MAXIMISING THE UTILITY OF HYDROMETRIC INFORMATION FOR THE USER COMMUNITY:
a national perspective

Harry Dixon
Data Acquisition and Retrievals Manager
National River Flow Archive

Centre for Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL

Providing an efficient and effective hydrometry service
BHS National Meeting: 21 June 2011

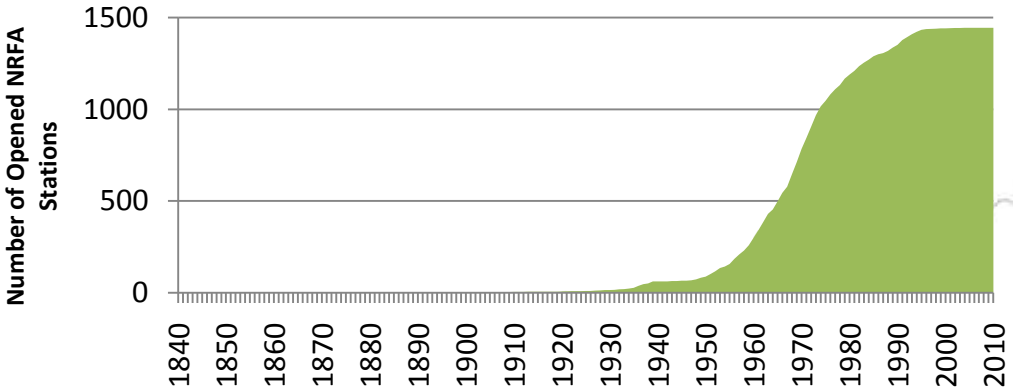
Presentation Outline

- History of the National River Flow Archive
- Hydrometric Information Lifecycle
  1. Monitoring and Network Design
  2. Data Sensing and Recording
  3. Data Validation and Archival
  4. Data Synthesis and Analysis
  5. Information Dissemination
  6. Information Usage and Decision Making
- Conclusions
  - How can we improve national hydrometric data for the end user?
  - Do we still need a National Archive?

History of the National Archive

- Primary national hydrometric archive for water resources

Late 19th/Early 20th C	Early pressure for a national survey
1935-1952	Inland Water Survey
1955-1964	Surface Water Survey
1964-1974	Water Resources Board
1974-1982	Water Data Unit
1982 -	National River Flow Archive (Institute of Hydrology > CEH)



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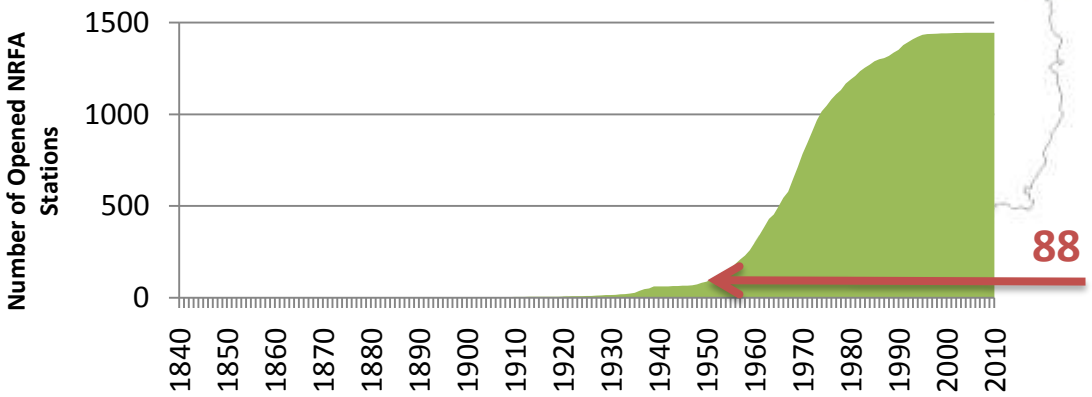

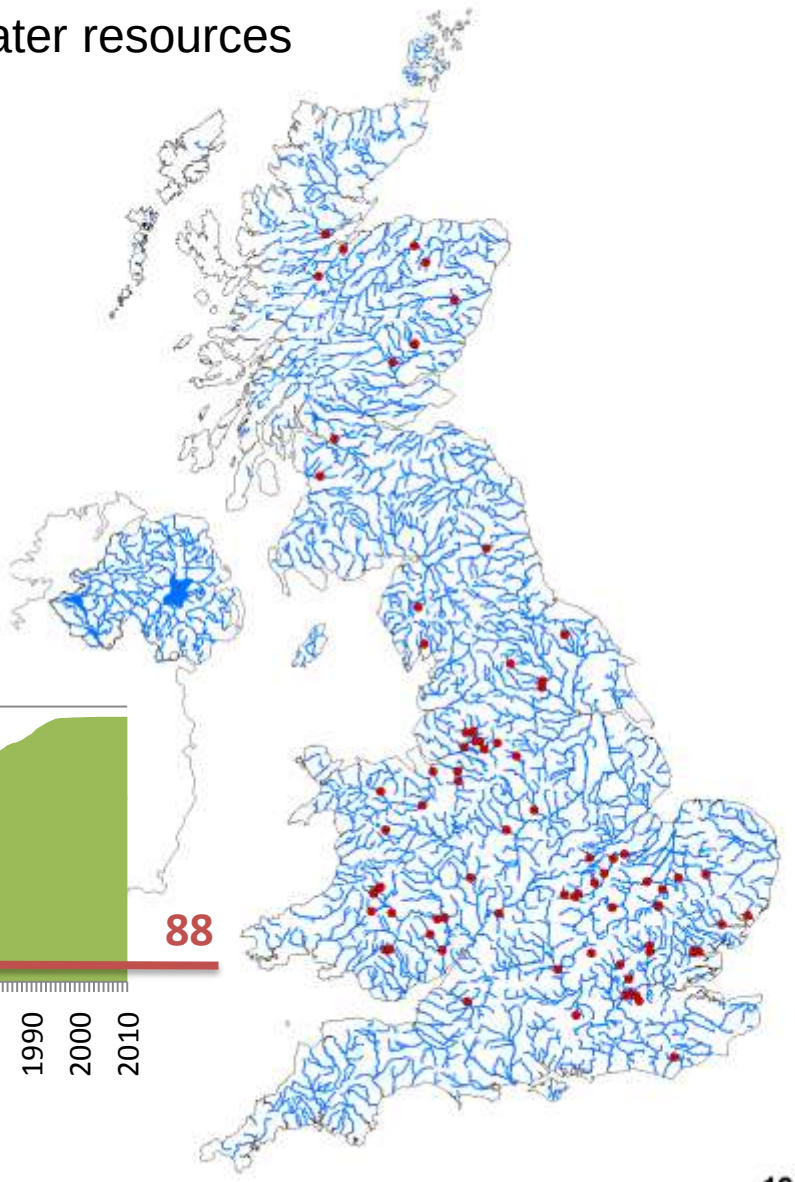

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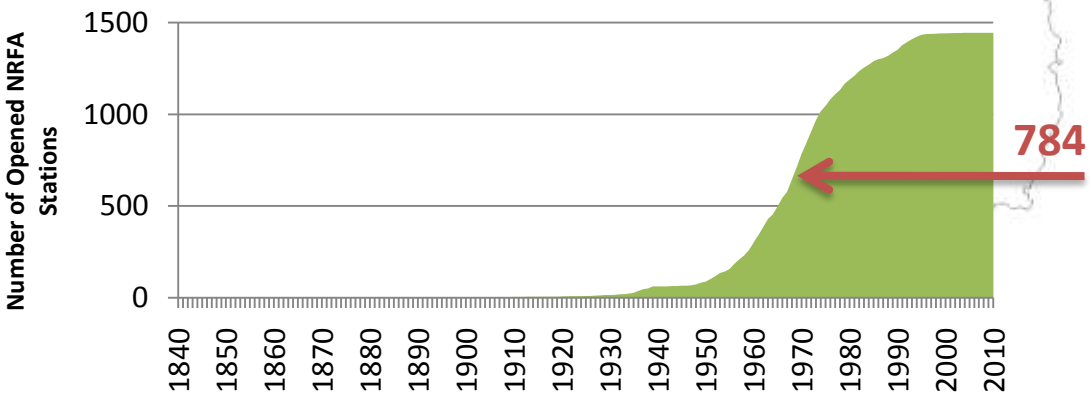

