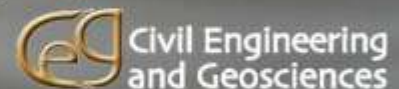


Flood and Diffuse pollution management using a catchment engineering approach with stakeholders in Belford Burn, Northumberland

Jennine Jonczyk, Mark Wilkinson, Paul Quinn,
and Alex Nicholson – Newcastle University

Phil Welton and Peter Kerr – Environment
Agency



Holistic management – engineer catchments

- **Engineer** our catchments for a new future - through *proactive* intervention.
- **Learning process** by which we change how catchments function, whilst evaluating who benefits and at what cost.
- **Catchment Engineering** – is the tool that gives us integrated catchment adaptation by providing understanding on how catchment function changes as we 'engineer' a solution together.
- **Bottom - up** approach to catchment management.

Belford – flooding

The village of Belford, Northumberland
– Many flood events (6km² catchment)



Belford – Background

- Environment Agency looked at the feasibility of a traditional flood defence scheme for Belford
- High costs meant economics did not stack up
- Alternative approach of **managing runoff** in the catchment was put forward
- The scheme was funded by the **Environment Agency's North East Local Levy**, raised by the **Northumbria Regional Flood Defence Committee** though **Local Authorities**

BBC NEWS **WATCH LIVE** BBC News 24

Last Updated: Monday, 13 August 2007, 15:43 GMT 16:43 UK
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Flood plan for town is approved

Flood prevention works costing £600,000 have been announced for the Belford area of Northumberland.

The Environment Agency says the works will include ways of preventing blockages in the stream which runs through Belford.

Staff will also work with local farmers so fields upstream of Belford can act as wet areas to allow surface water to drain away.

Work is expected to begin on initial phases of the project later this year.

An Environment Agency spokesman said: "Our climate is changing, which means that extreme weather will become more frequent in the future.

"We need to find new ways of dealing with our streams and rivers rather than only trying to wall up the water with flood defences.

"The innovative improvements will help to strengthen flood protection in the town. However flooding will become more of an issue in the future and everyone needs to take steps now to protect themselves."

