

# Evaluating multipurpose soft engineered mitigation measures in the Belford Burn catchment, Northumberland, UK.

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# Introduction

There is great potential for agricultural management to become a major part of improved strategies for controlling runoff.



# Catchment Systems Engineering

*“Catchment Systems Engineering aims to sustainably manage water quantity and water quality at the catchment scale whilst not affecting agricultural productivity using an interventionist approach”*



*Pond 3 Runoff Attenuation Feature (RAF)*



*SLOW, STORE, FILTER --- For example, making buffer strips do more*

# Belford case study

The village of Belford, Northumberland, UK  
– Many flood events (6km<sup>2</sup> catchment)



When sandbags and sympathy are not enough...Belford 'bereft' after floods



Belford finds itself under water — an not for the first time either..!



# 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 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.

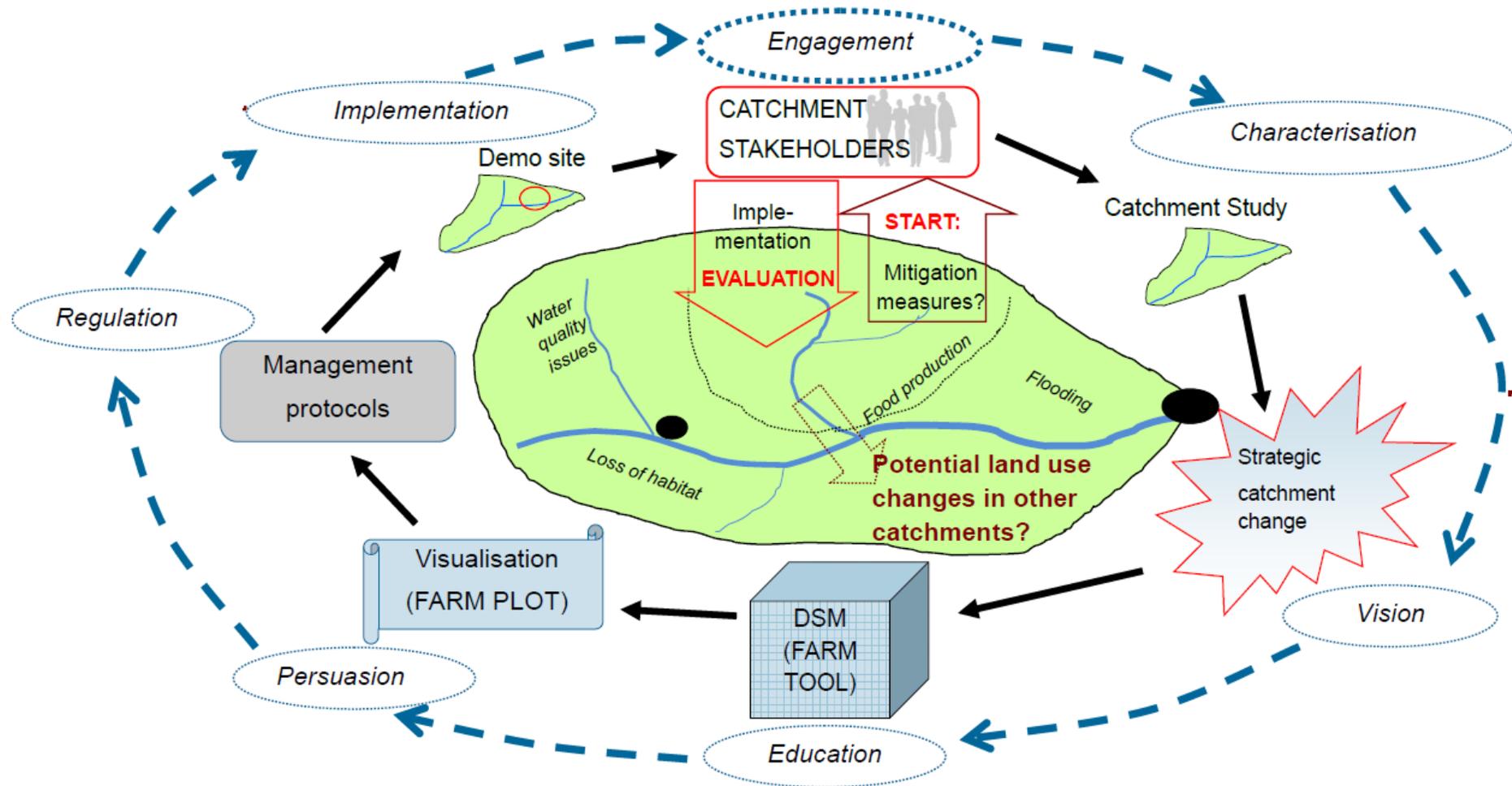
"We need to find new ways of dealing with our streams and rivers rather than only trying to wall up the water with flood defences.