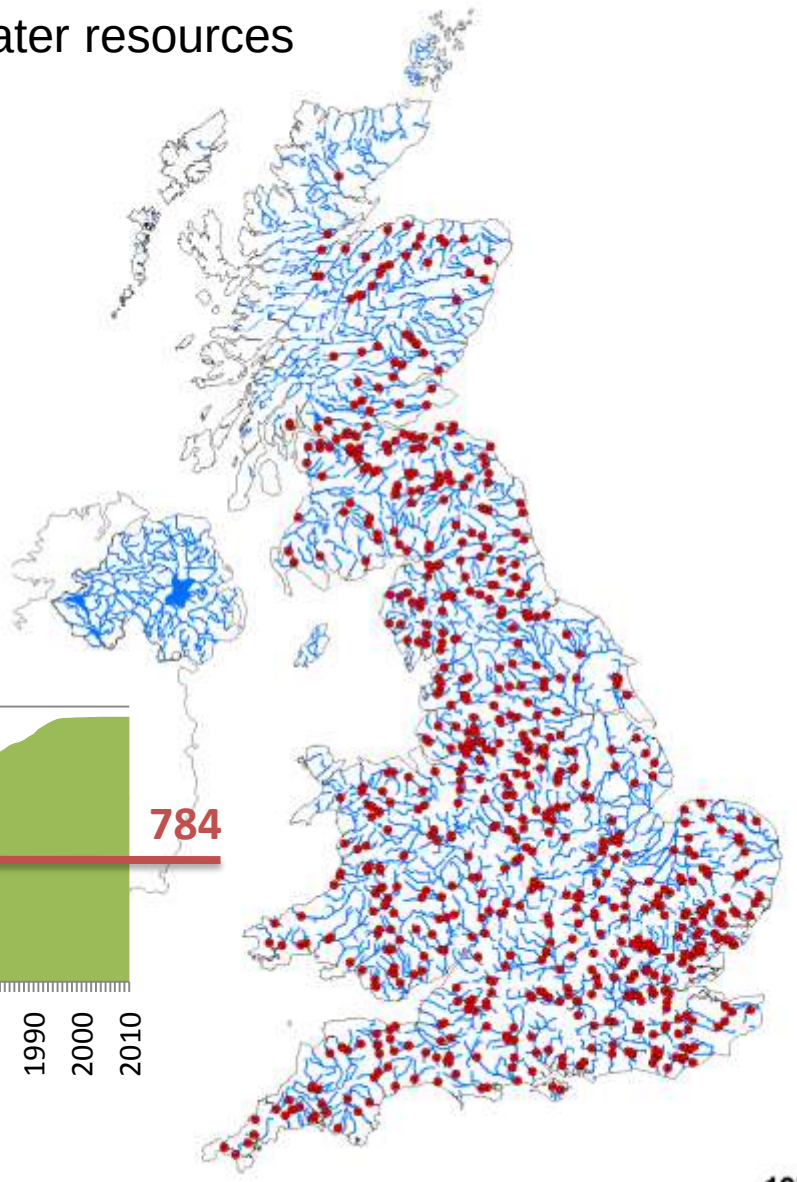

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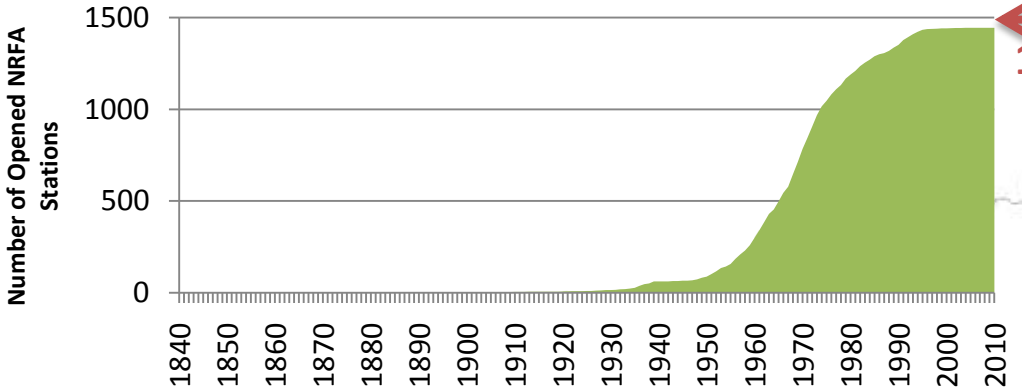

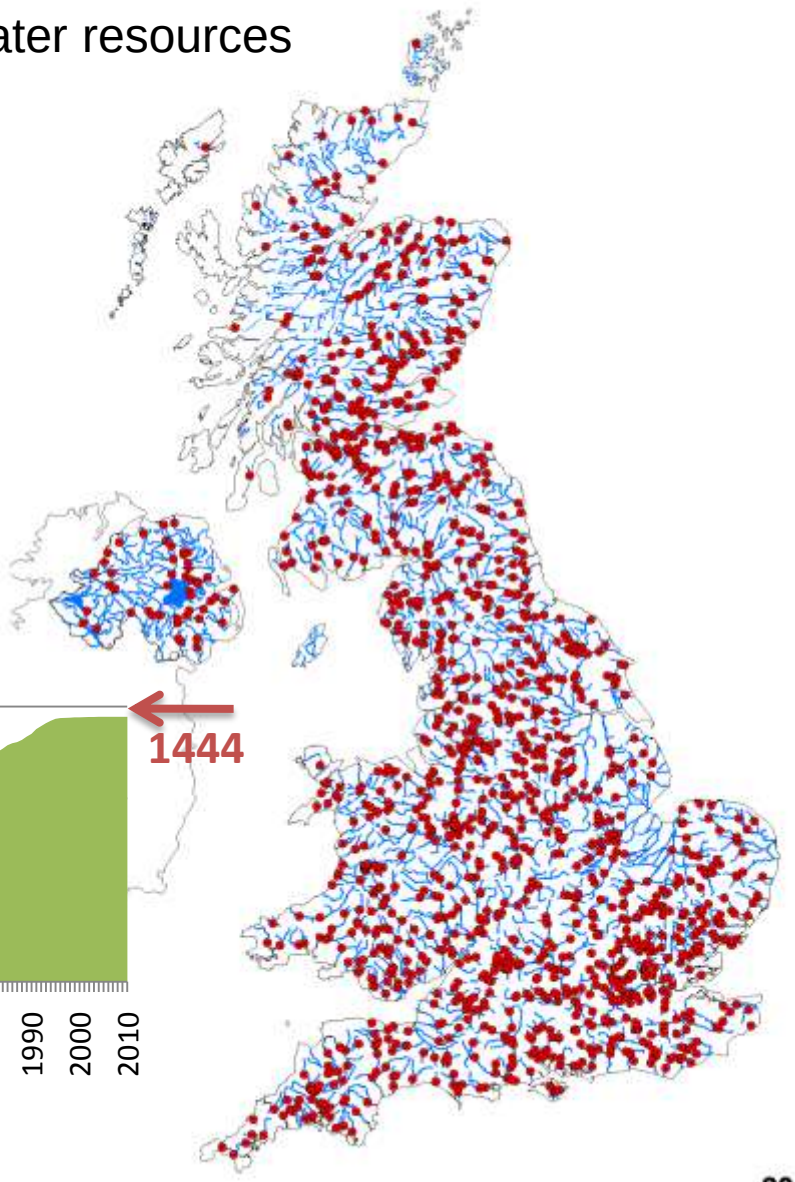

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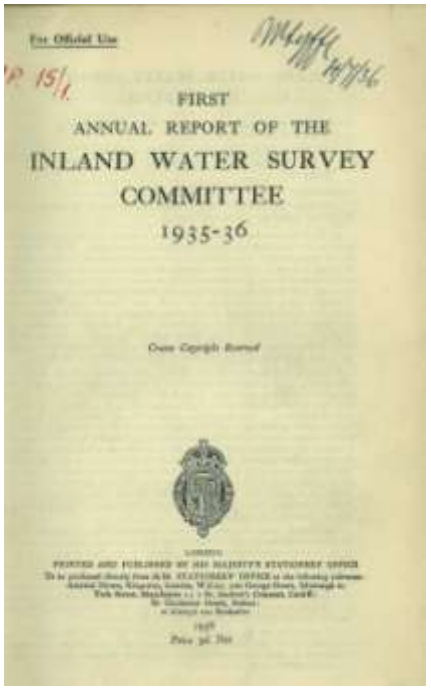
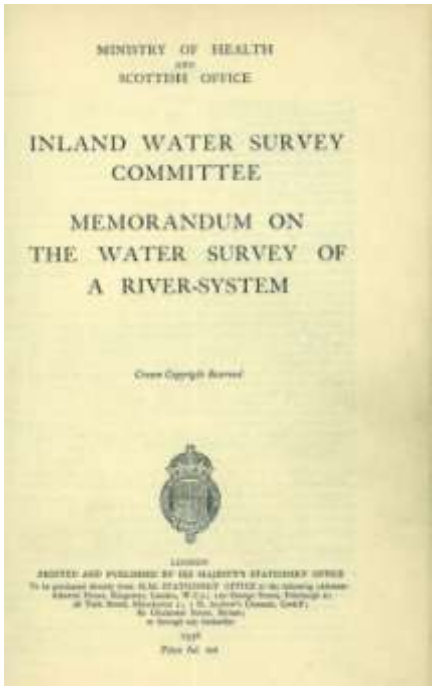
A National Archive by collaboration....

