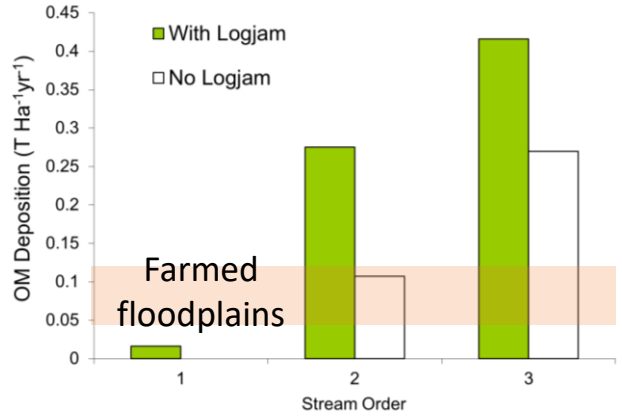


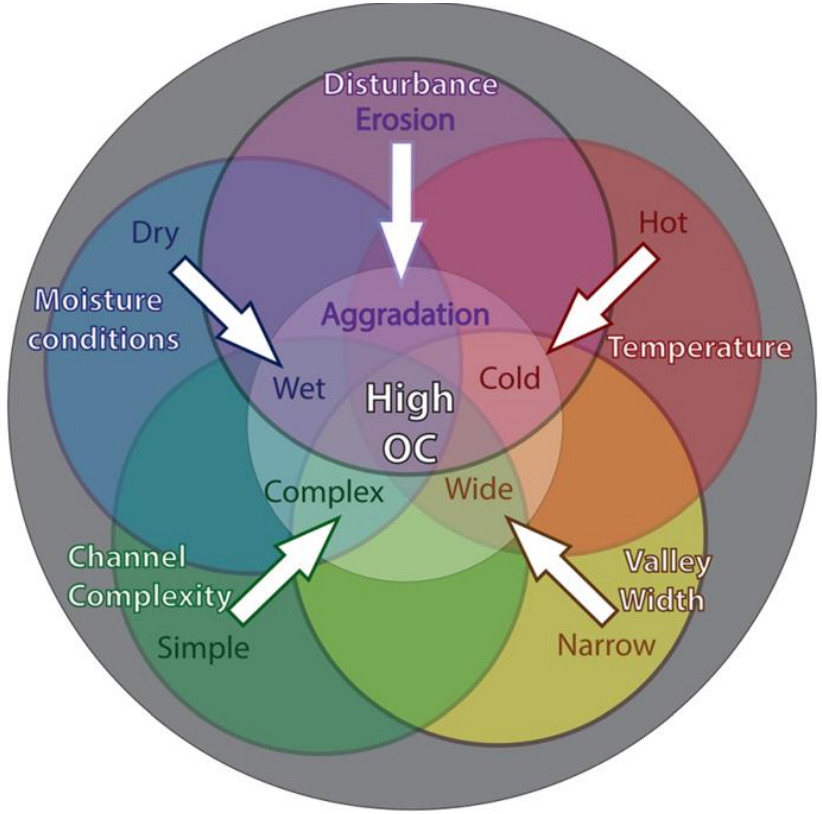
Dadson et al. (2017; in review)

Making River Restoration Relevant: Carbon Storage in Floodplains

After Pogue (2015)



