30 years of the NRFA at Wallingford. What's next?

Jamie Hannaford
Head, National River Flow Archive
Centre for Ecology & Hydrology, Wallingford, UK

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The future of the past

"The technology that allows one to operate a computer simply by touching the screen"

A predecessor to the Arc boat?

Tomorrow's World, 1982

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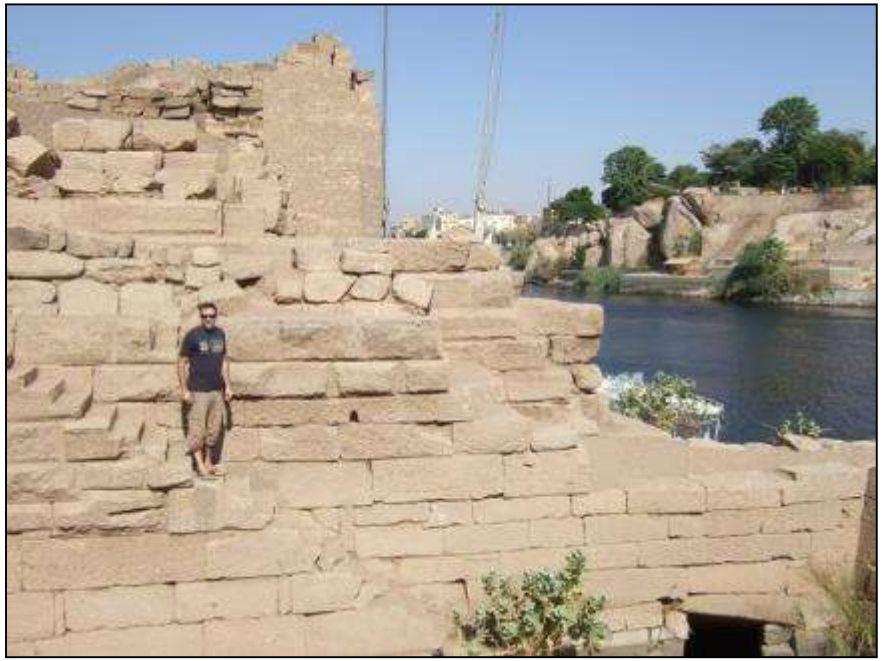
“Egypt…is a land which has been won by the Egyptians…
and is a gift of the river Nile”
Herodotus, Histories, Book II

The value of hydrometric data

‘Stage-boards’ on Greco-Roman Nilometer



Old Kingdom (< 1500 BCE) Nilometer in ‘stilling well’

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Nilometers on Elephantine Island, Aswan, Upper Egypt

The value of hydrometric data in the 21st century

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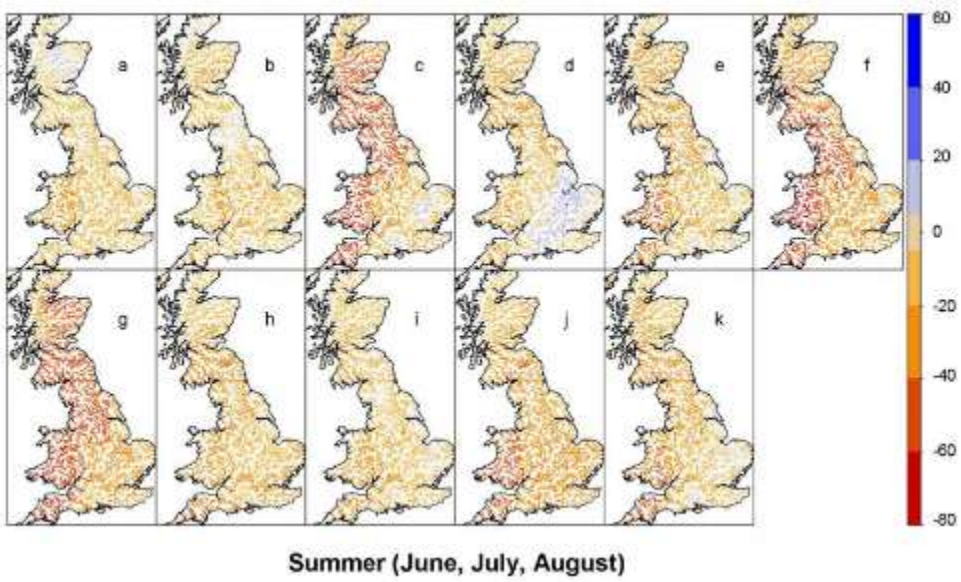
Environment › Climate change

IPCC: 30 years to climate calamity if we carry on blowing the carbon budget

Global 2C warming threshold will be breached within 30 years, leading scientists report, with humans unequivocally to blame

Fiona Harvey in Stockholm
The Guardian, Friday 27 September 2013 19.36 BST
Jump to comments (1410)



Summer (June, July, August)

Projected summer flows for the 2050s

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Source: Guardian; Prudhomme et al. 2012; Office of National Statistics

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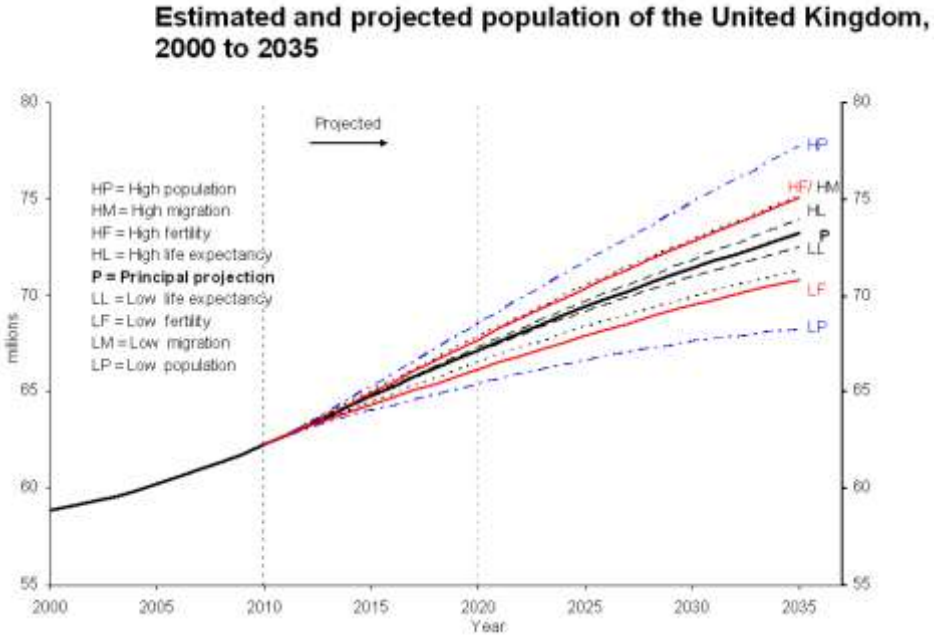