"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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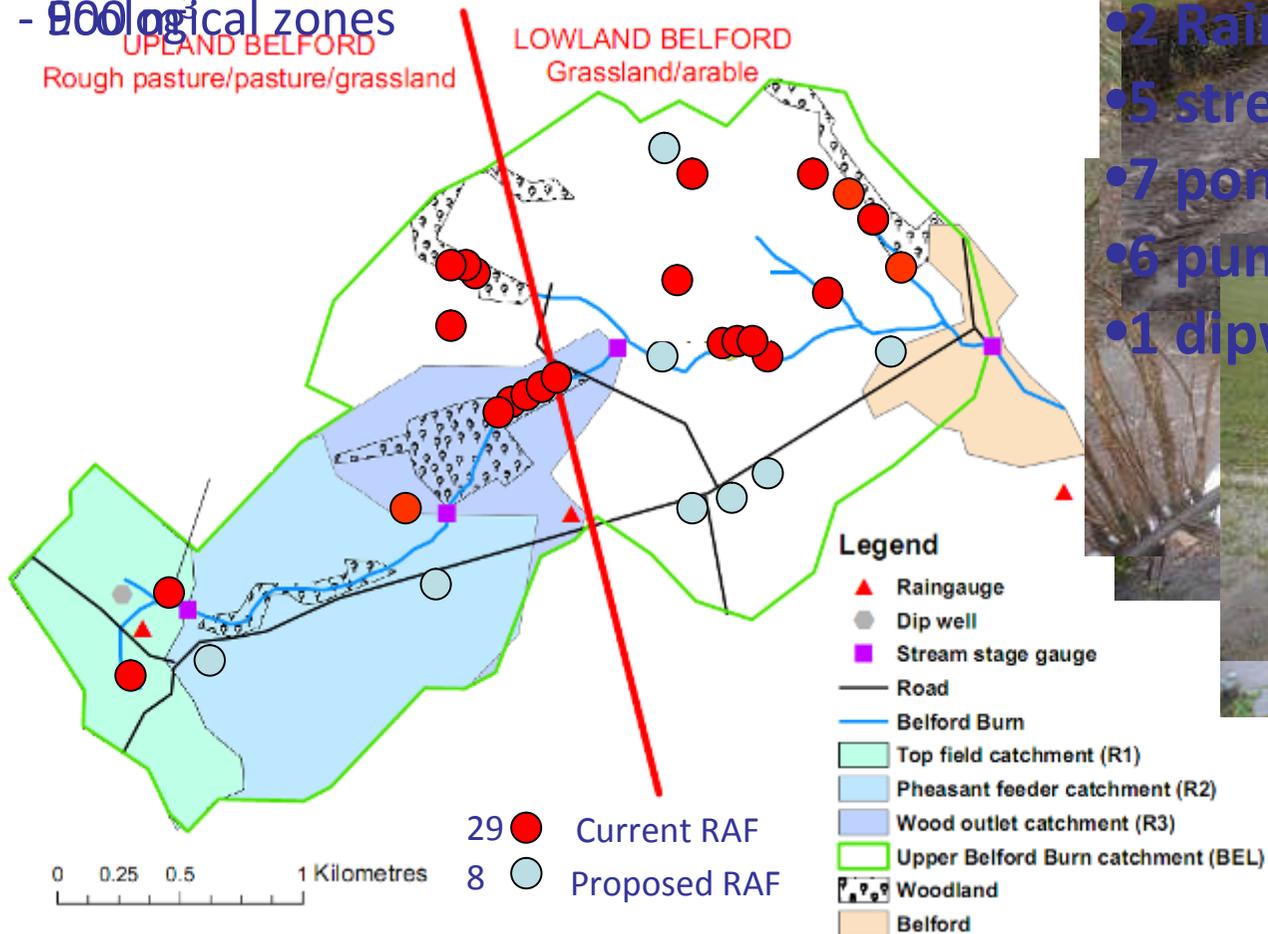