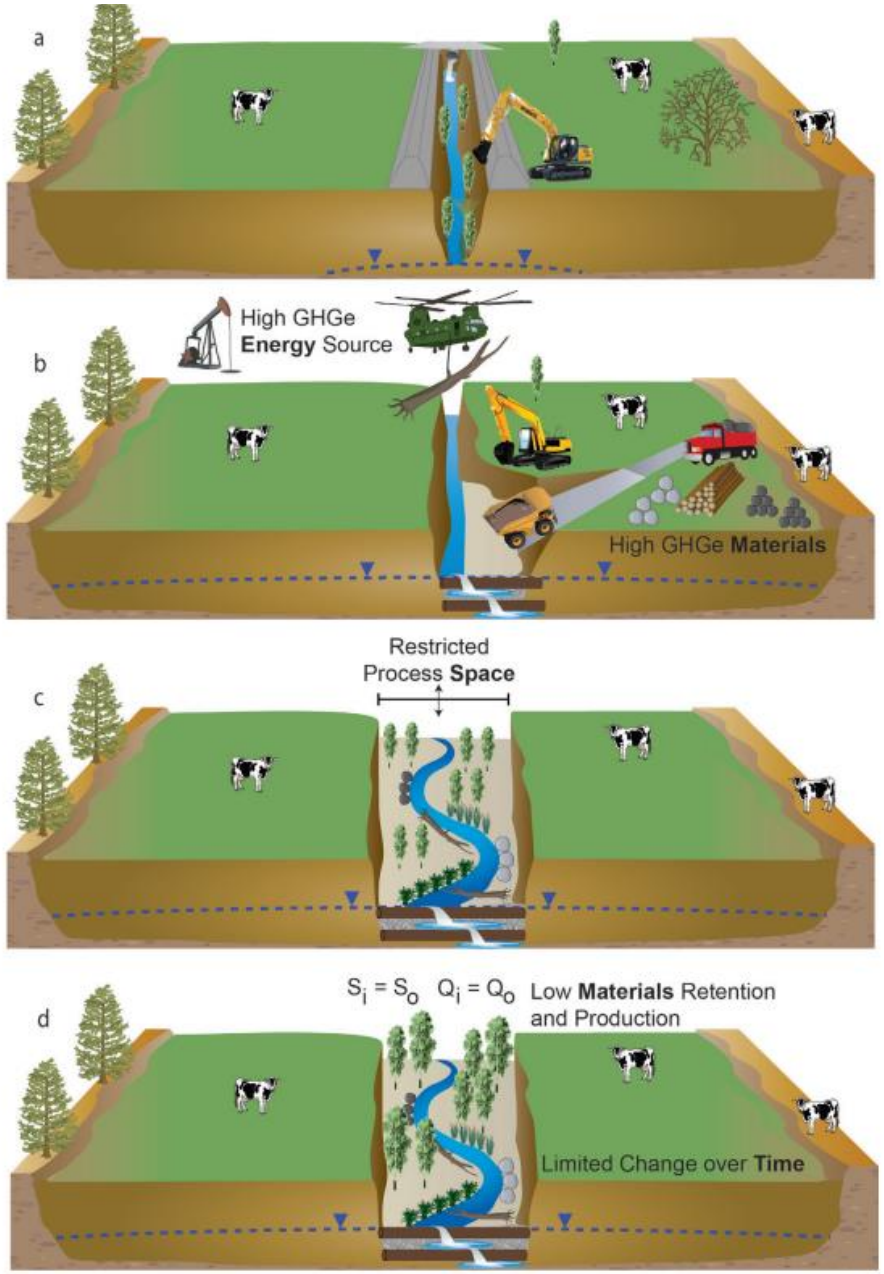




Whol et al., (2017)

Disconnected field drainage systems with carbon rich uncompacted soils + “messy” complex Rivers with connected floodplains deliver the largest C-Storage benefits.

FORM-BASED RESTORATION (1990's tech)