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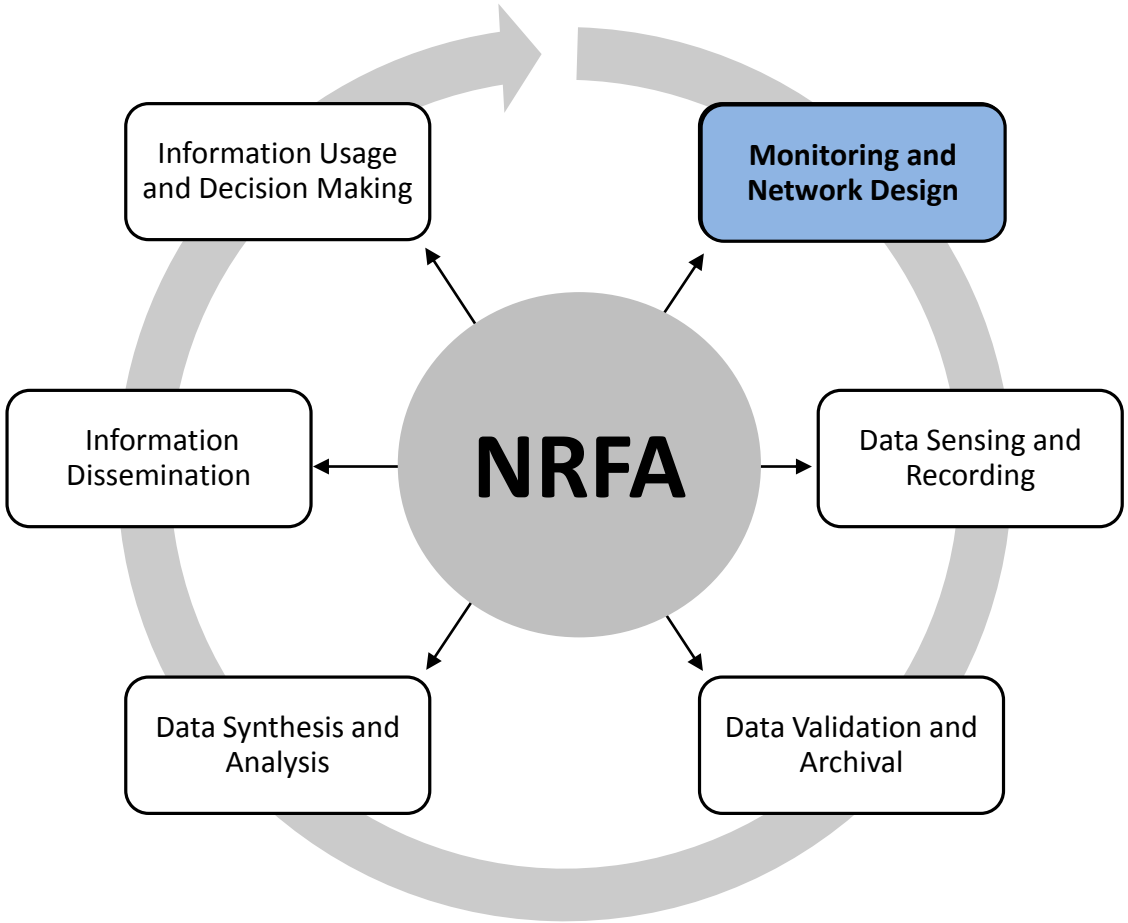
Source: Guardian; Prudhomme et al. 2012; Office of National Statistics

The hydrometric information life-cycle



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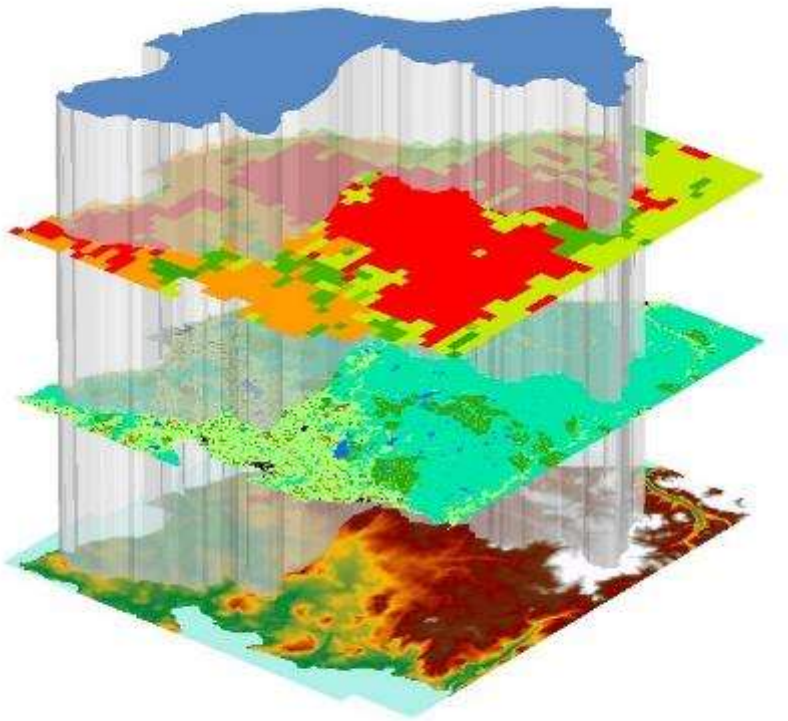
Dixon et al. 2013. Hydrological Sciences Journal.

Monitoring and Network Design



Exploiting the data holdings of the NRFA to assess the network

The Lambourn at Shaw (Berks):
A 50-year long flow record in a near-natural chalk catchment.

Networks under pressure: maintaining the strategic utility of the network will be a key focus for the NRFA

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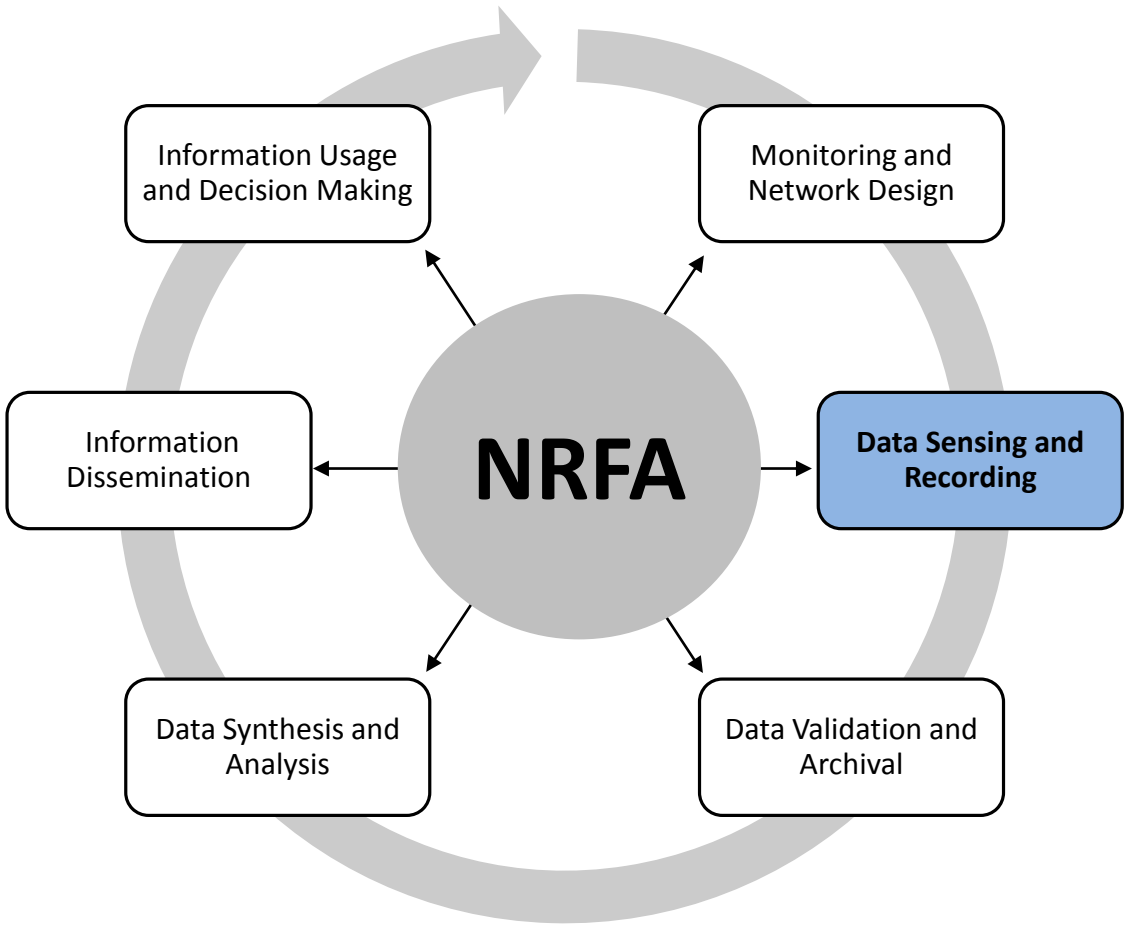
Laize et al. 2008 *Proc. ICE*; Hannaford et al. 2013. *Hydrology Research*