# Belford – The catchment engineering toolkit



# Instrumentation and mitigation

- 500mm diameter concrete pipe filled with coarse gravel
- 600mm stone over design to avoid scour
- Acts as road over low point
- Bank to be eroded to match top of flow to spill into feature
- Pipe raised slightly to allow for sediment capture
- 000 logical zones



## Gathering the evidence

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





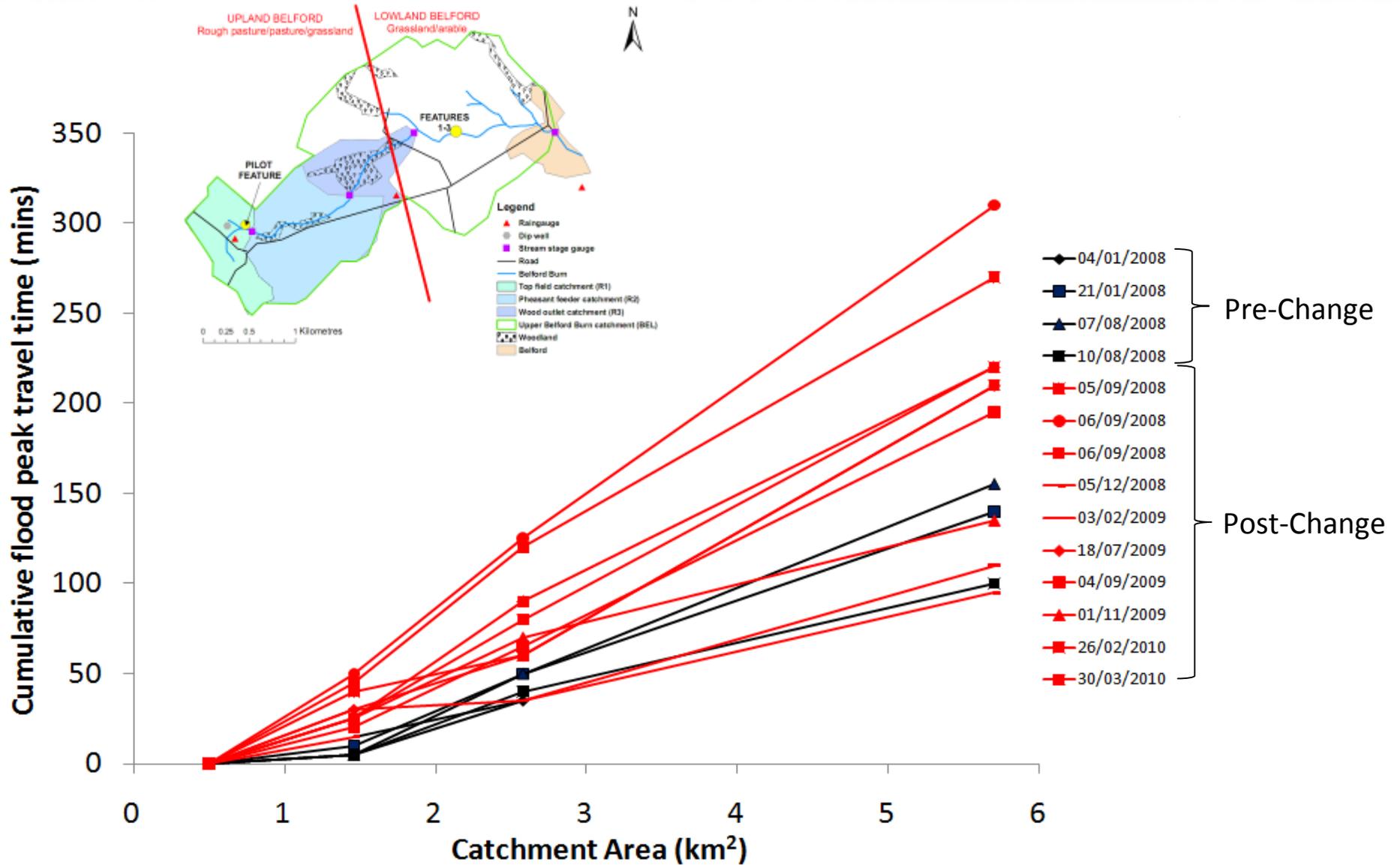
# Optimisation of RAFs for WQ



Nicholas Barber's PHD work

**SLOW, STORE AND FILTER** ---- An example of an in-stream intervention

# Travel time of peak



# The community feeling

## After September 2008 floods – During construction

July 2007 – Before the project

