

Restoring the Eddleston Water – measuring the impacts

Pilot Catchment Study

providing the scientific evidence for the effectiveness of restoration

▪Flood risk management -

Flood Risk Management (Scotland) Act 2009

▪River habitat restoration

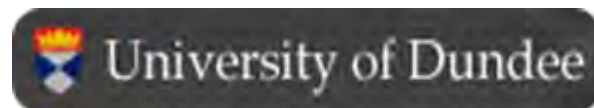
Water Environment & Water Services (Scotland) Act 2003

Both pieces of legislation look to improve the quality of rivers and 'reconnect' them to their catchments



Prof Chris J Spray

Jan 23rd 2014



Overall Aims of Eddleston Water project

... “to restore the river and its whole catchment whilst at the same time promoting livelihoods of those who derive income from the sustainable management of farms, forests and fishery”:

- improved physical habitat
- reduction in flood risk

.....whilst ***promoting sustainable management*** of the local farms, fisheries and forestry interests,

.....and ***enhancing wildlife and recreational*** opportunities for residents and tourists.

The Eddleston Water Project

Partnership Approach

Phase I: Scoping study - 2009/10

Phase II: Base line monitoring & planning 2010 - 2012

Phase III: Implementation & Monitoring 2013 - 2015.....



Environment Agency



Scottish Natural Heritage

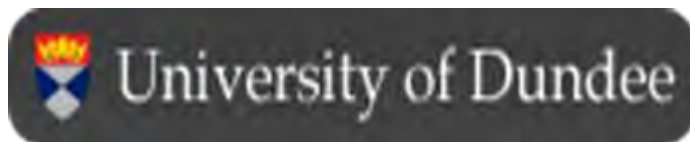
Tweed Foundation

Forest Research

Cbec Ltd



Land managers and community

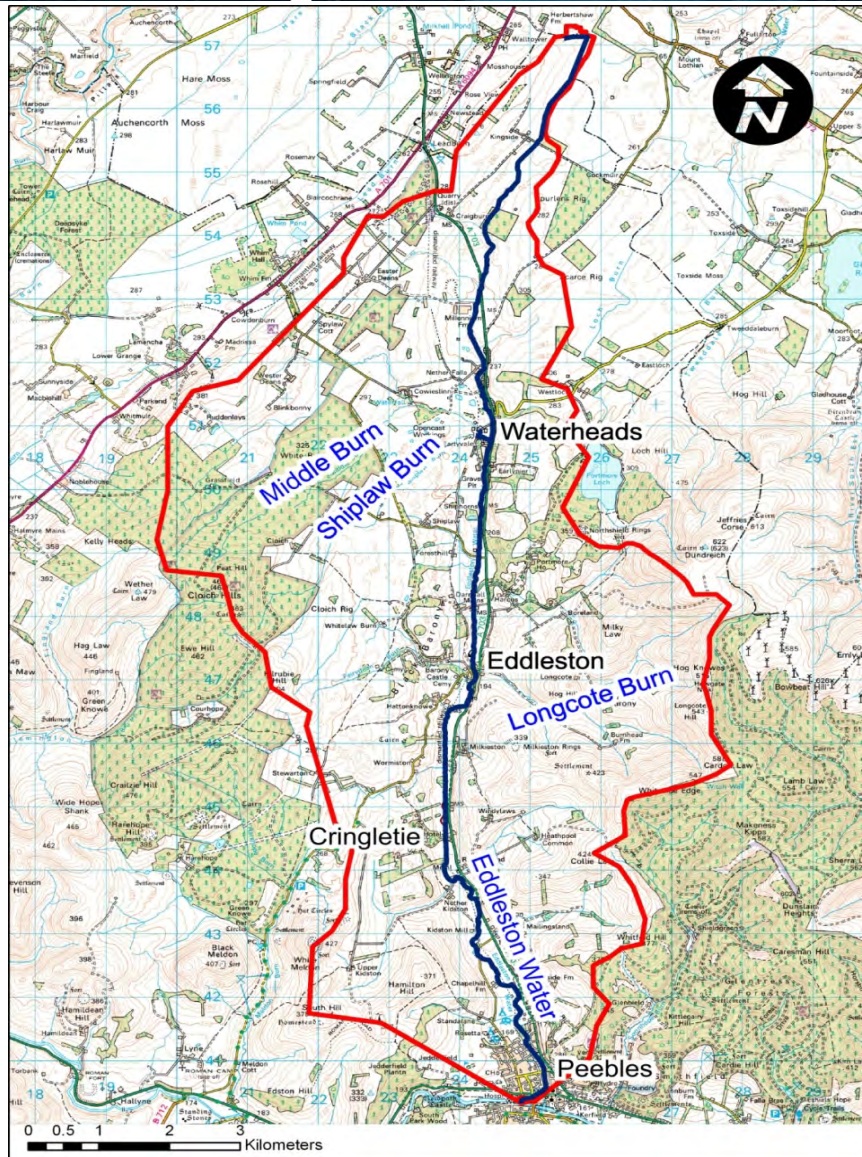


Eddleston Water – subcatchment of Tweed 69 sq kms

- Tweed length: 156 kms
- Catchment: 5,000 sq kms
- Scotland 84%; England 16%
- Mainly agricultural & valley towns
- 130,000 population, tourism, farming (sheep & cereals), Salmon, Rugby, Tweed woollens



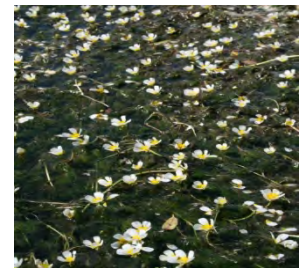
Eddleston Water – subcatchment of Tweed 69 sq kms



Long history of river and flood plain management – for agriculture mainly – and of **flooding** (1723, 1777, 1792, 1831, 1846, 1865, 1881, 1891, 1897, 1908, 1914, 1926, 1948, 1956, 1977, 1986, 1988, 1991, 1997, 2000, 2005, **2012**)

EU Conservation status as a ‘Special Area for Conservation’ - as a ‘Ranunculus type’ river,

- Atlantic Salmon
- Lampreys
- Otters.