The hydrometric information life-cycle



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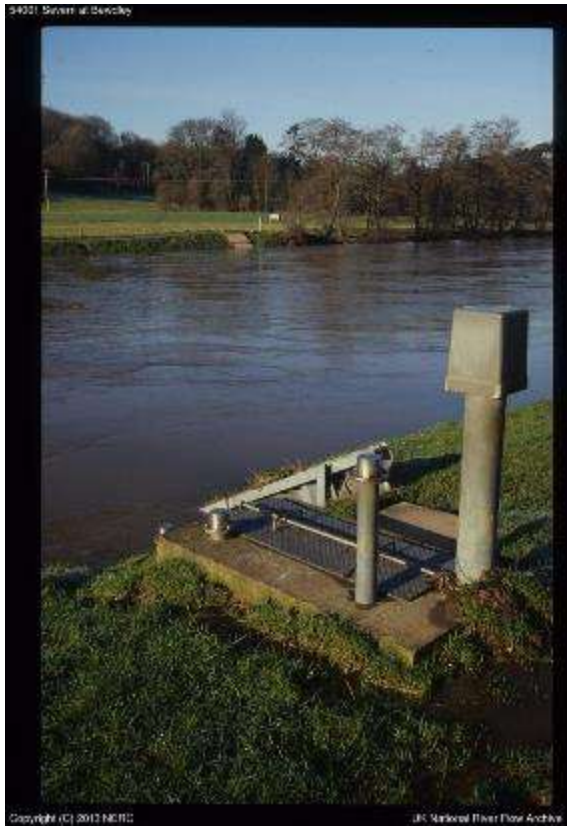
Data Sensing and Recording

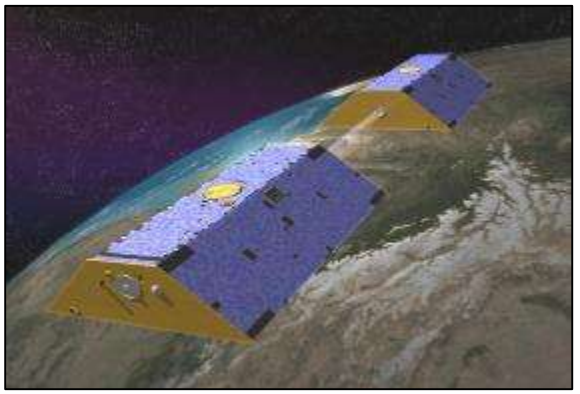


1980s:

Ultrasonic gauges

2010s:

ADCPs in routine use



2040s:

Will we need to leave the office at all....?

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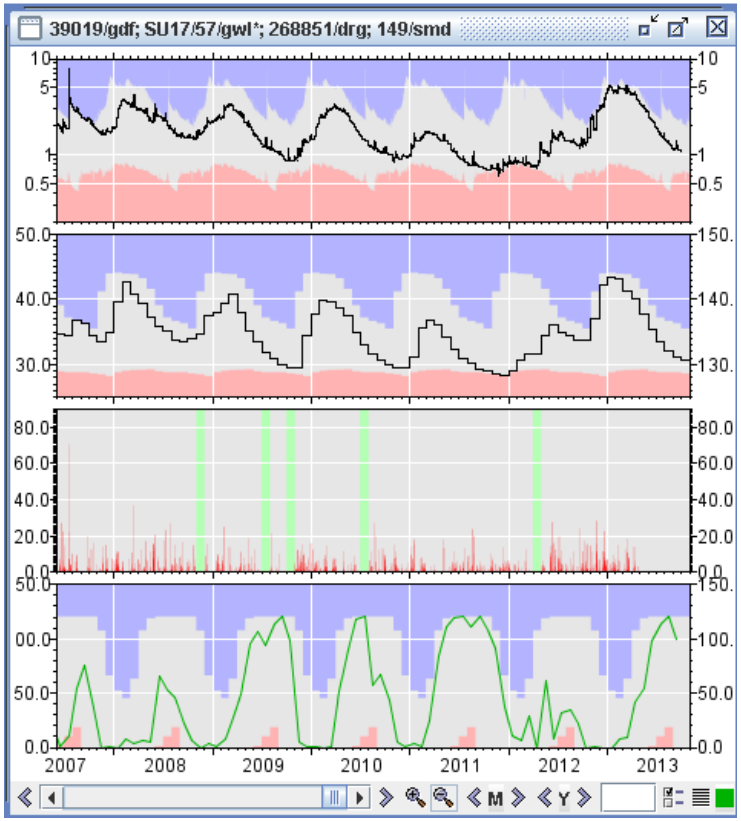
Images: NRFA, Nick Everard; Wikipedia Commons; NASA.gov

Data Sensing and Recording

New types of data
e.g. COSMOS

New sources,
e.g. Citizen Science



Bringing it all together: “virtual” integrated monitoring using time series and spatial data visualisation tools