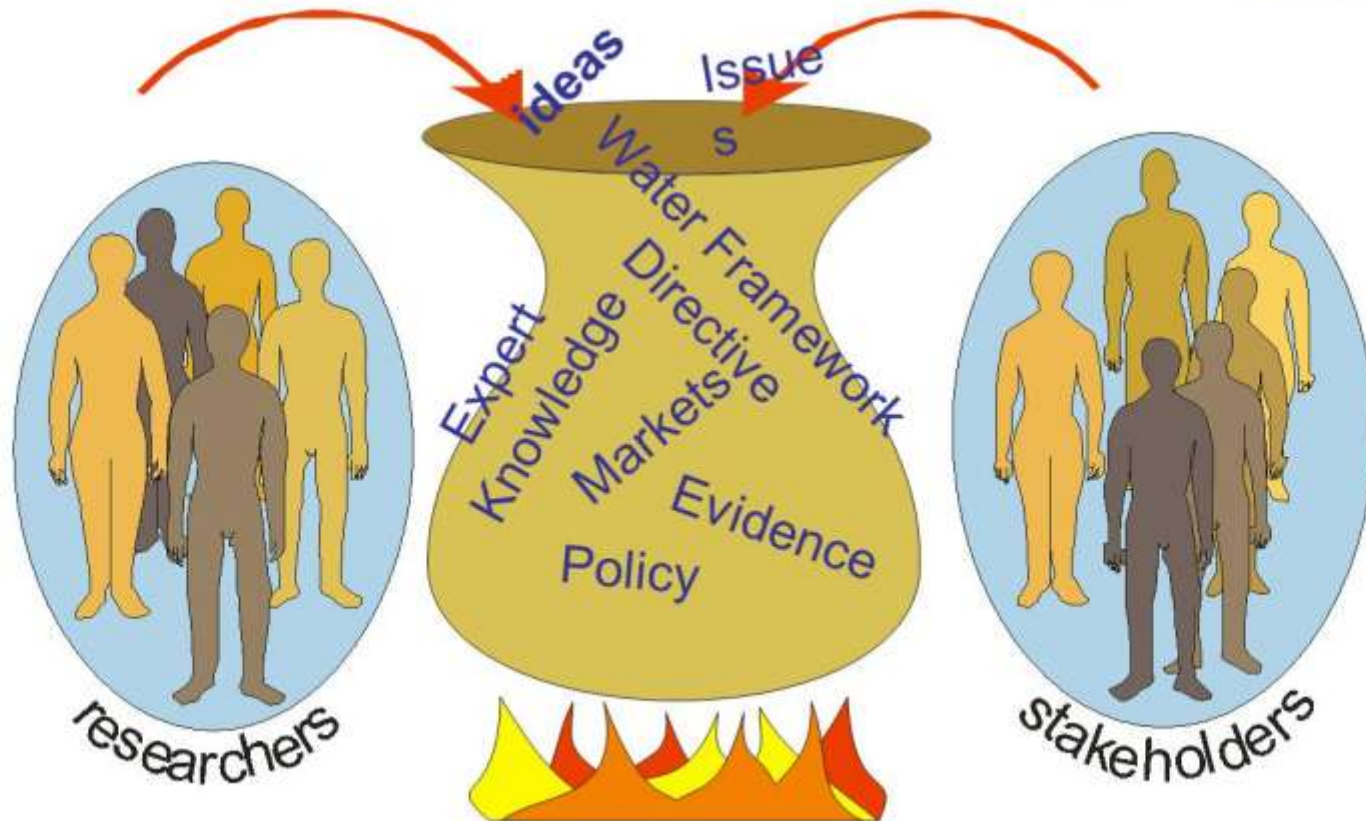
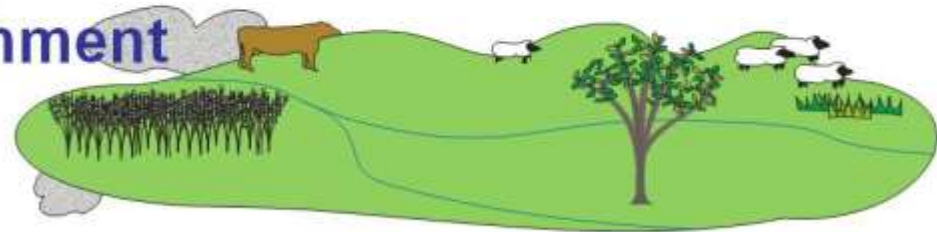
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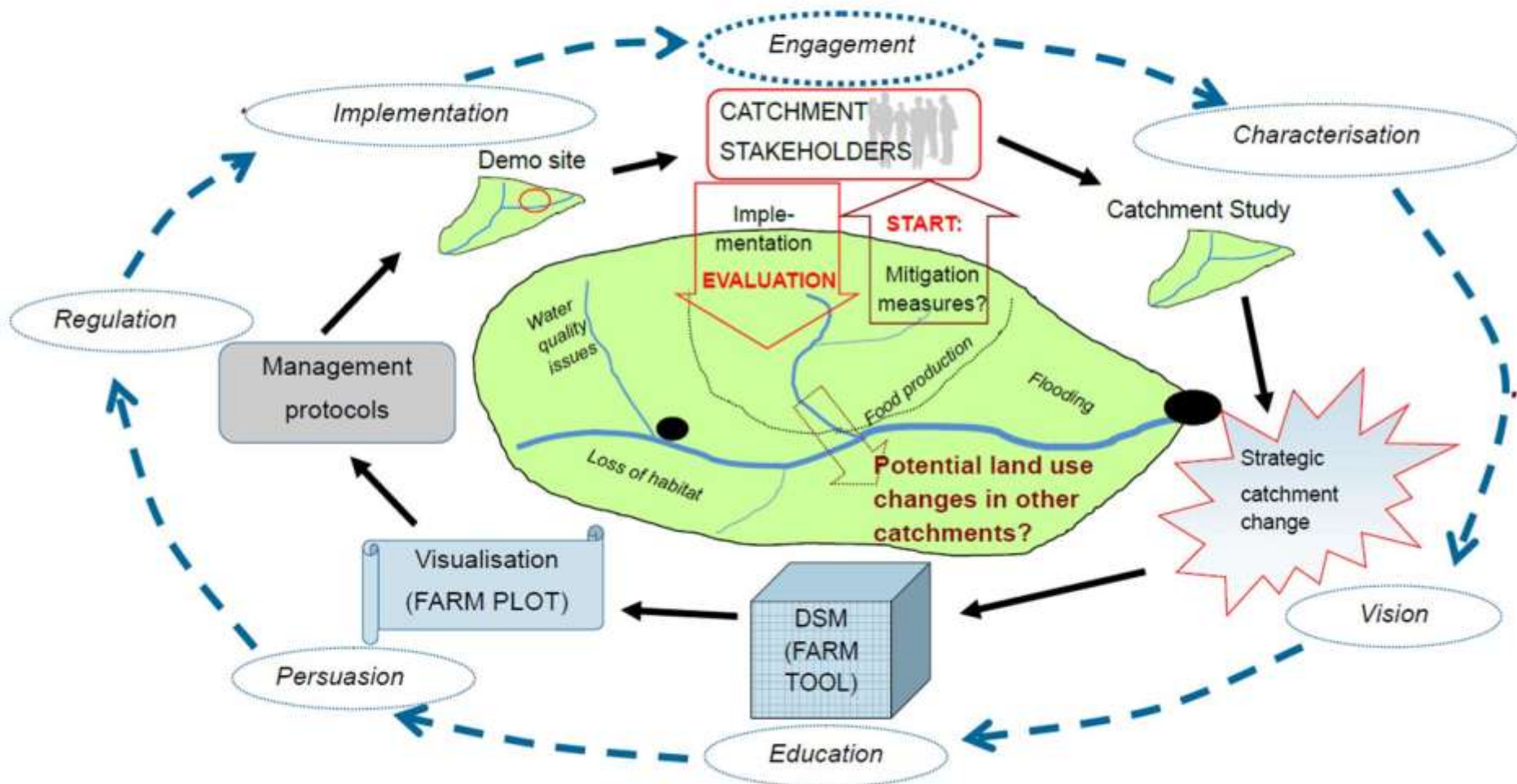


Develop a common vision for catchment management centred around local knowledge

Local Catchment



Belford – The catchment engineering toolkit



Stakeholders at the centre!

