Planning and delivering river restoration at multiple scales using evidence-led approaches with volunteers, experts and scientists

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the River Restoration Centre

The River Restoration Centre (RRC)

Vision and objectives

'Naturally functioning, wildlife-rich systems, valued by people'

- To actively **promote** the re-establishment of **natural processes**, features, habitats and biodiversity of a river system
- To **support others** to achieve this by **collating knowledge**, information and evidence to **share best practice** throughout the river and catchment management community.

Delivering practitioner-focused knowledge and capacity building

BETTER RIVERS!

Natural processes

Supporting others

Collating knowledge

Sharing best practice

Science

Decision-support

Advice

Evidence-Based River Restoration

Certification

Guidance

Training

River restoration at catchment scale: the story so far

Strategic frameworks
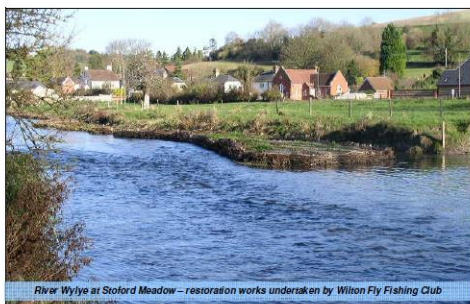
Opportunity-driven initiatives
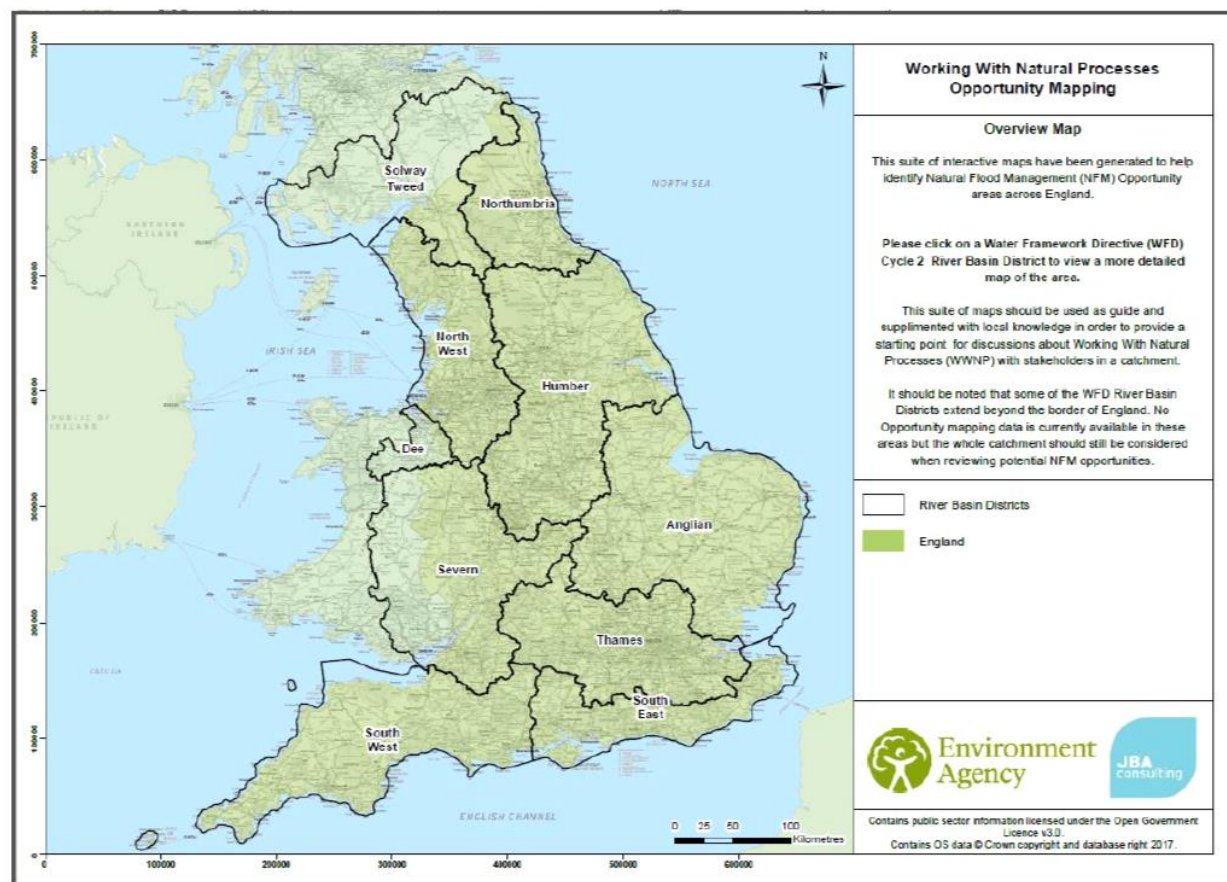
What are we looking to create?

- A restoration plan that works at **catchment scale** through the identification of **pressures and impacts** on **catchment and river processes**.

- A plan that identifies a set of **restoration options** that will contribute to improving catchment processes.

- A plan that delivers **SMART** aims and objectives.
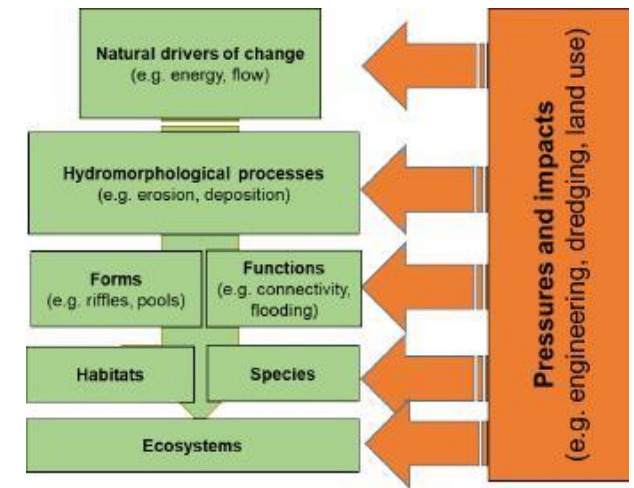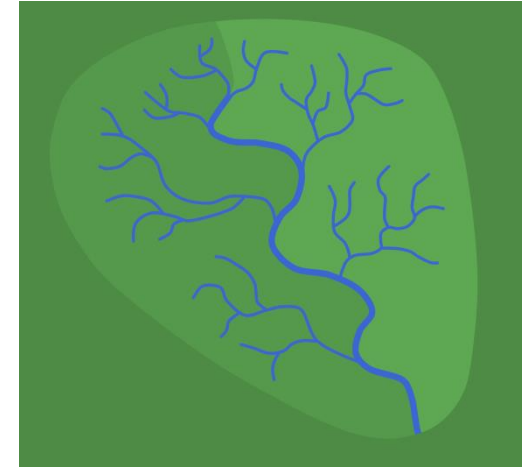
Catchment-centred restoration
What do we need?