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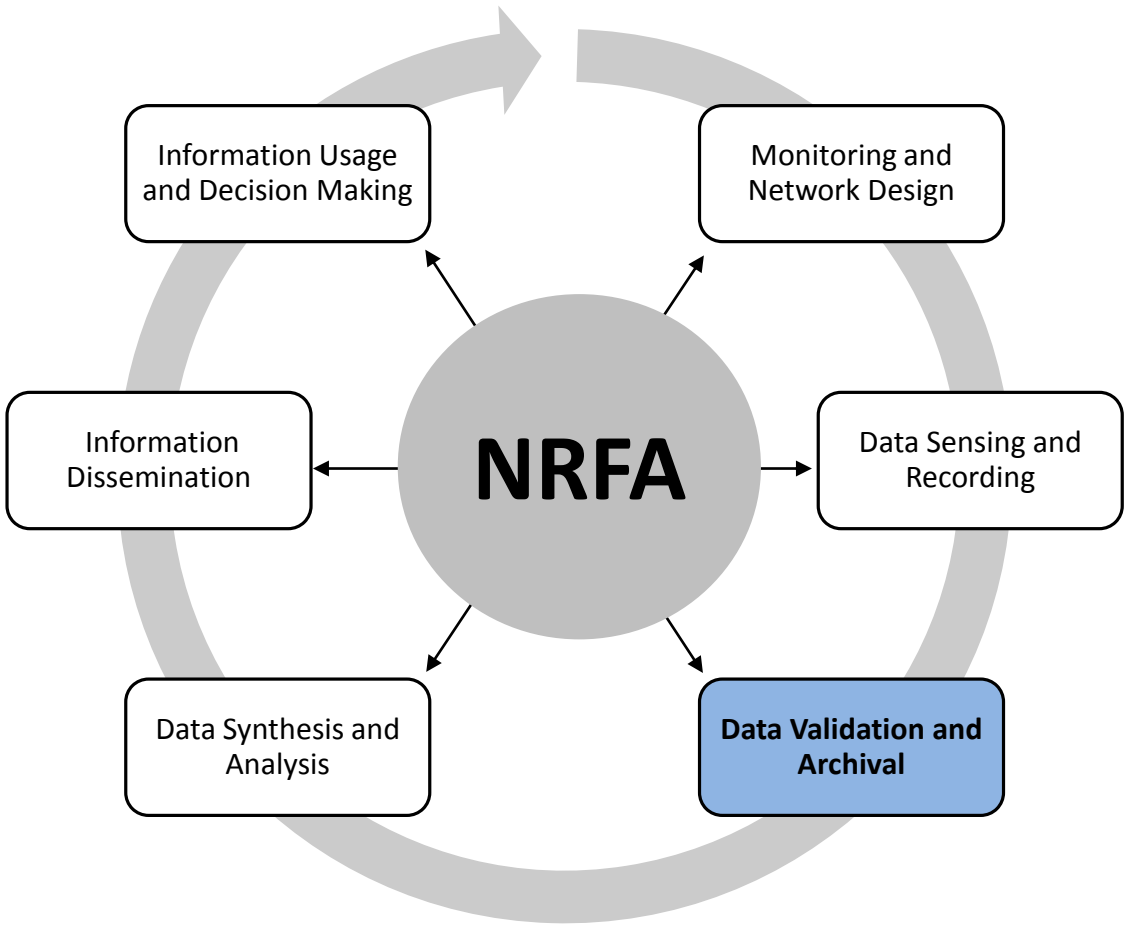
The exploitation of NRFA data will be more integrated with other types of monitoring in future

The hydrometric information life-cycle



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Data Validation

Despite the march of technology, hydrometric data quality will always be an issue...

Station downtime: remains of Abbey Heath station after vandalism by bulldozer

Cumbria, 2009. How to measure a 2000 year event?

Miller et al. 2013: Hydrology Research

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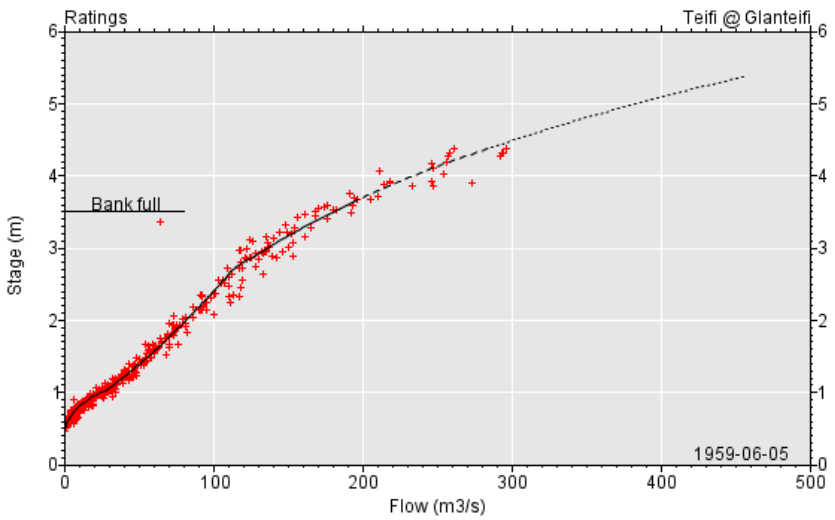
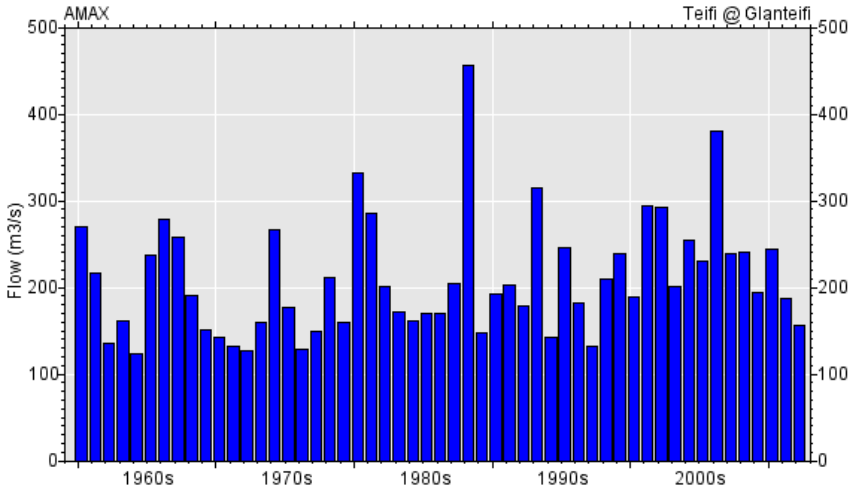
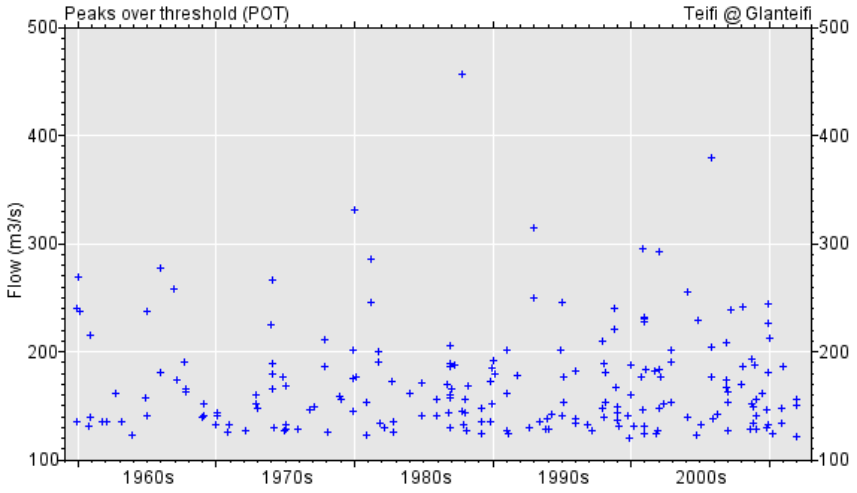
Images: EA Anglian,,NERC

