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Flood Risk Management: A water company perspective

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The role of water companies in flood risk management: a brief overview

- Water companies are classed as a " risk management authority" in the Floods & Water Management Act 2010 – duty to engage with the EA on the development of the national flood risk strategy
- Water companies in upland areas tend to be owners/operators of large areas of catchment land and storage reservoirs
- Multi-use reservoirs for flood attenuation and water supply already exist in some catchments (eg Celyn & Brenig on River Dee)
- The move towards more holistic catchment-based solutions to flood risk management in upland areas is increasingly involving water companies
- Floods can impact on water company assets and adversely affect drinking water quality – leading to adverse customer service impacts

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Case Study: Thirlmere Reservoir in the Cumbrian Derwent catchment

- 42,000 Ml impounding reservoir in upper Derwent catchment (St John's Beck) above Keswick
- In an average year, there is "spare storage" to hold back flood flows for around 70-75% of the year
- Even when full, the reservoir and dam slow down flow rates, reducing the peak flow to St John's Beck
- Some flood water from Helvellyn is diverted via Thirlmere rather than flowing directly into the rivers

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Thirlmere Reservoir: Actions to augment flood risk management

- UU has been working with Keswick Flood Action Group (KFAG) and the EA since flooding in 2005
- Reviewed ways to provide flood storage in winter at Thirlmere
- Balancing flood alleviation with risks to reliability of essential water supplies to over 700,000 people and businesses
- Trials of flood alleviation measures commenced during winter 2008-09
- Releases of 100 million litres per day during normal river flow conditions when water levels 1.5m (Sep-Dec) or 1.0m (Jan to mid-March)

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Flood Alleviation Actions: Thirlmere Reservoir Flow Releases