- An **analytical framework**,

- A **process**, and

- A **set of methods** that are:
  - **Simple** enough to be used by specialists and non-specialists
  - Use **cheap**/free tools and software
  - **Flexible**
  - Can involve volunteers
  - ….with a bit of training and help

The river restoration process

1. Understand your river and catchment

2. Setting objectives

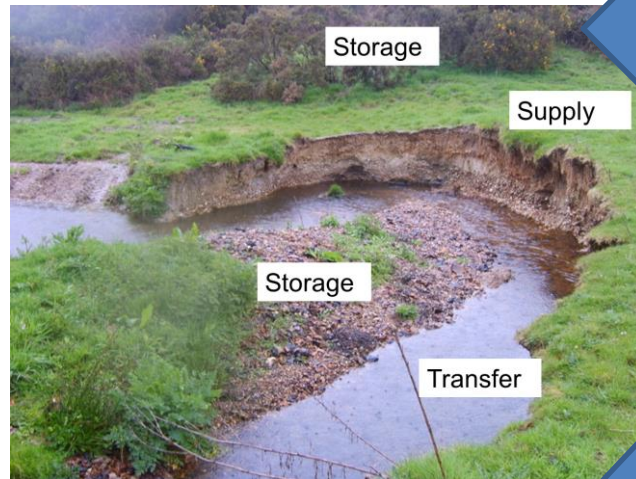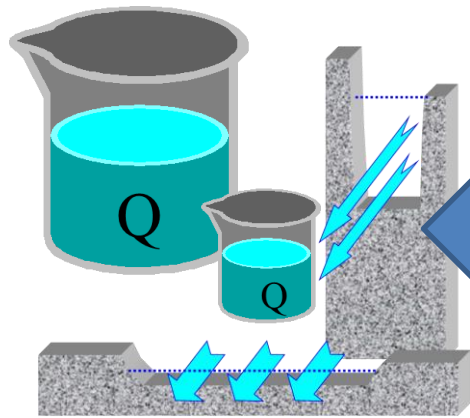3. Design

4. Delivery

5. Monitoring

6. Review
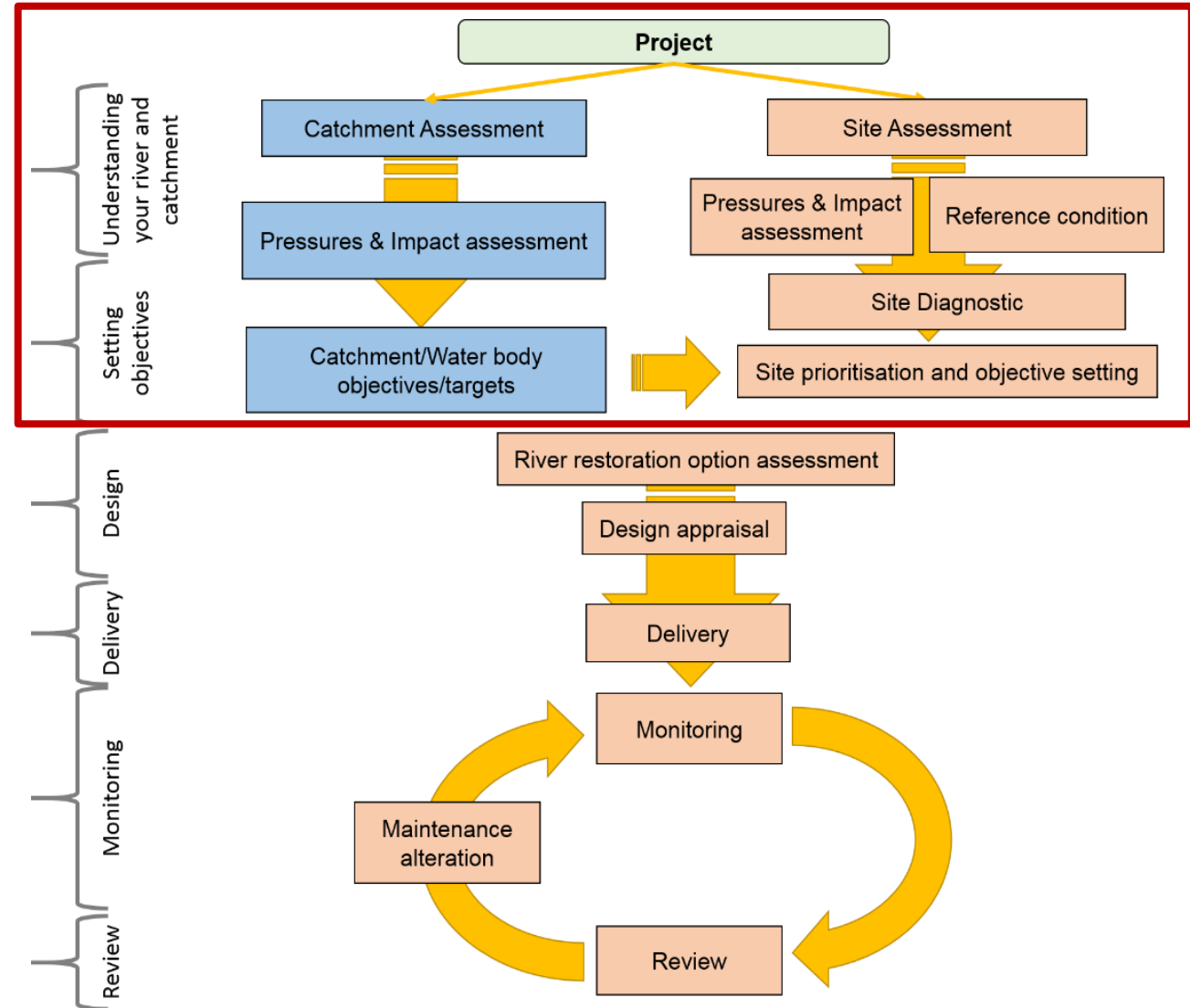
Assessing hydromorphology

Hydromorphology can be defined as the study of *'the physical habitat constituted by the flow regime (hydrology and hydraulics) and the physical template (fluvial geomorphology)'* (Orr et al 2008)

Hydromorphological Framework

Natural drivers of change
(e.g. energy, flow)

Hydromorphological processes
(e.g. erosion, deposition, runoff)

Forms
(e.g. riffles, pools)

Functions
(i.e. connectivity, flooding)