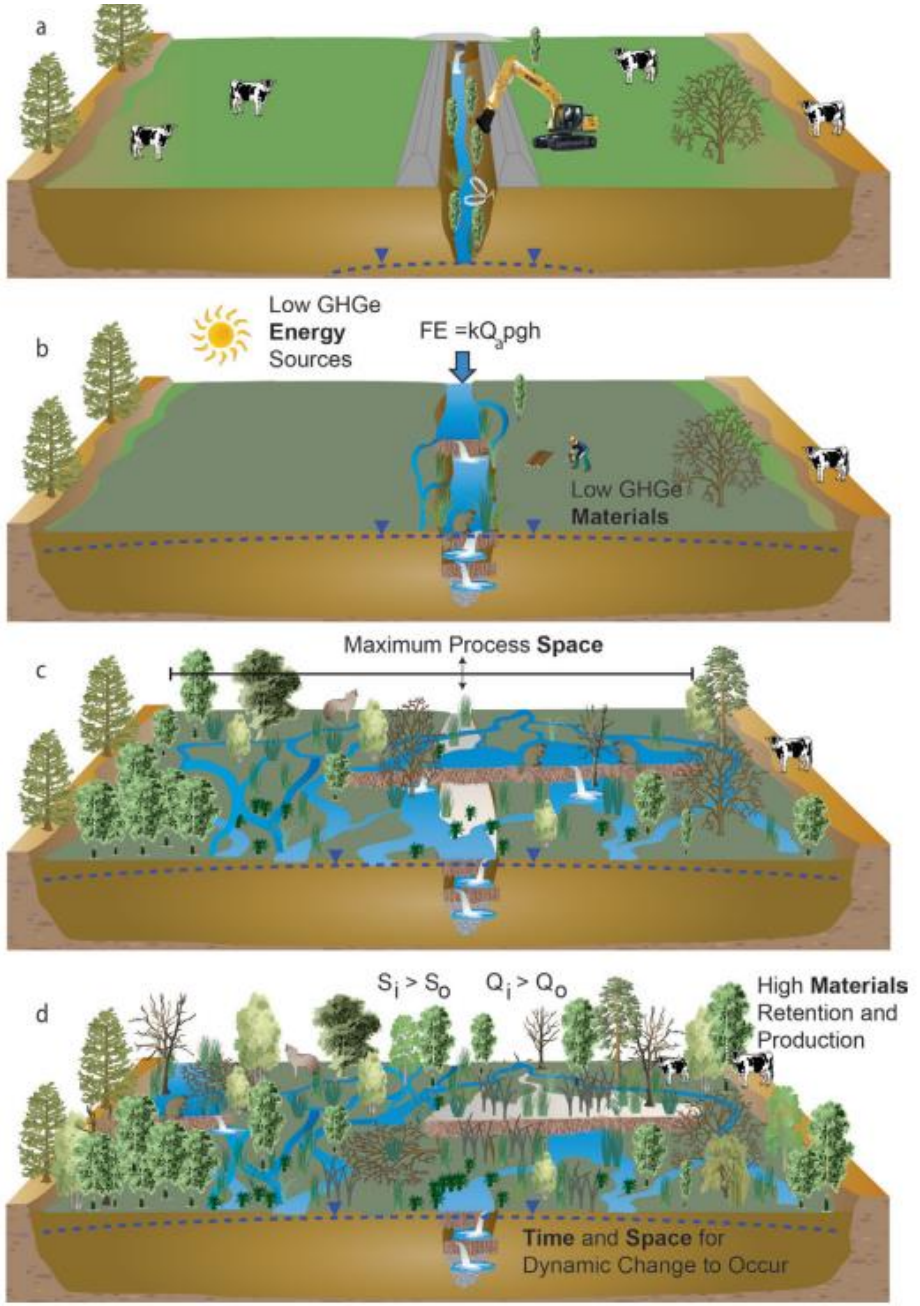
Ciotti et al., (2021)

Complexity and Connectivity Matter

>Carbon Storage
>Water Retention
> Biodiversity

But fix Catchment problems first!

PROCESS-BASED RESTORATION – 21st Century Tech



We can deliver “messy” rivers – but Scaling up?

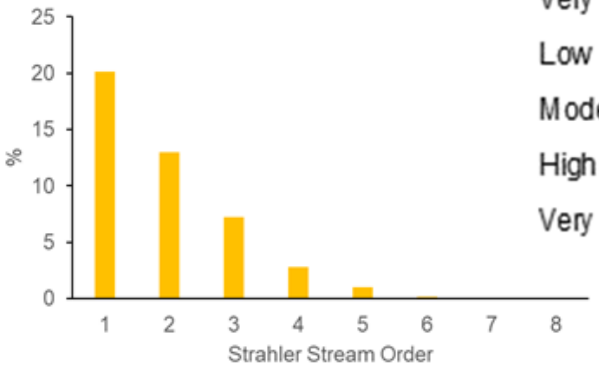
River Brede NERI (1998)