- “A water survey committee, composed of persons outside Government Departments, will be appointed to advise on the survey and on the progress of measures undertaken. In the constitution of the Committee attention will be paid to the inclusion of both scientific and practical experience.”

The Minister of Health (Sir Hilton Young) House of Commons 7 December 1934





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A National Archive by collaboration....

- UK Surface and Groundwater Archives Committee

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British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

SEPA
Scottish Environment Protection Agency

RIVERS Agency

Environment Agency

Met Office

The Scottish Government
Riaghaltas na h-Alba

defra
Department for Environment Food and Rural Affairs

Llywodraeth Cymru
Welsh Government

British Hydrological Society

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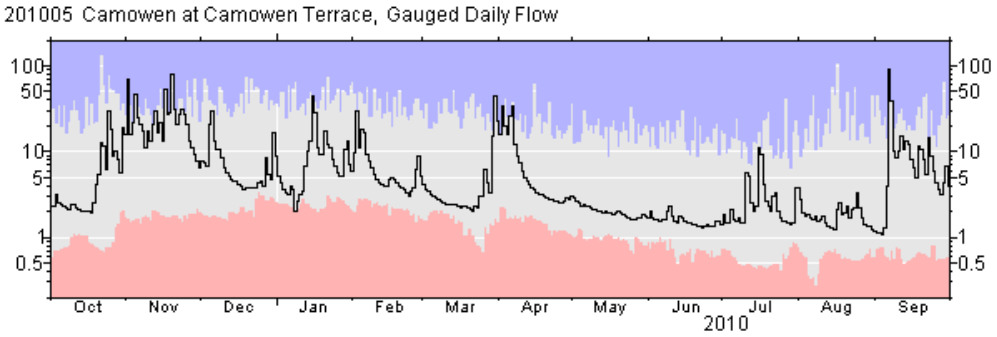
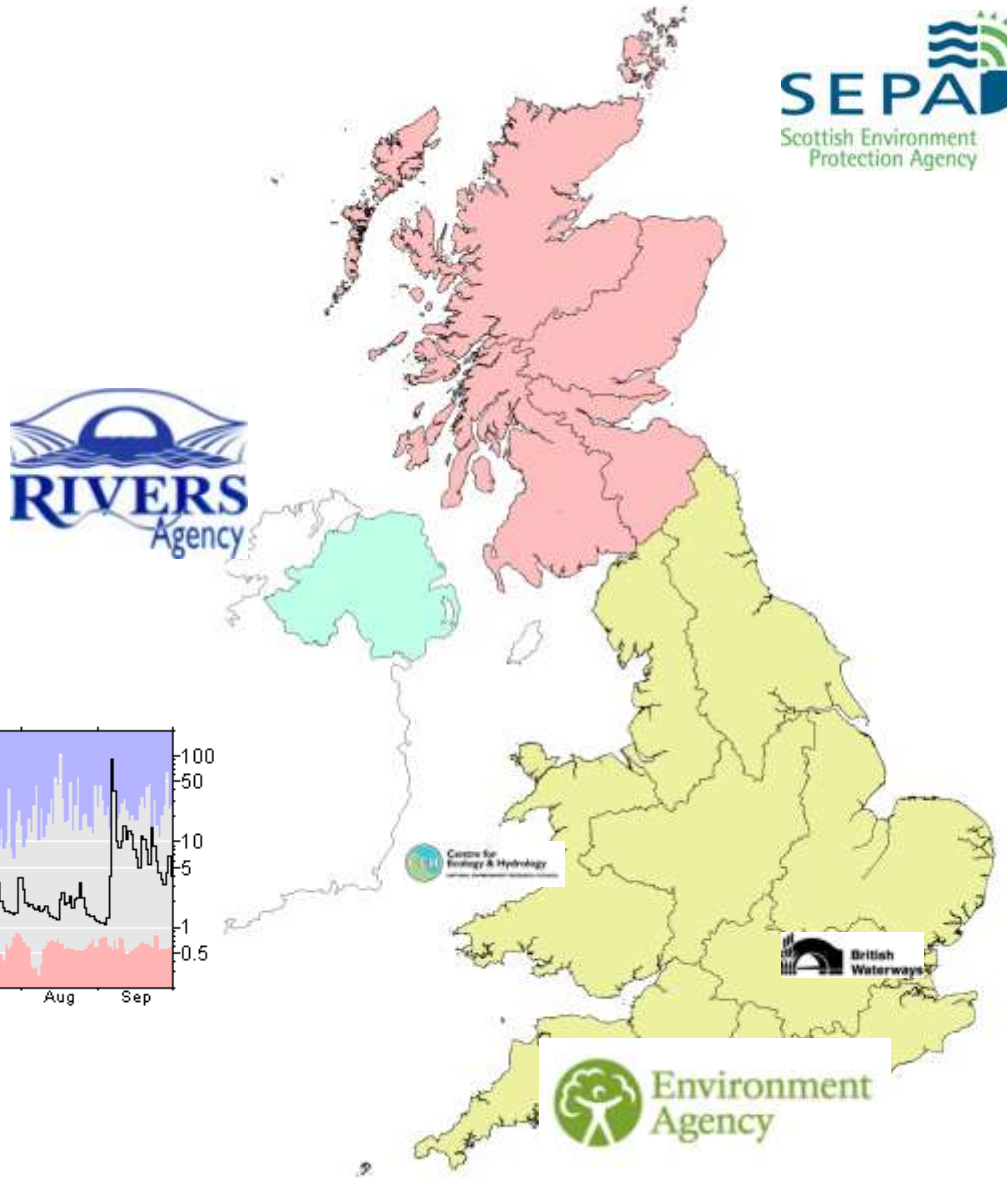
The National Archive Today

- National hydrometric archive
  - Primarily **Daily Mean Flow** Data
  - 53,000 Station years of data
  - ~1500 Gauging Stations
  - Earliest data from 1841 (Wendover Springs)
  - Metadata, archive of station history material, microfilmed level charts, etc...





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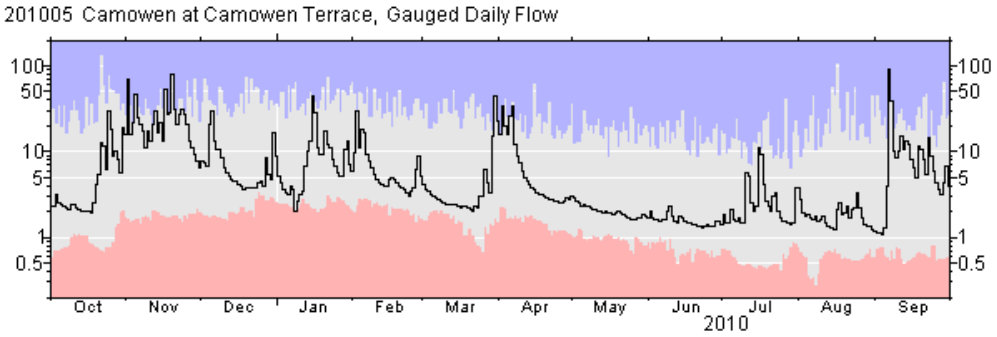