Habitats

Species

Ecosystems

Pressures and impacts
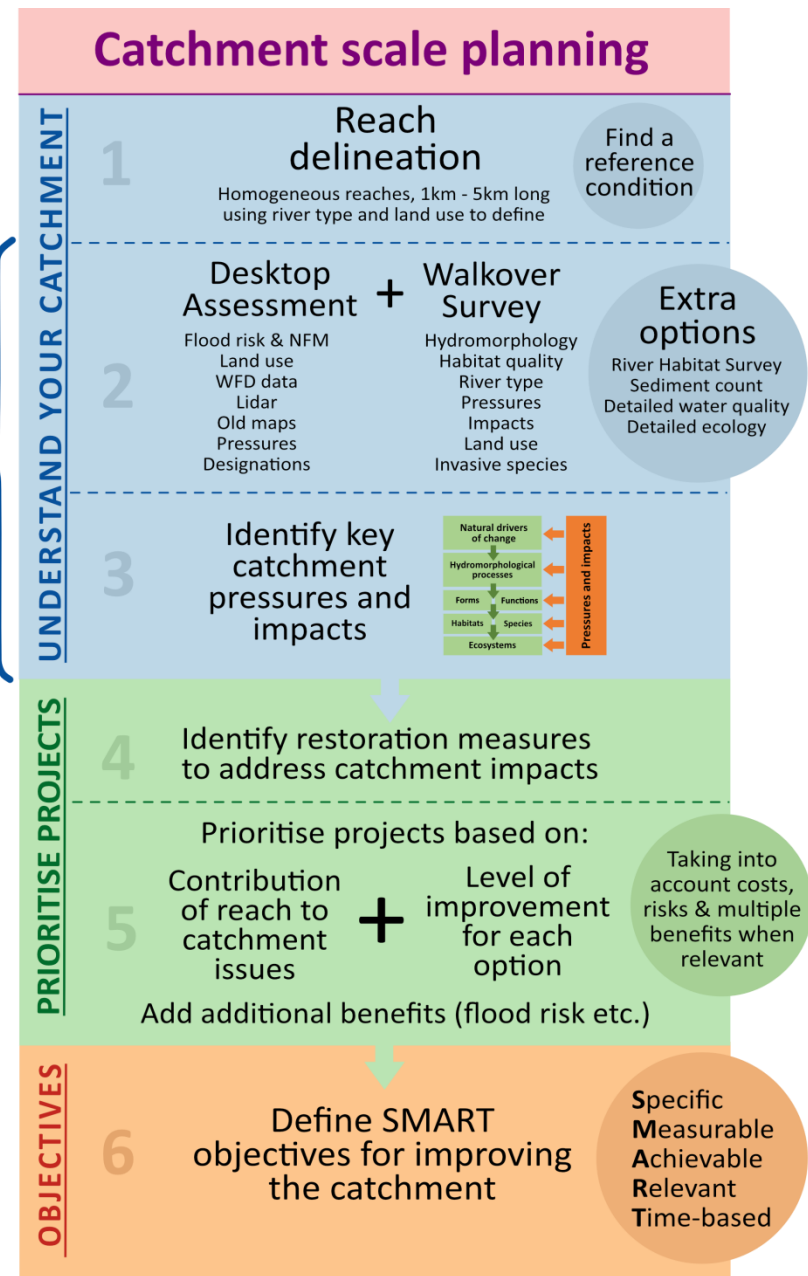(e.g. engineering, dredging, land use)
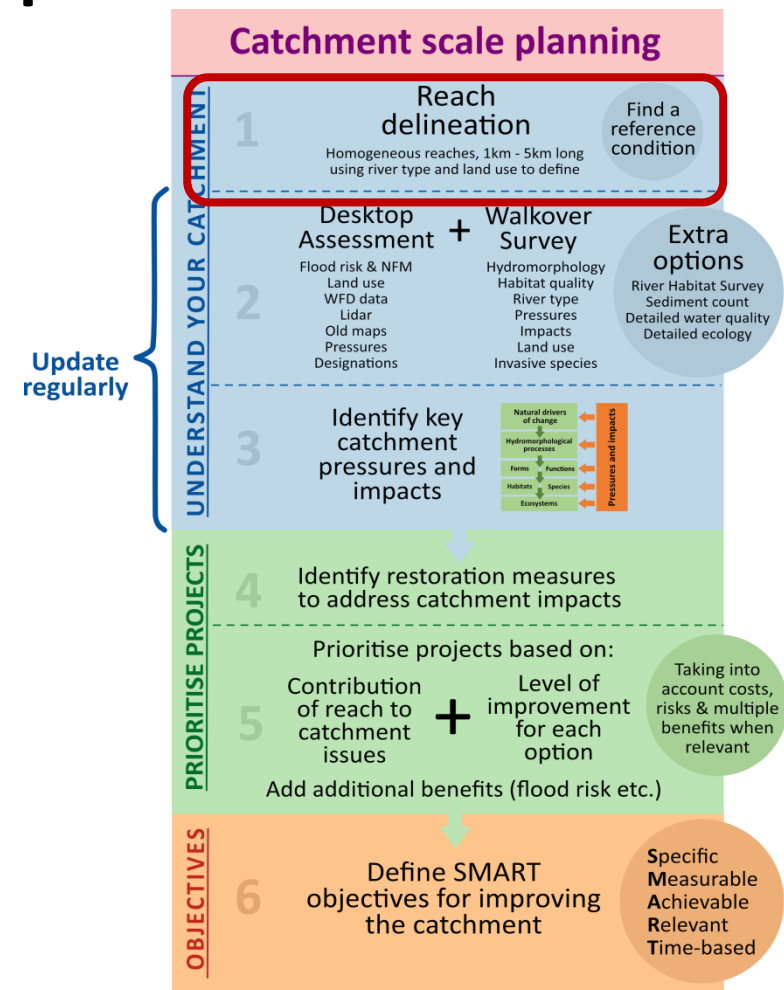
The steps…

- Understand your catchment
  - Reach delineation
  - Desktop assessment & walkover
  - Identify **catchment pressures and impacts**

- Identify **reach contribution** to **catchment impacts**

- Identify restoration options + **benefits on catchment impacts**

- **Prioritise** projects based on target, cost, benefits
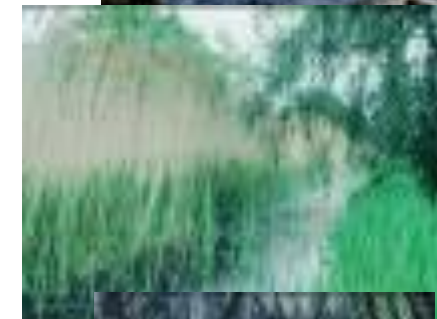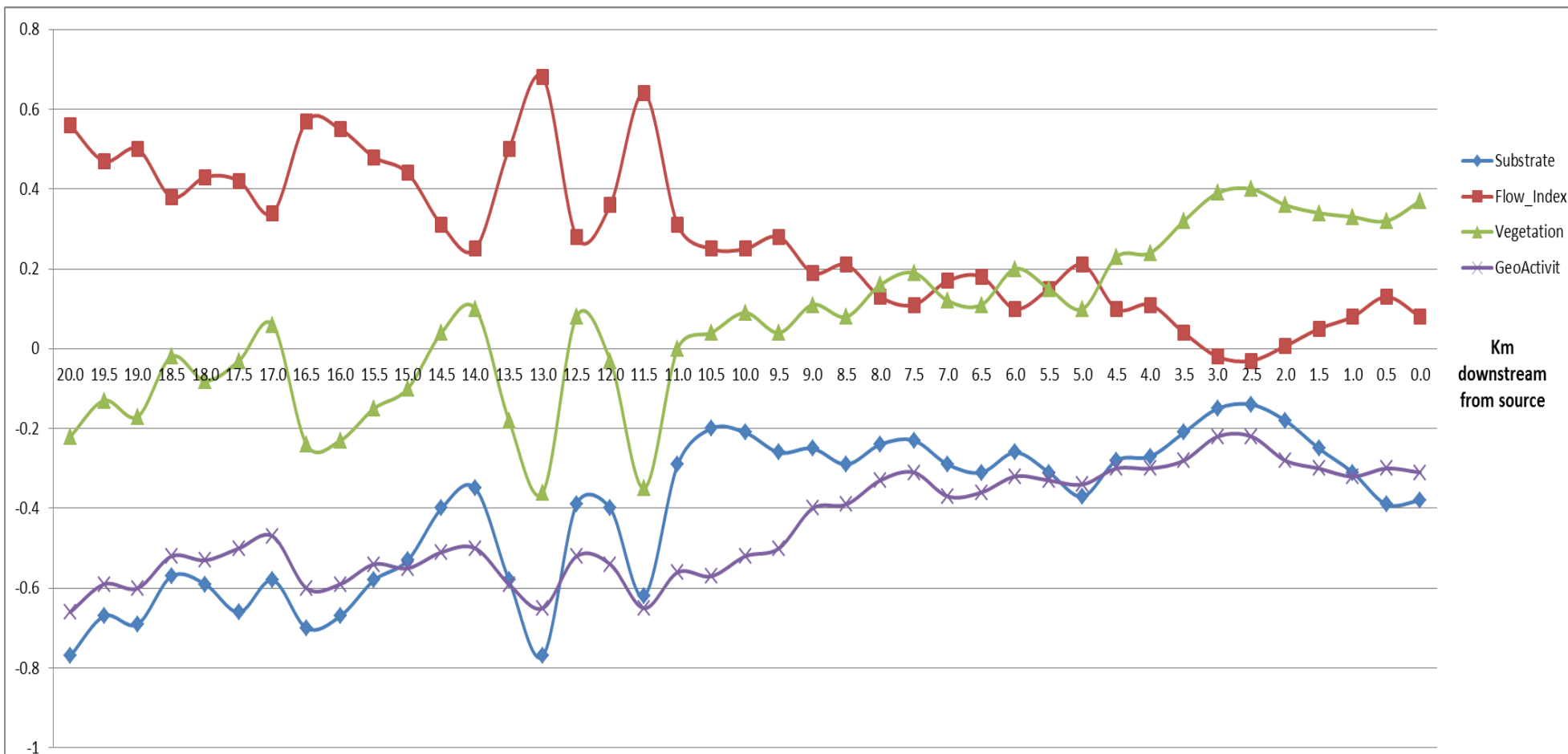
- Define **objectives**

1 - Reach delineation

- Hydromorphological **homogenous** reaches

- One observed and reference condition

Catchment scale planning

1 Reach delineation — Homogeneous reaches, 1km - 5km long using river type and land use to define — Find a reference condition

UNDERSTAND YOUR CATCHMENT

2 Desktop Assessment — Flood risk & NFM, Land use, WFD data, Lidar, Old maps, Pressures, Designations + Walkover Survey — Hydromorphology, Habitat quality, River type, Pressures, Impacts, Land use, Invasive species — Extra options — River Habitat Survey, Sediment count, Detailed water quality, Detailed ecology

Update regularly

3 Identify key catchment pressures and impacts

PRIORITISE PROJECTS

4 Identify restoration measures to address catchment impacts

5 Prioritise projects based on: Contribution of reach to catchment issues + Level of improvement for each option — Taking into account costs, risks & multiple benefits when relevant — Add additional benefits (flood risk etc.)