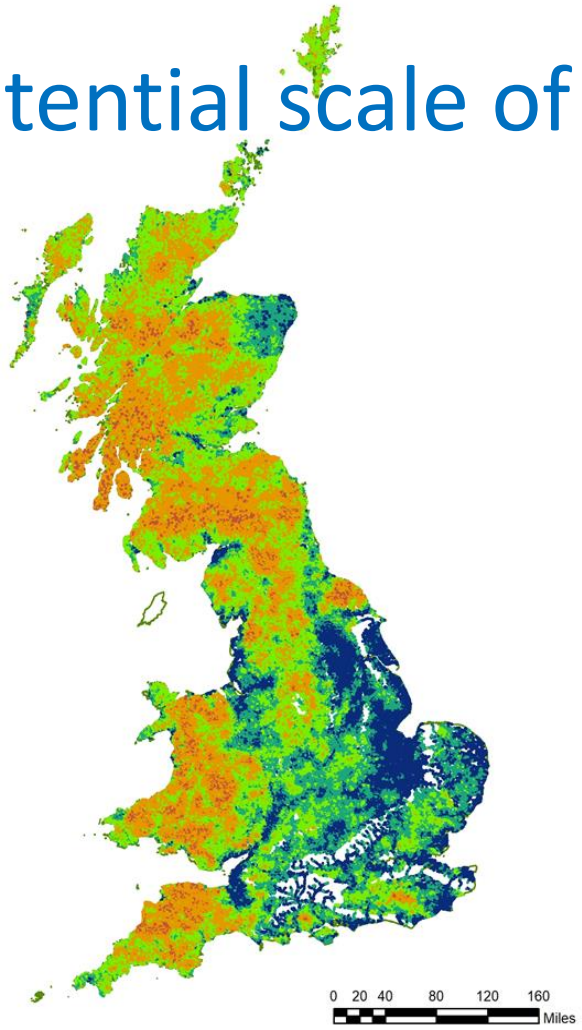
USDA – Deer Creek Story Map

River Nar
Photos Charles Rangely-Wilson

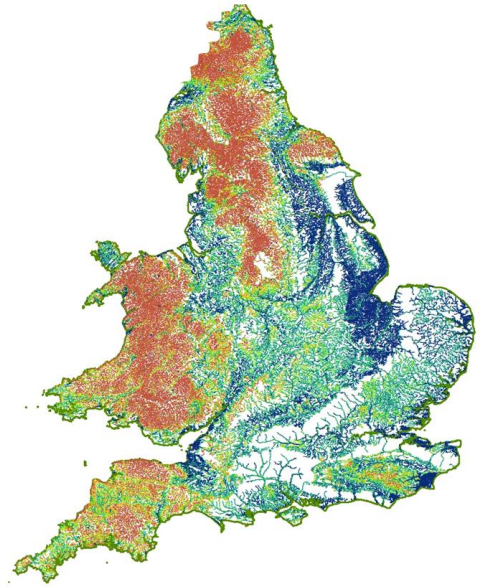
Scaling up 1: The Potential scale of Assisted Natural Recovery?

Geomorphologically Active Streams





Specific Stream Power (Wm^{-2})



Very low 0-10 W/m-sq
Low 10-35 W/m-sq
Moderate 35-100 W/m-sq
High 100-1000 W/m-sq
Very high >1000 W/m-sq

For England & Wales:

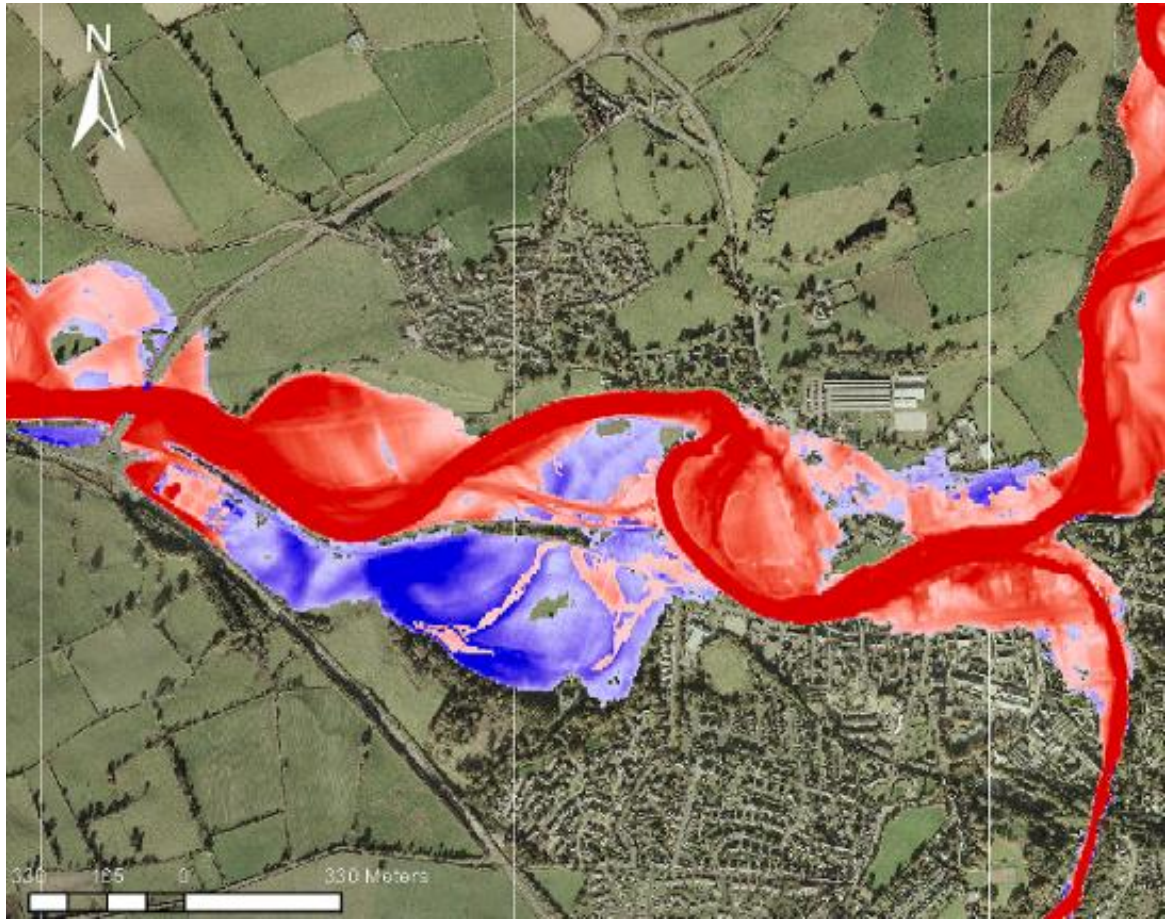
Marc Naura

22% of the most damaged rivers (37,500km) have V.High – High Geomorphic Activity.

39% (66,822km) have >35 Wm^{-2} stream power (erosional adjustment).

High potential to work with Natural processes to restore Rivers.

Scaling Up 2: Working with Floods to Deliver Restoration



Blue – Flood depth before 2009 event, Red flood peak after 2009 event.

Cumbrian Floods 2009 & 2015

Changes in channel morphology resulting from a 1:600+ year flood results in a decrease in flood risk.