Stakeholders have been consulted with throughout the project and are a vital part in the delivery of the project

“It’s good to talk”



Science



Policy makers

Landowners/managers

Local residents/tourists

Conservationists/*contractors*



Belford - Catchment adaptation



Trap sediment



N P pH etc.
Water quality improvements

DISCONNECT **FILTER**

Runoff attenuation features

SLOW **STORE**



Mammal Habitat

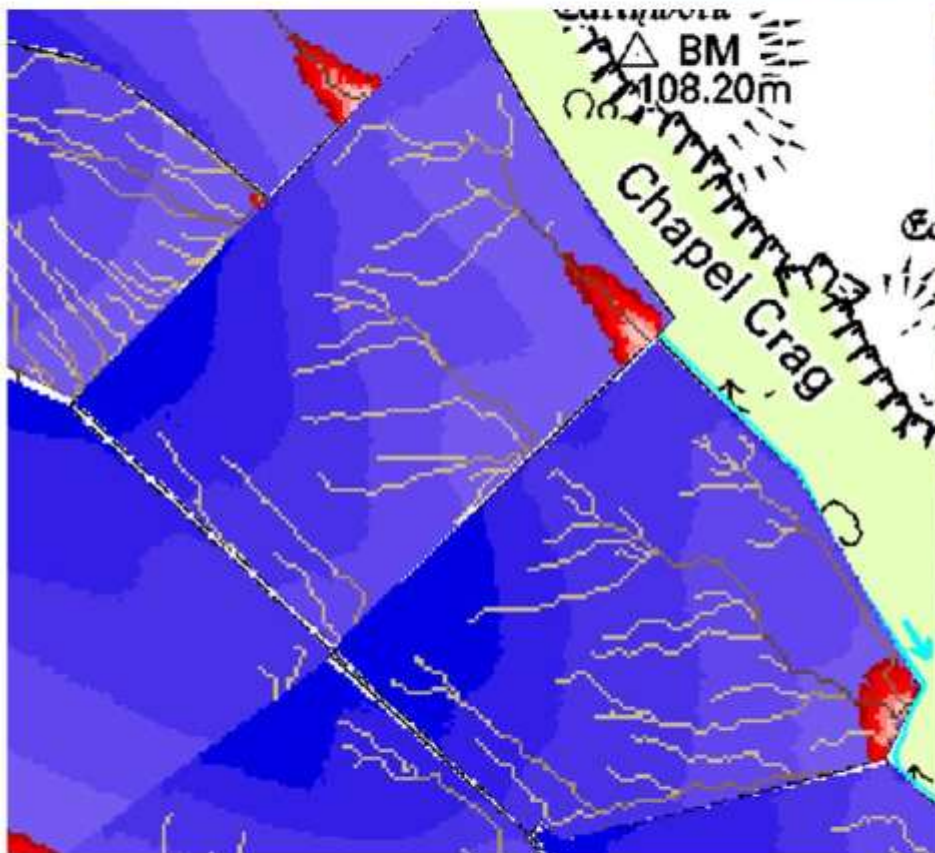


Flood reduction



Bird Habitat

Farm Pond Location Tool (Farm PLOT)