OBJECTIVES

6 Define SMART objectives for improving the catchment — Specific Measurable Achievable Relevant Time-based

1 - Reach Delineation:
Hydromorphological indices available for GB

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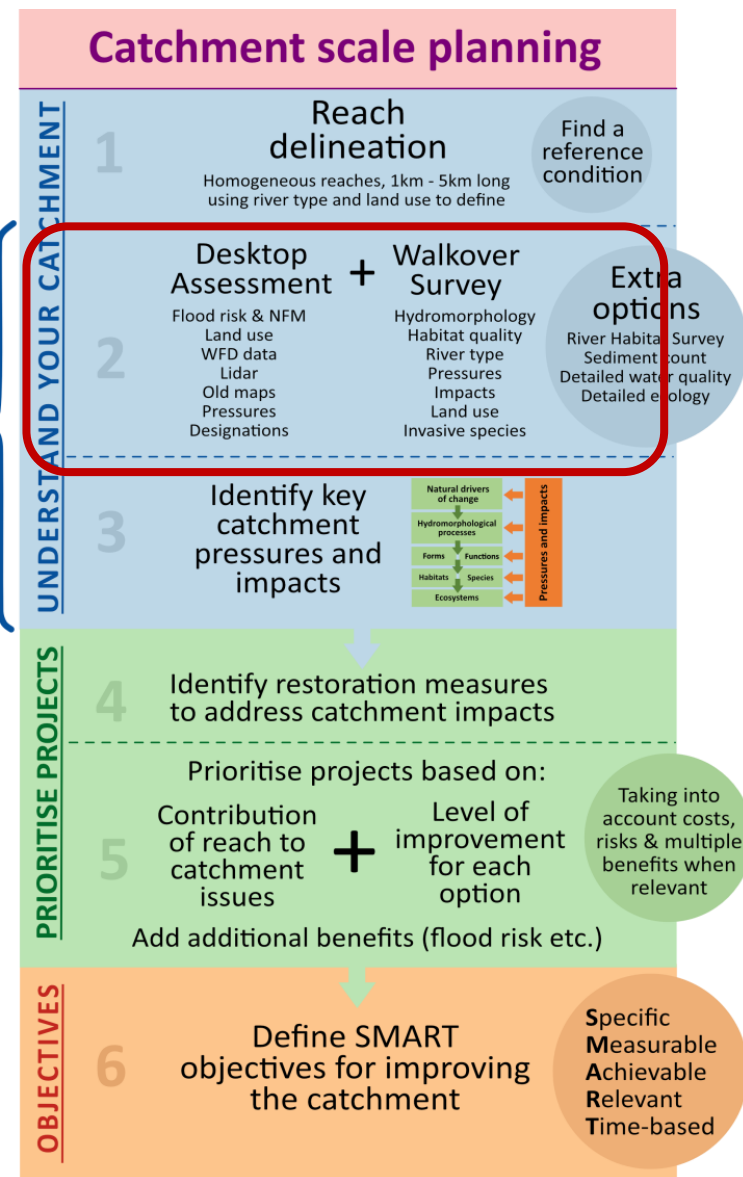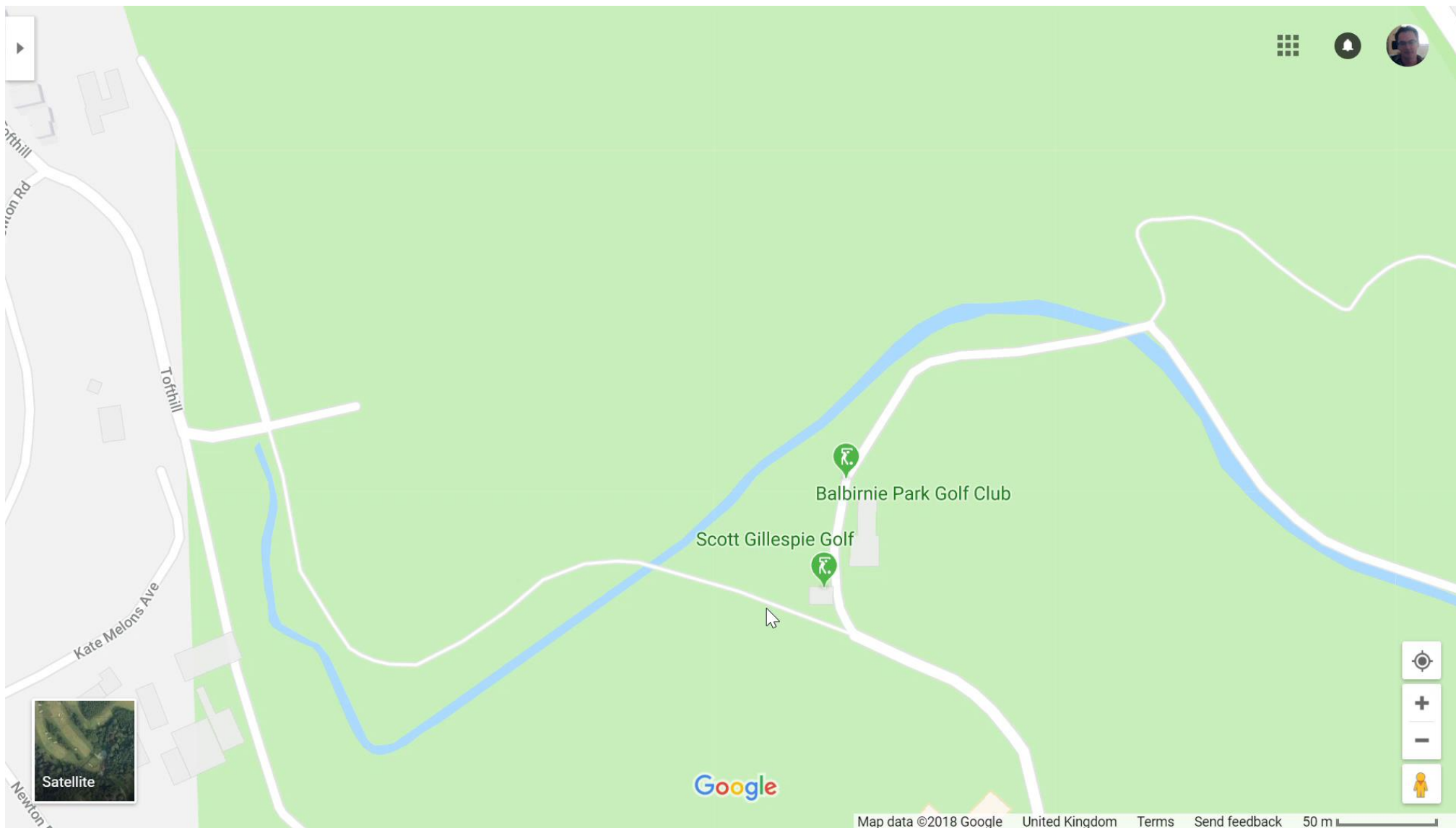
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Pitkevy
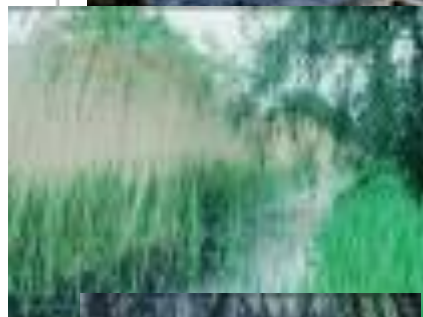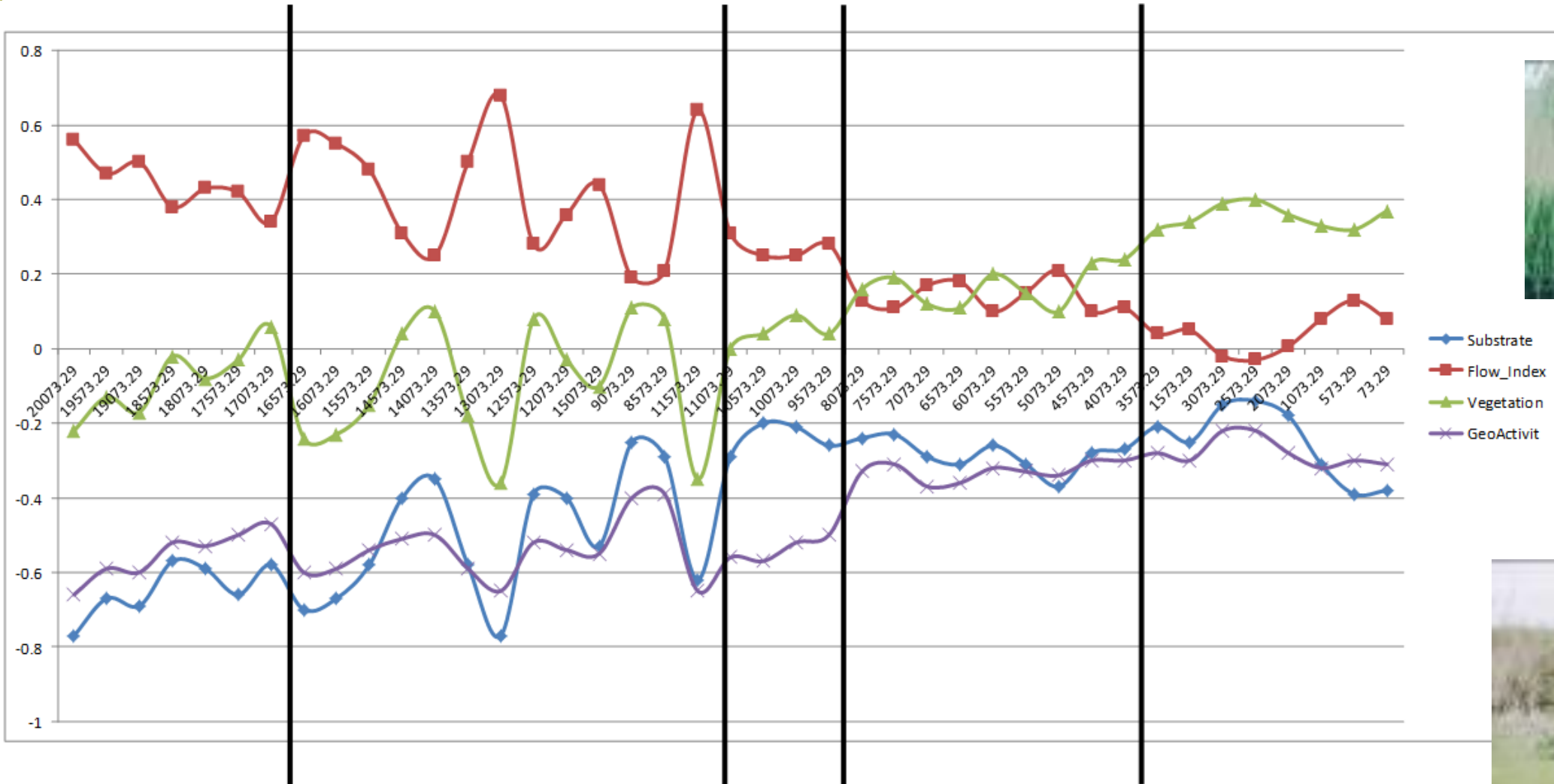
2 – Desktop assessment and walkover survey