- 100 million litres per day release at Thirlmere

- Releases downstream into St John's Beck, a tributary of the Derwent

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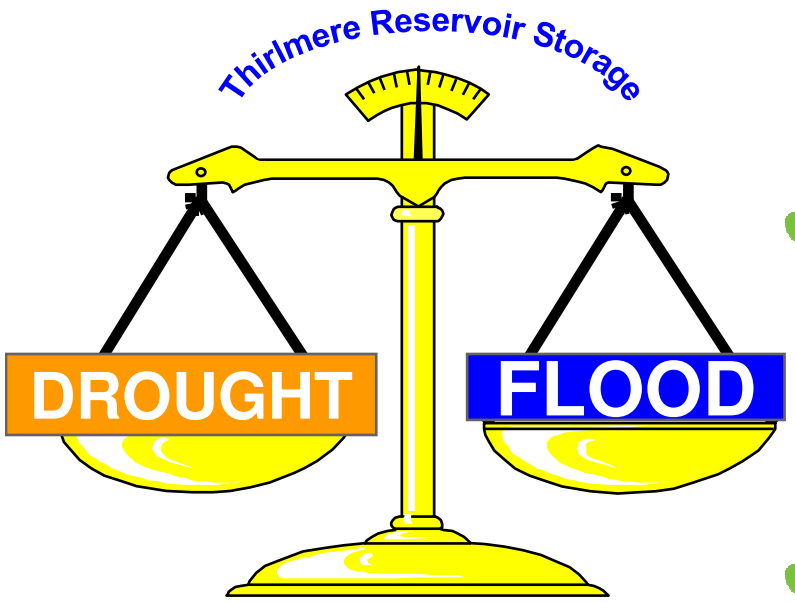
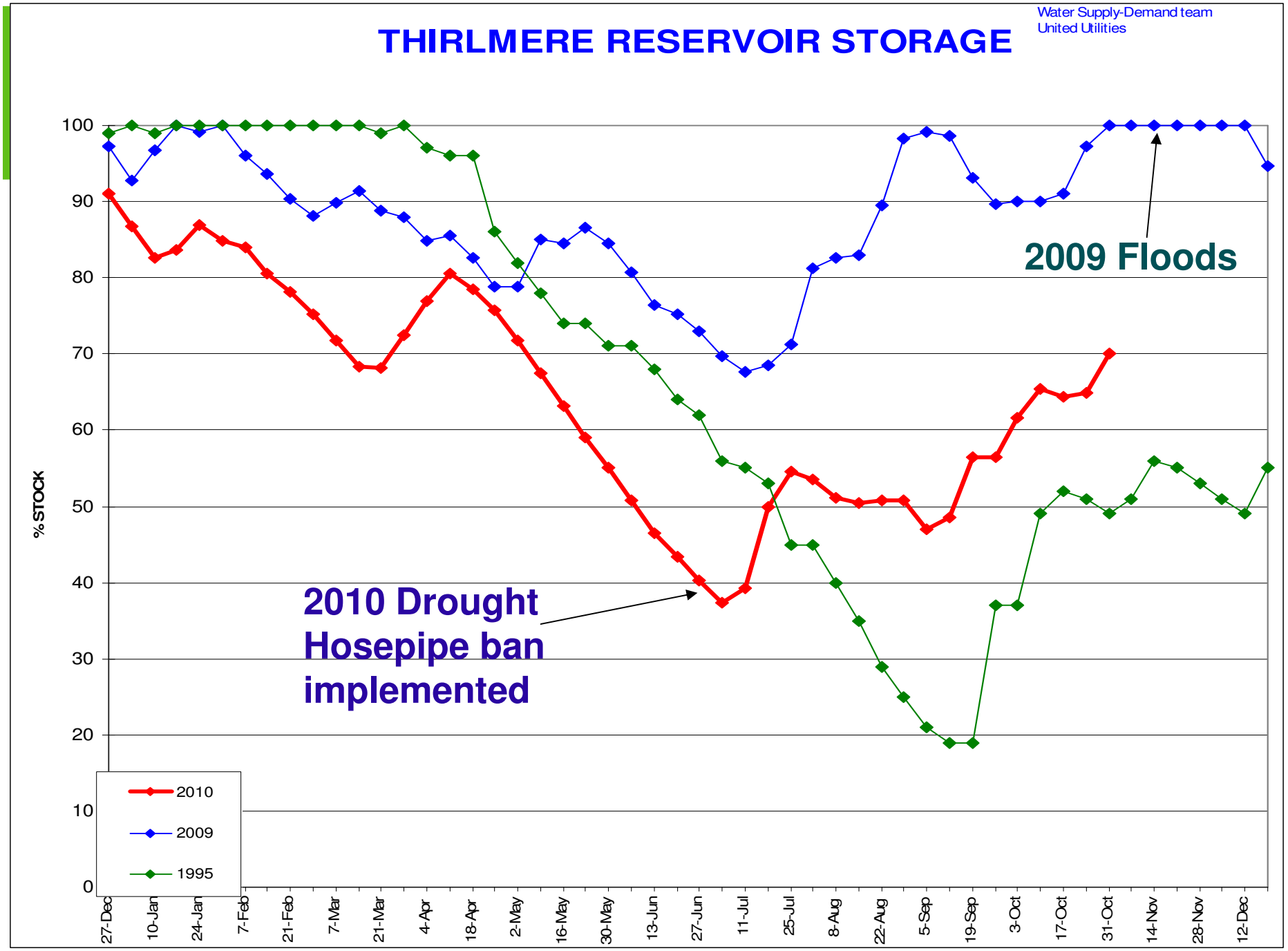
Thirlmere Reservoir: Further improvements to flood alleviation



- Following November 2009 floods, UU worked with Keswick Flood Action Group (KFAG) and the EA to assess what further measures could be taken at Thirlmere
- Increased risk to water supplies – 700,000 people and businesses in Keswick, Lancashire and Greater Manchester rely on Thirlmere for essential water supplies
- Balancing two weather extremes: flood and drought
- Protecting the environment and ensuring no damage to property along St John's Beck