Floodplains stored ~1.6 million tonnes of coarse sediment.

c.£300 Million to have done this through river restoration.

Big Floods Drive Change – Need to evaluate Benefits and Costs before reacting

Scaling Up 3: Working with Biological Communities to Deliver Restoration.

Large Wood important for Channel Adjustment and Complexity

Logjams and Beaver important for Floodplain connectivity

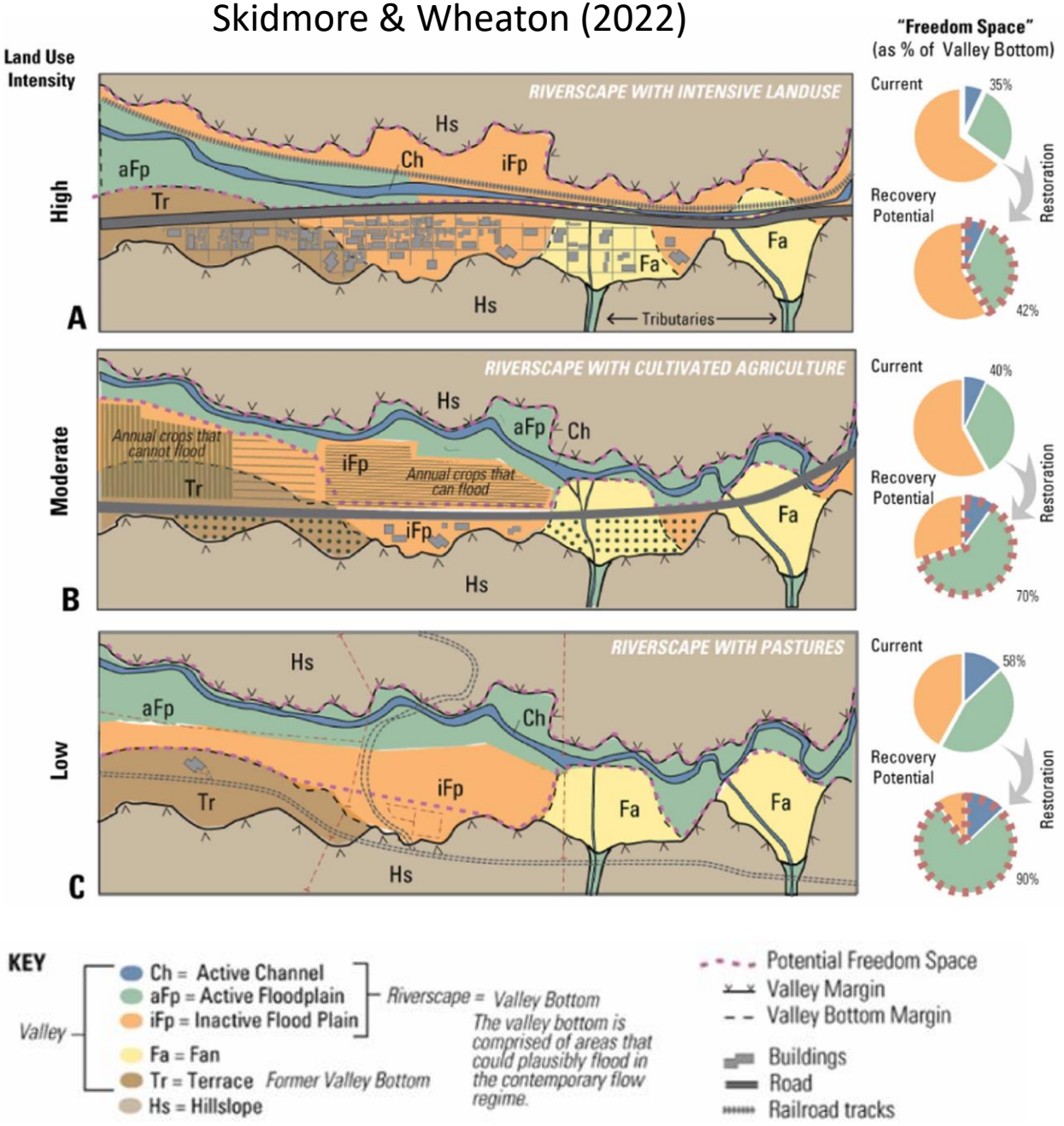
Vegetation & Fish Especially important in lowland rivers