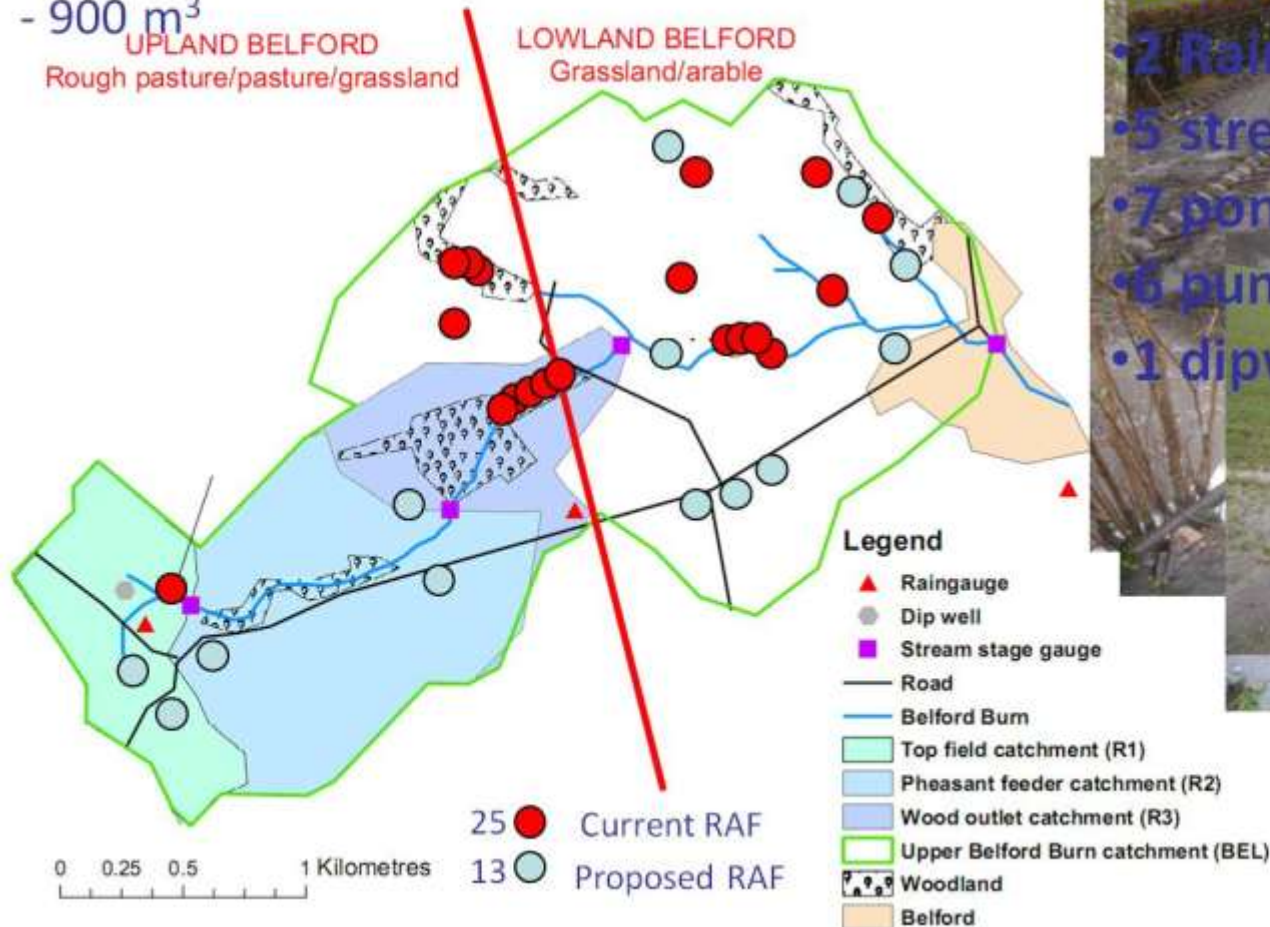


- Use of Lidar data: locate flow pathways and potential storage areas
- Export information to Google Earth

Instrumentation and mitigation

PILOT RAF: The demonstration site

- Wooden bund that collects runoff and spill from stream
- Cost more, less of impact on ground
- 900 m³



Instrumentation network

- 2 Rain gauges
- 5 stream gauges
- 7 pond level gauges
- 6 pump samplers
- 1 dipwell



