

Belford: A case study of catchment scale natural flood management

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Belford Workshop–
Nov 2011

Catchment Management:

*Natural Flood Management and Joining
NFM to WFD*

<http://research.ncl.ac.uk/proactive/>

*Videos, papers, presentations, Runoff
Attenuation Feature Handbook*

Introduction

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

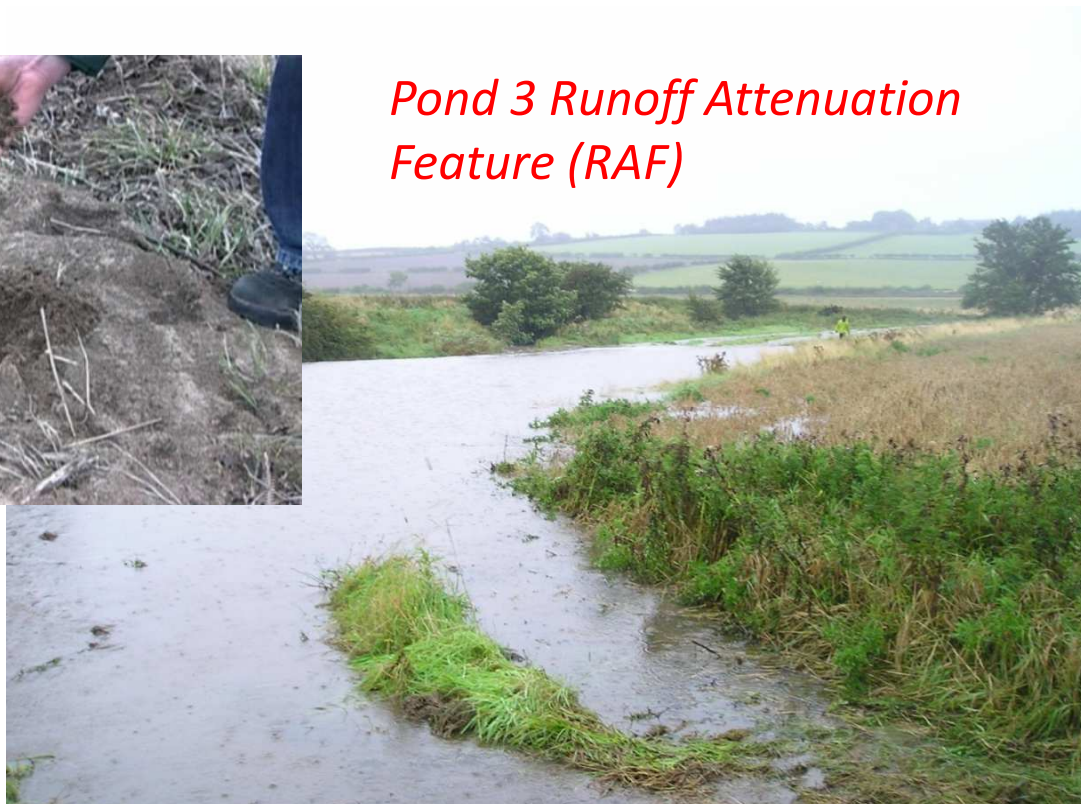


Catchment Systems Engineering

“Catchment Systems Engineering is an interventionist approach to managing water quantity and water quality at the catchment scale”



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 (6km² catchment)



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

Advertiser 12.07.07



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

By KARE SMYTH

Small villages in Northumberland have been hit by a series of floods, with water reaching levels not seen for decades. The village of Belford, which is situated in a valley, has been particularly badly affected. The floods have caused significant damage to the village, with many homes and businesses under water. The water has also caused a lot of damage to the roads and bridges in the area. The floods have been caused by heavy rain, which has fallen over the area for several days. The water has risen very quickly, and has now reached its peak. The floods have caused a lot of damage to the village, and many people have been displaced. The water has also caused a lot of damage to the roads and bridges in the area. The floods have been caused by heavy rain, which has fallen over the area for several days. The water has risen very quickly, and has now reached its peak. The floods have caused a lot of damage to the village, and many people have been displaced. The water has also caused a lot of damage to the roads and bridges in the area.



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 through 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.

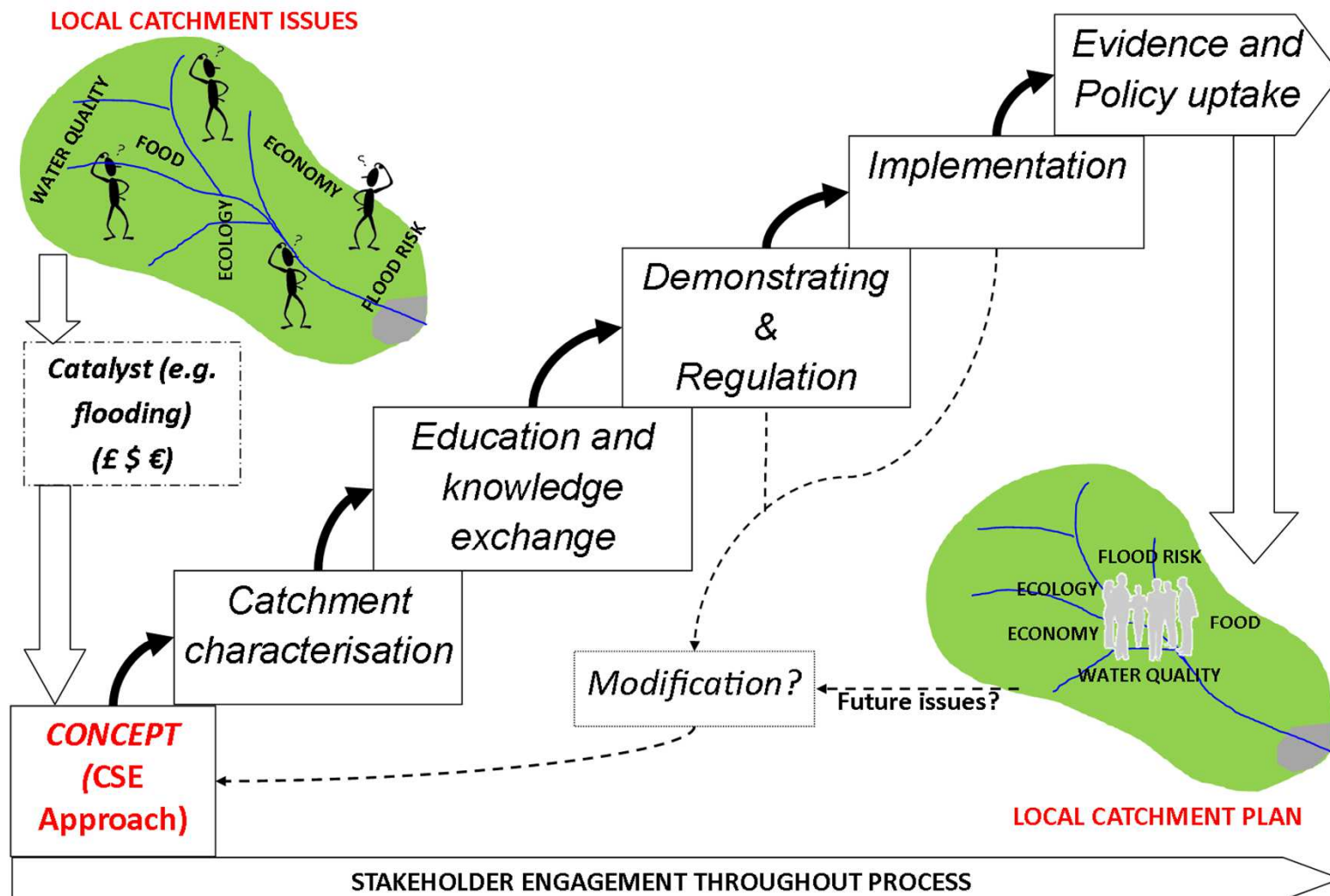
"The innovative improvements will help to strengthen flood protection in the town. However flooding will become more of an issue in the future and everyone needs to take steps now to protect themselves."