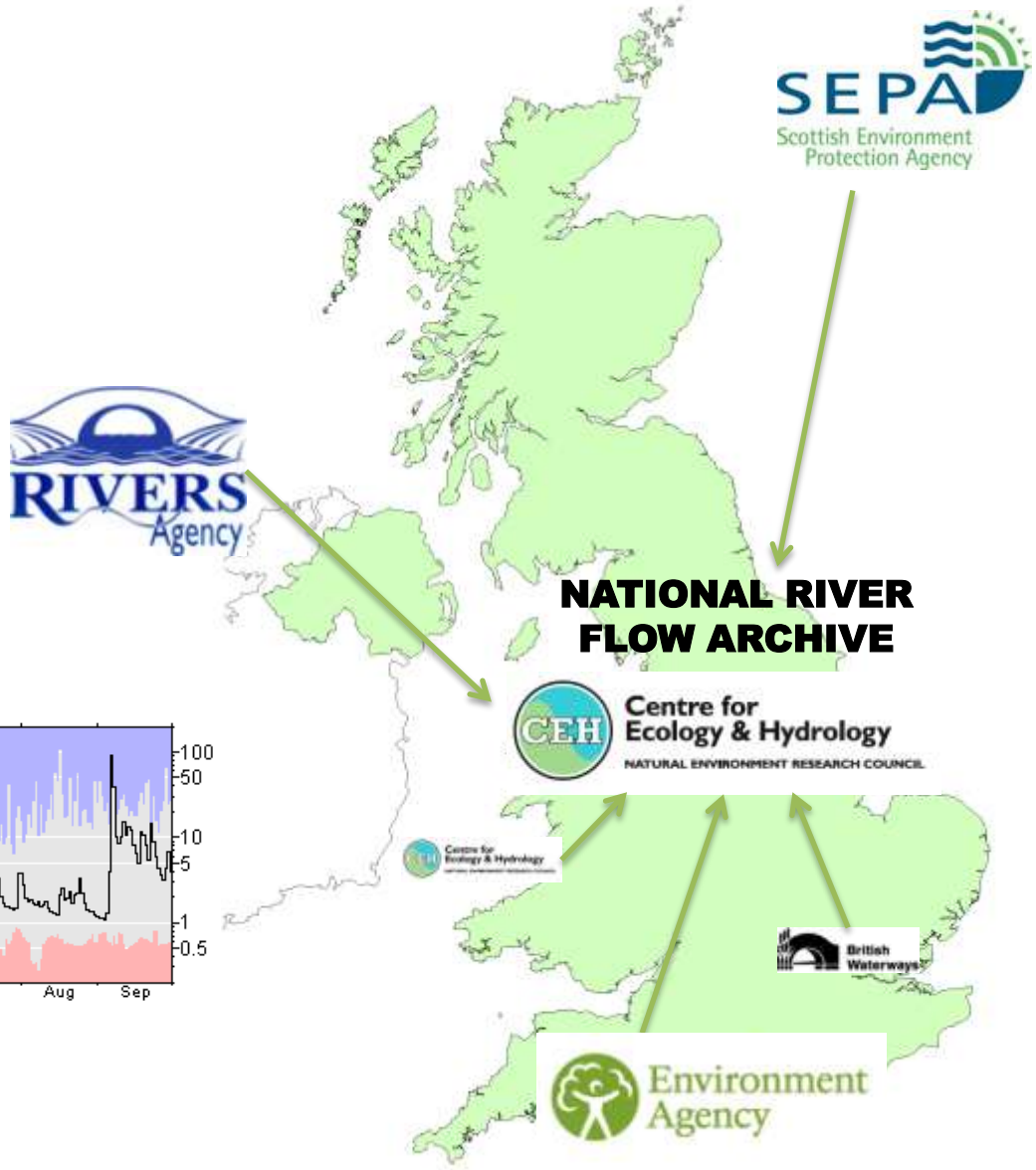

CEH Centre for Ecology & Hydrology
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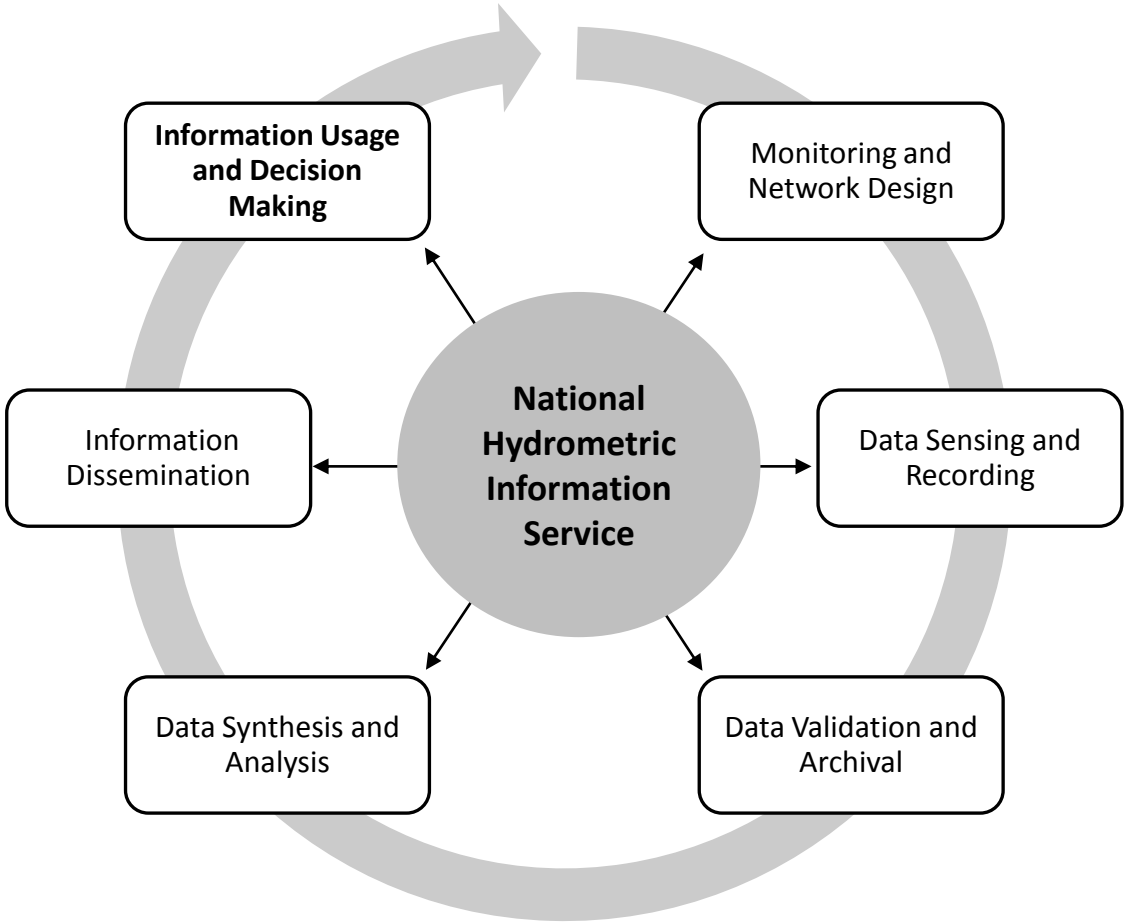
Hydrometric Information Lifecycle

- Importance of links between all aspects of hydrometric data production and analysis
- Encompassing different organisations and users
- Internationally National Hydrological Services vary greatly in organisation setup.
- The NRFA tries to engage around the cycle