Data Validation







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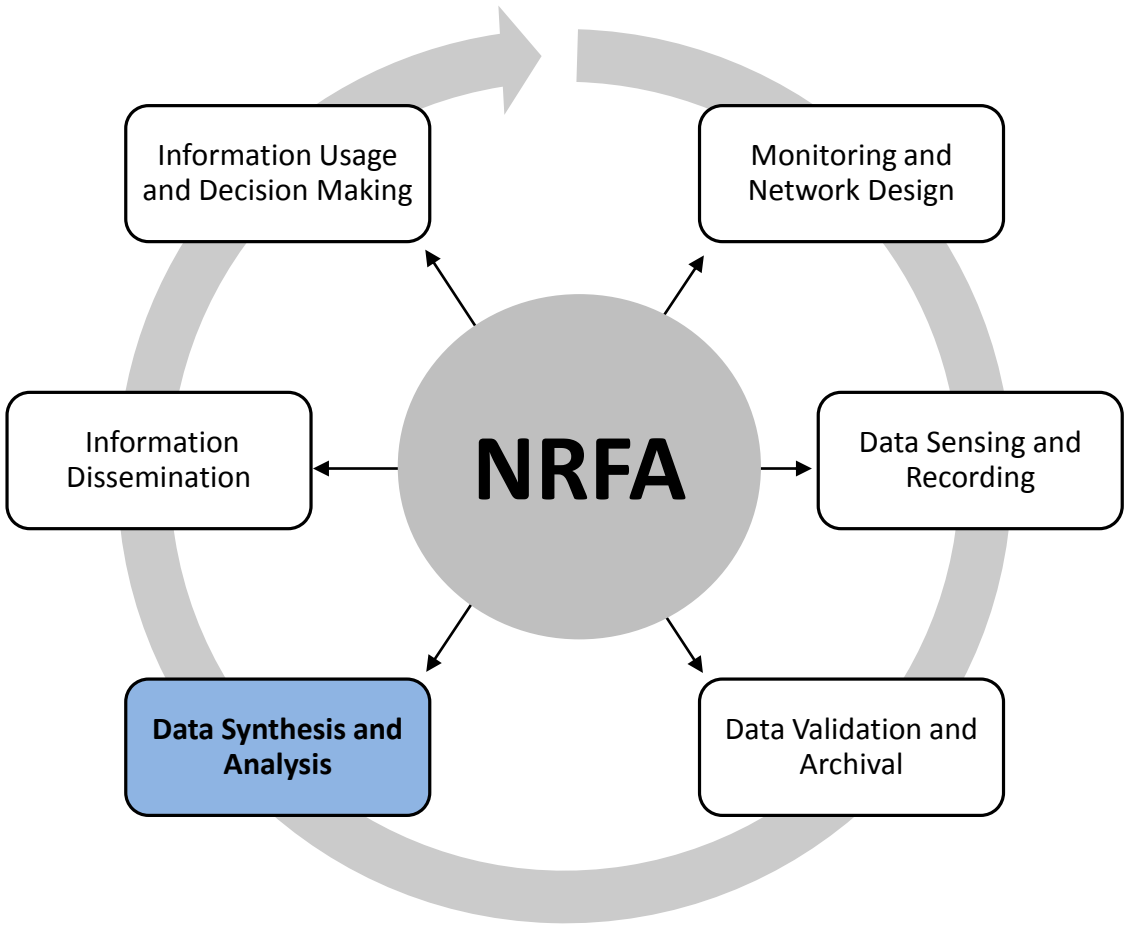
A new challenge: integrating the validation of flood peak data with daily mean flows

The hydrometric information life-cycle



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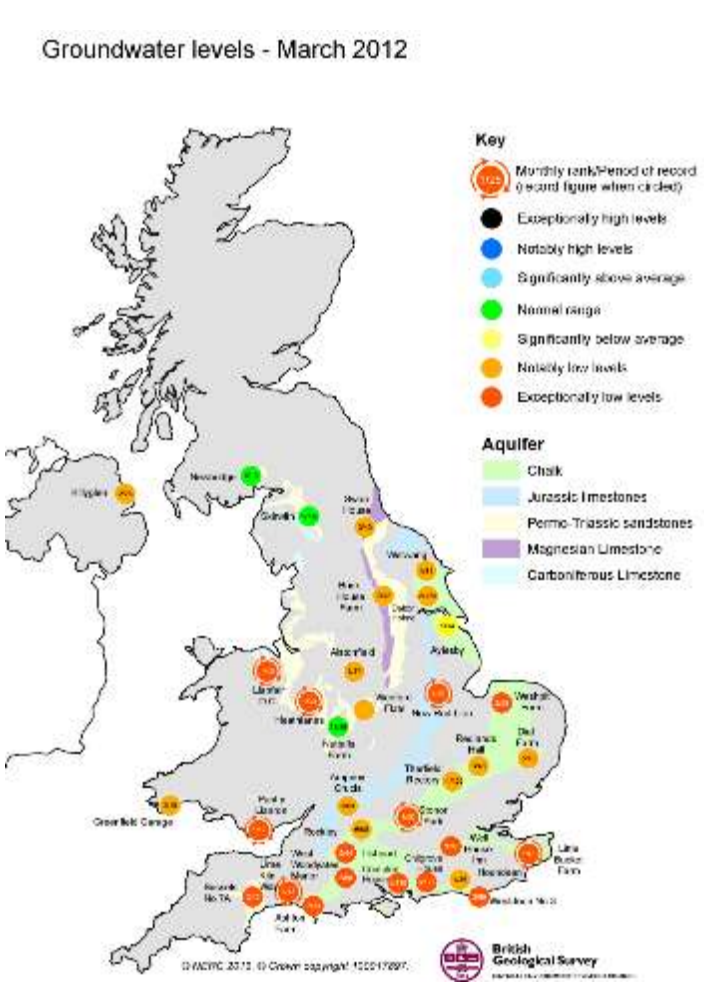
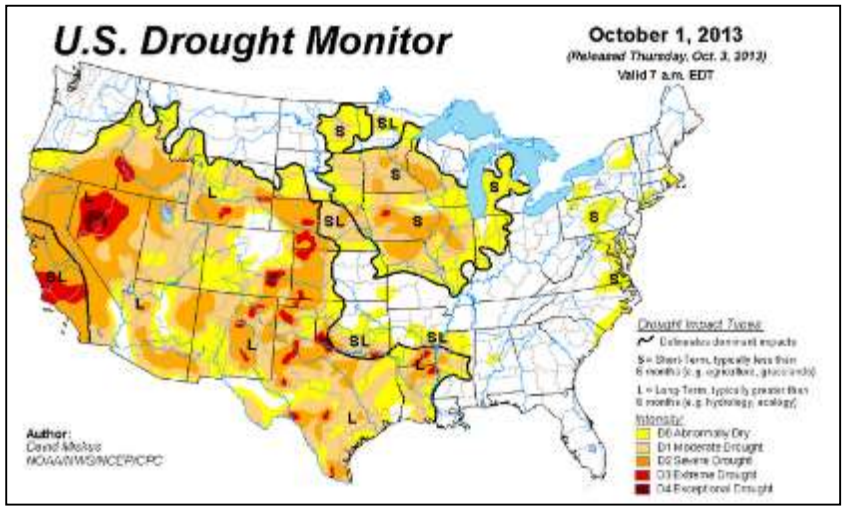
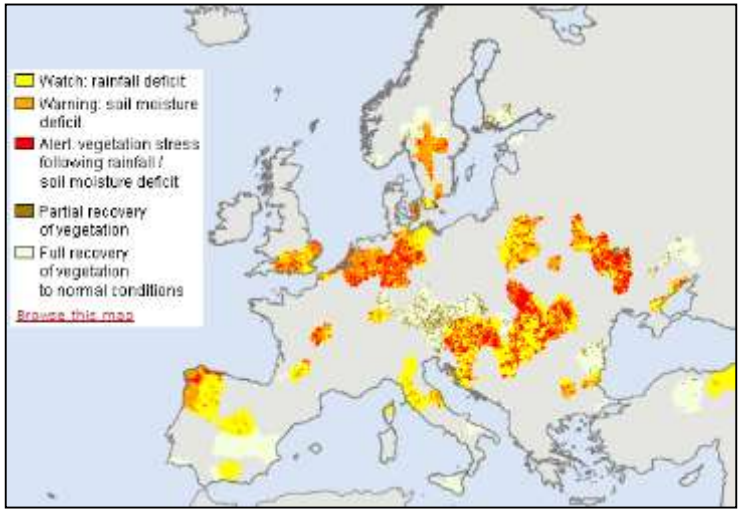
Analysis and synthesis: situation monitoring



Monitoring the 2010 – 2012 Drought



What can we learn from the rest of the world?