Principal sources, aqueducts and large diameter trunk main systems
Carlisle
Workington
Whitehaven
Crummock Water
Ullswater
River Eden
Thirlmere
Haweswater
Ennerdale Water
Windermere
River Duddon
River Lune
N
Barrow
Morecambe Bay
Lancaster
Stocks Reservoir
River Wyre
Blackpool
Preston
River Ribble
Burnley
Blackburn
Southport
Rivington Reservoirs
Rochdale
Wigan
Bolton
Oldham
Longdendale Reservoirs
Manchester
Stockport
Birkenhead
Liverpool
Warrington
River Mersey
Macclesfield
Llyn Brenig
Crewe
River Dee
Oswestry
SHROPSHIRE UNION CANAL
Service reservoirs
Water treatment works
Gravity supply
Pumped supply
Direction of flow
Connections from aqueducts and large diameter trunk mains to local supply areas


THIRLMERE RESERVOIR STORAGE
Water Supply-Demand team
United Utilities
% STOCK
100
90
80
70
60
50
40
30
20
10
0
2009 Floods
2010 Drought
Hosepipe ban
implemented
2010
2009
1995
27-Dec
10-Jan
24-Jan
7-Feb
21-Feb
7-Mar
21-Mar
4-Apr
18-Apr
2-May
16-May
30-May
13-Jun
27-Jun
11-Jul
25-Jul
8-Aug
22-Aug
5-Sep
19-Sep
3-Oct
17-Oct
31-Oct
14-Nov
28-Nov
12-Dec

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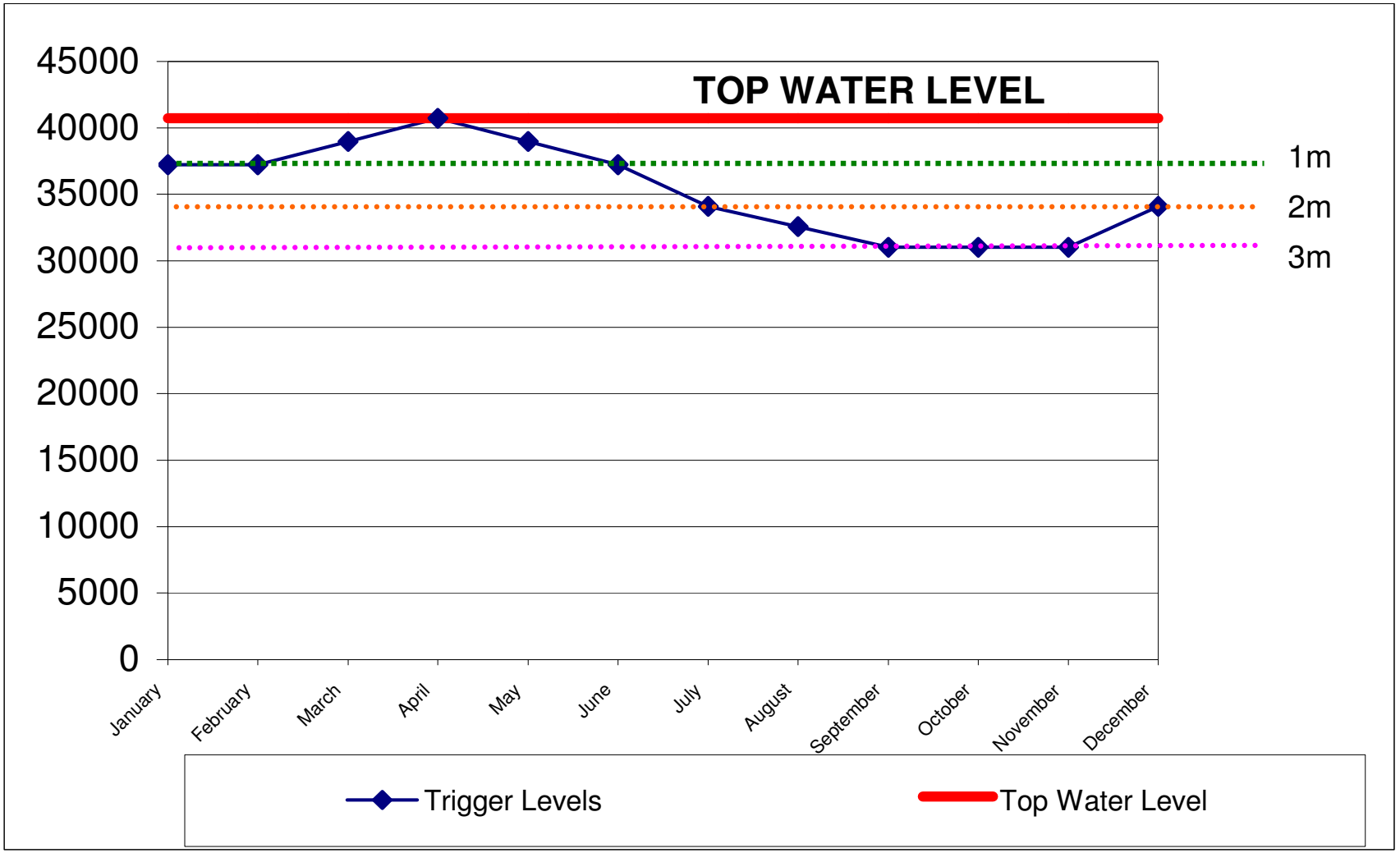
Flood alleviation actions: trial of revised "trigger levels" for flow releases