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Belford – The catchment system engineering toolkit

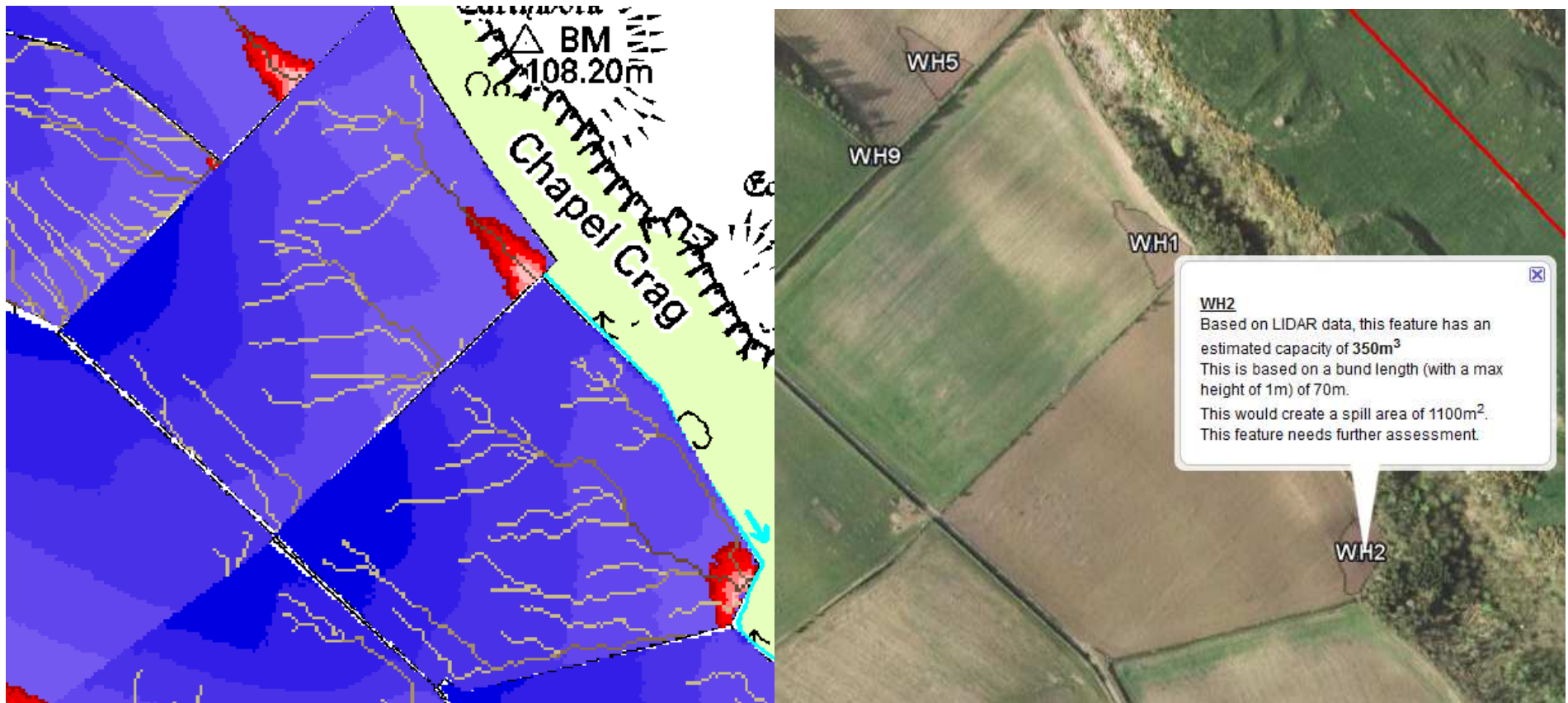


Stakeholder engagement

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



Farm Pond Location Tool (Farm PLOT)

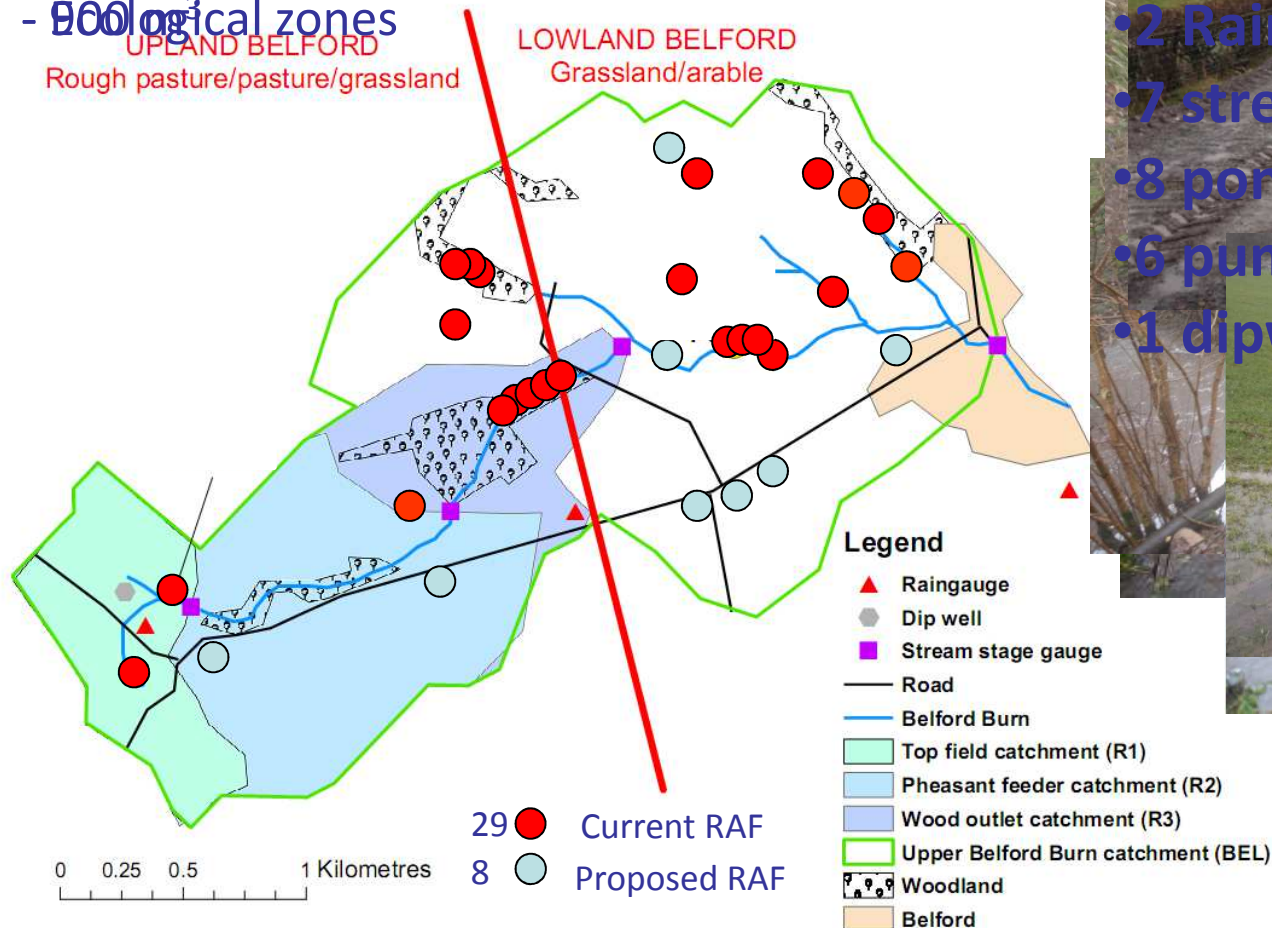


- Use of Lidar data: locate flow pathways and potential storage areas
- Export information to Google Earth