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Images: JRC; US Drought Monitor, National Drought Mitigation Center

Hydrological Outlook UK

Period: From October 2013 Issue date: 14/10/2013

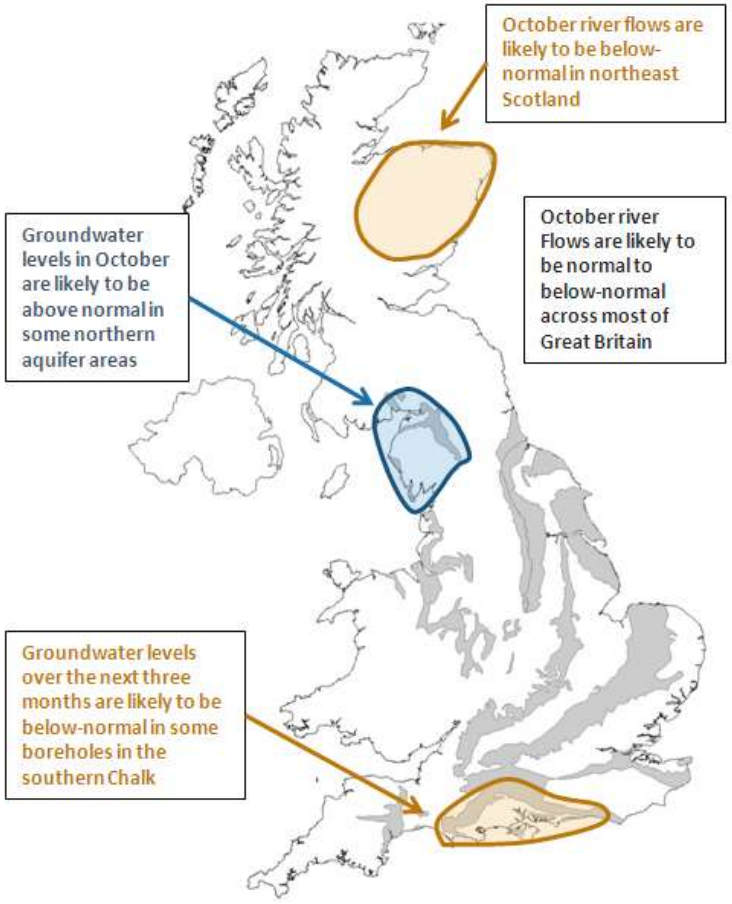
SUMMARY
The general outlook for October is for a continuation of the current situation. River flows are likely to be normal to below-normal, with a high likelihood of low flows in northeast Scotland. Groundwater levels are likely to be normal or above-normal except in the southernmost parts of the Chalk aquifer, where below-normal levels will likely persist. The outlook for the next three months suggests little change to this situation, although considerable uncertainty surrounds any longer-term outlook at this time of year. The late autumn/early winter typically marks the start of the groundwater recharge season, and the timing of its onset will be especially influential on the water resource outlook. Soils are currently very dry, which implies a possible delay to recharge, leading to a higher likelihood of below-normal groundwater levels and river flows.

Rainfall: Confidence in the forecast precipitation over the next three months is low. There is a preference for near-to-below average rainfall during October. For October-November-December as a whole, the signal is similar to climatology, although with a slightly higher probability of above-average rainfall. The probability that UK precipitation for October-November-December will fall into the driest of our five categories is around 20% and the probability that it will fall into our wettest category is 20% (the 1981 – 2010 probability for each of these categories is 20%). Click here for more detailed information on the Met Office long-term forecast. [rainfall outlook based on Met Office forecast issued 27th September 2013]

River Flows: River flows in September were in the normal range or moderately below normal at a majority of sites; below-normal flows were more widespread in northeast Scotland and some catchments in Wales and western England. (click here For further information on the situation in September). The one-month ahead outlook suggests the general expectation is for a continuation of the current situation, with normal flows most likely for the majority of the UK but with a higher likelihood of below-normal flows persisting in some areas (in northeast Scotland especially). The three-month outlook is not suggestive of any major change in this situation, with model projections generally favouring flows in the normal range. However, comparisons with historical data suggest below-normal flows could persist in many catchments. For full information on the river flows outlook, click **here.**

Groundwater: Groundwater levels in September were in the normal range across most of southeast England (with the exception of some boreholes in the southern Chalk which were below normal), whilst above-normal levels were registered in many western Permo-Triassic boreholes. (click here For further information on the situation in September). The outlook suggests a similar situation for October: normal levels are projected for the majority of boreholes and below-normal levels are likely to persist in parts of the southern Chalk, whilst above-normal levels are likely in some boreholes in the Permo-Triassic. The three-month outlook is suggestive of broadly similar patterns, but these projections are highly uncertain; with notably high soil-moisture deficits in early October, there is a high likelihood of the seasonal onset of recharge being delayed. For full information on the groundwater outlook, click **here.**

This document provides an outlook for the water situation for the UK over the next three months and beyond. For guidance on how to interpret the outlook, and a much wider range of information on the hydrological situation, please visit the website: www.hydoutuk.net



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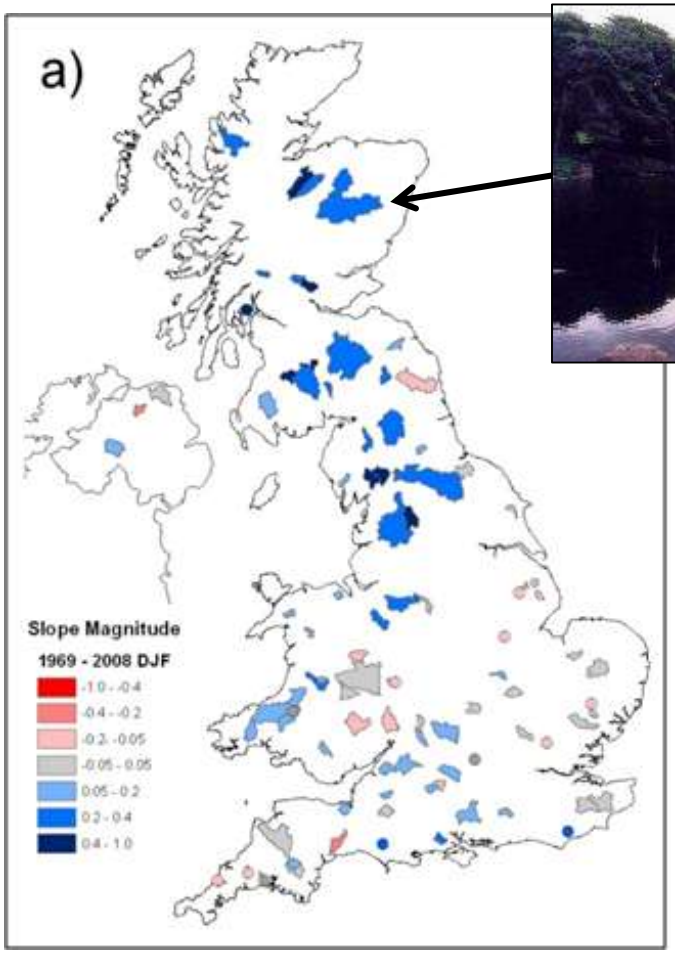
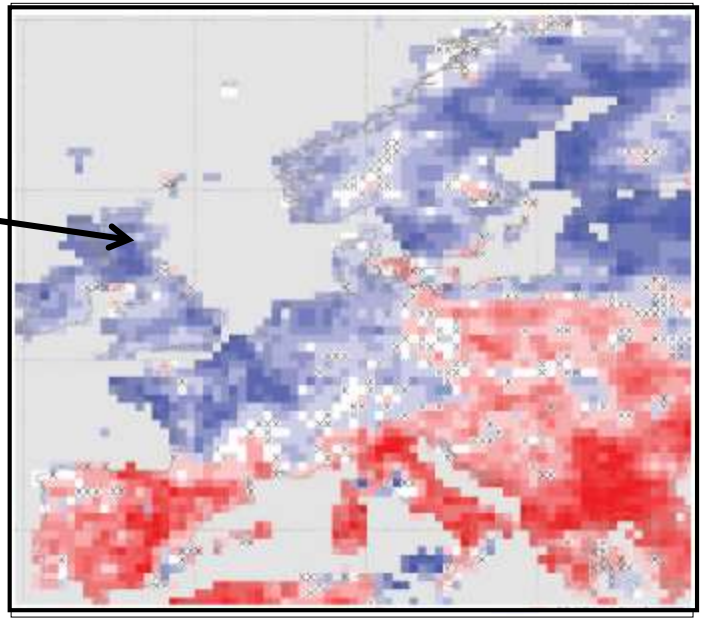
Analysis and synthesis: long-term change