- Overview data: RRC walkover survey, 360 photos

- Semi-quantitative data: RHS, RHAT, MIMAS, Mesohabitat mapping…

Catchment scale planning

UNDERSTAND YOUR CATCHMENT

1 — **Reach delineation**
Homogeneous reaches, 1km - 5km long using river type and land use to define

Find a reference condition

2 — **Desktop Assessment** + **Walkover Survey**

Desktop Assessment
Flood risk & NFM
Land use
WFD data
Lidar
Old maps
Pressures
Designations

Walkover Survey
Hydromorphology
Habitat quality
River type
Pressures
Impacts
Land use
Invasive species

Extra options
River Habitat Survey
Sediment count
Detailed water quality
Detailed ecology

Update regularly

3 — **Identify key catchment pressures and impacts**

Natural drivers of change
Hydromorphological processes
Forms — Functions
Habitats — Species
Ecosystems
Pressures and impacts

PRIORITISE PROJECTS

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Specific
Measurable
Achievable
Relevant
Time-based

360 photos and Streetview
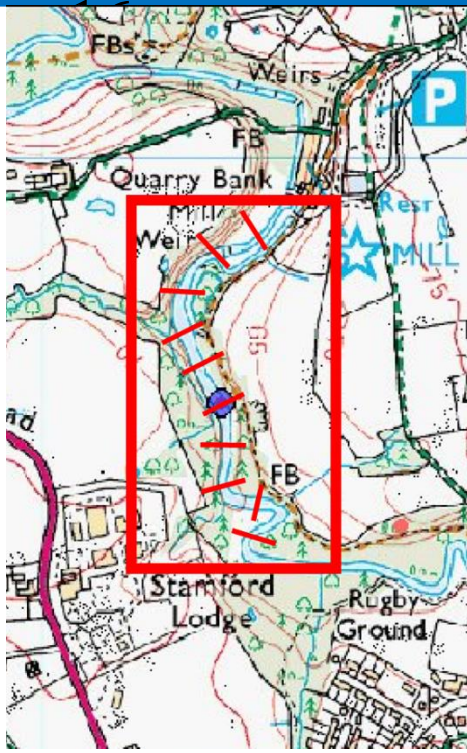
River Habitat Survey

Figure 2 Features recorded at RHS spot-checks.