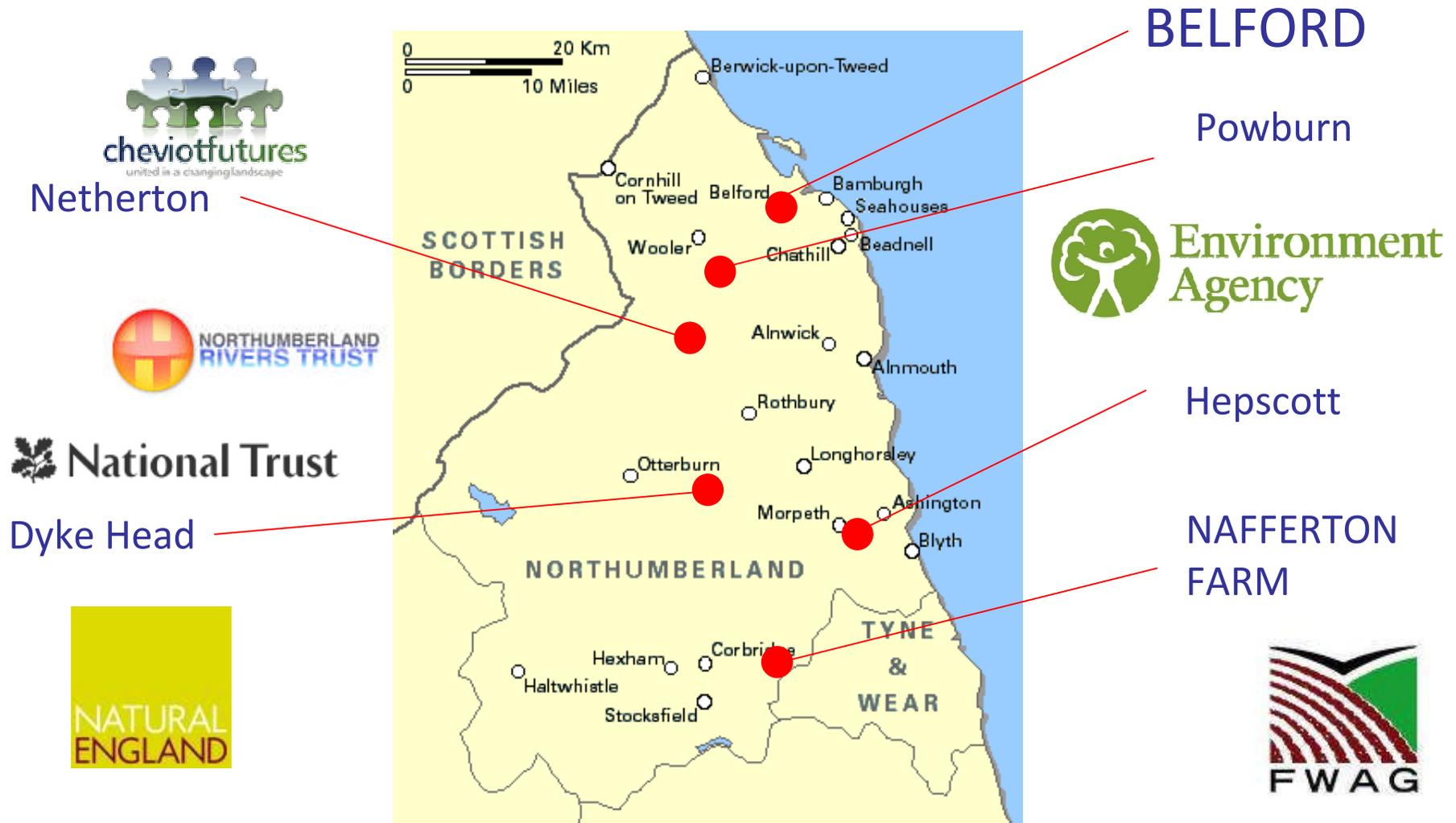


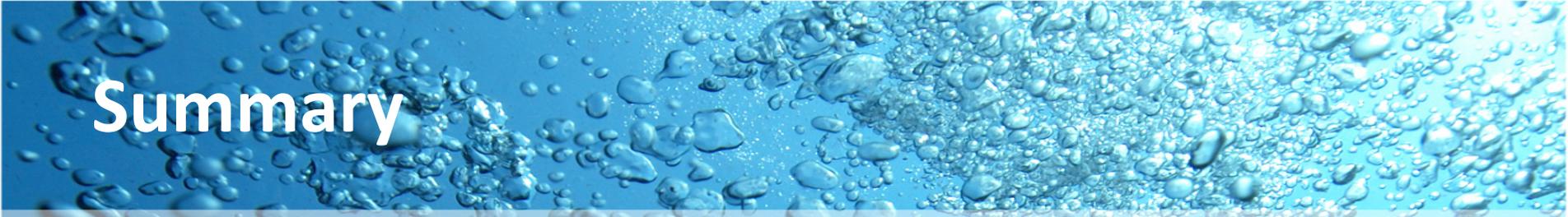
The Berwick Advertiser website header includes navigation links for News, Sport, Community, Your Say, Newspaper, Health Info, and Money. A date of 23rd September 2009 is visible. The main article is titled "Pioneering ponds save Belford from flooding".

The Journal Live website header includes navigation links for Home, News, NUFC, SAFC, Sport, Videos & Pics, Blogs, Taste, Business, homemaker, and Culture. The main article is titled "Belford flood scheme used as example" and is dated Feb 1, 09 02:53 PM in Councils. The article text reads: "Berwick MP Sir Alan Beith has met the Environment Agency to ask about improvements to flood defences in Northumberland. He was hopeful that progress was being made. 'The Agency is clearly very pleased with the work at Belford on catchment ponds and are now actively looking at developing similar schemes in other areas.' We'd like to hear from you. Send your stories, pics and videos to northumberland@ncjmedia.co.uk".

# Uptake

*Further sites in Northumberland taking the runoff management approach*





# 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?



[Research.ncl.ac.uk/proactive/](http://Research.ncl.ac.uk/proactive/)

**Wilkinson ME, Quinn PF, Welton P. (2010)  
*Runoff management during the September 2008  
floods in the Belford catchment,  
Northumberland. Journal of Flood Risk  
Management, 3(4),***

*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.*