Winter runoff trends 1969 - 2008
Hannaford & Buys, 2012



European runoff trends
Stahl et al. 2010, 2012

Panta Rhei
IAHS
AISH
Everything Flows

Hydrology and Earth System Sciences

16, 1379–1387, 2012
ci.net/16/1379/2012/
79-2012

HESS Opinions

"More efforts and scientific rigour are needed to attribute trends in flood time series"

B. Merz, S. Vorogushyn, S. Uhlemann, J. Delgado, and Y. Hundecha
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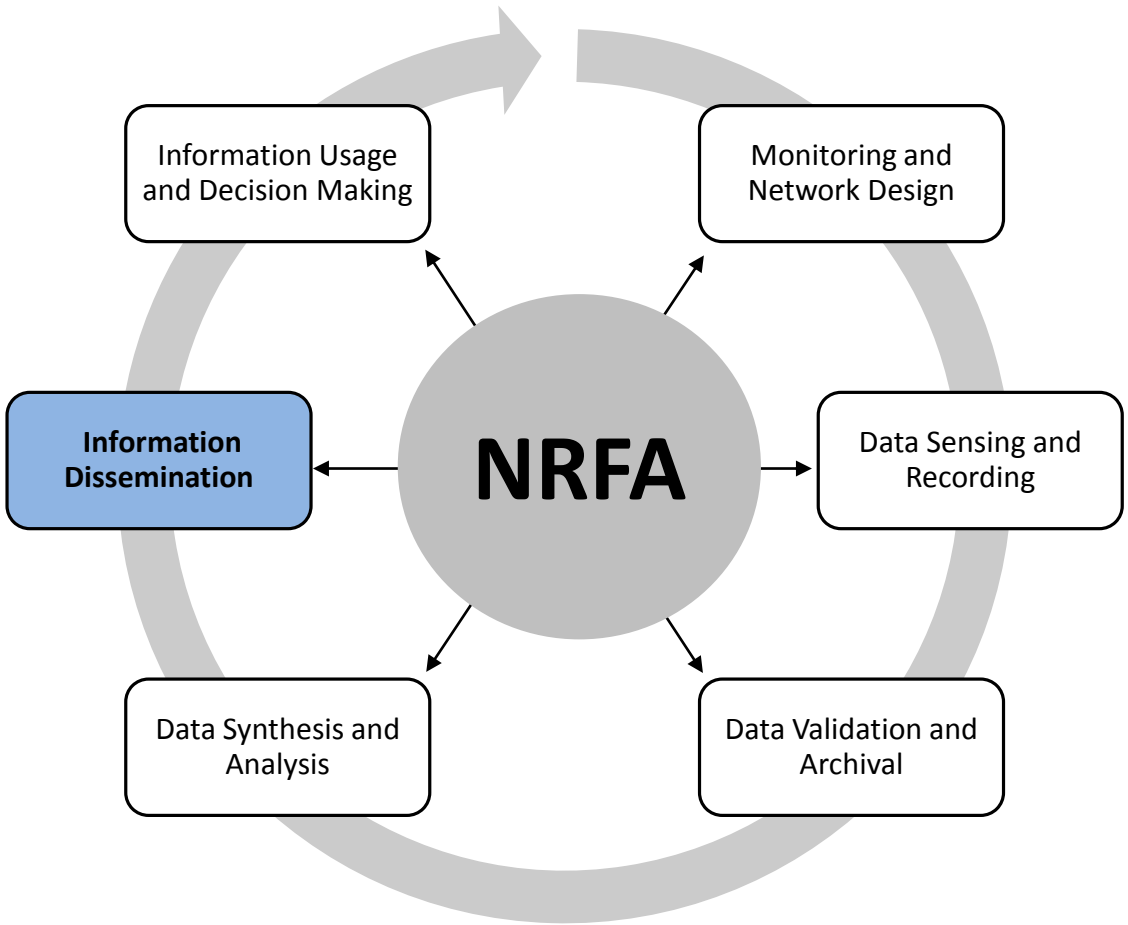
The hydrometric information life-cycle



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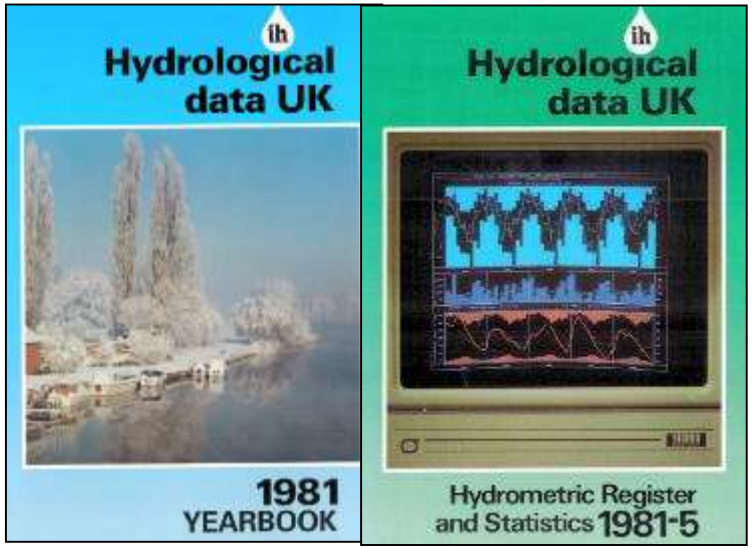
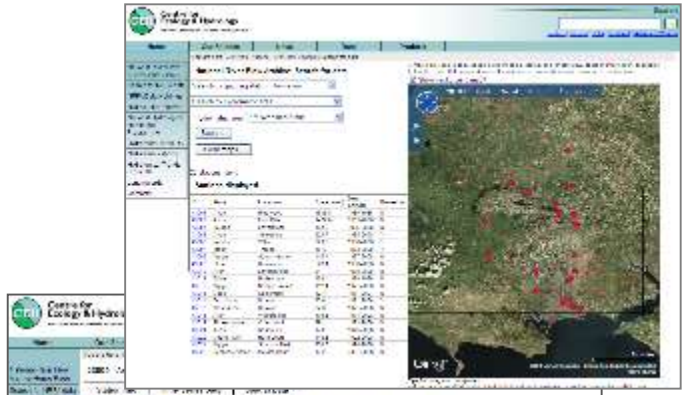
Information Dissemination