Classed as ‘bad’ ecological status under the EU Water Framework Directive:

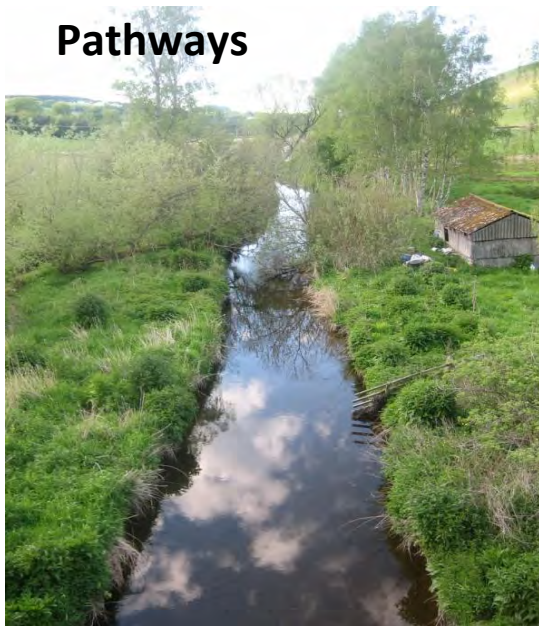
- channel morphology
- aquatic plants (medium)

Distinct character of the current landscape

Sources



Pathways



Receptor (Peebles)



The Eddleston Water has been straightened, embanked and cut off from its floodplain – a long time ago!



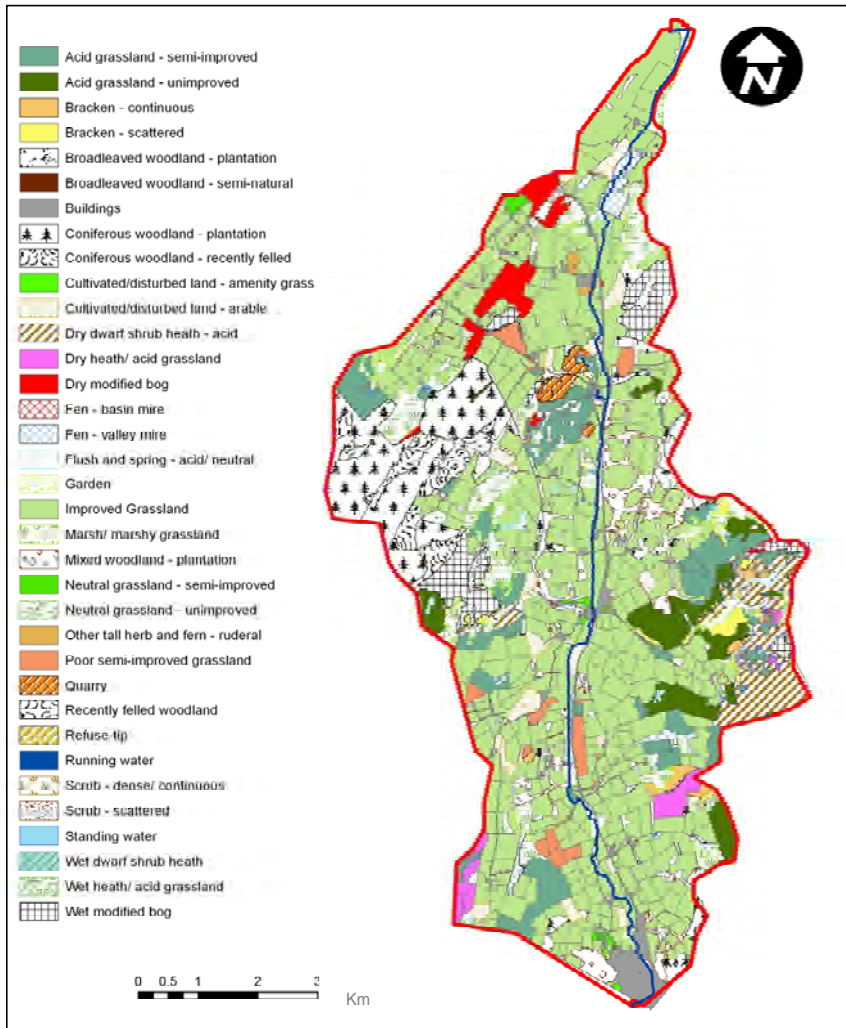
Main stem sinuous c.1750: **Roy Map**

but extensively straightened by at least 1811

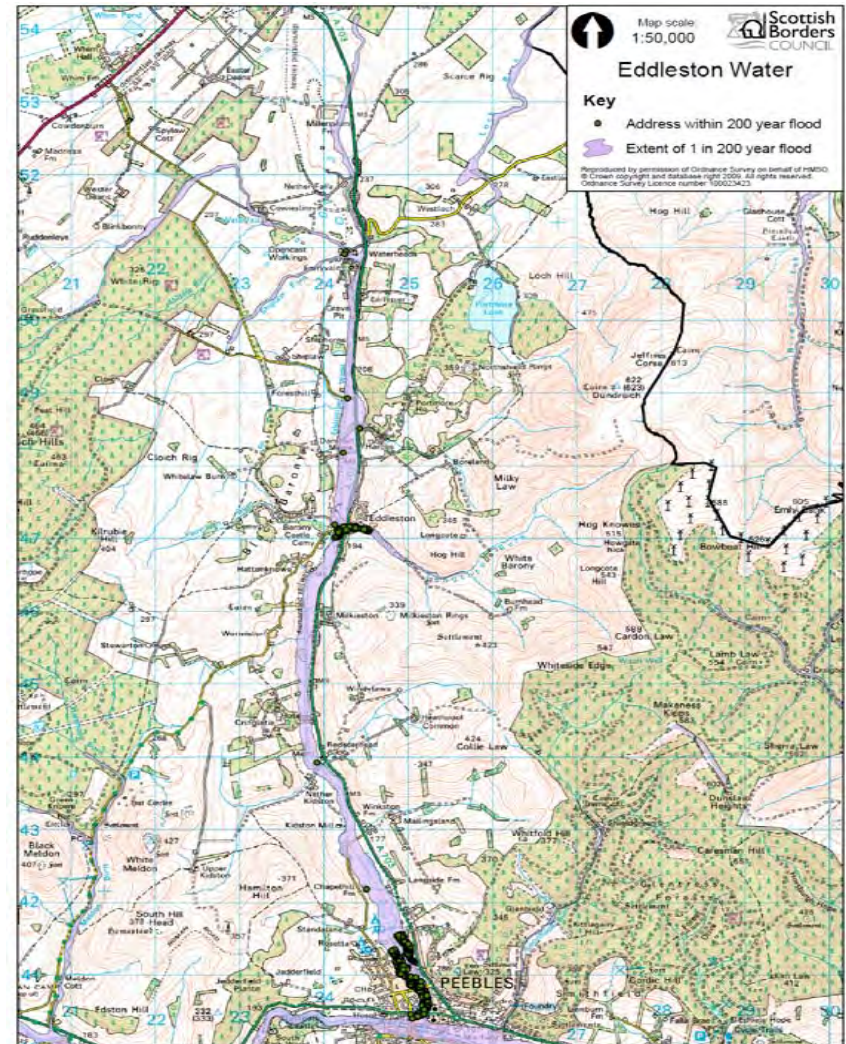
Toll road map: - old course 1790's

Eddleston Water – current land use and flood risk

Habitat map (air photos)