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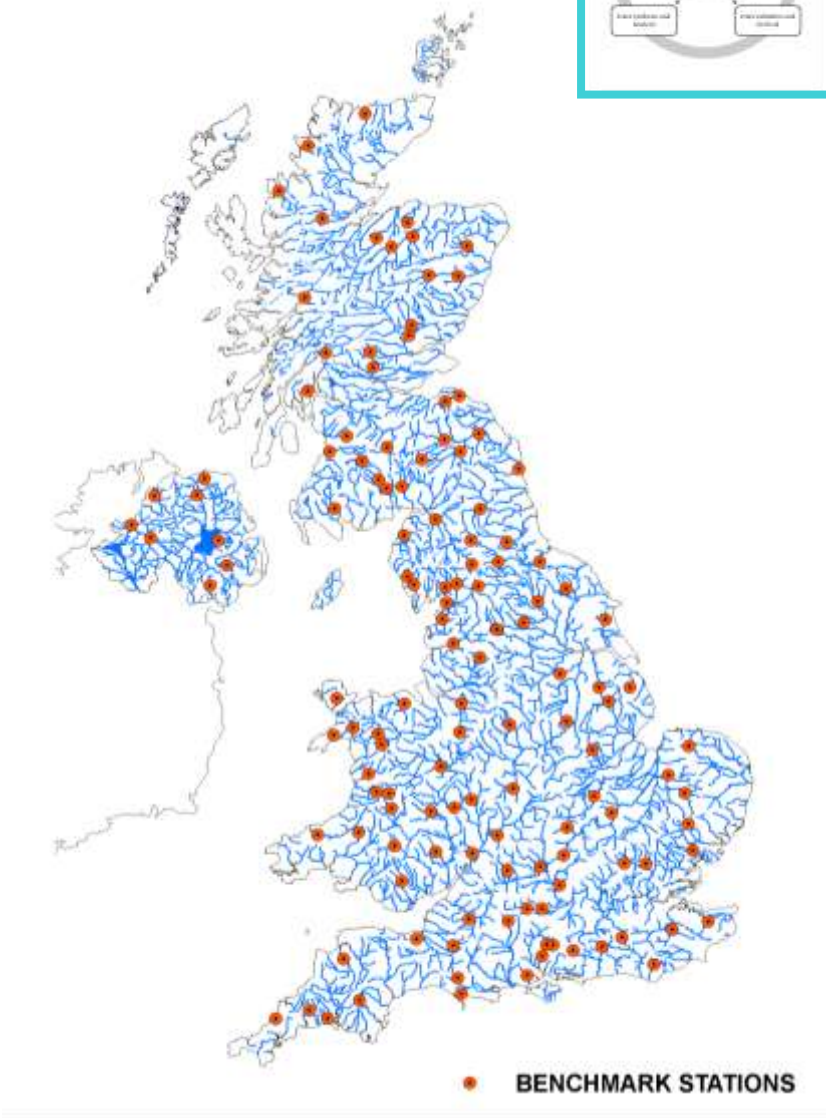
Monitoring and Network Design

National sub-networks:

Recent:

- Benchmark Network
  - 130+ ‘Near natural’ catchments



Benchmark Network: Bradford & Marsh (2003)
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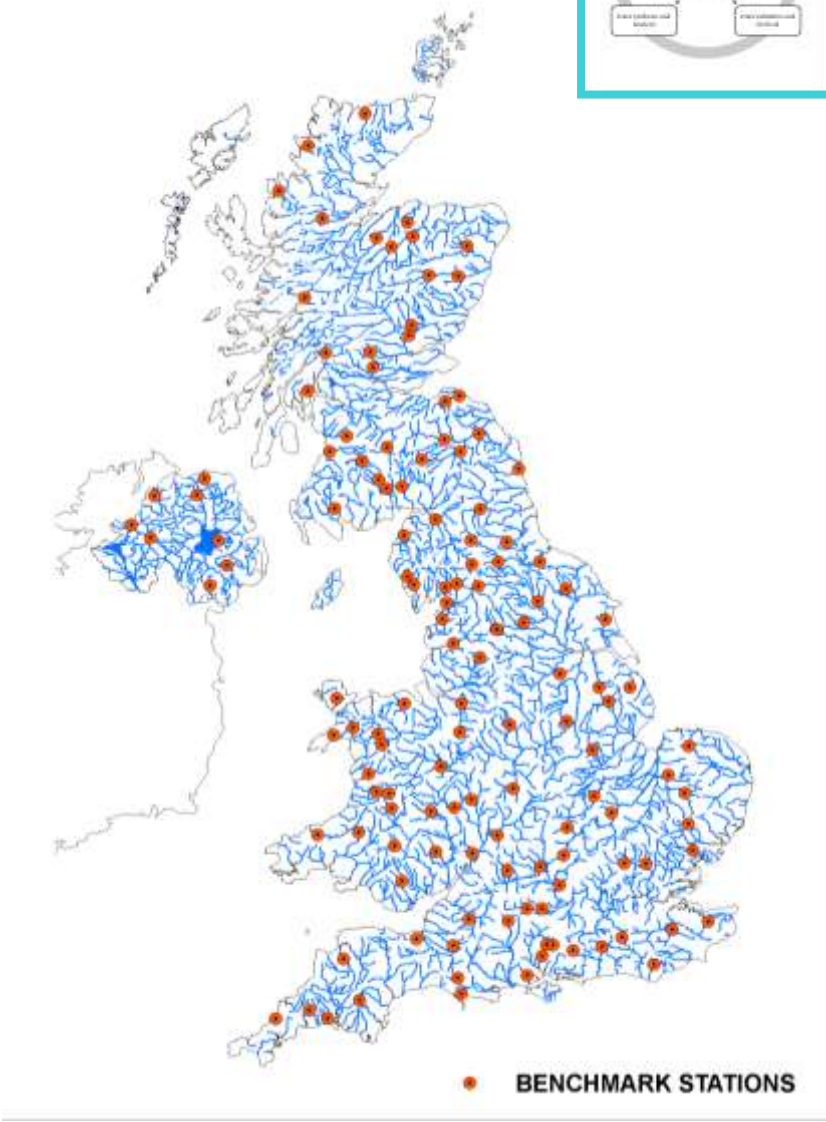

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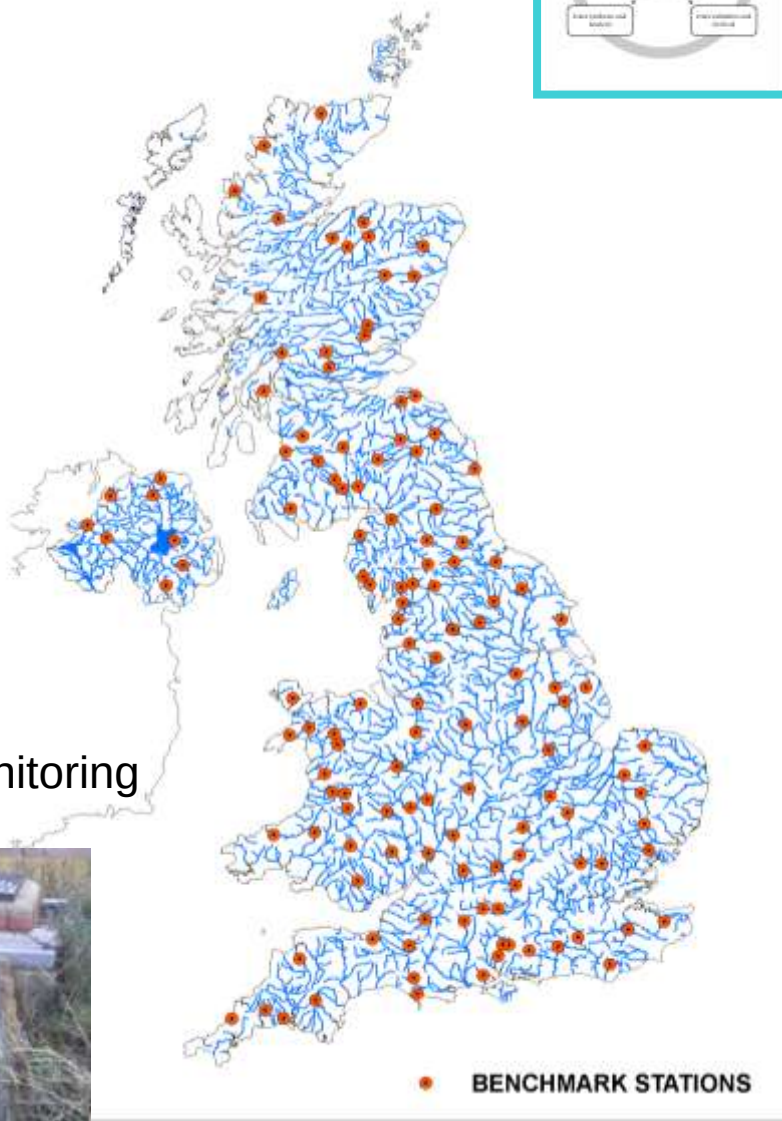
Future:

- More integrated monitoring at national scale
  - Added information delivery from co-located monitoring