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Combined Flood & Ecological Habitat Improvements at Mill Gill (Helvellyn)

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Flood Alleviation Actions: Flow Release Trials

- Can flow releases be increased any further without impact on downstream property and the river environment?

- Trials carried out to assess potential impact in an SAC river

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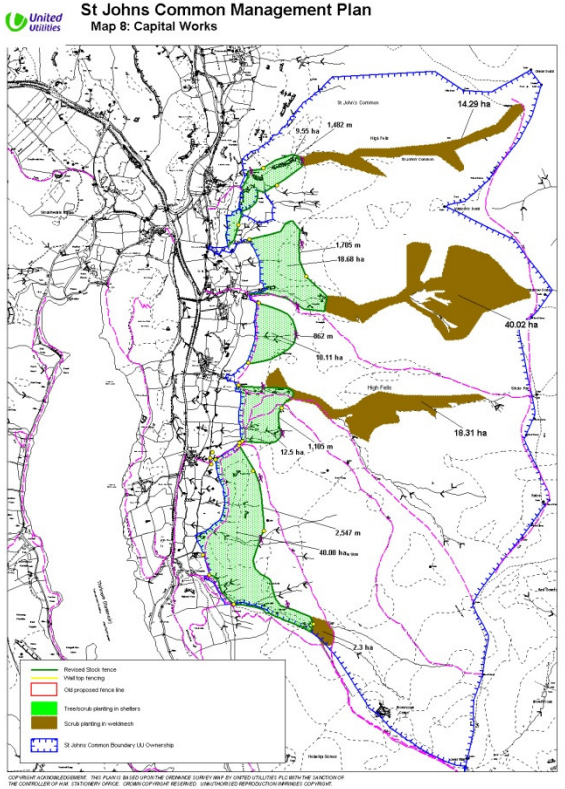
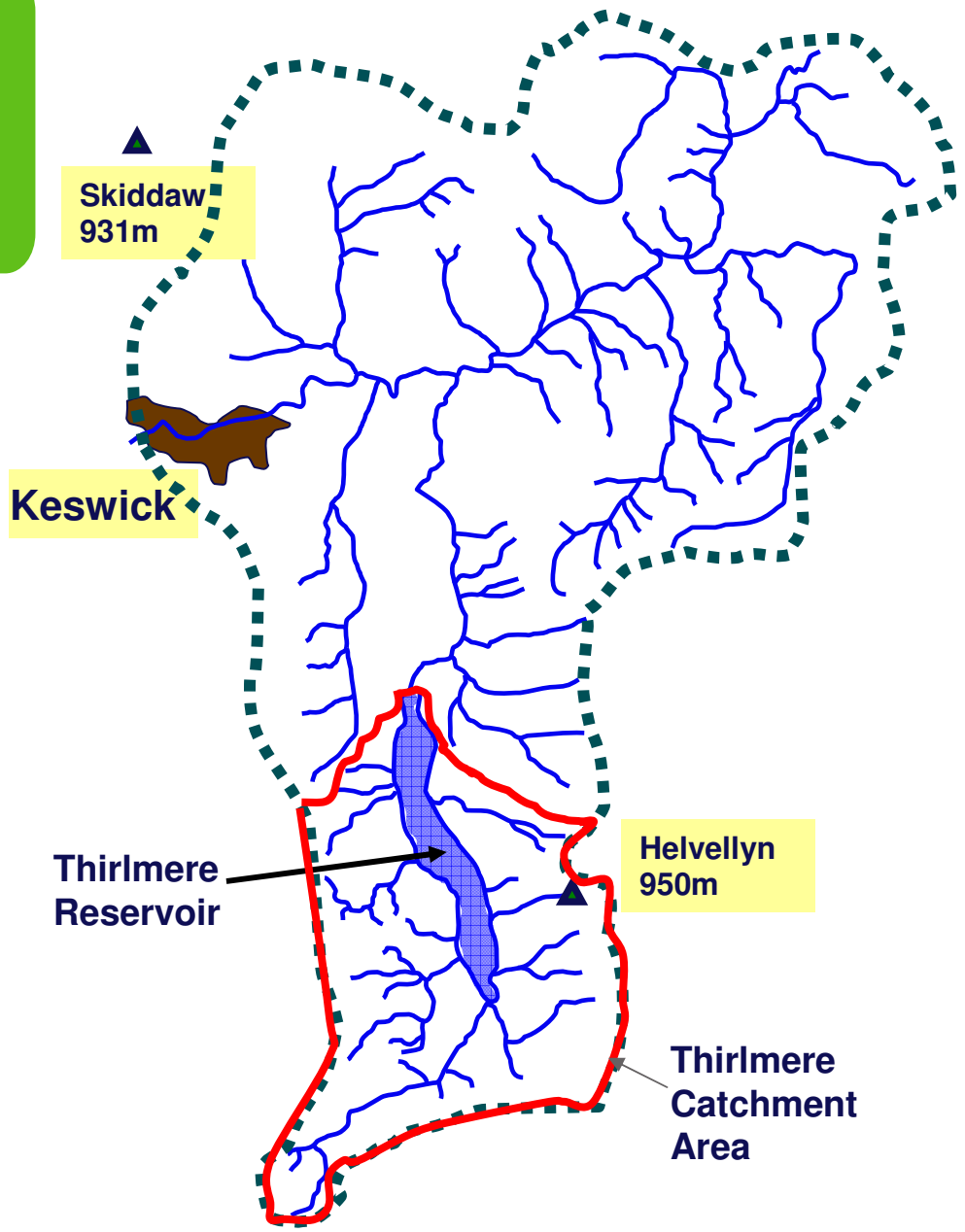
Role of UU Sustainable Catchment Management Programme at Thirlmere

- St Johns Common – juniper scrub, woodland, stock reduction, SoS fence (approval pending)
- Westhead farm - woodland, scrub, fencing of water courses, decrease in stock numbers, cottage/building as incentive
- Stybeck - scrub planting, stock reduction on moor
- Armboth Fell & Bleaberry Fell – juniper scrub, SoS fence to prevent trespass sheep and control numbers



Integrated catchment approach to flood risk management

- UU actions at Thirlmere provide a contribution to flood risk management
- One element of an integrated approach to managing flood risks in Keswick
- BUT…action at Thirlmere alone will not prevent flooding in Keswick



ALFA Project – River Eden

PhD Study - Ian Pattison

UU/EA/NU/ERT PhD on flood and drought flows in upland areas

Investigated the impact of two land management changes:

1. landscape - scale changes such as planting woodlands and reducing soil compaction
2. modifying river channels and increasing floodplain storage through wet woodland creation and woody debris dams.