Flood maps (SEPA)



Recent flood events in 2012

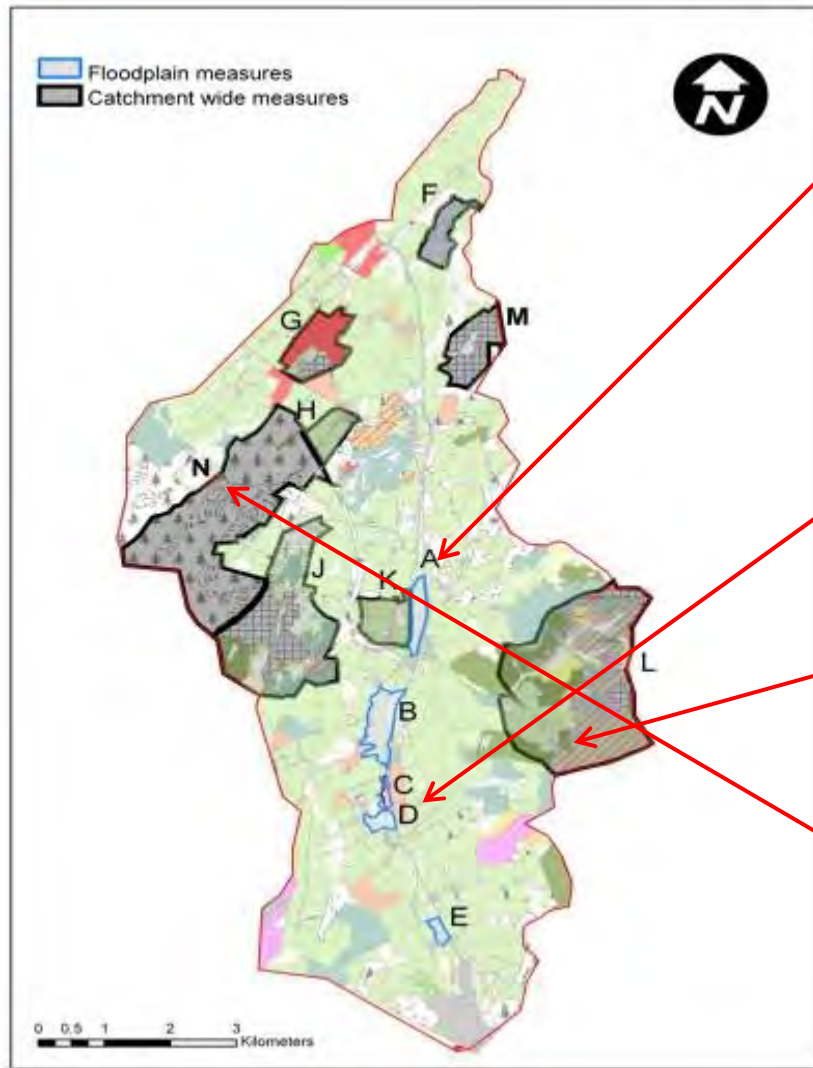


**Peebles –
March
Street, June
2012.**

**Linfall
Bridge, 2012**



Identified potential options to restore the river: - reduce flood risk and improve habitats - in different locations (sources and pathways)



Selected options/measures:

A: breach/set back embankments, new fence margins, riparian woodland, wet woodland,

C: re-meander channel - Cringeltie

L: Reduced stocking density, tributary woodland, floodplain forest – Longcote burn

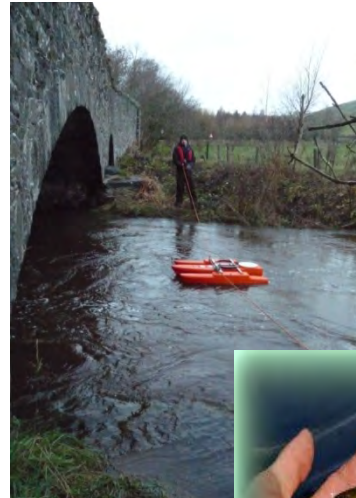
N: create ponds, wetlands, riparian woodland block ditches, engineered log jams – Middle burn