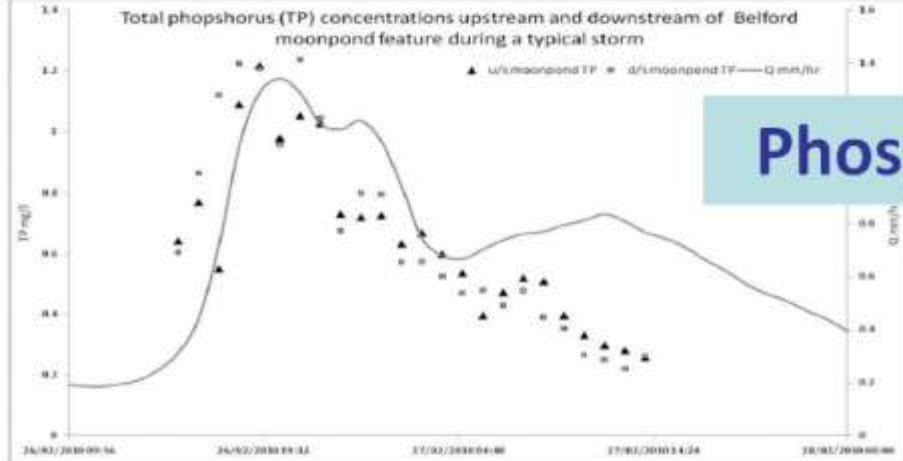
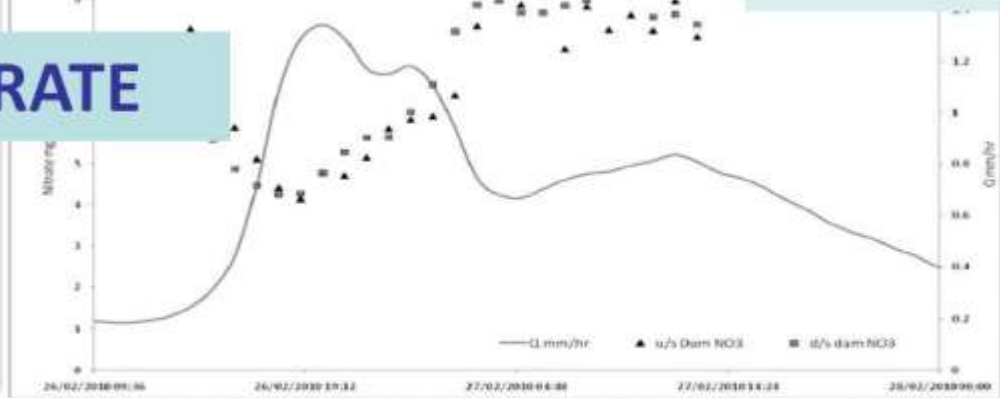
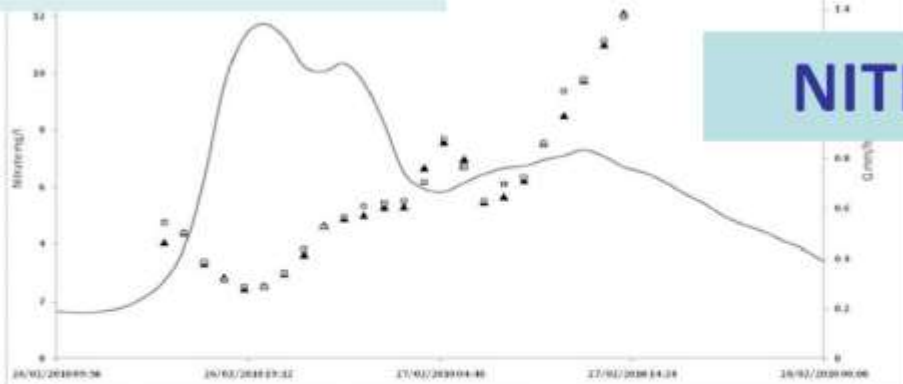
"Moonpond"

upstream and downstream of Belford moonpond during a typical storm

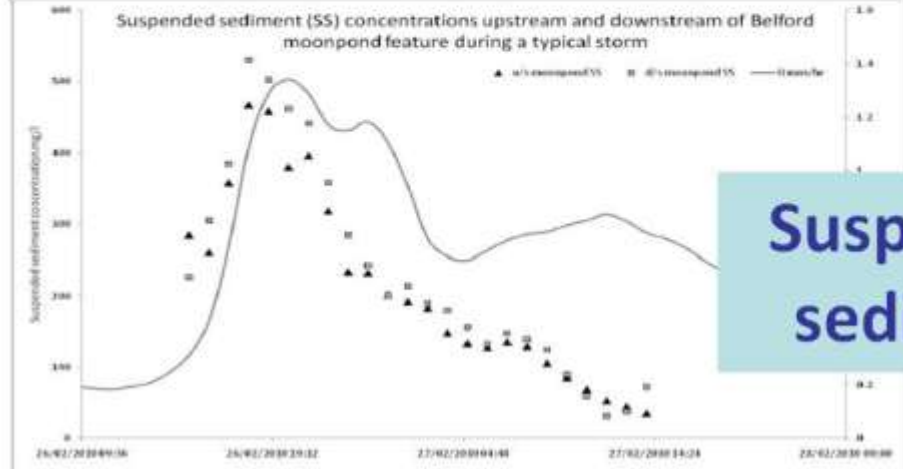
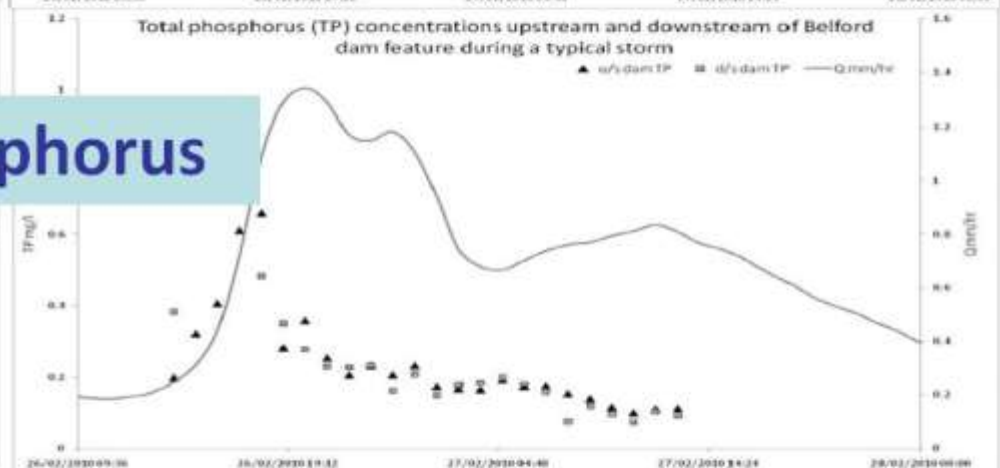
"Dam"