Instrumentation and mitigation

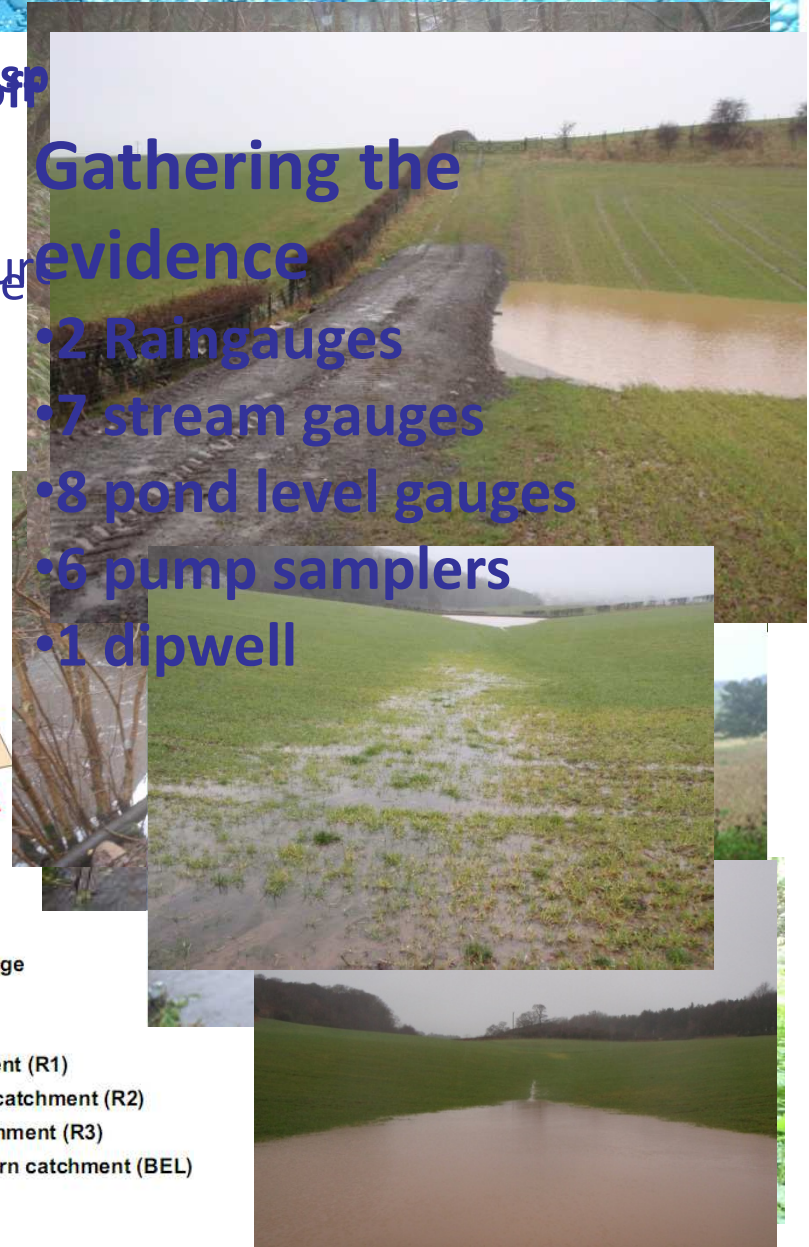
Power of the water table in the flow stream sp
Ladies Well RAPIA RAPI that collects surface runoff

- 500mm concrete channel in the field to collect runoff from a sp
- 600mm stream design to avoid scour
- Acts as road over low point
- 100mm concrete channel to collect runoff from a sp
- Pipe raised slightly to allow for sediment capture
- 100mm concrete channel to collect runoff from a sp