Comprehensive Monitoring Programme across whole catchment

Installed detailed baseline networks

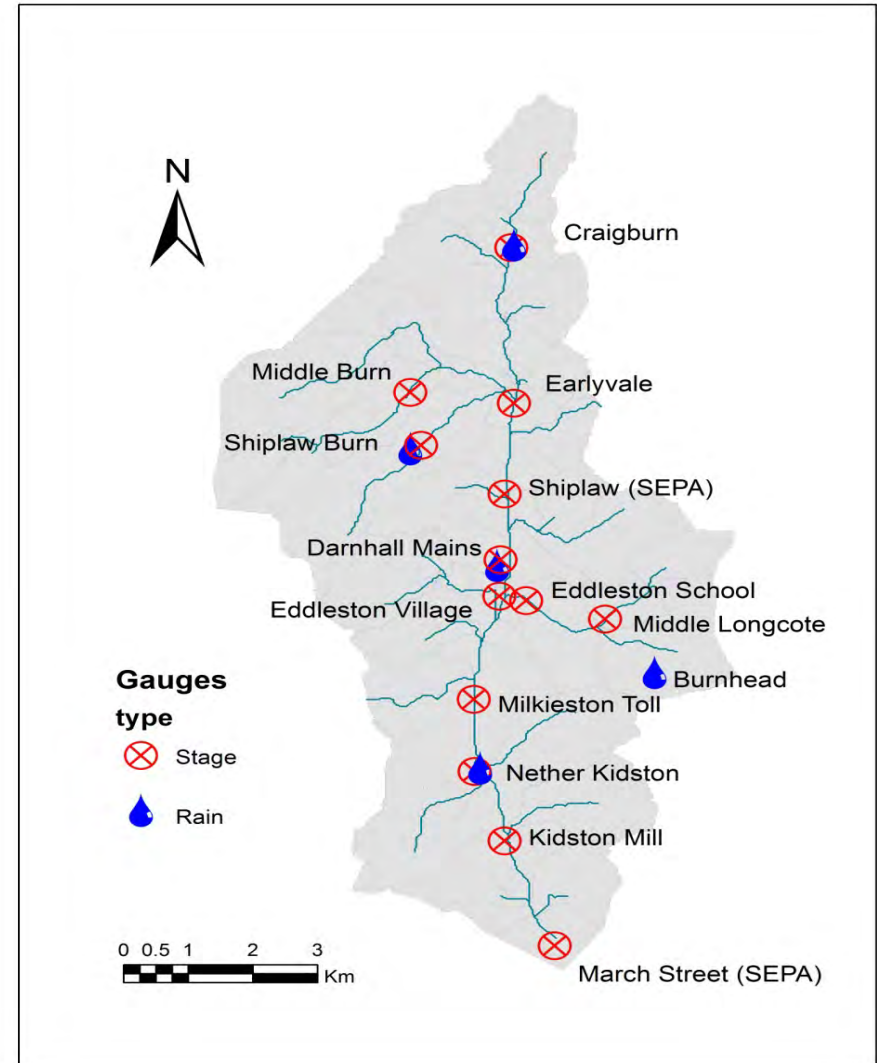
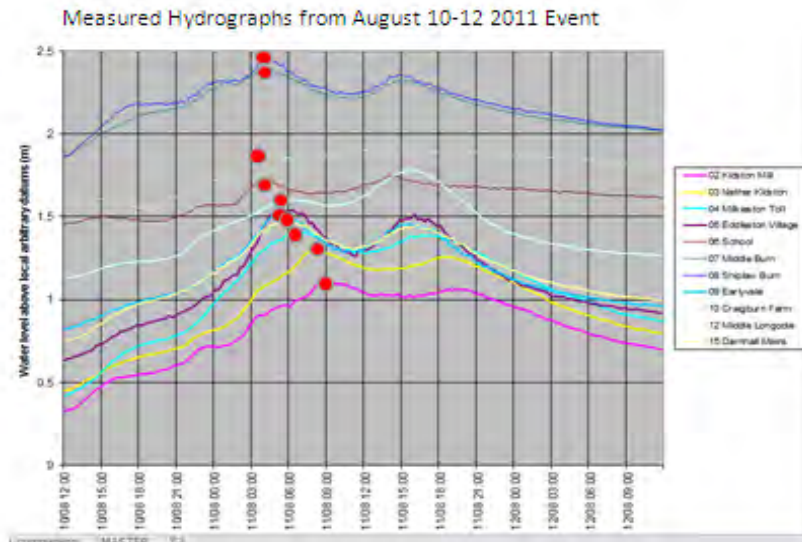
Measuring:

- Precipitation and weather
- Flows and river Levels
- Groundwater
- Physical stream habitats and hydro-geomorphology
- Ecology – plants, fish, invertebrates
- Acceptability to local farmers



Installed Monitoring network for Catchment flood flows

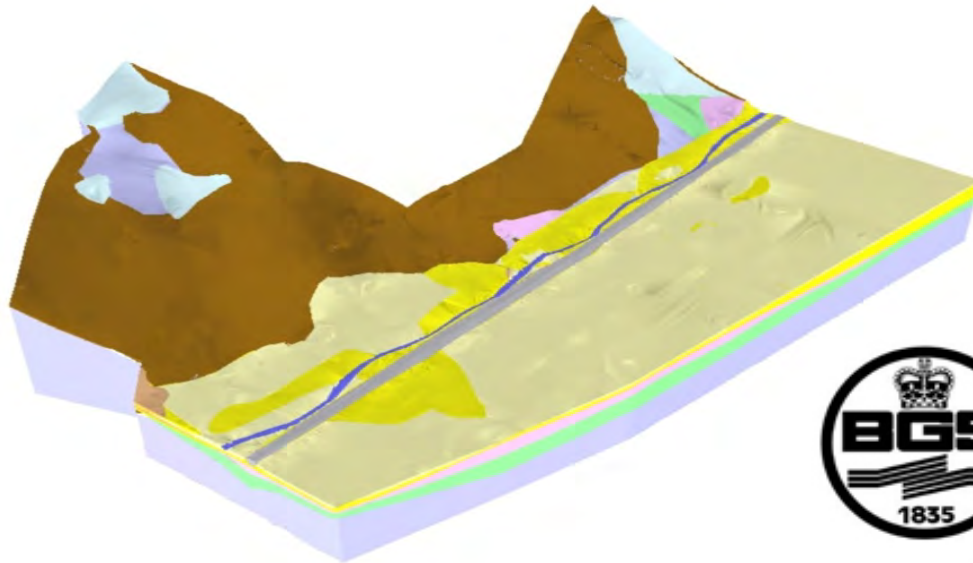
- Installed a new detailed Hydrometric Network to record river levels and flood flows. Also Weather stations
- Identification of how and where flood runoff is initiated and its conveyance downstream, causing flooding



Installed detailed network of boreholes to assess the contribution of groundwater flow to flood generation

- complex interaction between surface water and groundwater
- a significant contribution of groundwater to localised flooding
- a valuable aspect of this study, missed in many others