Nitrate (NO3) concentrations upstream and downstream of feature during a typical storm

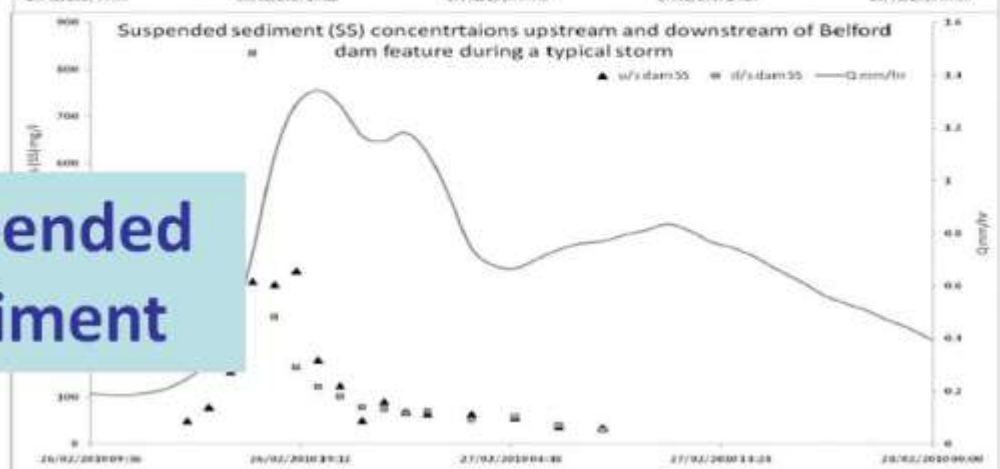
NITRATE



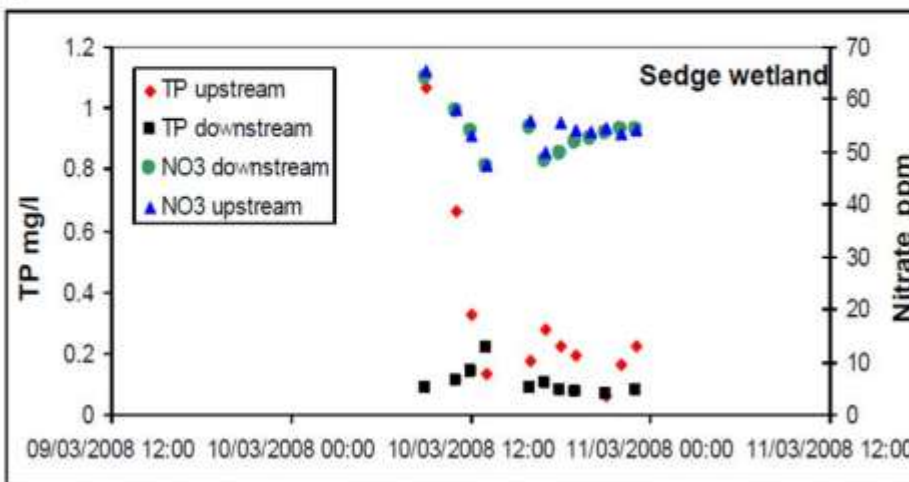
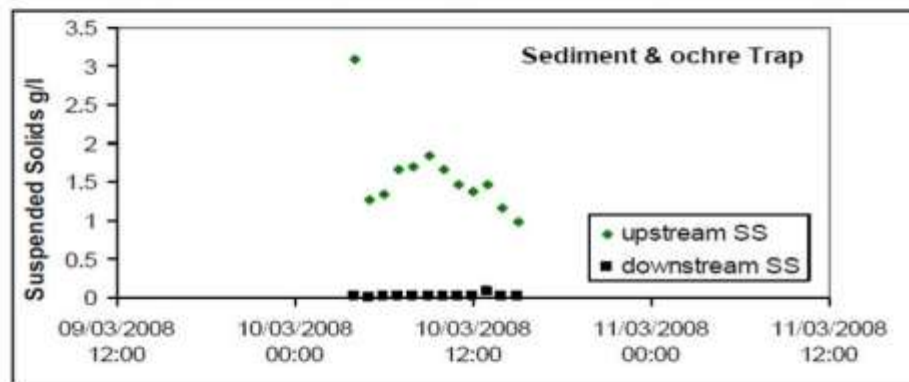
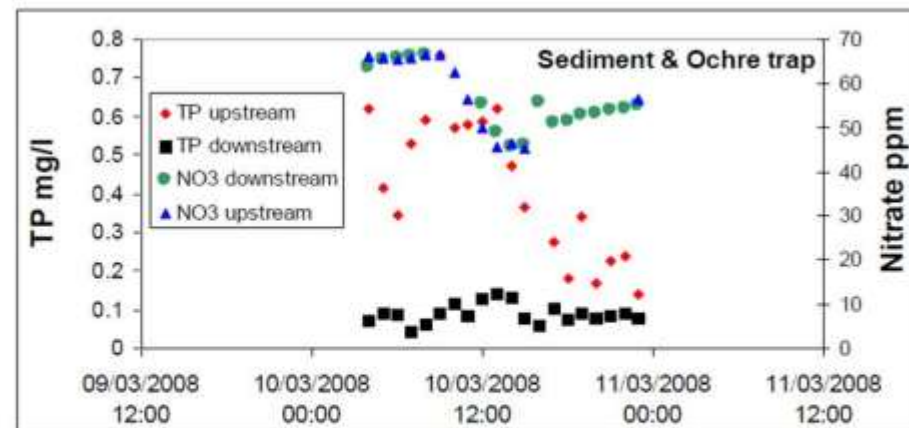
Phosphorus