We need to understand ESE Role in Restoration and delivery of Ecosystem Benefits to society.

How to integrate ESE's into Restoration planning and Natural Capital / ESS accounting.

Source of photos: Caddis Johnson et al 2017; Beaver The Economist; Barbel Andy Pledger

Skidmore & Wheaton (2022)



But…What about all the farmland, infrastructure and buildings?

- Integrated Land use planning framework needed.
- Take Time….7% increase is OK!
- Build Partnerships – longitudinal and lateral.
- Involve Good engineering at Risk points.
- Monitor, Learn and Communicate.

Education challenge - What Rivers do people want?

1990's

Clean, clear, 'comfortable wildness' with access and facilities particularly in urban areas – no wood in urban.

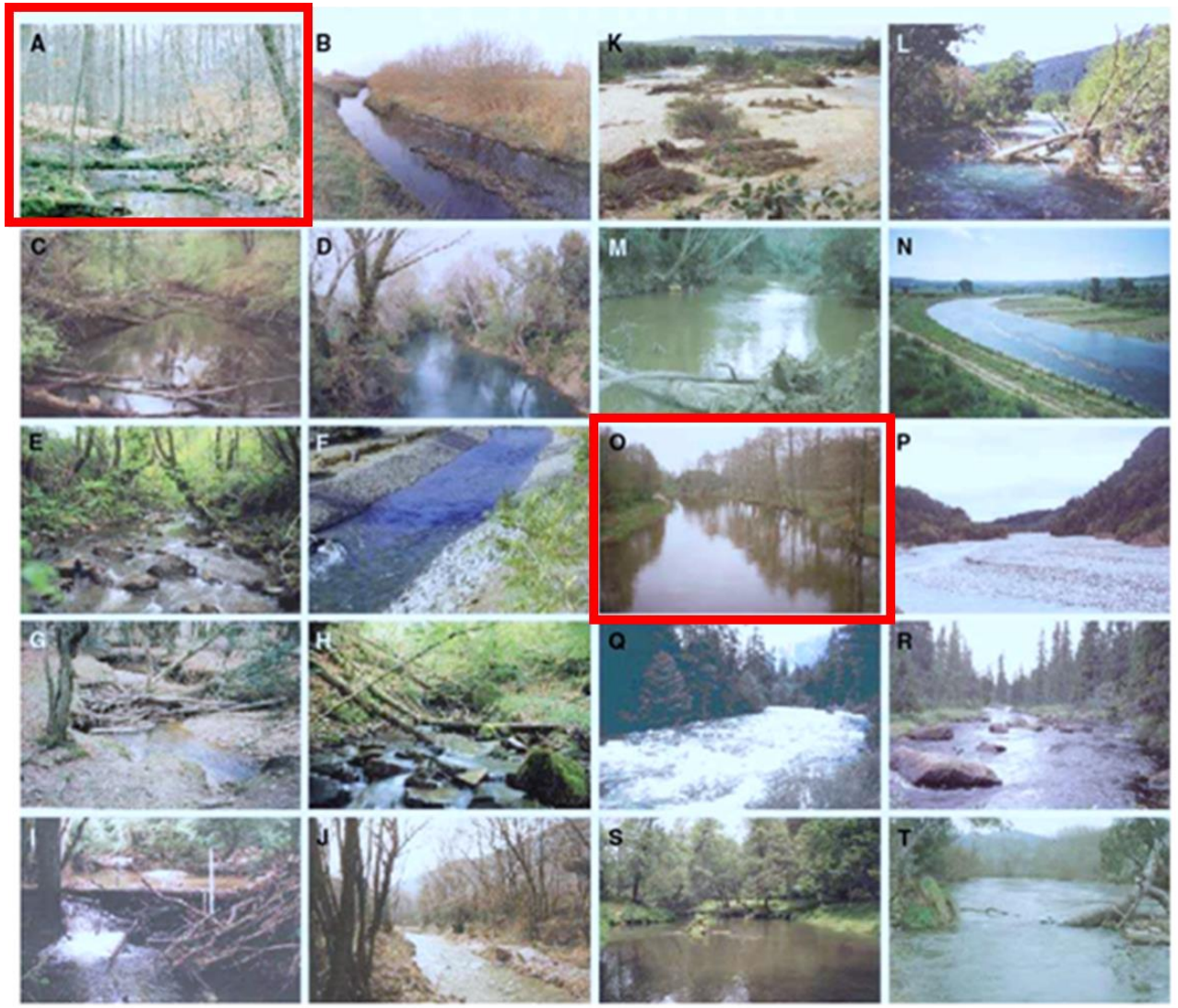
2000's

Clean, clear, accessible rivers with wooded riparian zone, wood in rural rivers but not urban.

The Education Challenge

2020's+

Messy, complex Rivers and floodplains with wood and beaver. Challenge to access, with good water quality.



Gregory & Davies (1993); Piégay et al., (2013)

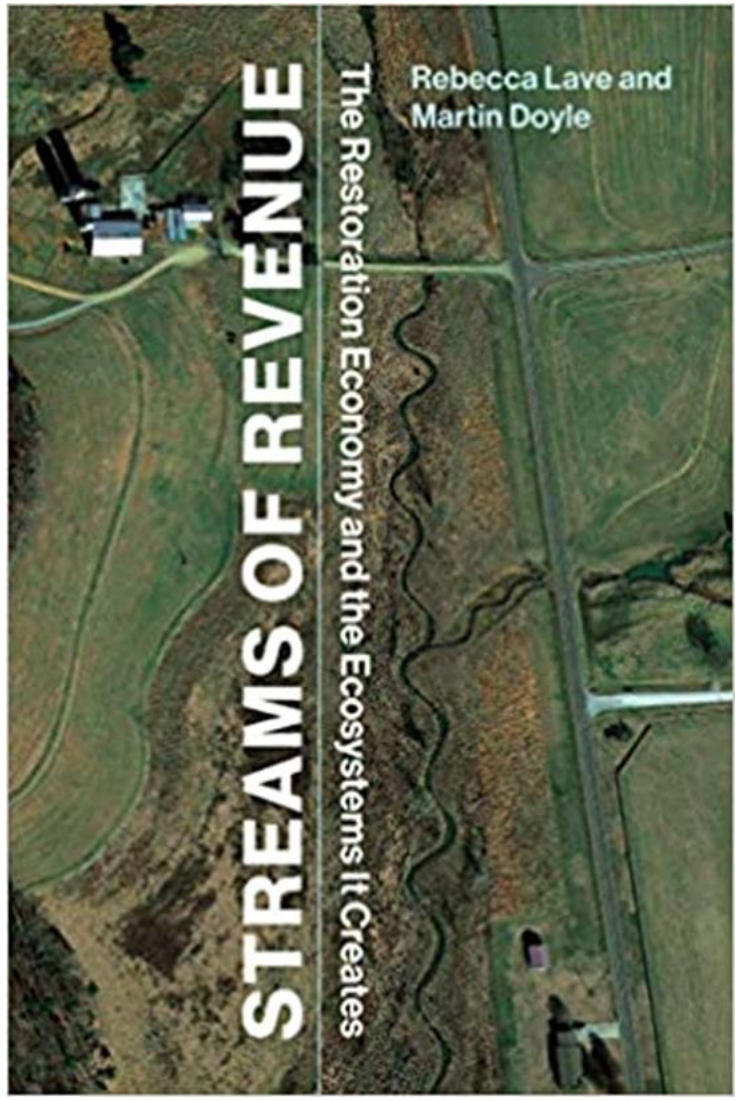
So … the 3 Key Needs for Mainstreaming River Restoration

Think Catchment First - I do not think we've done enough to join up the catchment with our reach based restoration delivery. We're still too site focussed. NFM helping this….but needs to be more than water! Need to work across sectors to deliver this.

Work With Natural Processes – it's the most effective way to scale up, its cheaper long term, BUT it requires room to achieve its best.

Communicate and Educate - We know why and how to restore river catchments and river networks, and we know they can deliver societal benefits. The biggest constraints now lie in convincing people – and that needs evidence and education.