Geological model of Darnhall site



Detailed survey of the river channel along whole length

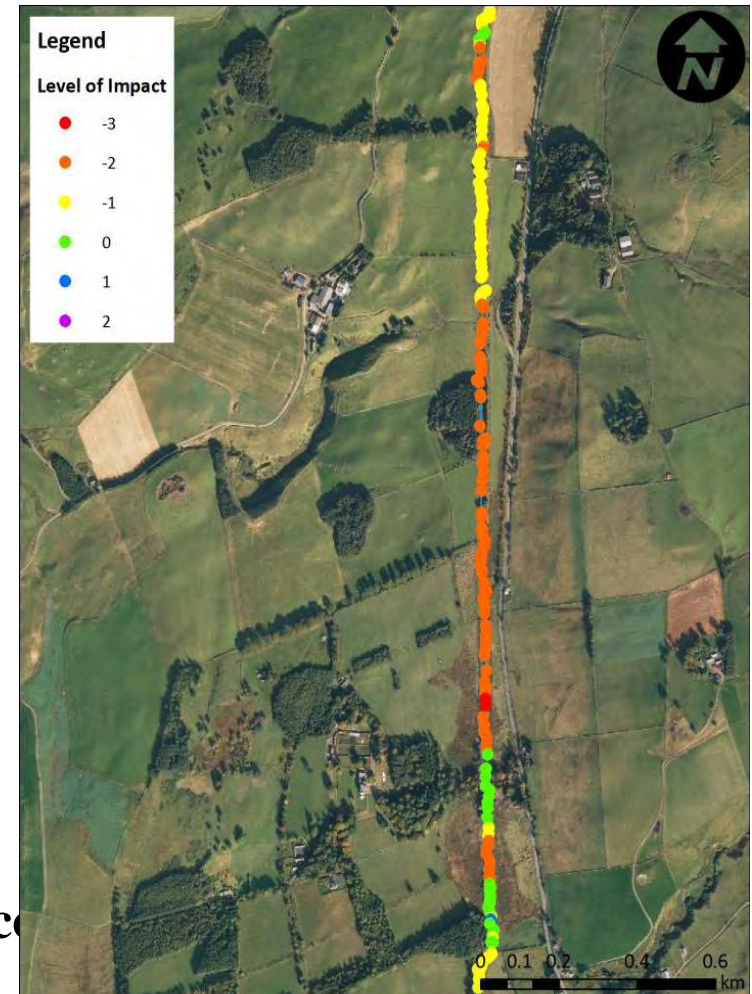
Detailed Surveys done: - Bad ecological status

- High impact channel realignment 37%
- Low impact channel realignment 15%
- Embankments and floodwalls 26%
- Loss of bankside riparian vegetation 14%

Implications for restoration:

- Enables targeting of interventions
- u/s good value, inexpensive meanders
- d/s selected re-meandering & embankments
- Can improve to moderate & potentially good ecological status

Cringeltie and Lake Wood



Detailed survey of the ecology and habitats of the river

Ecological studies:

- Aquatic Invertebrates
- Aquatic plants
- Fishery surveys 2009 & 2012
- Historical analysis of past invertebrate records at all 8 sites along the river

Implications for restoration:

- Establishes comprehensive base-line for analysis of long-term changes at catchment scale