Suspended sediment



Example of performance of within-ditch features during a small storm



Nafferton Farm Expts

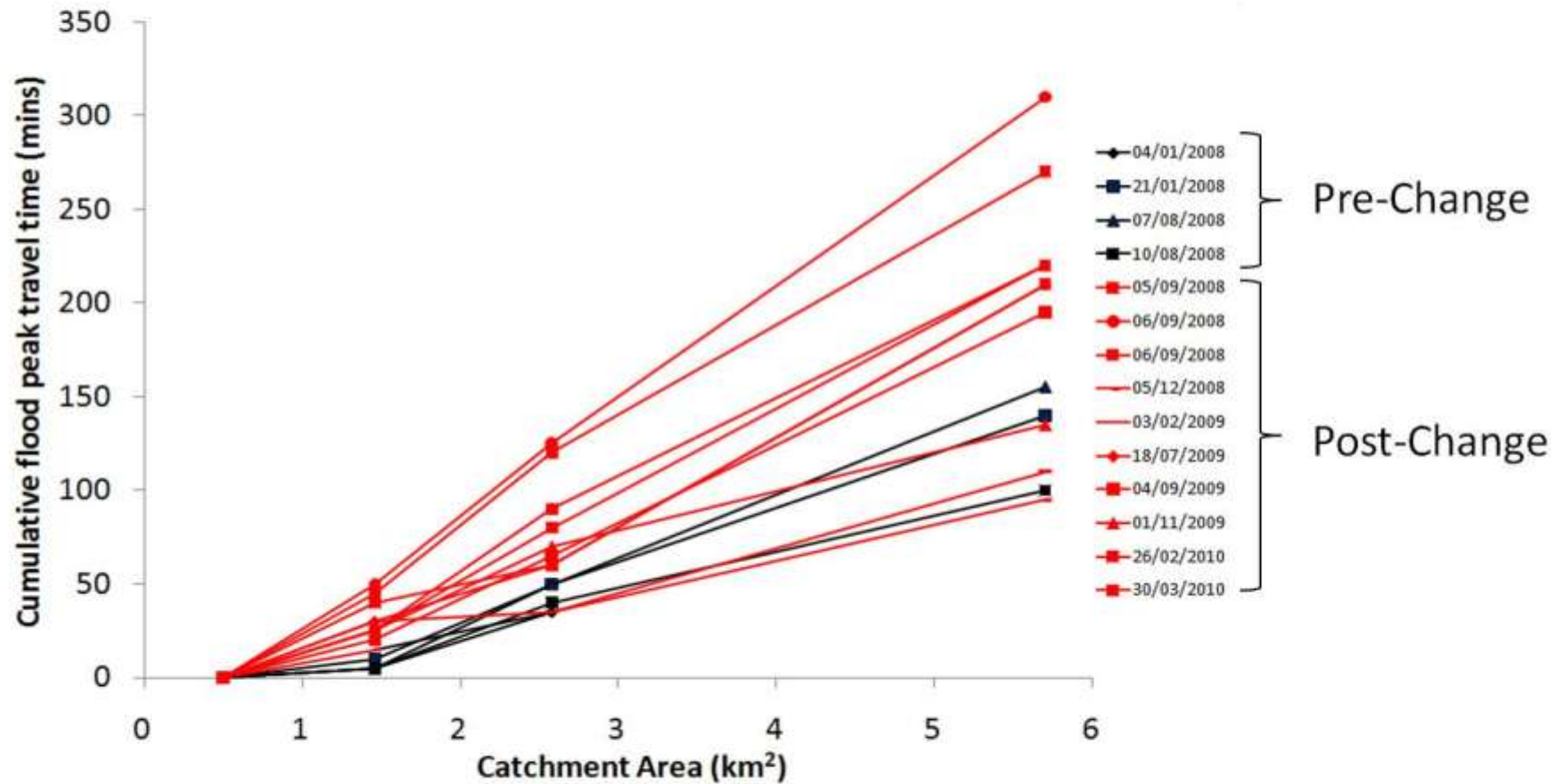


Optimisation of RAF for WQ

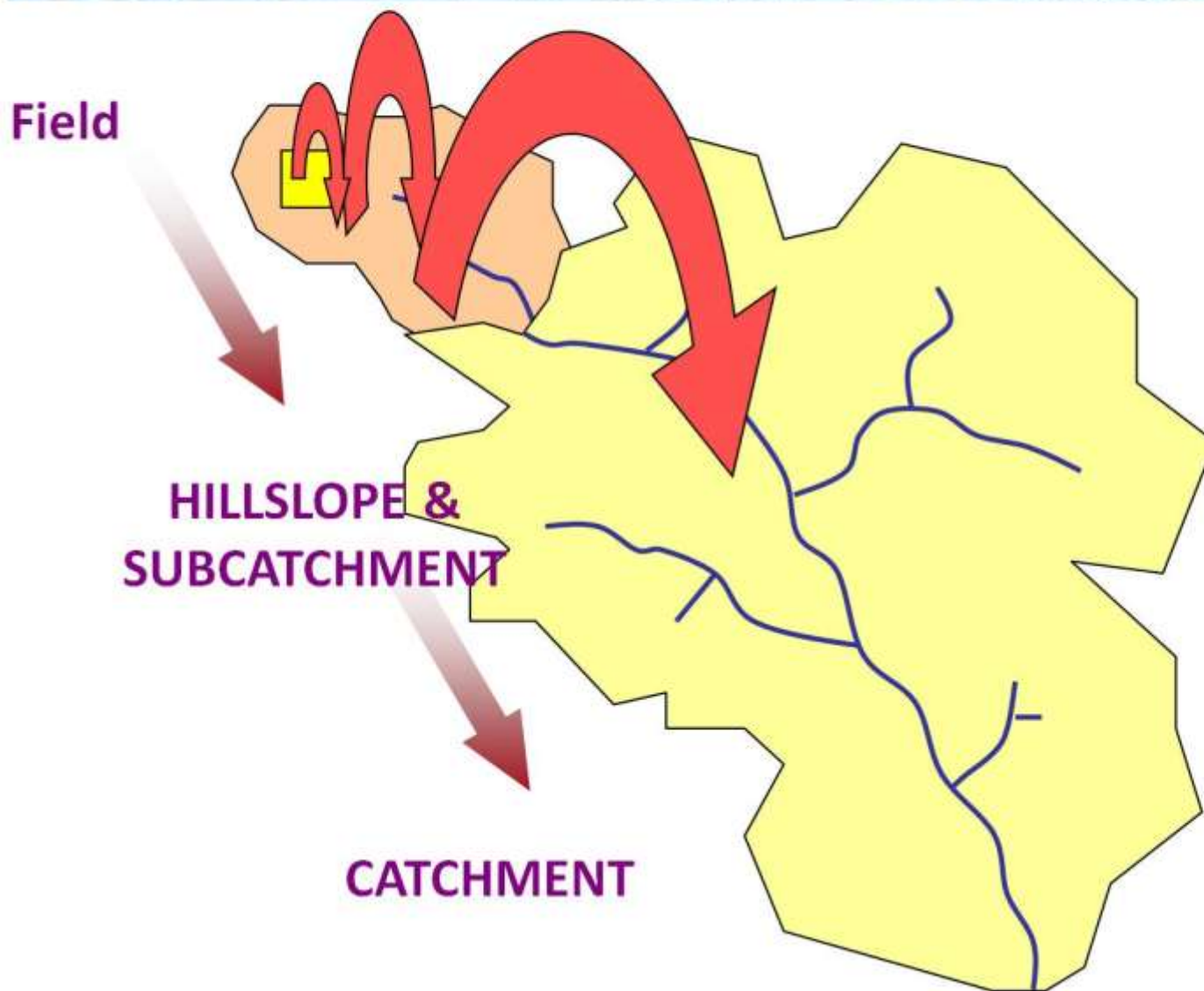


Nicholas Barber's PHD work

Travel time of peak



The Bottom-Up approach



- In terms of the evidence base we need to quantify what is happening locally
- But for policy, we still need to upscale
- Good quality multi-scale catchment experiments are vital



Summary

- **Hands on**, multi-objective work is a cost effective way to catchment management
- Different Runoff Attenuation Features (controlling fast runoff pathways, while tackling water quality and other issues) have been implemented in the catchment **in partnership with farmers and local landowners**
- Visual observations and preliminary data show the effectiveness of the features locally
- However, more data, data analysis and modelling are required to quantitatively assess the impacts of the features at the catchment scale

Questions?



www.ceb.ncl.ac.uk/proactivefarms



Soon to be

research.ncl.ac.uk/proactivefarms

*Belford Proactive Flood Solutions is an Environment Agency Project funded by the **North East Local Levy**, raised by the **Northumbria Regional Flood Defence Committee** through **Local Authorities**.*