A cautionary tale…. Monetizing and Metrics in River Restoration Scaling Up or Dumbing Down?



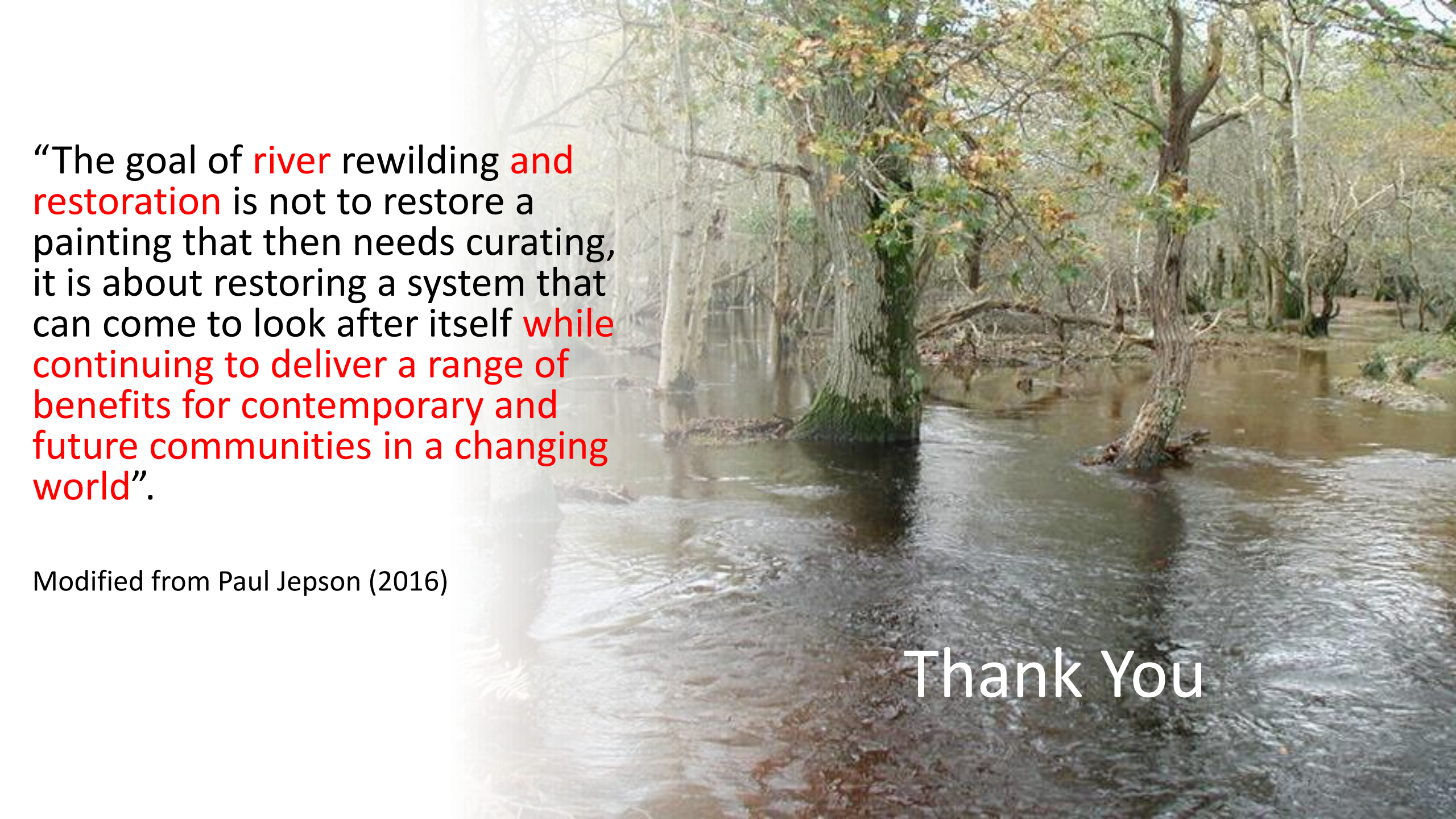
Mitigation Credits and Mitigation Banking….

In N. Carolina, USA – length of restored river is the credit. More stream restored more credits. Prevailing model for restoration is the single thread meandering channel.

Result is homogenous meandering channels everywhere!

Doyle et al., (2015)

We Need to be careful in selecting our measures and targets for Restoration and we need strong informed regulators.



“The goal of river rewilding and restoration is not to restore a painting that then needs curating, it is about restoring a system that can come to look after itself while continuing to deliver a range of benefits for contemporary and future communities in a changing world”.

Modified from Paul Jepson (2016)

Thank You