- **The results…**
- management changes must be carried out in the right location.
- rural land use could have an effect on catchment scale flood risk, even for extreme flood events such as those experienced in Carlisle, UK, in January 2005, if carried out in the right locations.

Compaction:

- light to heavy soil compaction in a tributary increase 65%
- downstream at Carlisle this could alter flows by up to 3.5%

Land cover type:

- Changing land cover in the Dacre Beck area was shown to have different effects on river flow.
- Cropping produced the lowest peak flow during an extreme storm
- deciduous woodland produced the least “flashy” (fewest high and fewest low) river flows throughout a year.
- pasture and coniferous woodland produced the highest peak flows, more frequent peak flows and peak flows which lasted for a longer duration.

Roughness

- Wet woodland and debris dams cause resistance to the flow of water over the floodplain and through the channel.
- Increasing roughness could reduce peak flows by 4-5 hours
- include re - naturalisation of river channels and increases in in - stream vegetation eg water crowfoot.

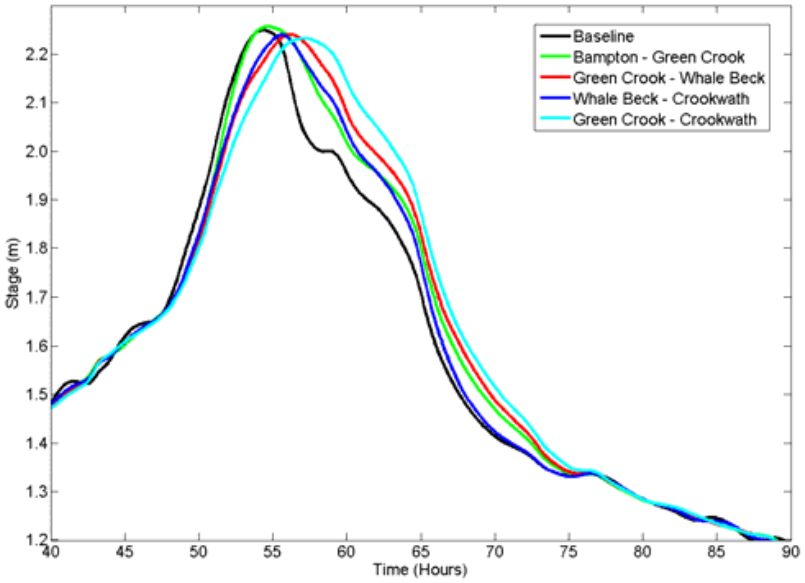


Figure 1: The black line (representing current flows on the River Lowther at Eamont Bridge) is the baseline of the model. Each coloured line represents the impact on this baseline of introducing wet woodland and woody debris dams within a different reach of the River Lowther.