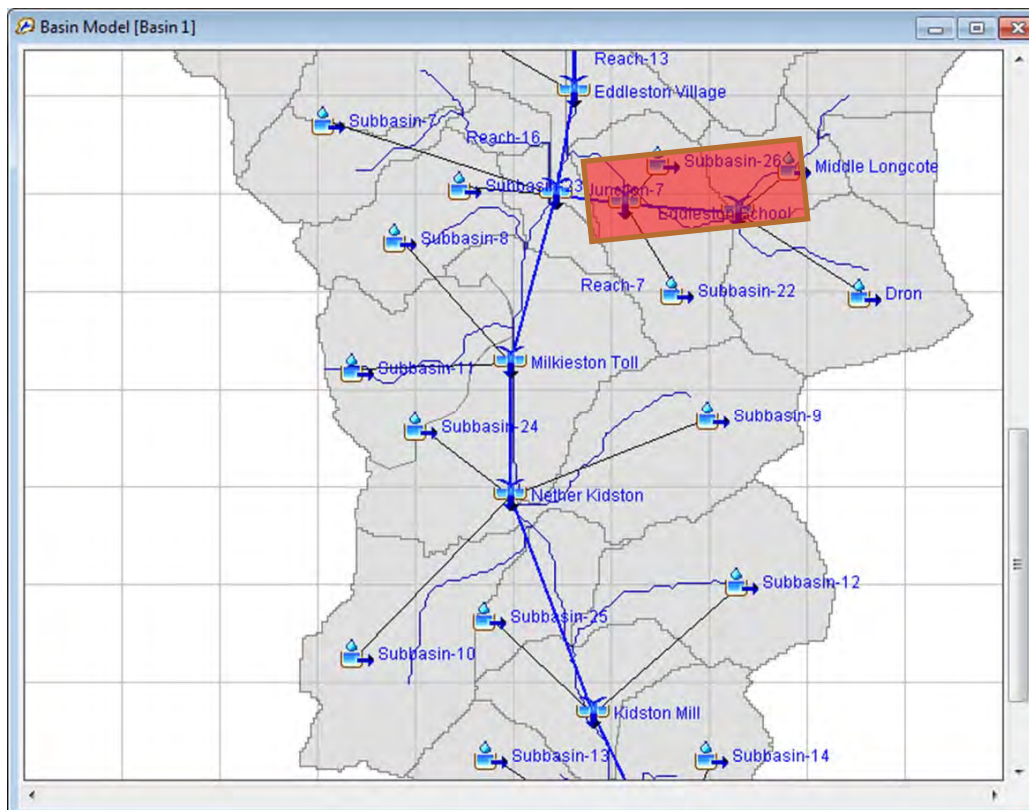


Tweed Foundation Fishery surveys



Monitoring individual interventions to reduce flooding

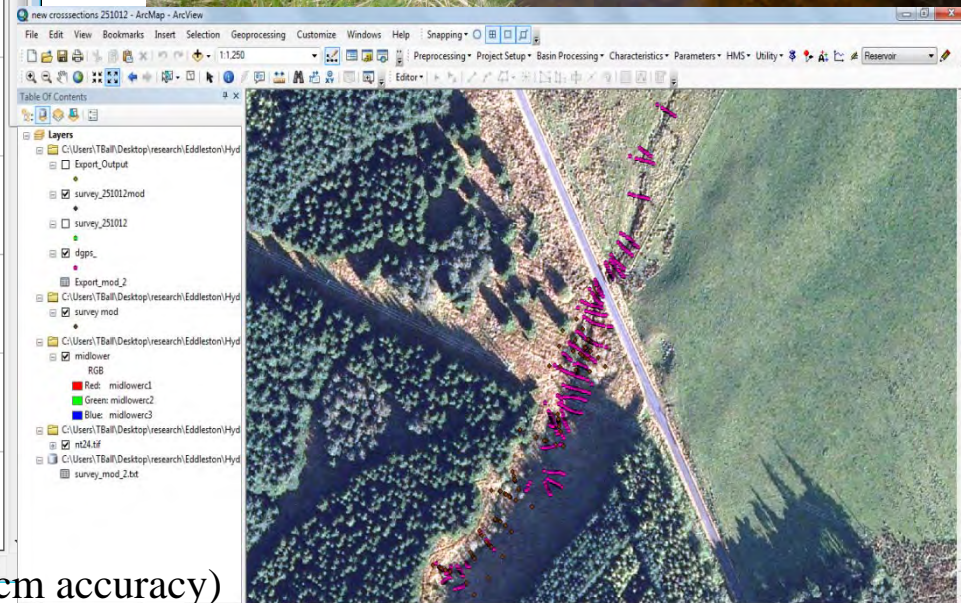
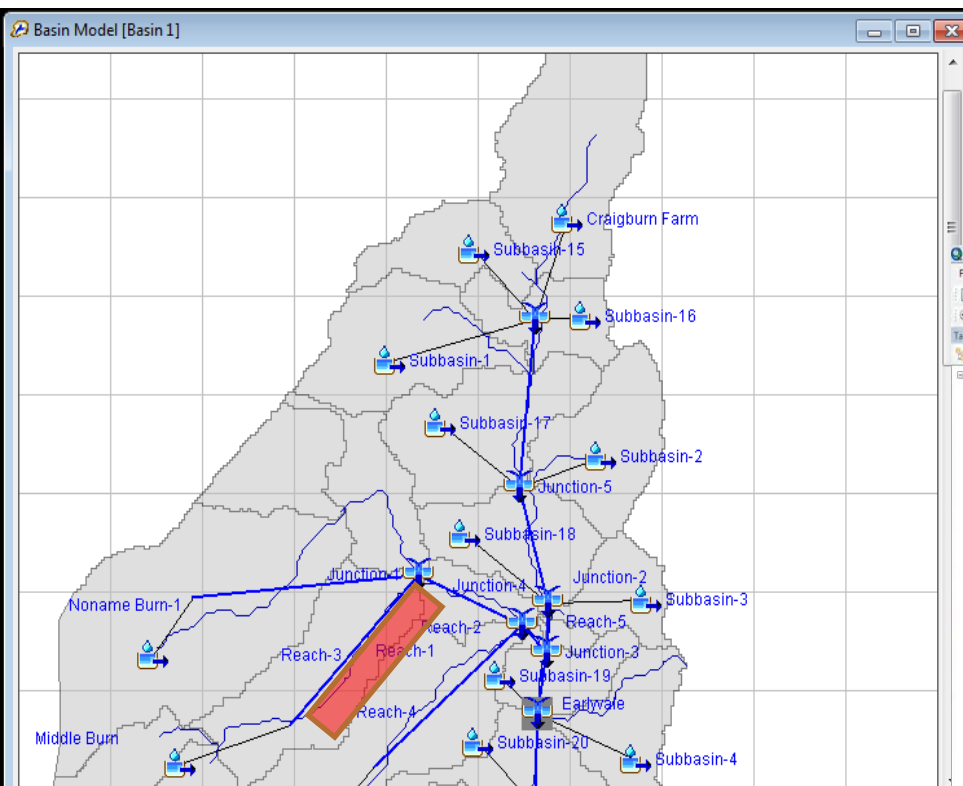
- Assessing stream flows and floods following **floodplain and gully tree planting** in the Longcote burn (Forest Research)



- Fish survey work also being undertaken to assess ecological benefits as well as flood reduction (Tweed Foundation)

Monitoring individual interventions to reduce flooding

- **Flow restrictors** (engineered log jams) placed in the Middle Burn
- Use of the stream gauging network in hydrological modelling



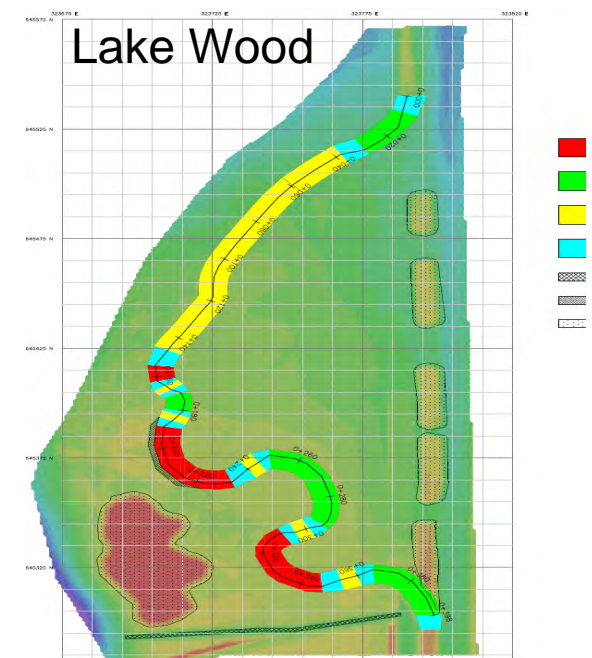
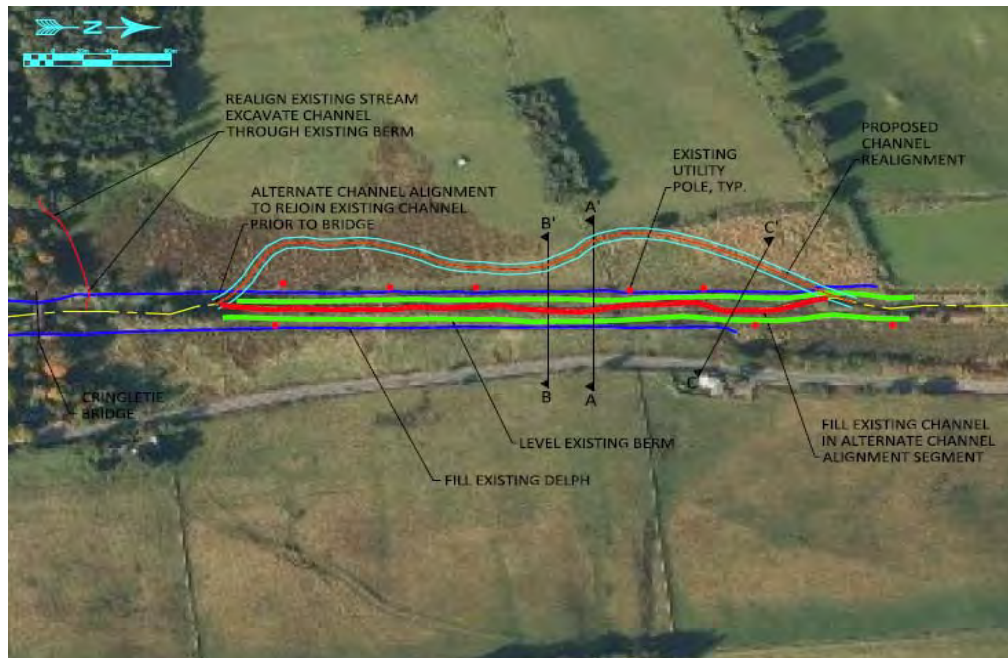
Channel survey using dGPS (2-10cm accuracy)

Monitoring the impact of re-meandering the river

Overall Aim of intervention monitoring: To measure those components of ecology and hydro-morphology that will be affected by the specific physical changes made to the river / flood plain at intervention locations

Flood and channel studies combined with ecological studies:

- Hydraulic modelling of the 2 re-meandered sites to assess flows, flood storage and effectiveness of NFM measures, and subsequent measurements.