Gathering the evidence

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



Upland RAFs on peat soils and grassland with shallow soils





Belford proactive flood solutions



Belford proactive flood solu



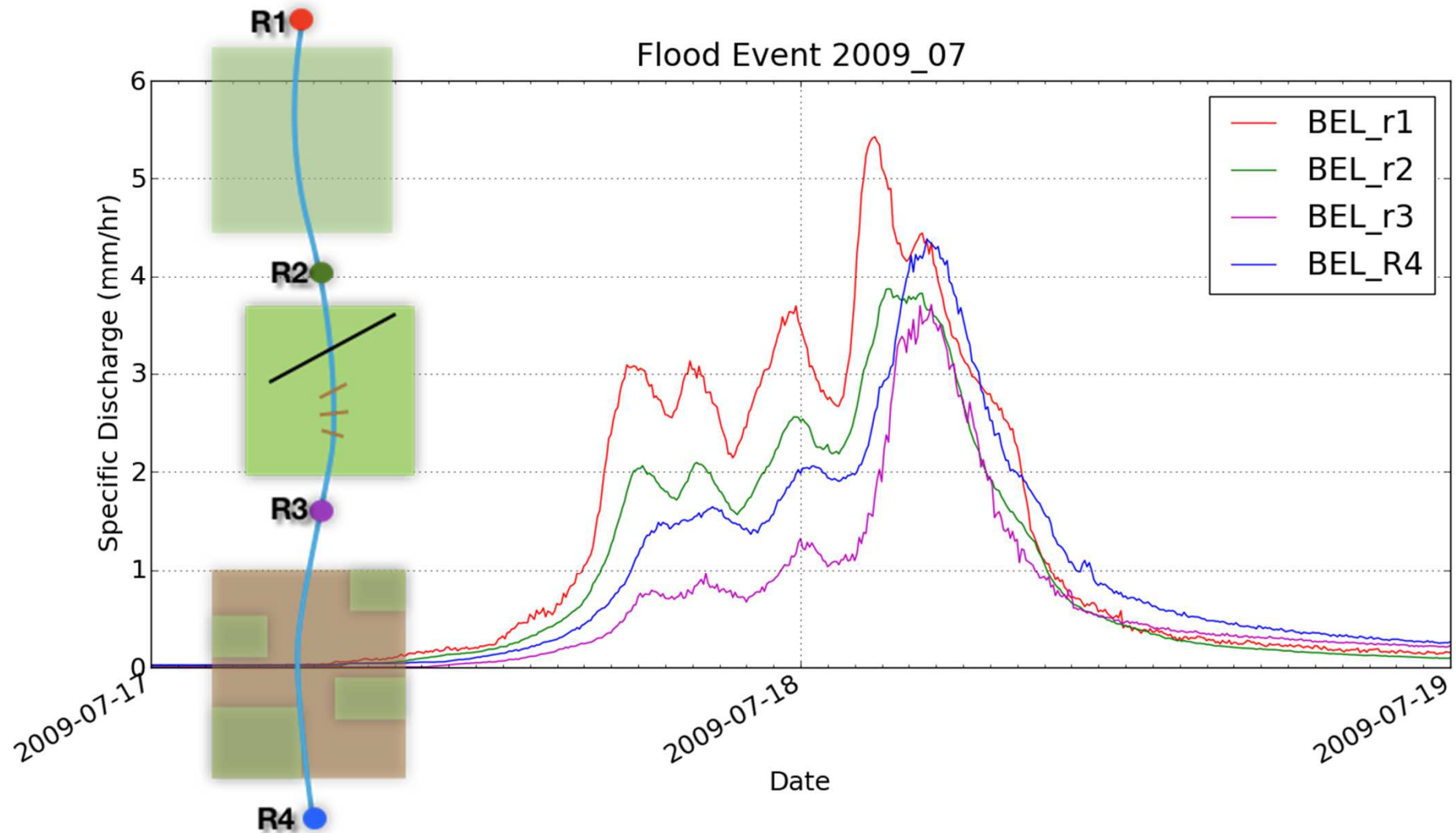
Belford proactive flood solutions



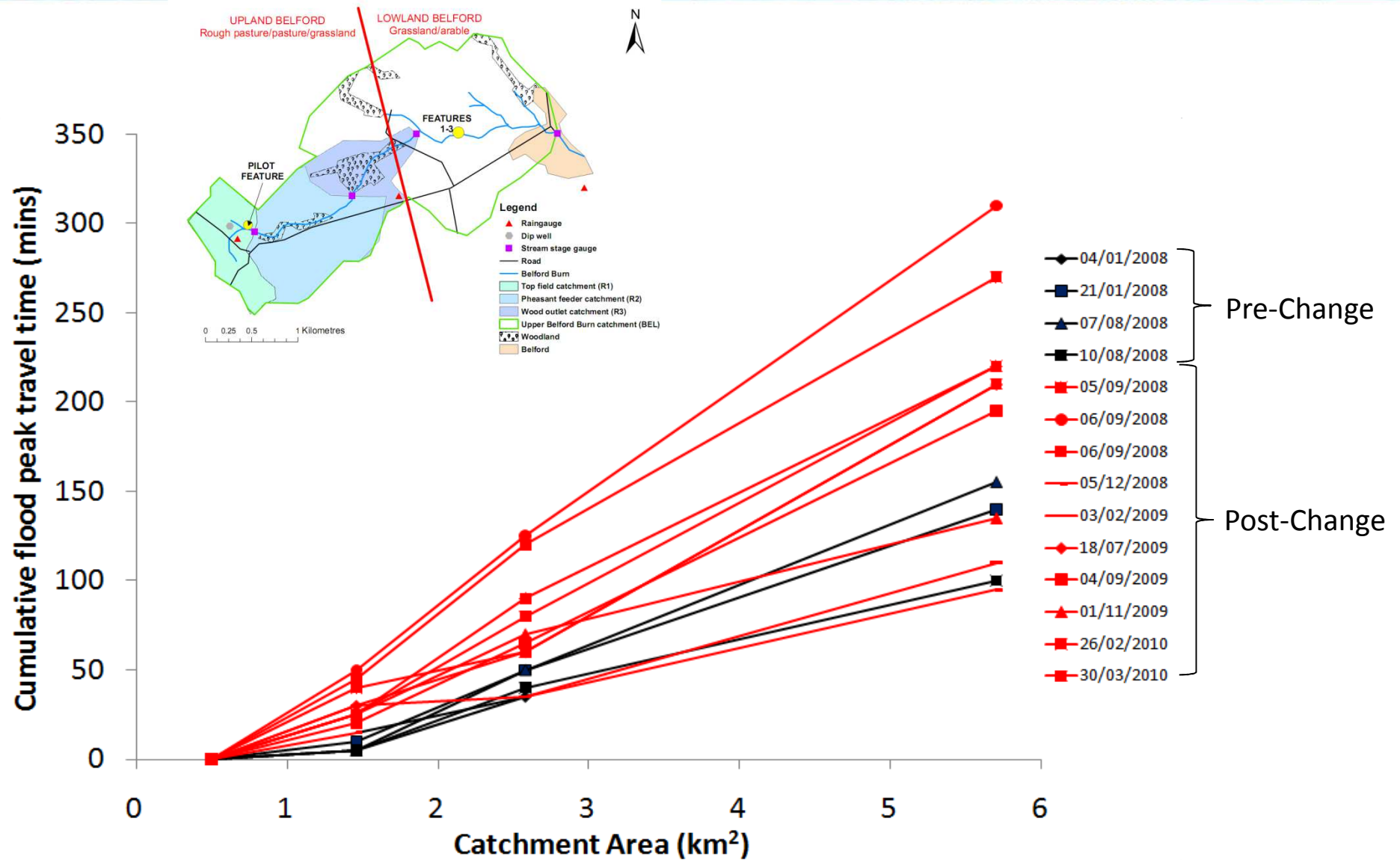
Belford proactive flood solutions