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  - Representative Catchment Index
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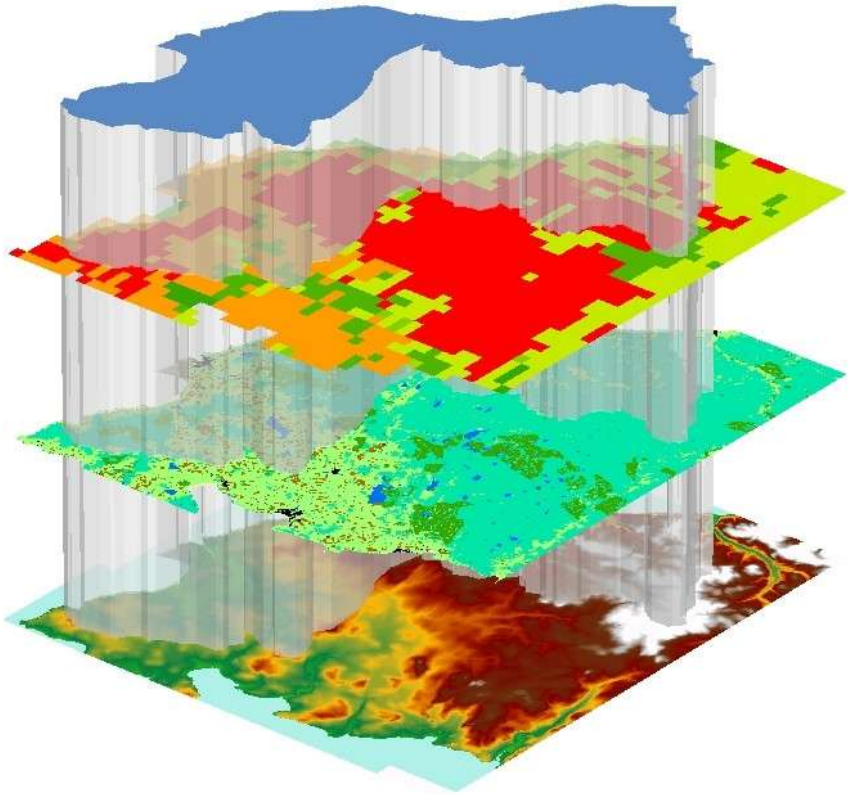

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Assessment tools: Laizé et al (2008)

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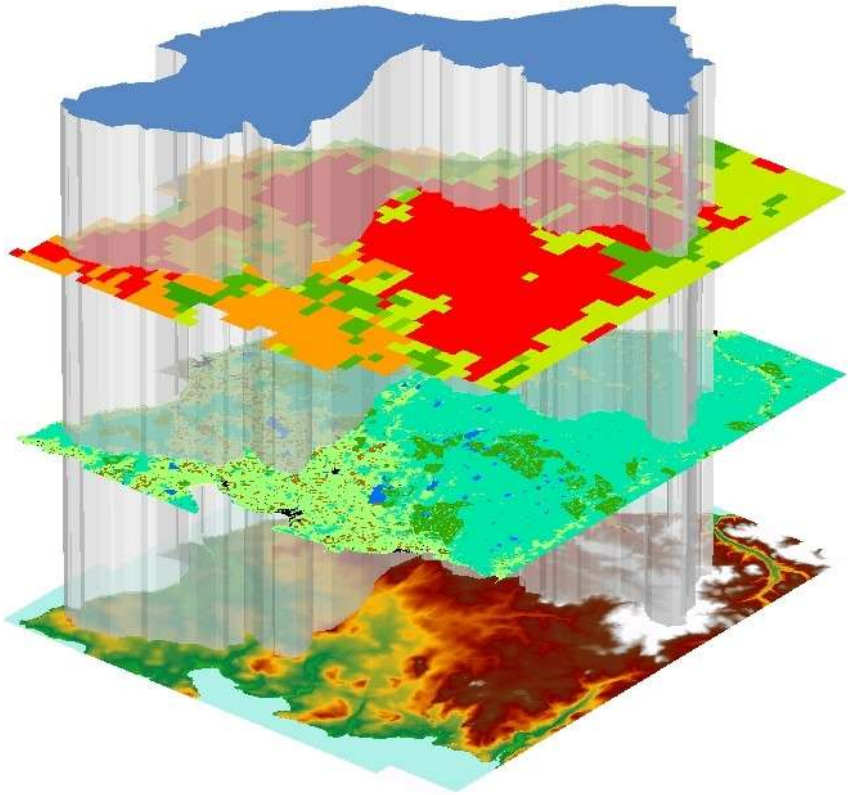
  - Important that all user needs are considered
  - Operational AND strategic needs



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Network Review: Hannaford et al (2011)

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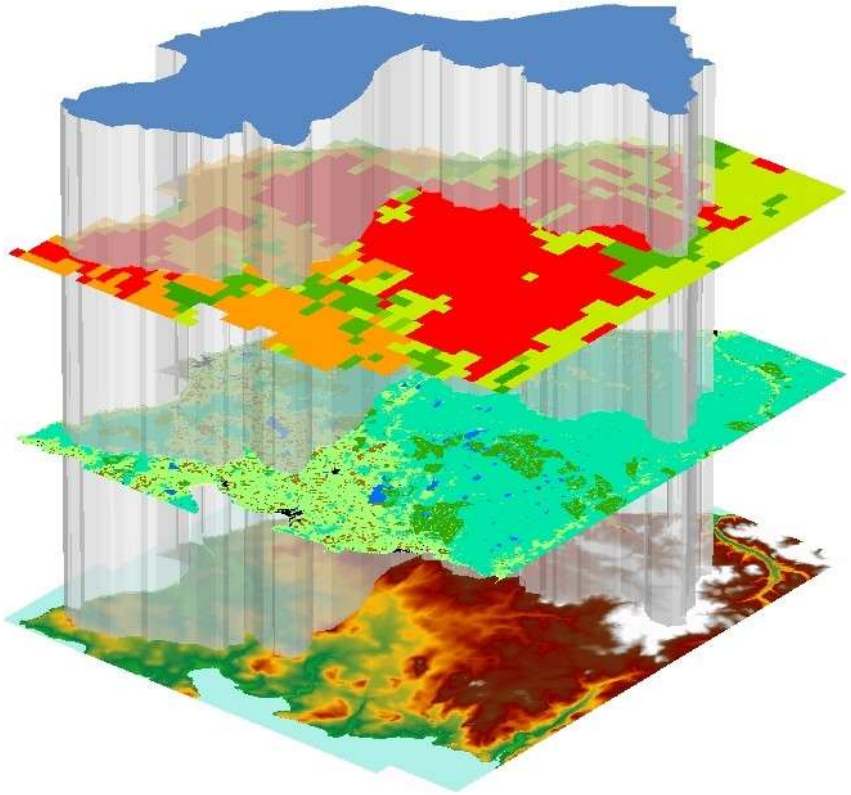
Future:

- Web-based user tools for catchment assessment



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Data Sensing and Recording

Recent :

- Understanding and communicating hydrometric issues through the cycle:
  - NRFA regional hydrometric data specialists
  - Concentration on overall utility of datasets
  - Information for a range of scales:

    National/International **vs.** Regional/Local

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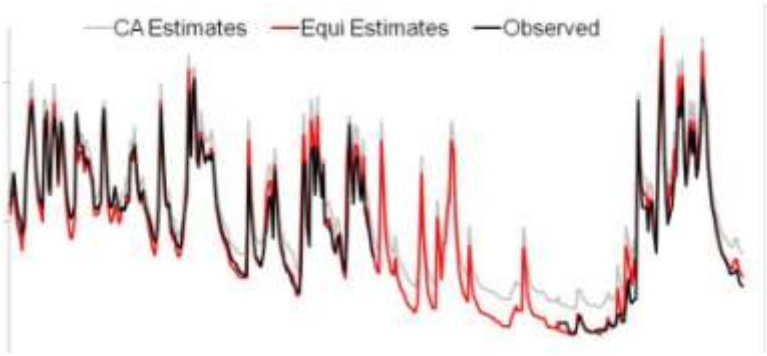
  - Small gaps in flow series remain a problem
  - Research into infilling techniques
  - Guidance to promote consistency & auditablity



Data Infilling: Harvey et al (2011) Accepted

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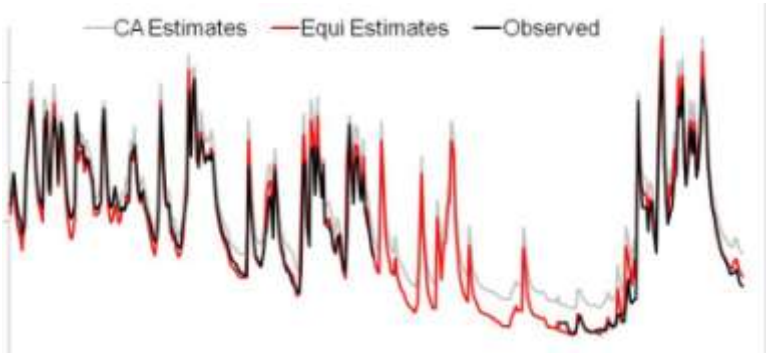

Future:

- Communicating uncertainty!