River Habitat Quality (RHQ)

River Habitat Quality (RHQ)

Issues

Pressures

Land use
Barriers
Channel modifications
Flood risk management

Impacts

Fine sediment input
Poor channel habitat
Disconnected habitat
Poor riparian habitat
Un-natural morphology
Poor floodplain habitats

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Walkover Survey:
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Habitat quality
River type
Pressures
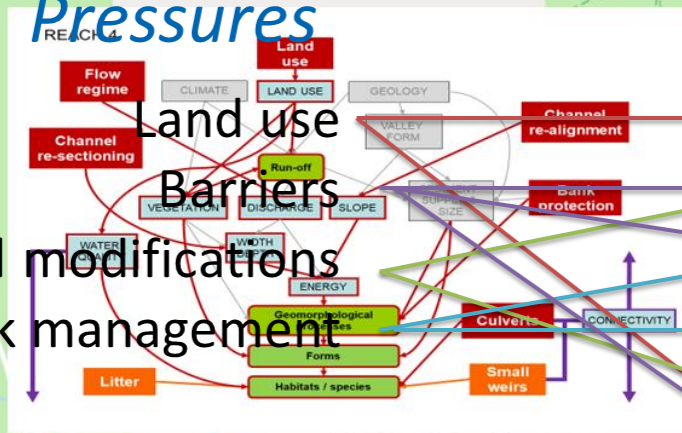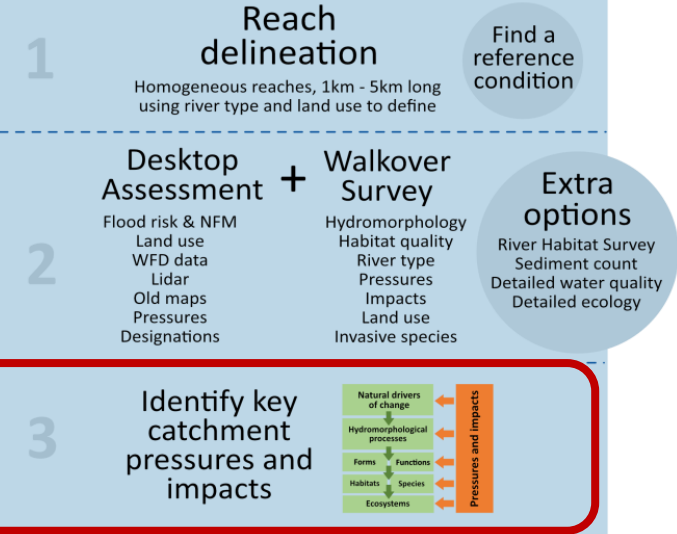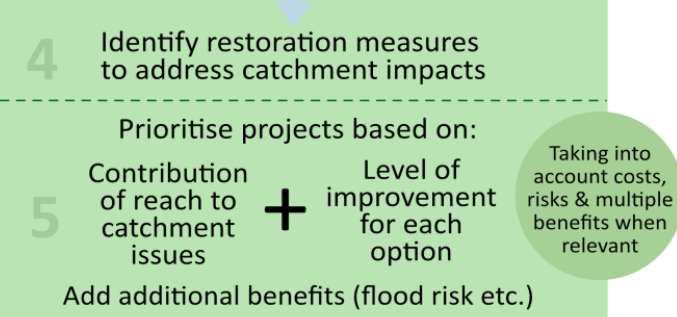Impacts
Land use
Invasive species

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3 - Pressures and impacts

4 – Option identification

Reach contribution to catchme			
	Un-natural morphology	Poor quality in-channel habitats	Fine sediment accumulation	Discor hab
Reach 1	0	0	3	
Reach 2	3	3	3	
Reach 3	2	2	0	
Reach 4	3	3	3	
Reach 5	3	2	2	
Reach 6	2	2	0	
Reach 7	3	3	3	

Update regularly

Catchment scale planning

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4 – Option identification

Land use management

Option description	Poor channel habitat quality	Fine sediment accumulation	Poor riparian habitats	Risk	Cost
Increase buffer size	1	2	3	L	££
Land management practice	1	2	0	L	£
Sediment Bund / filter barrier	1	2	0	L	£

Small weirs

| Option description	Poor channel habitat quality	Disconnected habitats	Risk	Cost
Remove weirs	1	1	L	£

4 – Option identification

Option description	Un-natural morphology and planform	Poor channel habitat quality	Fine sediment accumulation	Disconnected habitats	Poor riparian habitats	Disconnected floodplains	Risk	Cost
Re-connect old channel with step-pool outflow	3	3	1	2	2	1	M	££££
Partially re-connect old channel	2	2	1	0	1	0	L	££
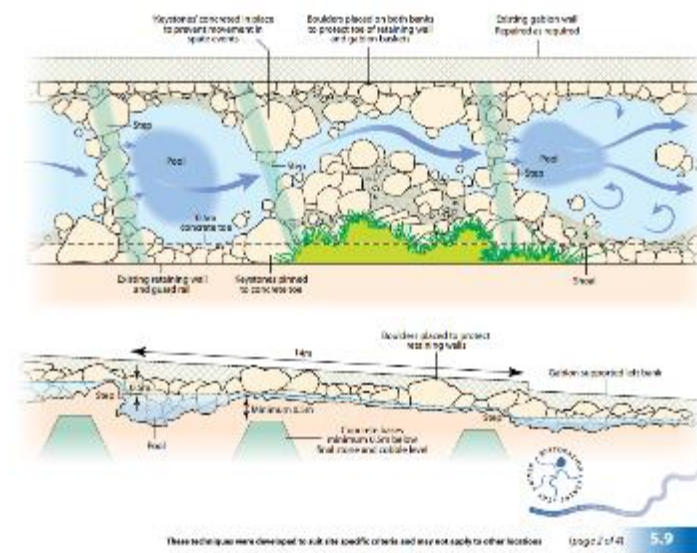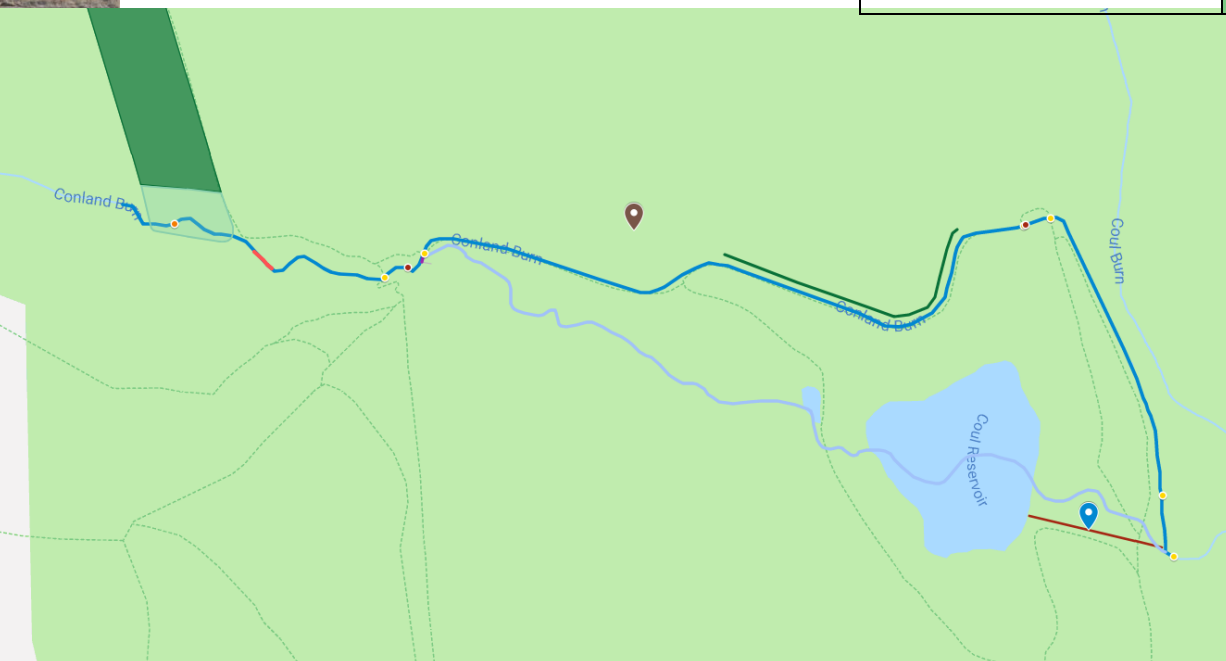
5 - Prioritisation

|	Details		Disconnected habitats	Un-natural morphology and planform	P... ha...
Reach	**Reach pressure**	**Option**			
1	Land use fine sediment pressure	Increase buffer size	0	0	
		Land management practice	0	0	
		Sediment bund	0	0	
	Small weirs	Remove weirs	1	1	
2	Channel re-alignment	Re-connect old channel with step-pool out	2	3	
		Partially re-connect old channel	0	2	
	Weir upstream of Coul Den	Remove weir	1	2	
		Retrofit baffles	1	0	
	Weir in re-aligned channel	Remove weir	1	0	
	Weirs in conifer plantation	Remove weirs	0	1	
	Land use - Conifer plantation	Remove conifers in the riparian zone	0	0	
		Improve conifer land management	0	0	
	Land use fine sediment pressure	Increase buffer size	0	0	
		Land management interventions	0	0	
		Sediment bund	0	0	
	Litter	Litter and barbed wire removal	0	0	