Physical works on the ground - new meanders Autumn 2013



Social challenges – Opportunities and Barriers to restoration

conducting a series of studies designed to answer some of the questions posed above. This will mean that members of the team may be seen working in and along the river, mapping it and taking measurements. Others will be talking with farmers, land-owners and those at risk of being flooded to seek their views. We very much hope that, if invited, you will assist the team from Dundee University in their investigations.

The outcome of the study will be a report (completed by the end of the year), which will identify opportunities for both restoring the physical condition of the river and reducing the risk of flooding. No actual works will be commenced or undertaken without more detailed studies and the involvement of local communities.

Should you have any questions or information that could be of interest to the Dundee University team,

please contact:
Professor Alan Werritty (School of Social and Environmental Sciences, University of Dundee, DD1 4HN, tel 01382 389084); or
Luke Comins (Tweed Forum, South Court, Drygrange Steading, Melrose, Roxburghshire TD6 9DJ, tel 01896 849723).

You can get this document on tape, in large print, and various other formats by contacting us at the address below. In addition, contact the address below for information on language translations, additional copies, or to arrange for an officer to meet with you to explain any areas of the publication that you would like clarified.

??????
Council Headquarters | Newtown St Boswells |
MELROSE | TD6 0SA
tel. 01835 77777 | email: ?????@scotborders.gov.uk



Printed in the Scottish Borders. Designed by Scottish Borders Council Design & Design Services.



Improving the Eddleston Water for People and Wildlife



- **Interviews with key stakeholders:** Scottish Govt, SEPA, Tweed Forum, Scottish Borders Council, SNH, Tweed Foundation, Scottish Water, NFU(Scotland), Scottish Wildlife Trust, RSPB, Country Landowners Business Association.

In August 2009 the Tweed Forum invited the University of Dundee to undertake an initial study on how the Eddleston Water might be restored, so that it reduces the risk of flooding in Peebles and the village of Eddleston, and provides a better habitat for wildlife.

This forms part of a major initiative by the Scottish Government and Scottish Environment Protection Agency (SEPA) to improve the status of all of Scotland's rivers by improving their physical condition to support wildlife (restoring them to a more 'natural' condition), and by slowing their flow (where possible) to reduce the risk of flooding downstream.

Increasingly the public wishes to see rivers returned to a more 'natural' state and flood risk reduced by means that are both cost-effective and sustainable over the long term. Neither of these


goals is easy to achieve as some of the science and technology required for successfully restoring rivers is still in its relative infancy. The valley of the Eddleston Water is an ideal location in which to explore these ideas for the following reasons:

- Much of the main stem of the river was straightened in the mid 19th century when the Edinburgh to Peebles railway was constructed
- This has resulted in a poor habitat for wildlife (notably salmon) and has increased the speed with which water running off the surrounding hills (generated by rain storms on the higher ground) flows onto the main valley floor and downstream to the communities of Eddleston and Peebles.

The overall goal of the initial scoping study is to explore ways in which:

- conditions for wildlife could be improved (eg by restoring the former meanders and improving the habitats within the river channel itself); and
- the downstream flood risk could be lessened, by reducing the rate at which runoff is generated from the surrounding hills and by slowing flood waters as they pass down the river, before reaching Eddleston and Peebles.

Over the next two months, a team from Dundee University (working closely with Scottish Borders Council, and under the direction of the Tweed Forum) will be



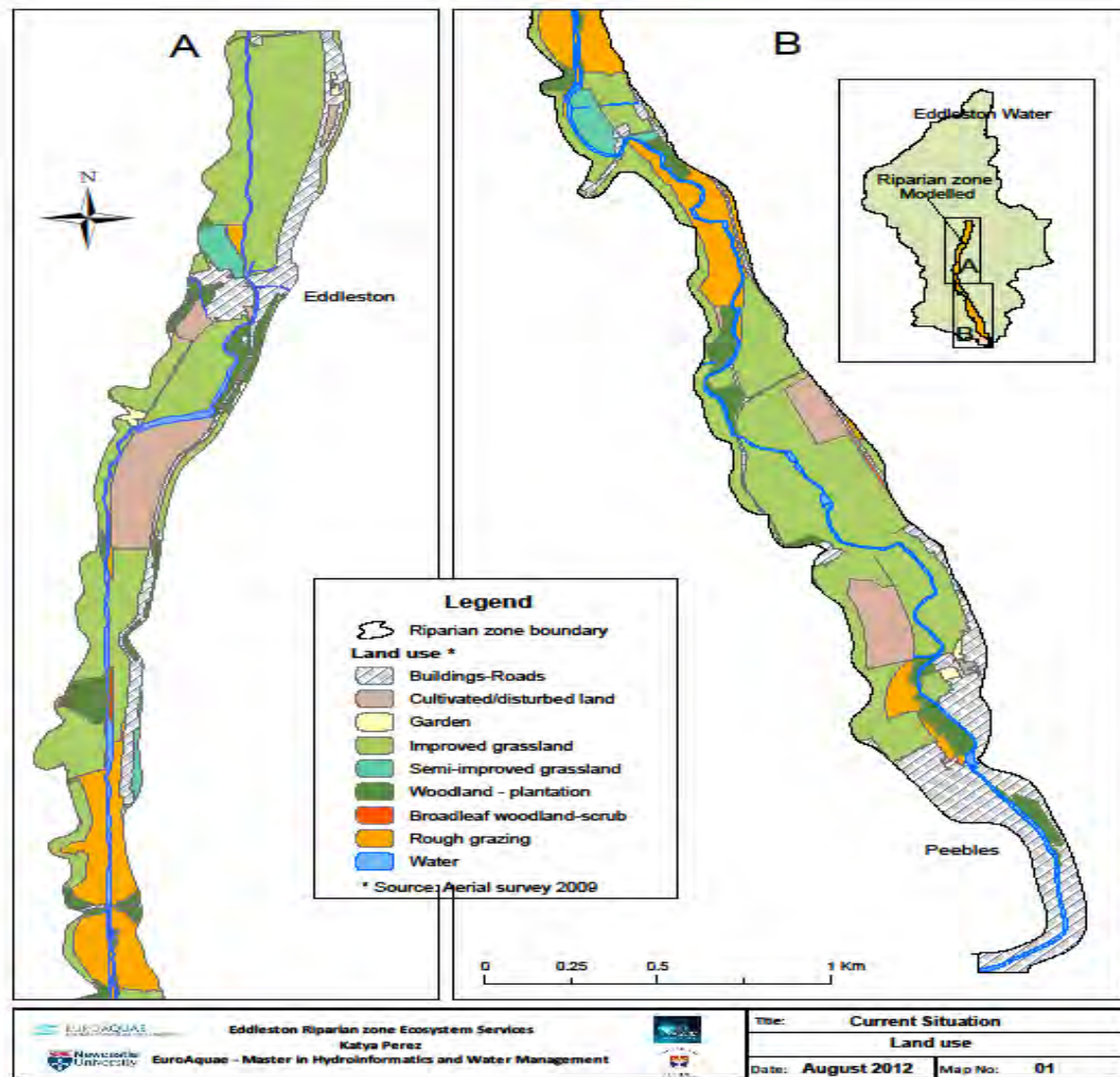
- **Interviews with landowners** (three floodplain and two upland farmers) middle-aged, male, long-term landowners in the valley (>30 years) with several sources of income.
- **Literature review**
- **On-going study on Farm businesses and NFM measures across Tweed**