Coalburn Research

Centre for Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL

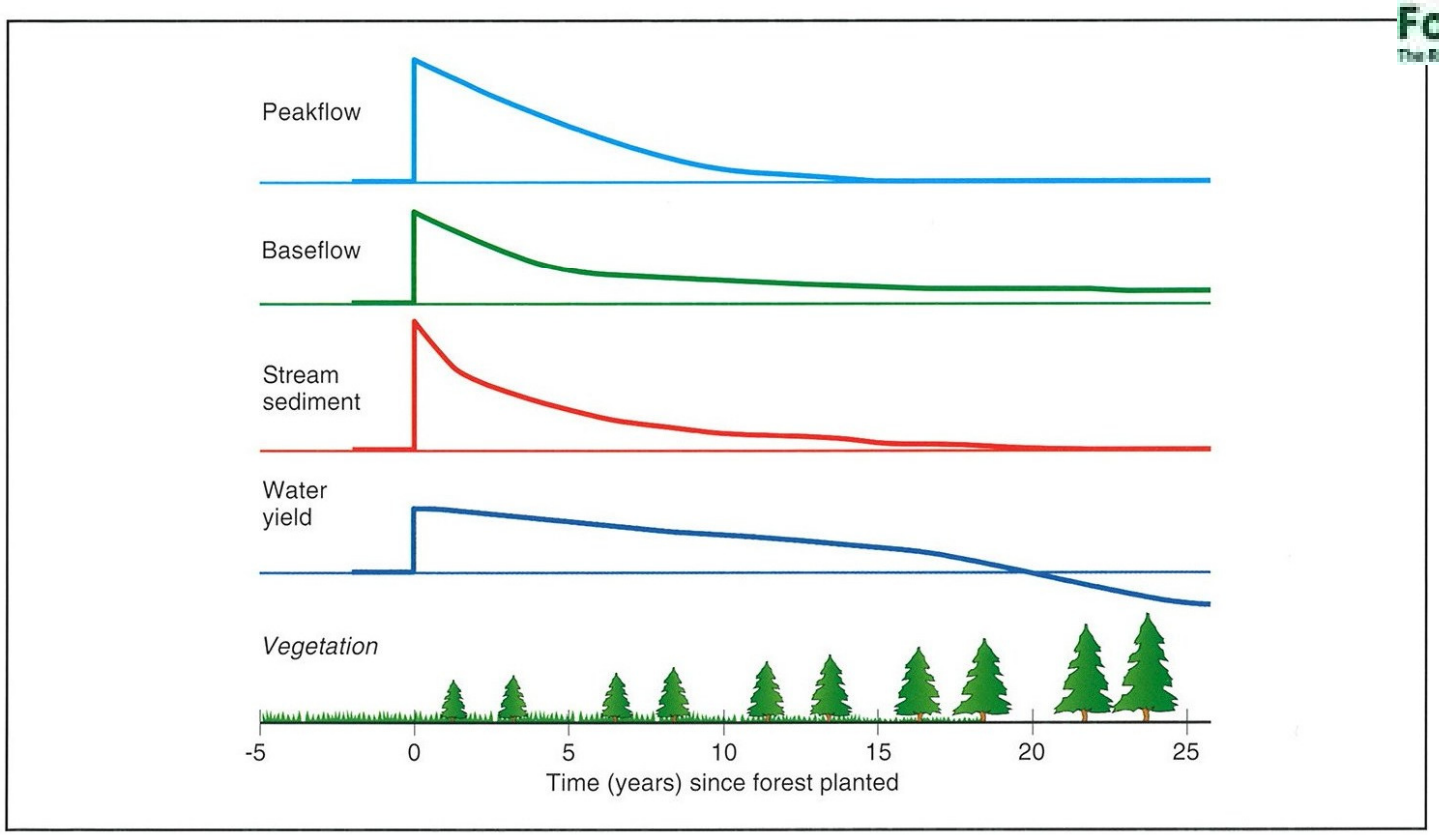
Forestry Commission

Environment Agency

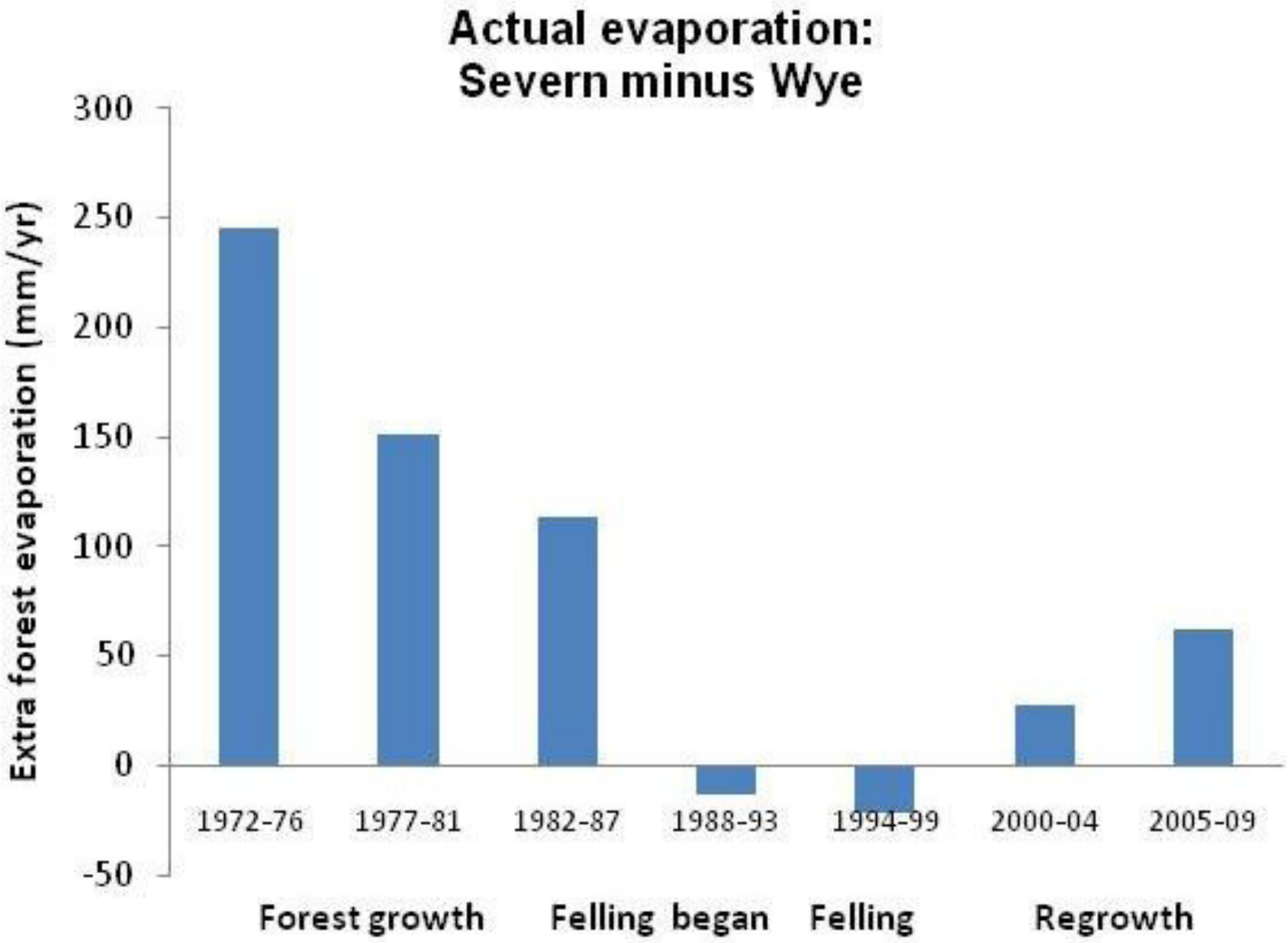
Forest Research
The Research agency of the Forestry Commission

Impacts of upland forestry through time

Coalburn shows that the short-term and long-term impacts of plantation forestry may be very different: Forestry ploughing temporarily increased peak flows and stream sediment - both now back to original levels. Low flows appear to be permanently increased. The annual stream flow at first increased after ploughing, and then declined with forest growth.



Plynlimon


Actual evaporation:
Severn minus Wye
Extra forest evaporation (mm/yr)
300
250
200
150
100
50
0
-50
1972-76
1977-81
1982-87
1988-93
1994-99
2000-04
2005-09
Forest growth
Felling began
Felling
Regrowth

Runoff Attenuation Features

- A guide for all those working in catchment management

Belford Catchment Solutions Project

"The Belford project has also demonstrated the link between reducing flood risk and improving water quality as most of the features constructed deliver both of these benefits, as well as increased habitat and biodiversity in some areas."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Any Questions ?
United Utilities