Update regularly

Catchment scale planning
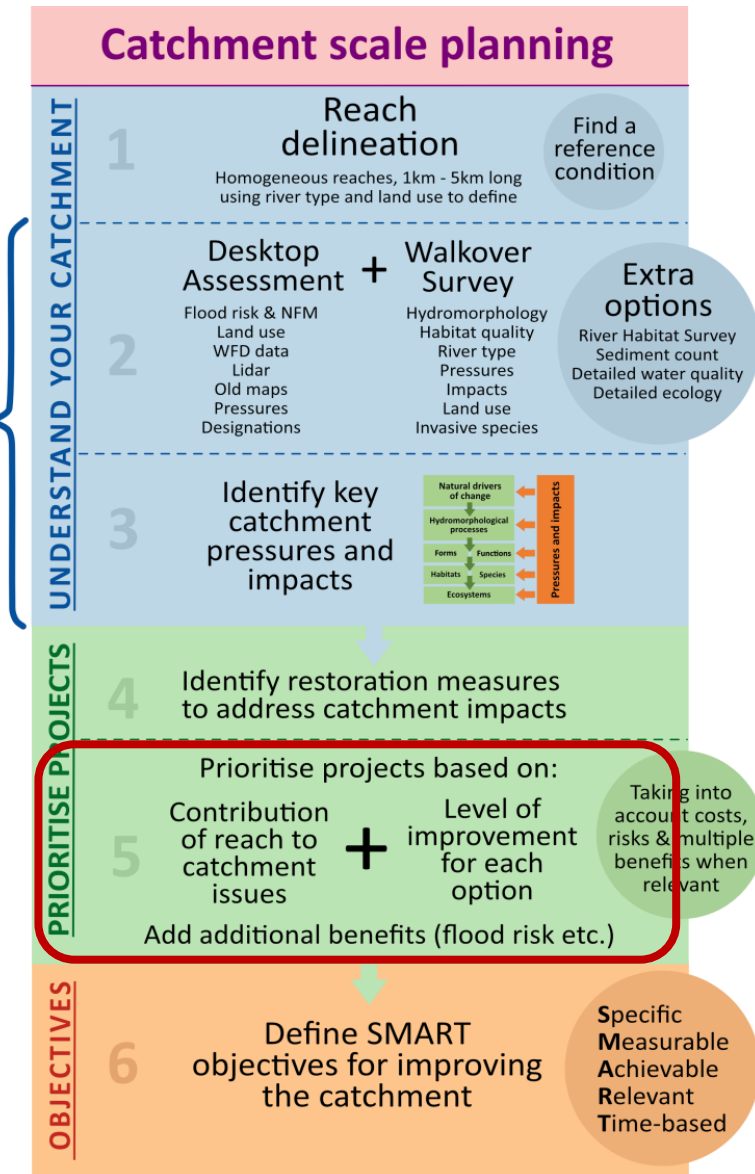
5 - Prioritisation

Reach	Reach pressure	Option	Flood risk benefits	Multiple Benefits	Negative consequences or constraint	Cost
1	Land use fine sediment pressure	Increase buffer size	1	7	0	££
		Land management practice	0	3	0	£
		Sediment bund	1	4	0	£
	Small weirs	Remove weirs	0	2	0	£
2	Channel re-alignment	Re-connect old channel with step-pool out	2	14	1	££££
		Partially re-connect old channel	1	7	0	££
	Weir upstream of Coul Den	Remove weir	0	4	1	££££
		Retrofit baffles	0	1	0	££
	Weir in re-aligned channel	Remove weir	0	1	2	££££
	Weirs in conifer plantation	Remove weirs	0	2	0	£
	Land use - Conifer plantation	Remove conifers in the riparian zone	0	3	0	££
		Improve conifer land management	1	2	0	£
	Land use fine sediment pressure	Increase buffer size	1	6	0	££
		Land management interventions	0	3	0	£
		Sediment bund	1	4	0	£
	Litter	Litter and barbed wire removal	0	1	0	£