Exploring the impact of changes on catchment land use and benefits provided (ecosystem services)

Current land use and straightened course of the river:

Current farming in the flood plain is predominantly improved grass, and cut for silage

Eddleston Water was severely straightened, embanked and shortened (c.30%) at the end of the 18th Century

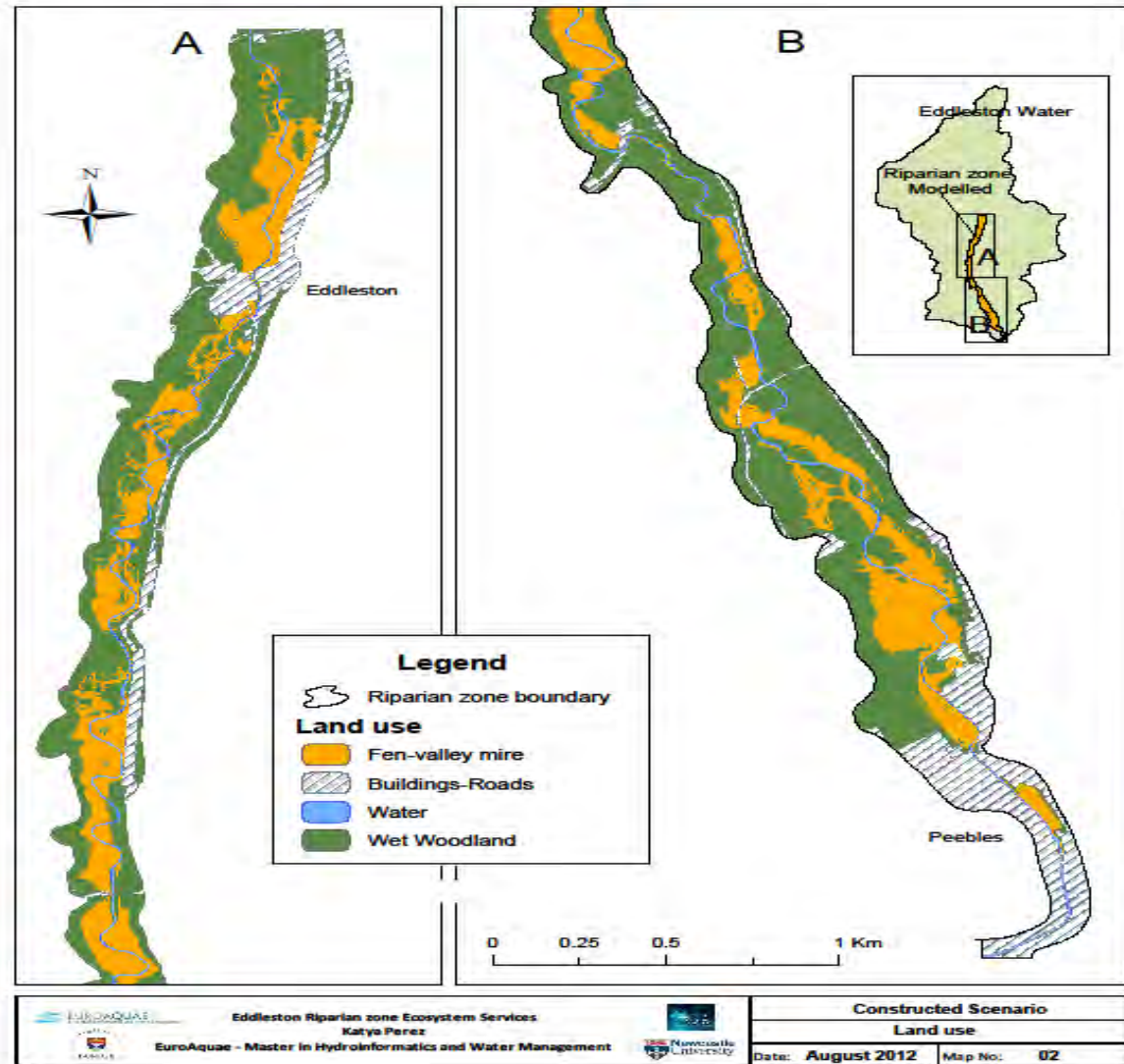


A potential theoretical (modelled) flood regulation land use scenario

Flood risk regulation scenario, using NFM techniques:

Farming in the floodplain is replaced by Wet Valley Woodland - max flood retention & high Mannings 'n'

River course has now been “re-meandered”, based on course of the old river and embankments “removed”



Eddleston Water - unique monitored pilot catchment for ‘proving’ the value, costs and benefits of restoring river environments for people and wildlife

Linking Science, Policy and Practice

River flow and flood gauges

Ground water surveys and boreholes

Rainfall and weather stations

River habitats and hydro-morphology

River biology – fish, plants, invertebrates

Land-owner & community engagement

Long term Study