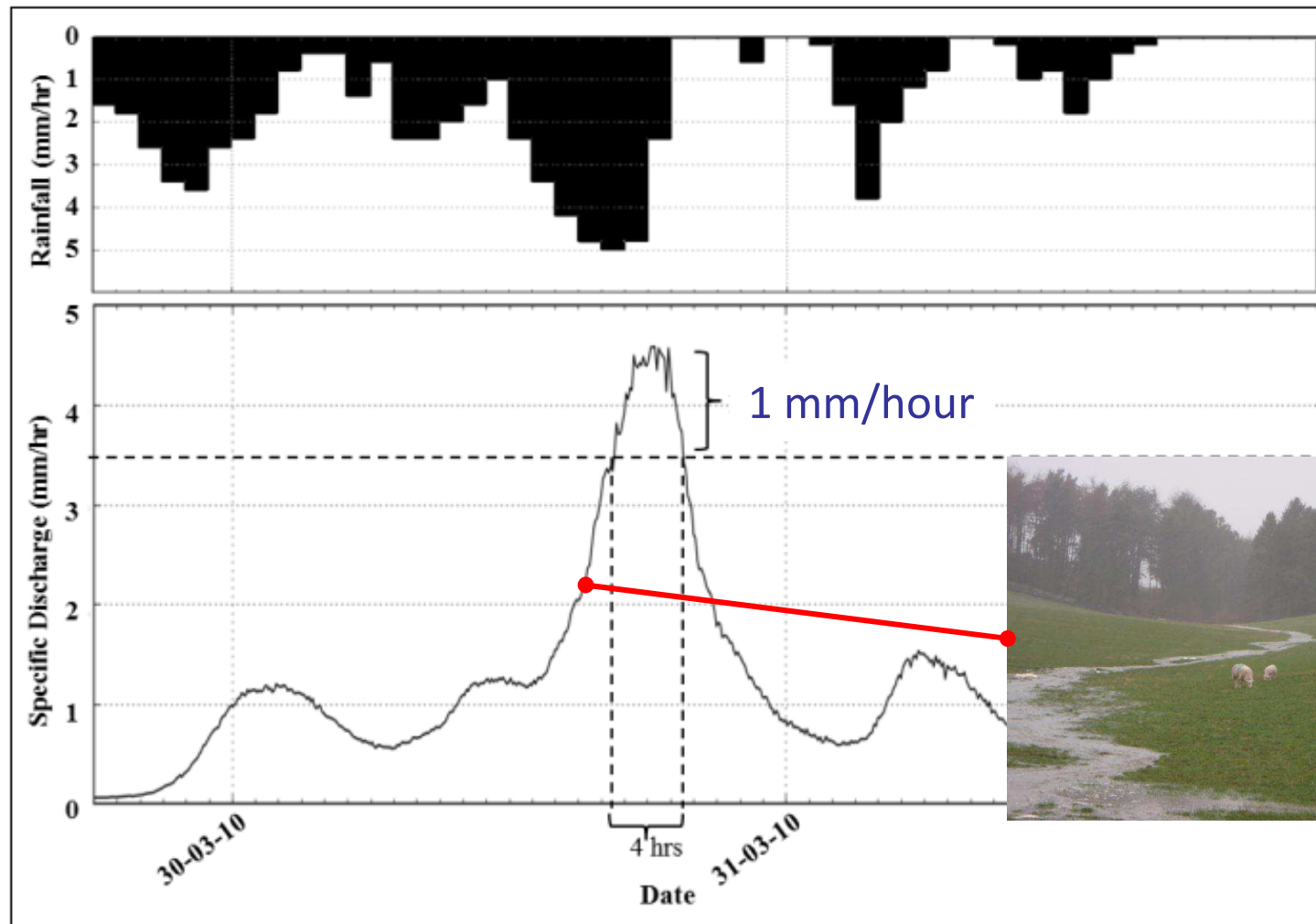
Data Analysis – July 09



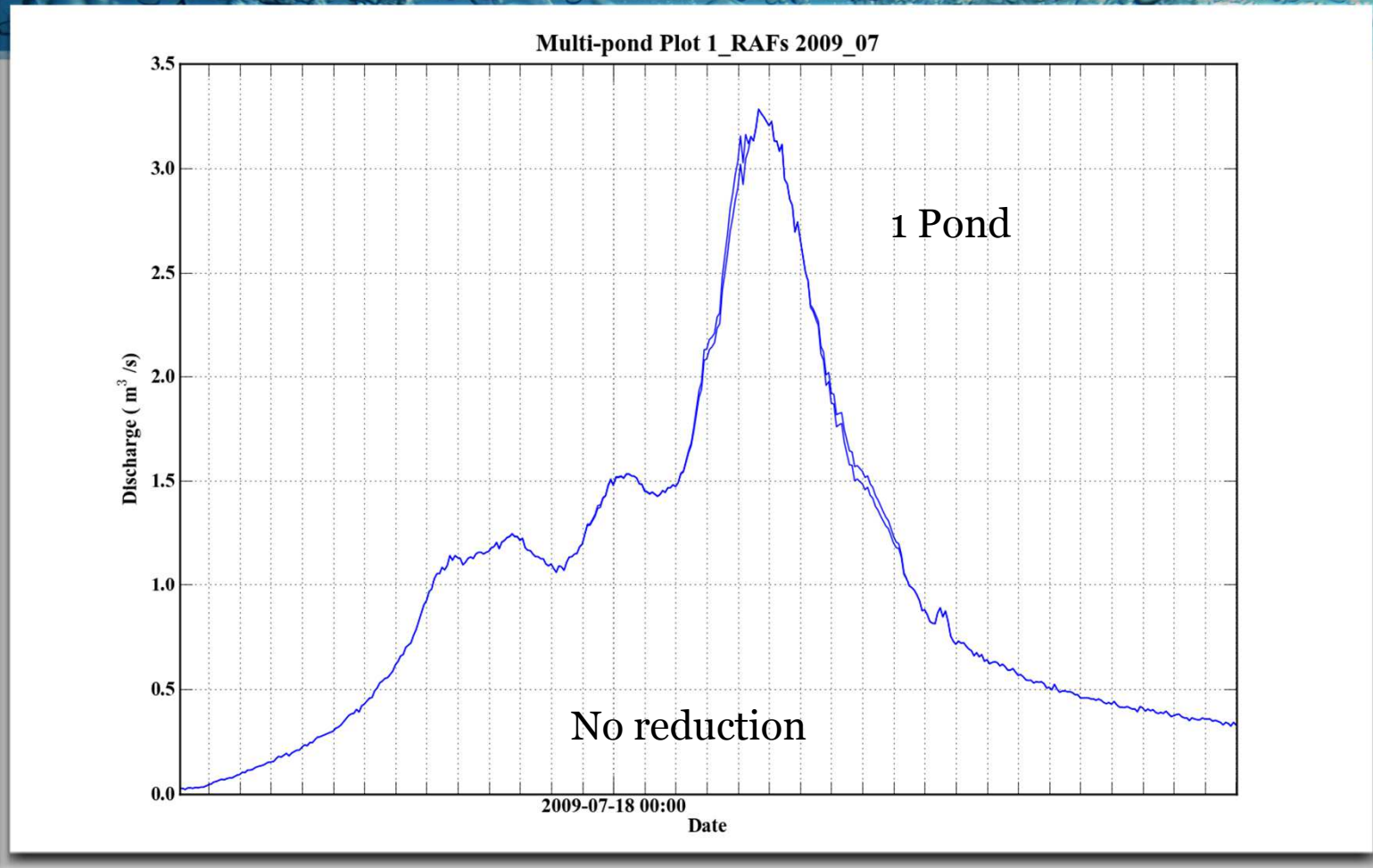
Travel time of peak



How much Flood water do we have to manage?

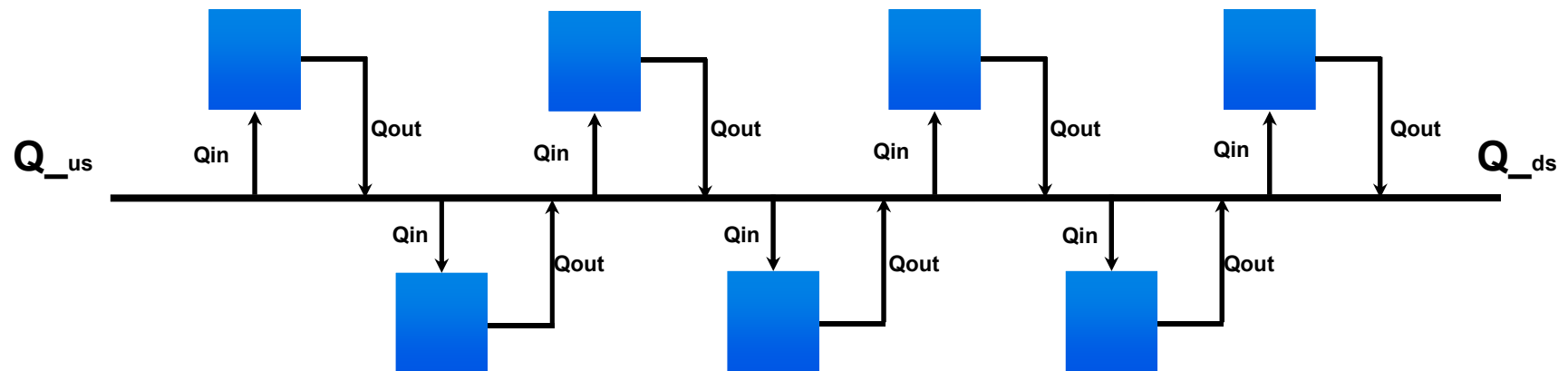


Impact of a Pond?

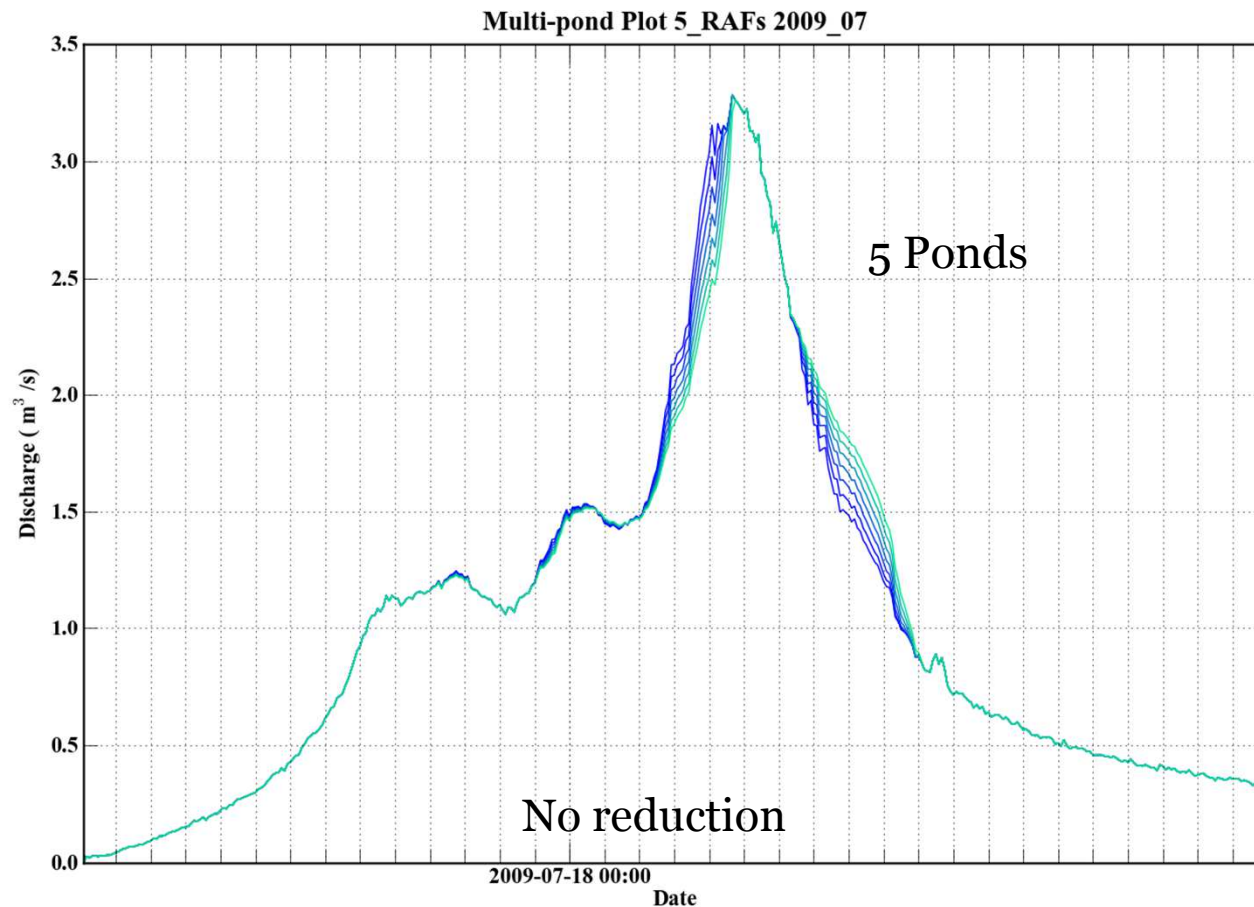


- Post change: 3
- Volume capacity = 560m
- Inlet height = 0.55m

Pond Network Model:



Pond Network Model:

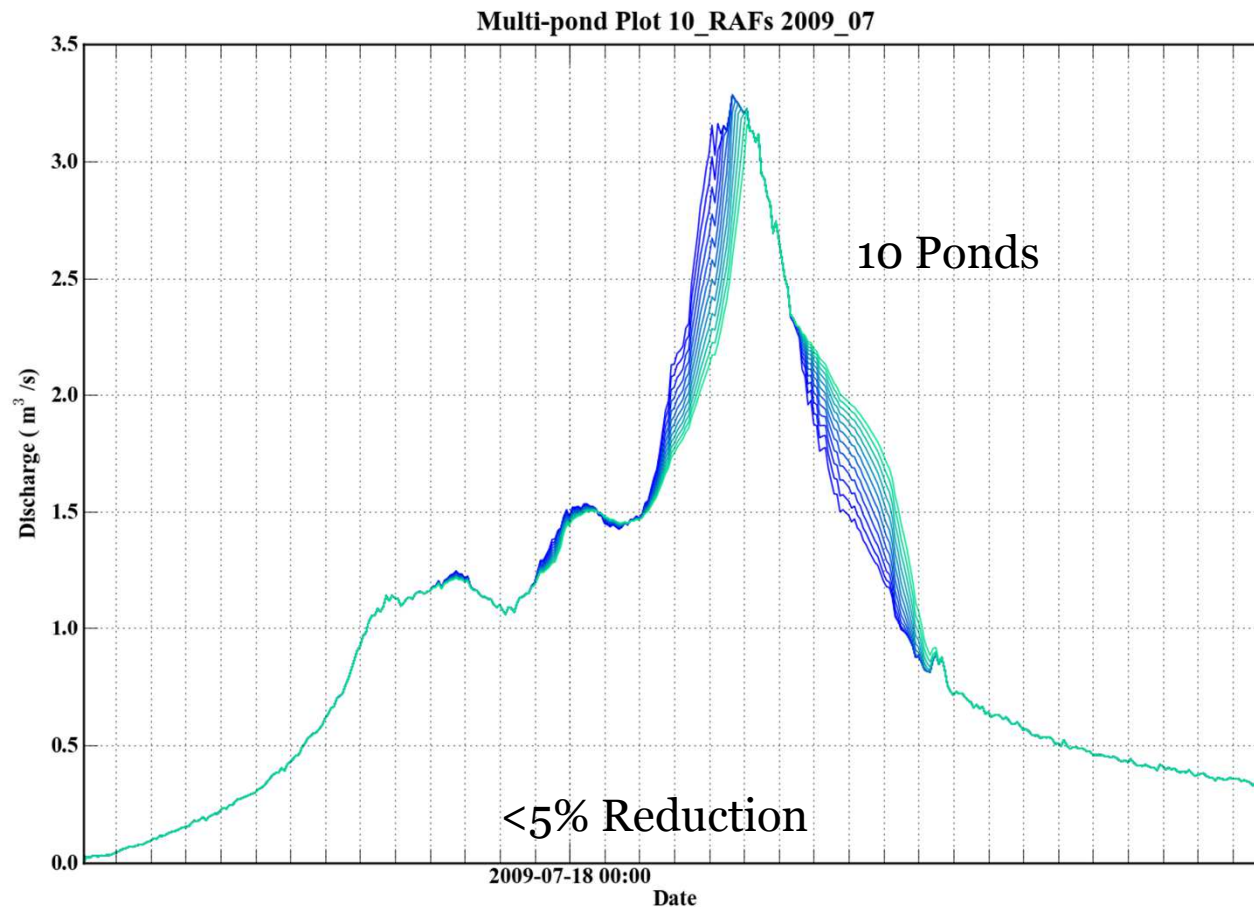


Post change:

Volume capacity = 560m^3

Inlet height = 0.55m

Pond Network Model:

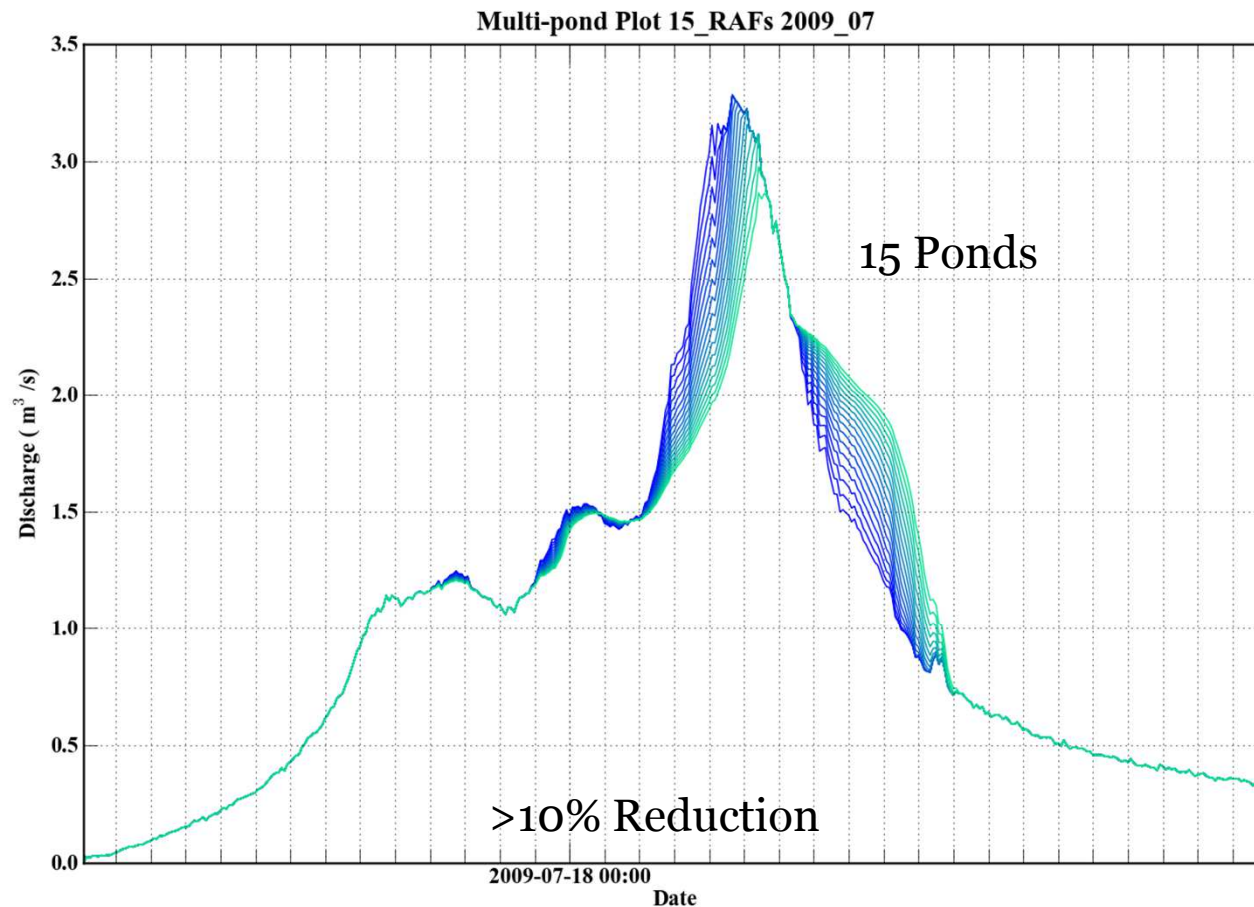


Post change:

Volume capacity = 560m³

Inlet height = 0.55m

Pond Network Model:

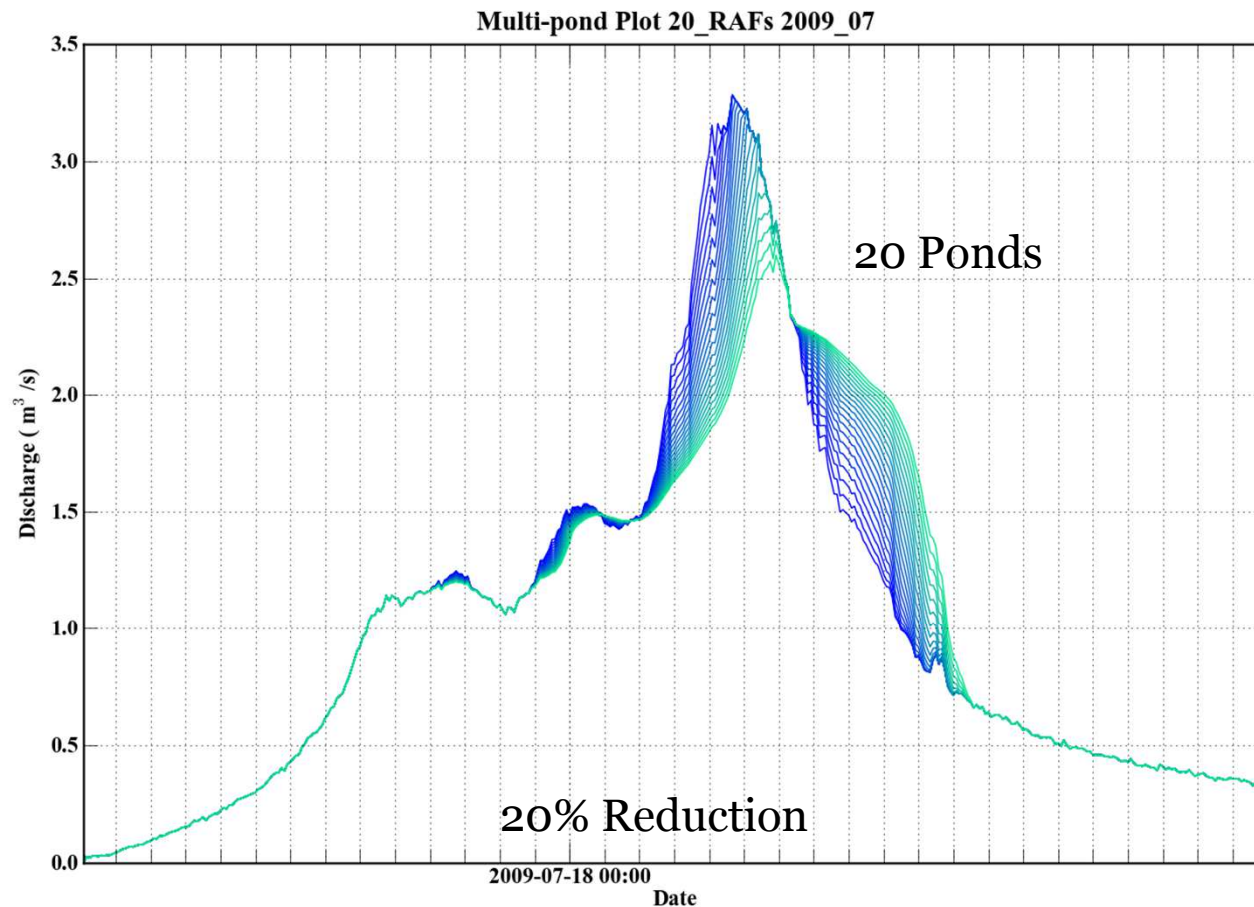


Post change:

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Pond Network Model:

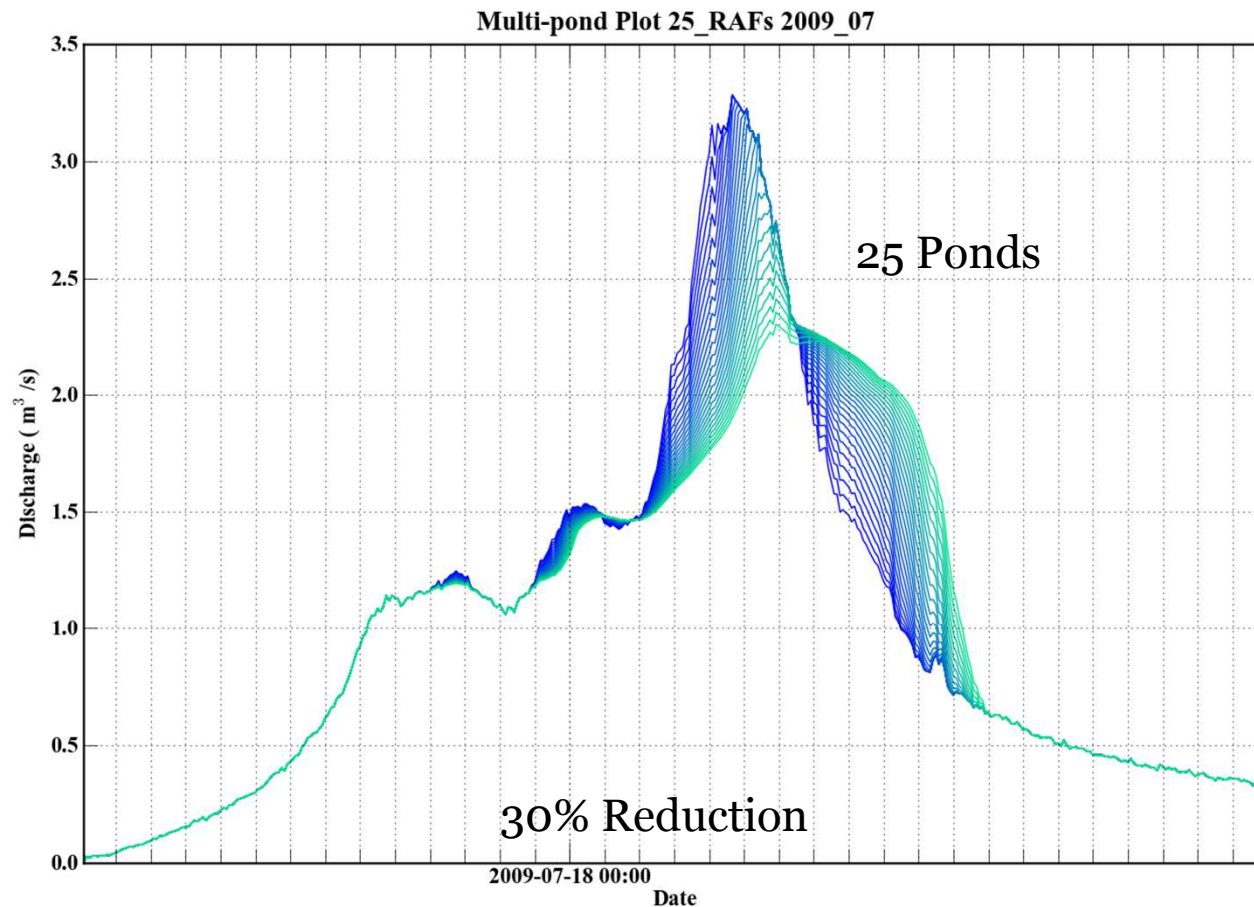


Post change:

Volume capacity = 560m^3

Inlet height = 0.55m

Pond Network Model:

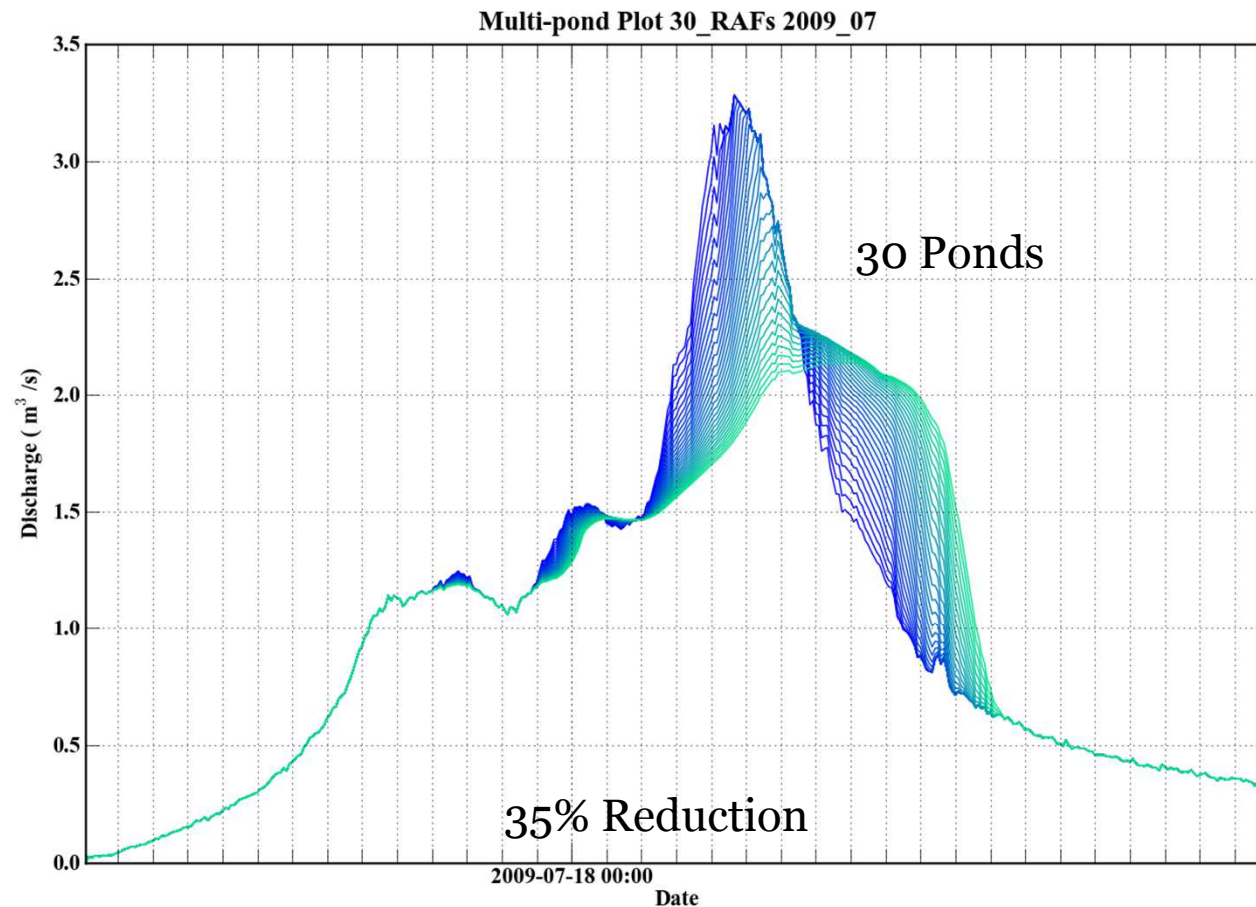


Post change:

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Post change:

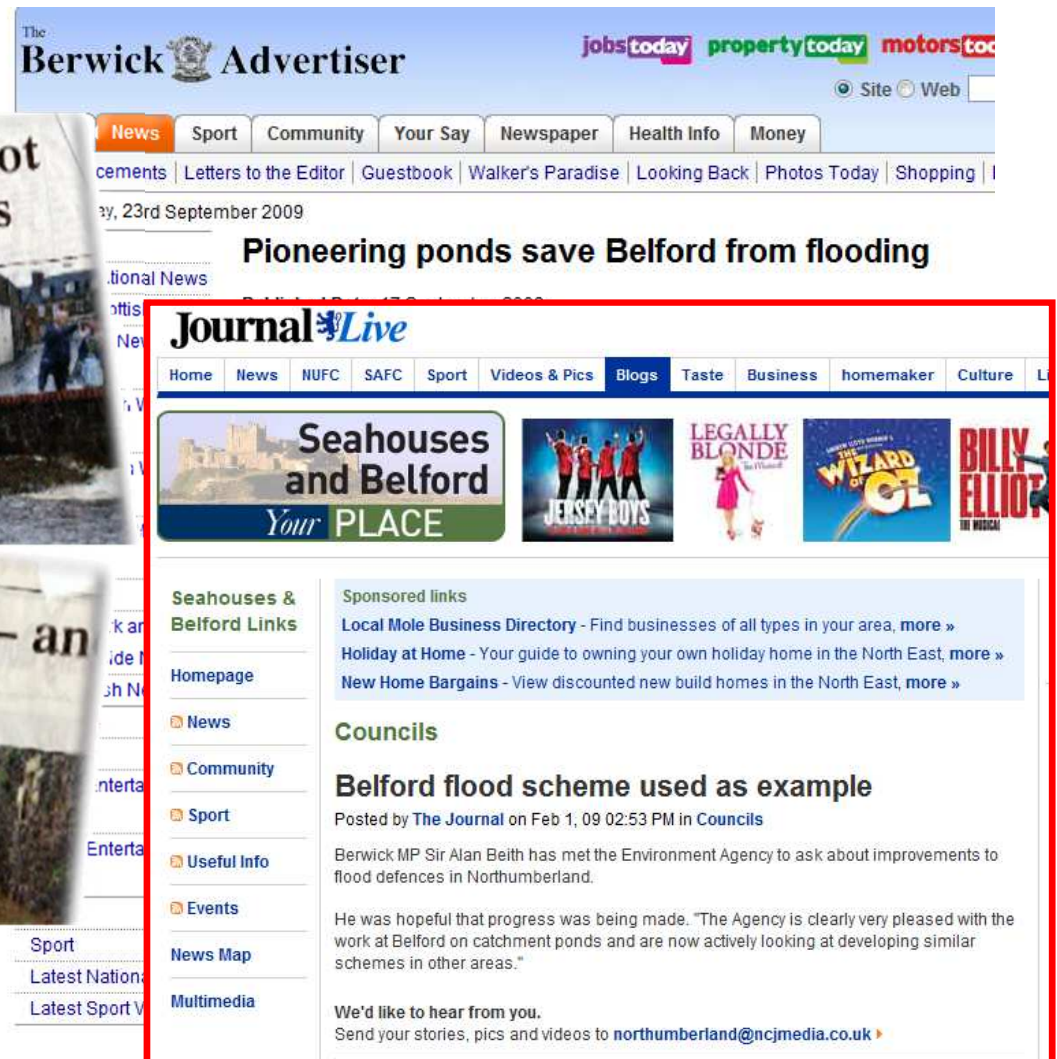
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The community feeling

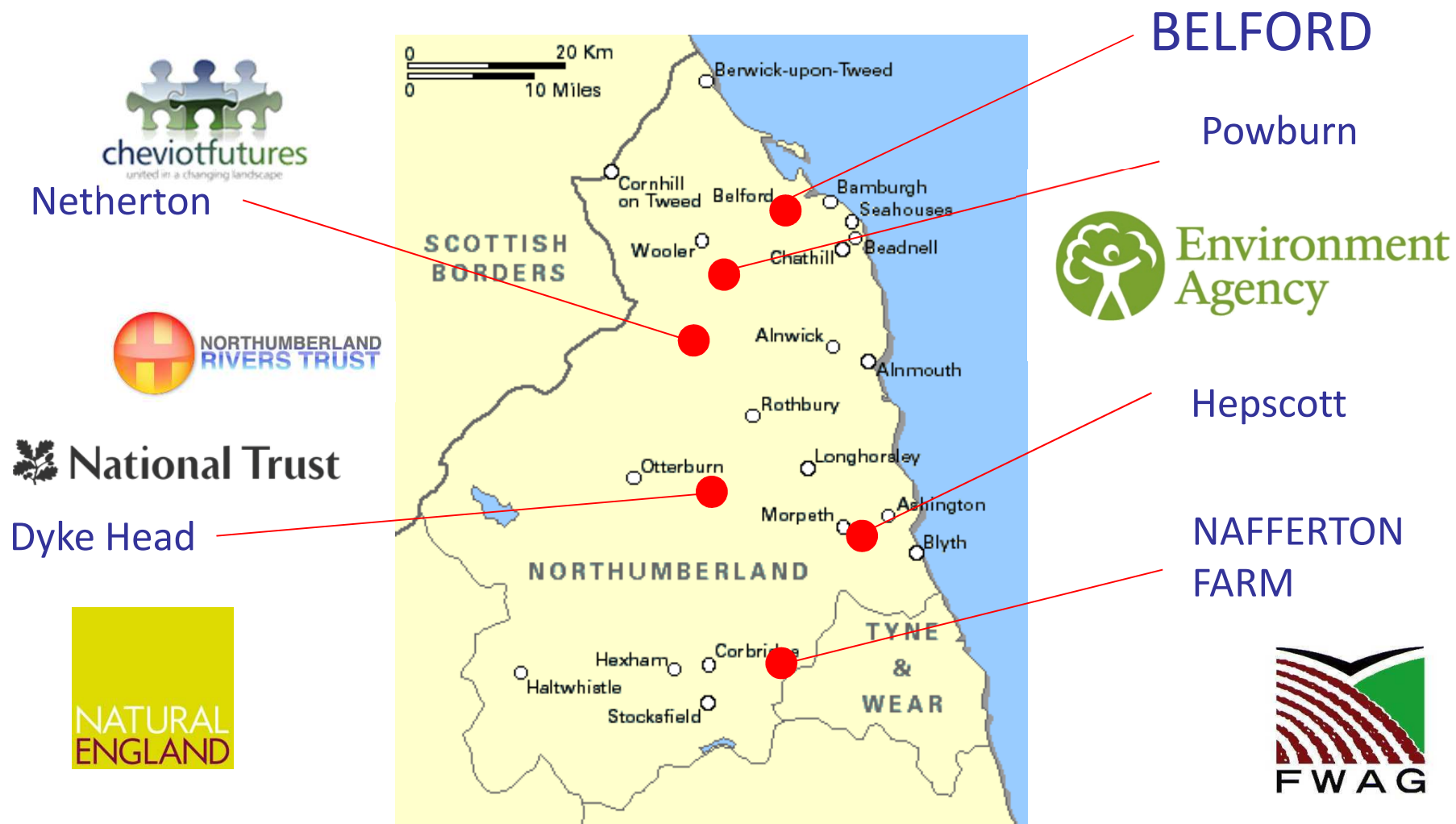
After September 2008 floods – During construction

July 2007 – Before the project



Uptake

Further sites in Northumberland taking the runoff management approach





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.