6 Objectives and targets at catchment and reach scale
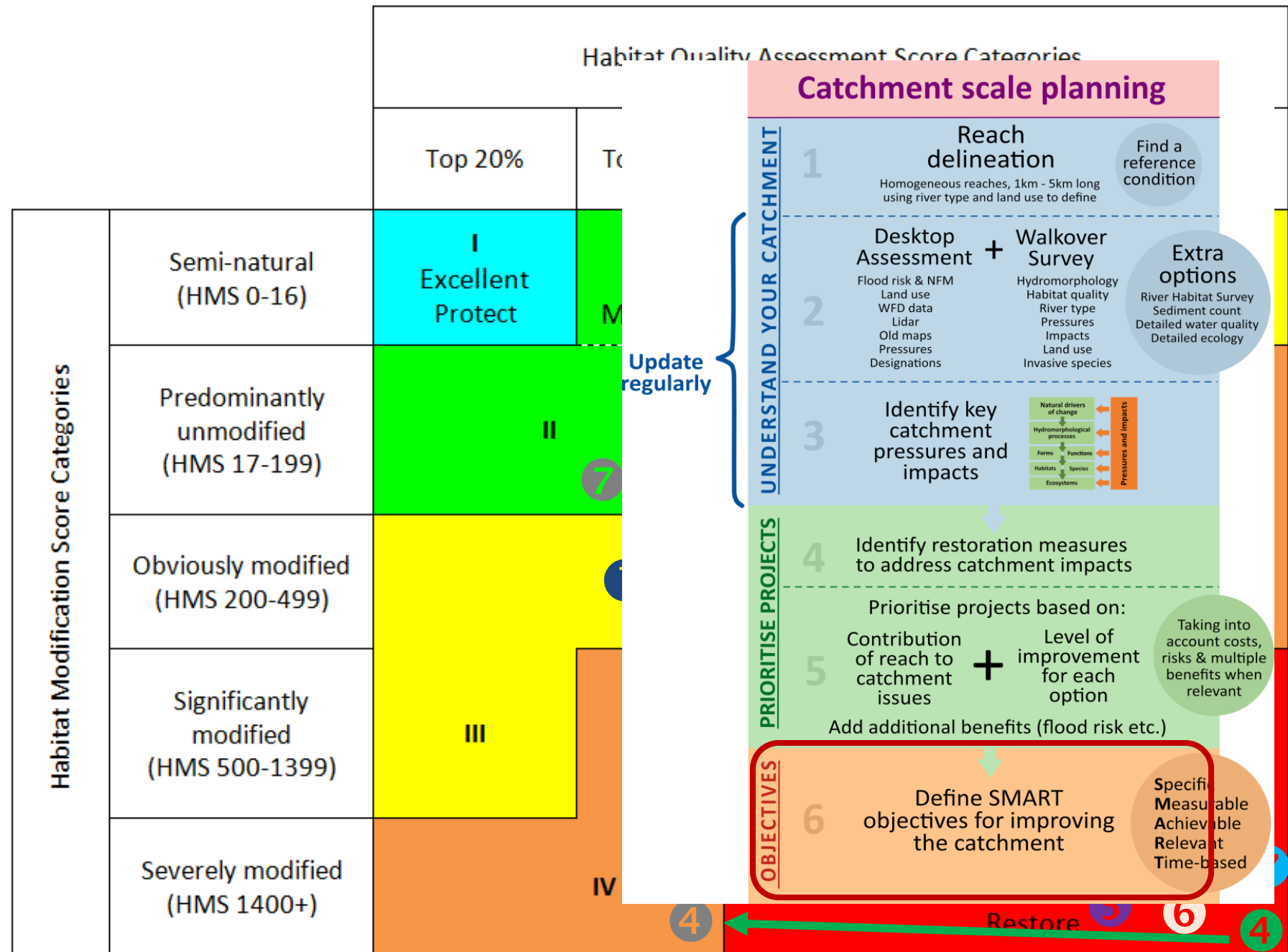
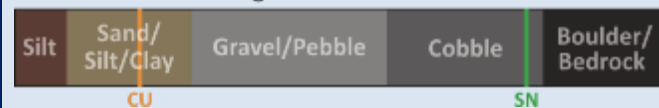# Communicating outputs using google maps
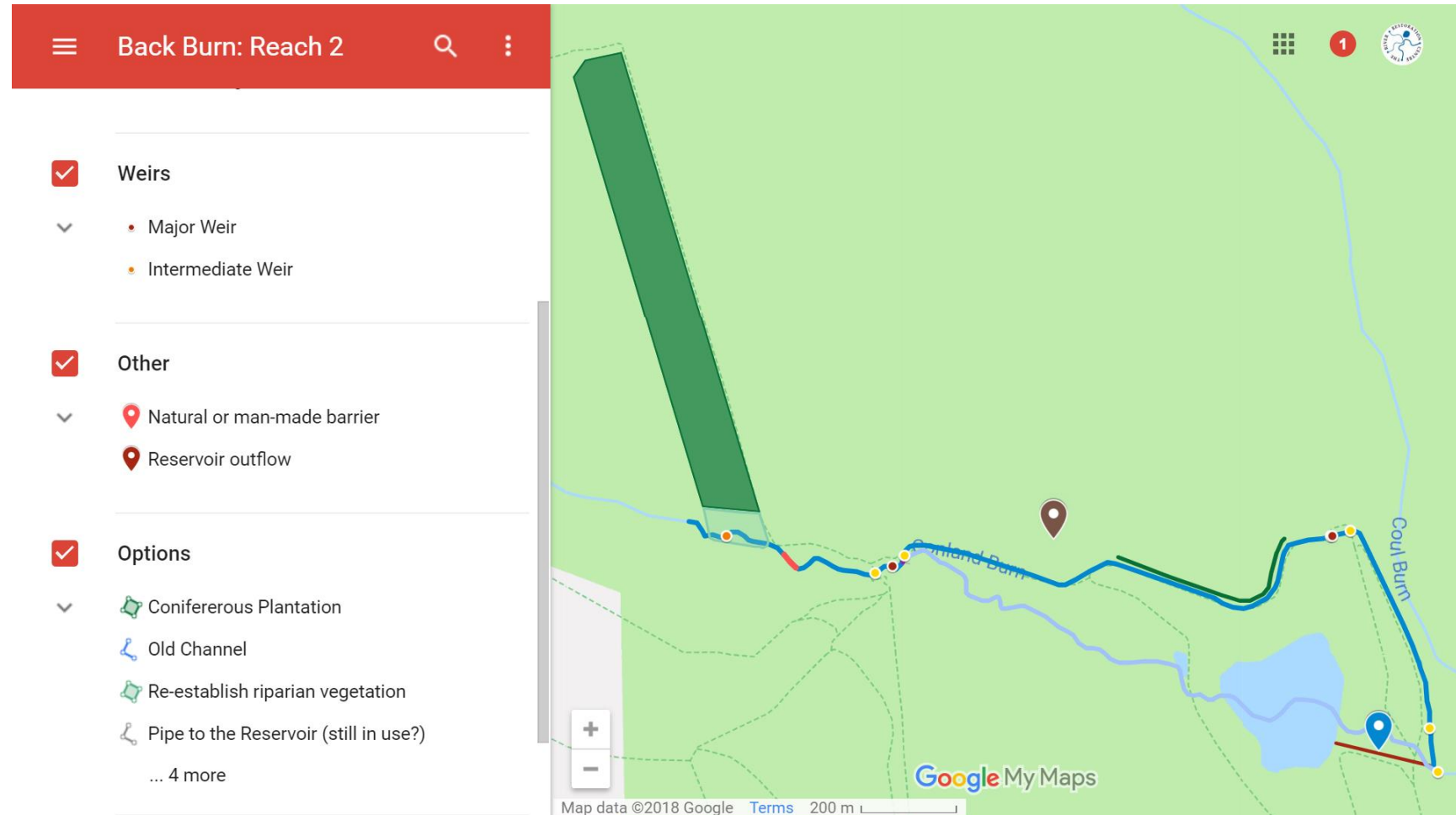
Report less
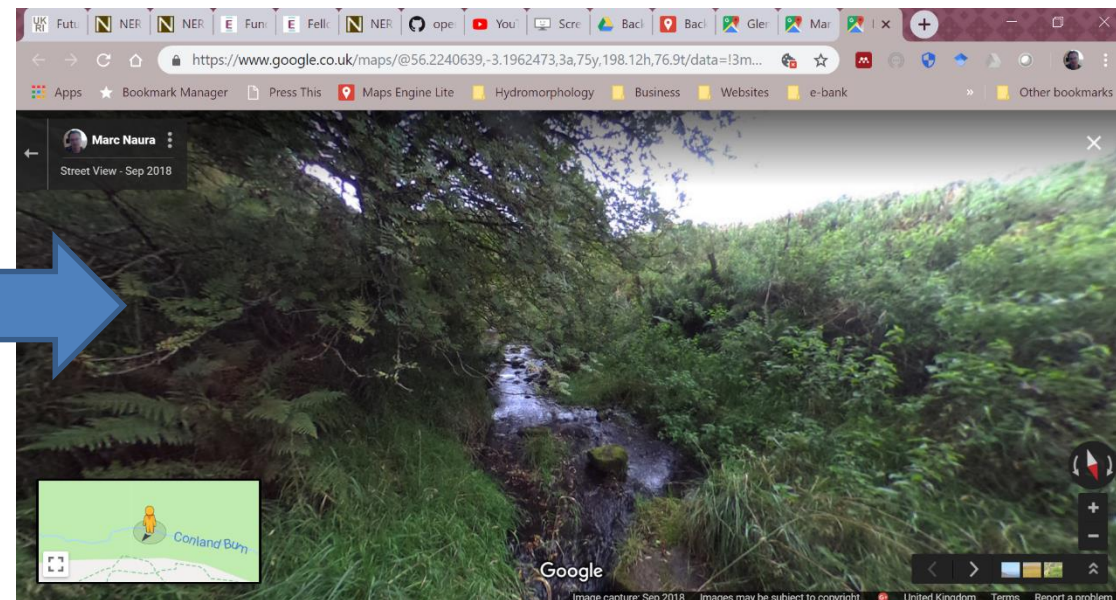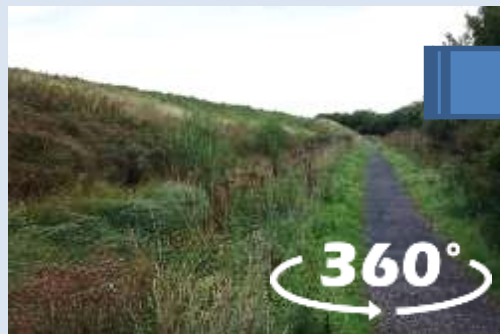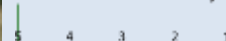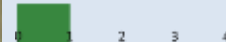
Summary

- **Structured process** for delivering catchment-centred river restoration

- Use of **simple data and methods**

- Use of **Google map and street view** (360 photos)

- **Flexible** and can involve non-specialists

Lessons learnt:

- – Involve stakeholders from the beginning
- – Share tasks amongst groups to reduce costs