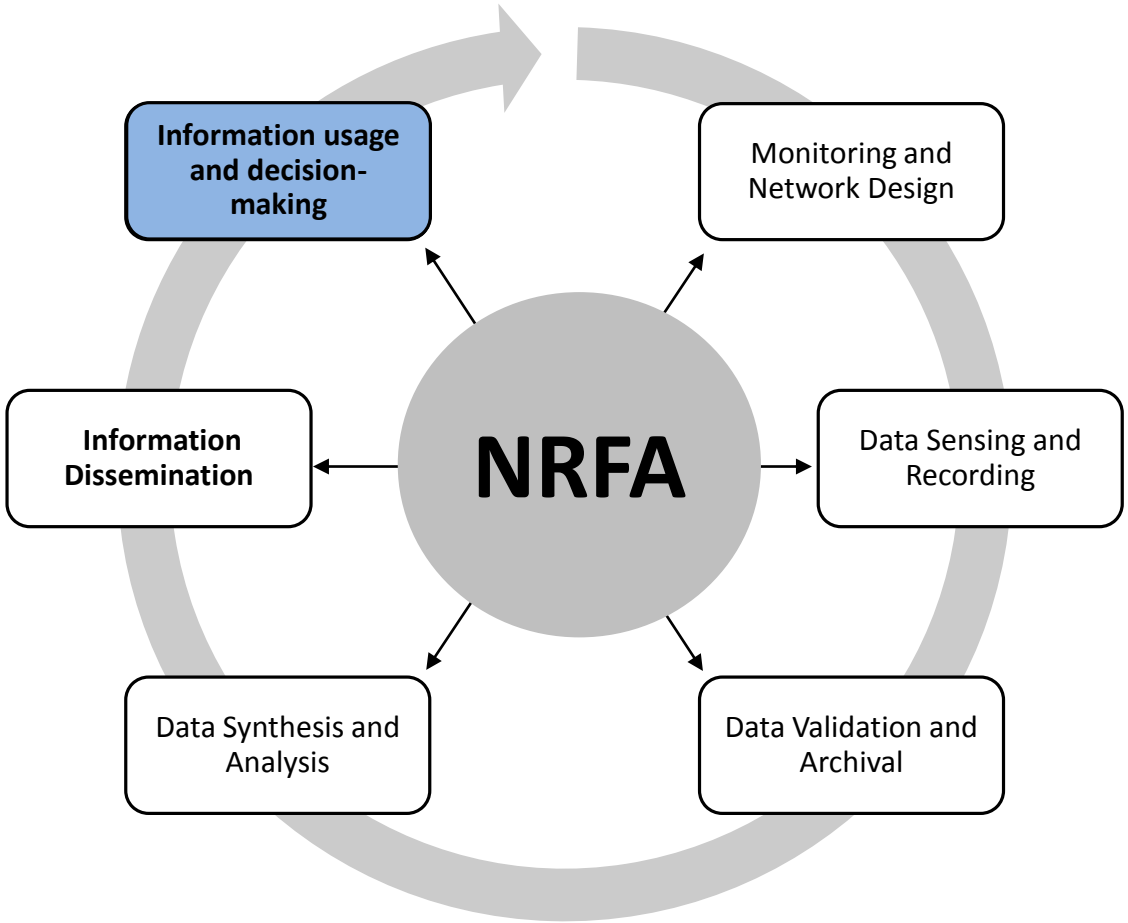




In an era of Big Data, the NRFA will continue to champion "turning data into information"

Images:Twitter, Wikipedia Commons

The hydrometric information life-cycle



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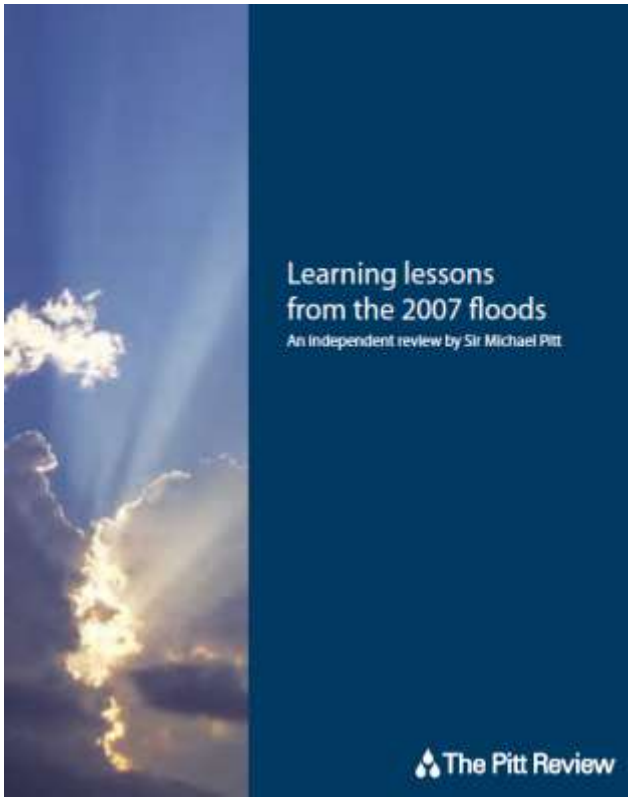
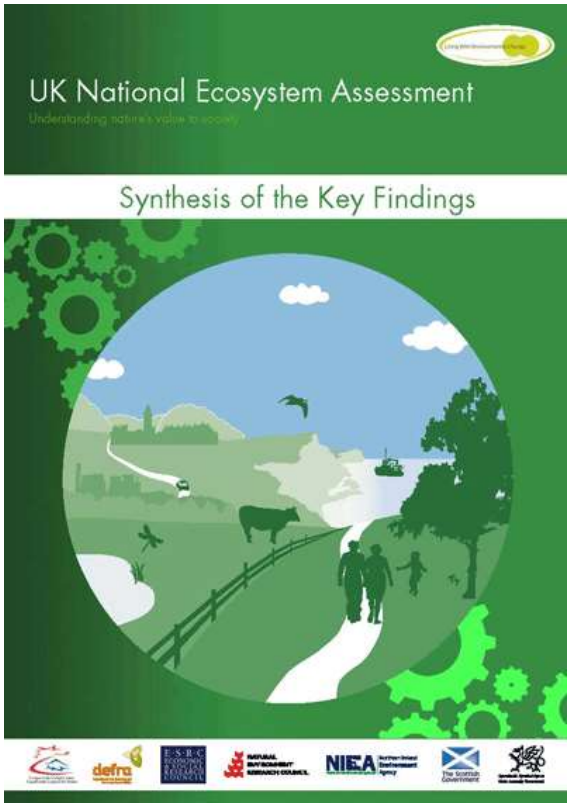
Decision making





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A future Archive by collaboration....

&....?

Celebrating 60 years of the NRFA

The face of regional liaison in the 2040s?

Here's to the next 30 years!

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Image: Honda.com