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Data Validation and Archival

Annual data acquisition:

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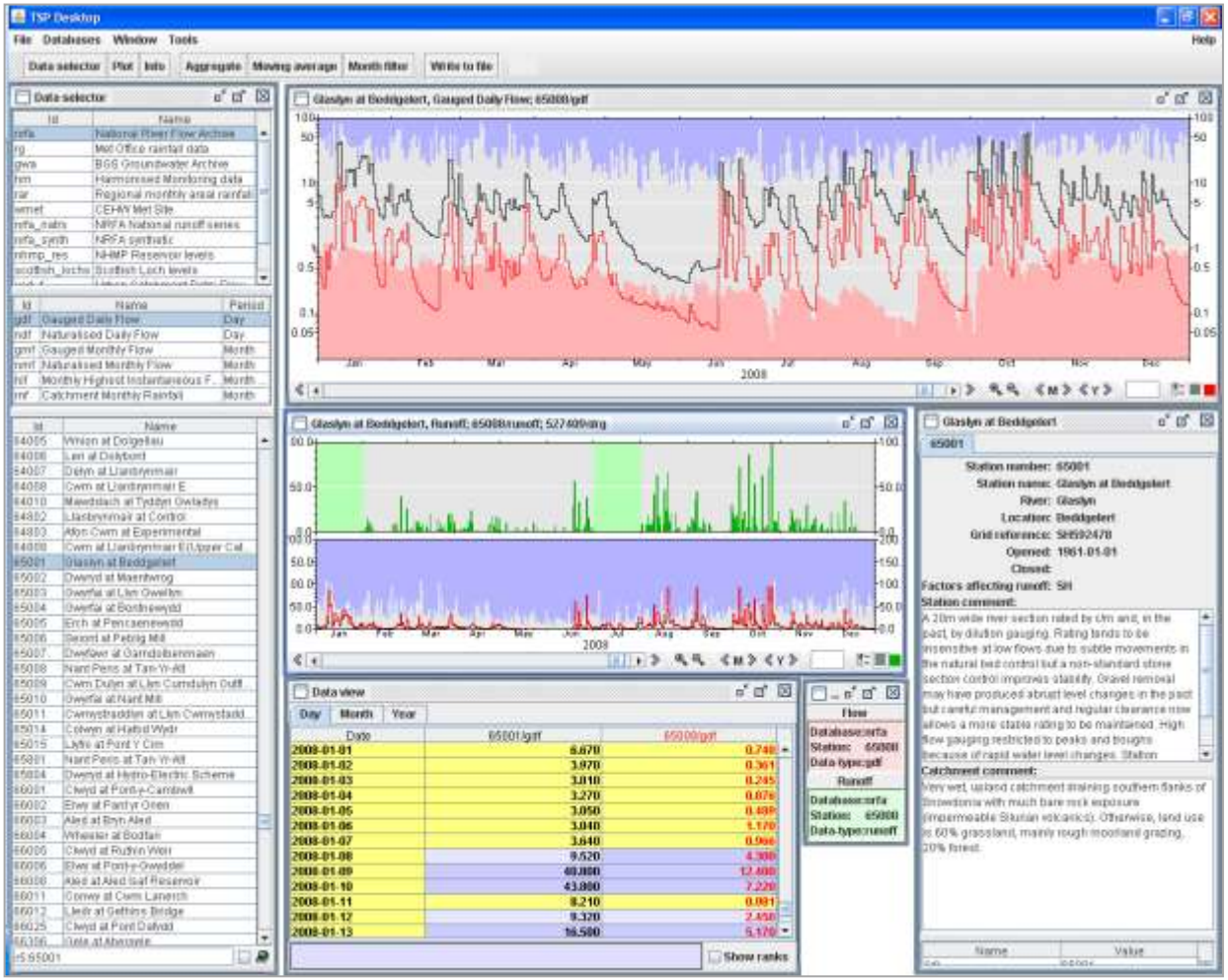
- Data queries lead to improved data for all parties
- Bespoke data handling systems developed for visual and automated checking:



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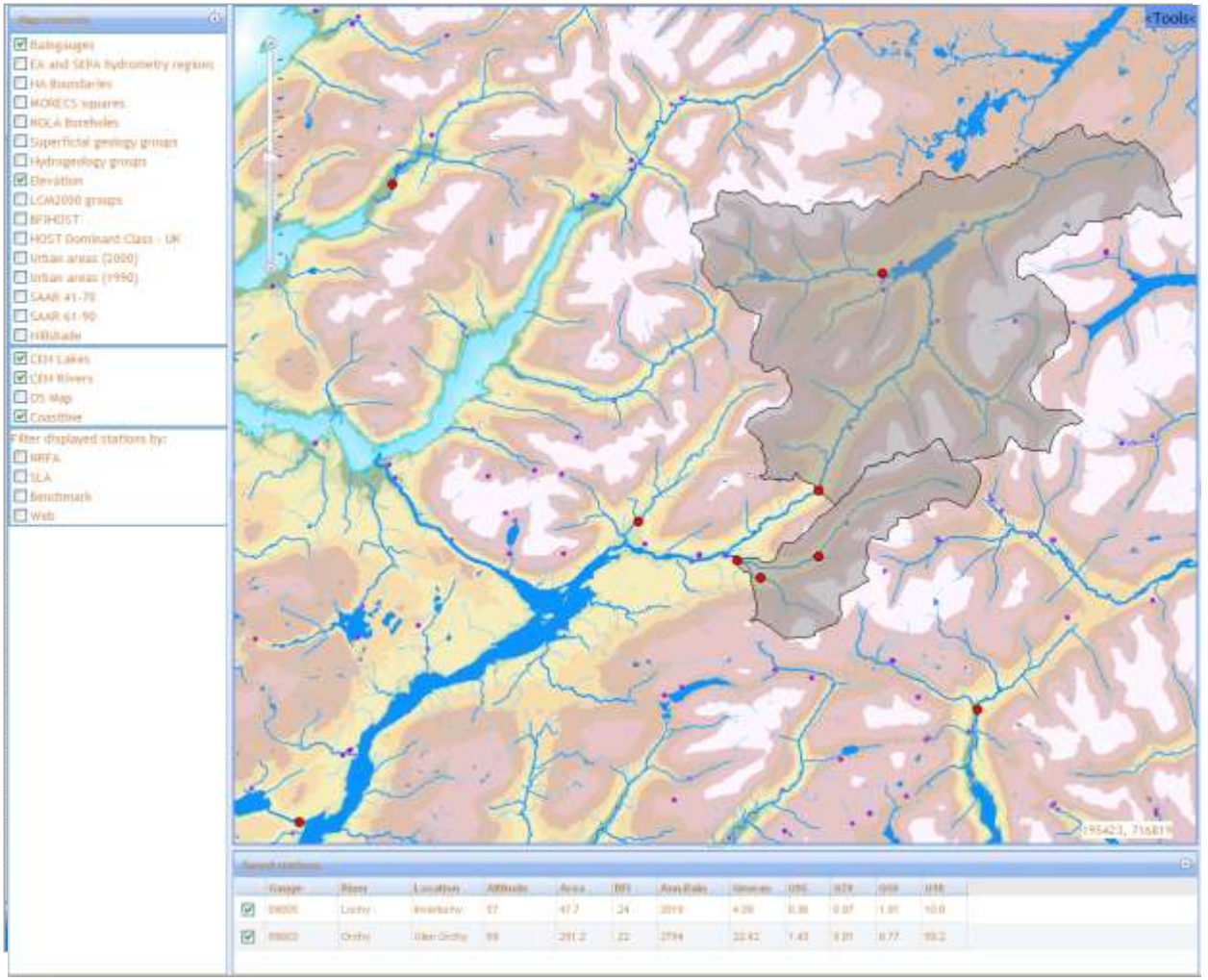

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Controlling data provision to the national archive:

- Service Level Agreement since 2002
- Aims:
  - Promote **stability** in national network
  - Improve data **quality**
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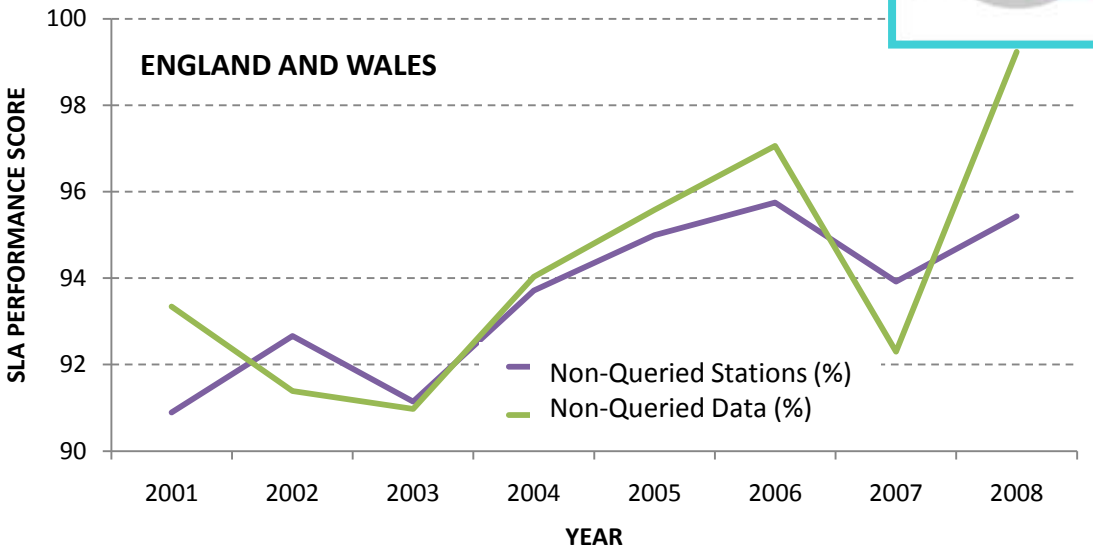
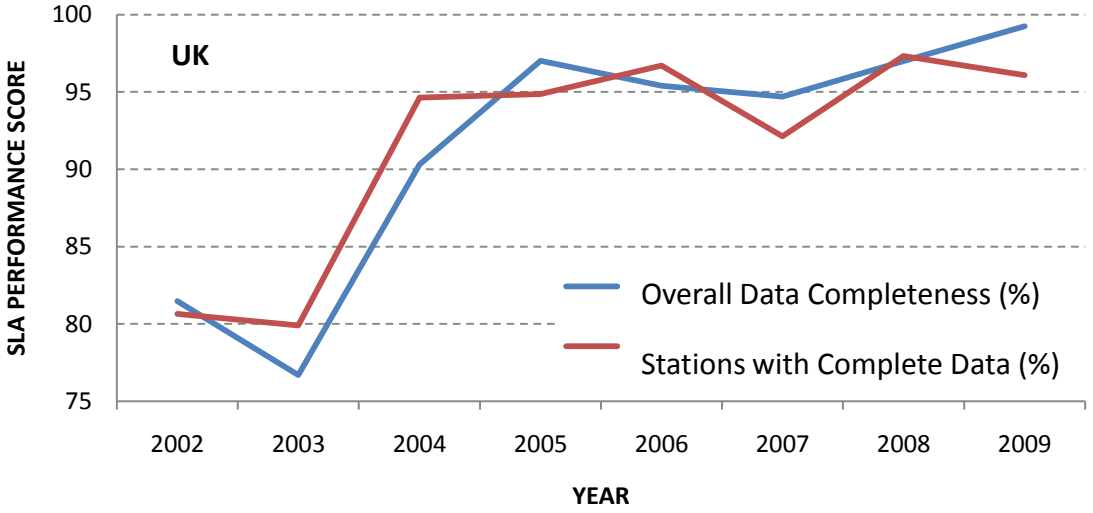


- Subset of network monitored through Performance Indicators
  1. Data provision timeliness
  2. Data completeness
  3. Data queries



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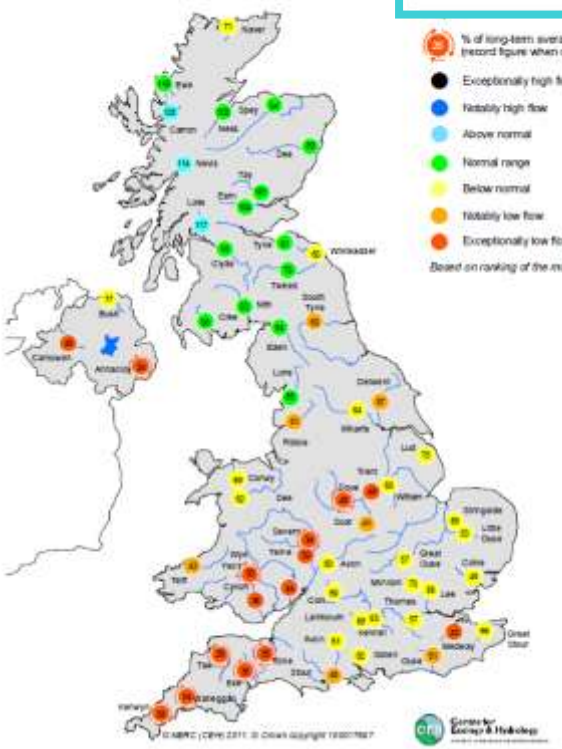
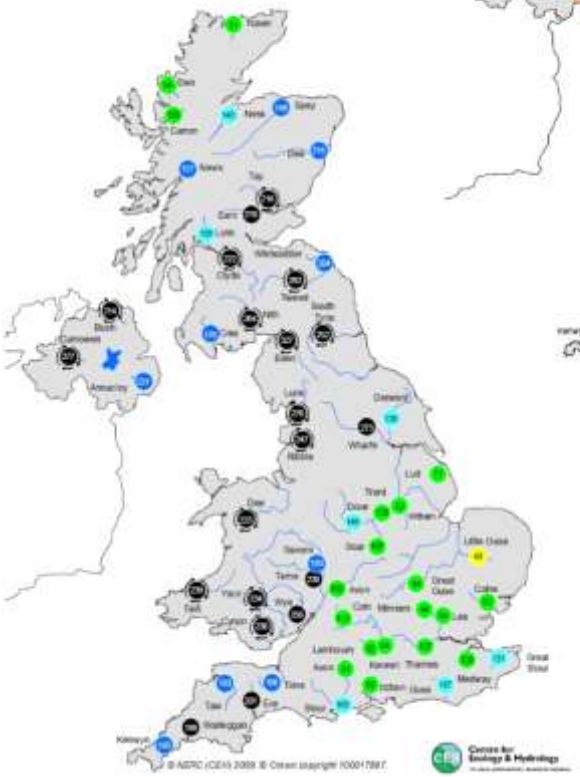
National Hydrological Monitoring Programme

- Started in 1988
- Monthly situation reporting
- Hydrological review of major events

River flow: March - May 2011



River flow: November 2009



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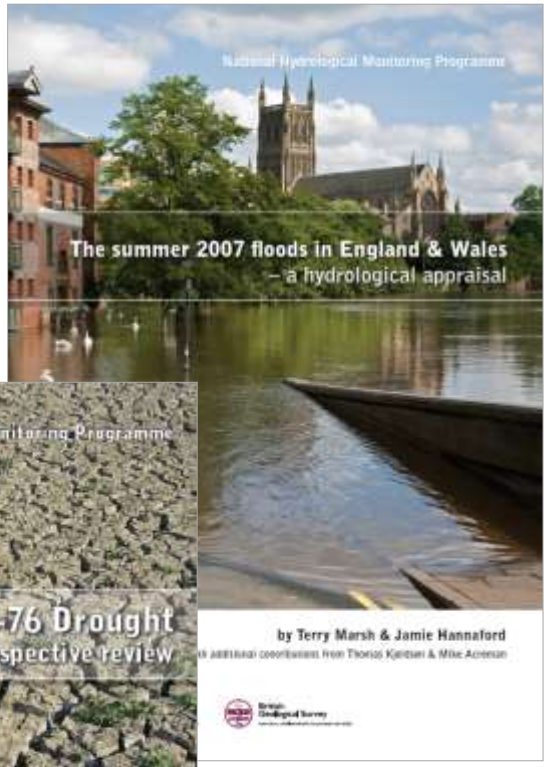

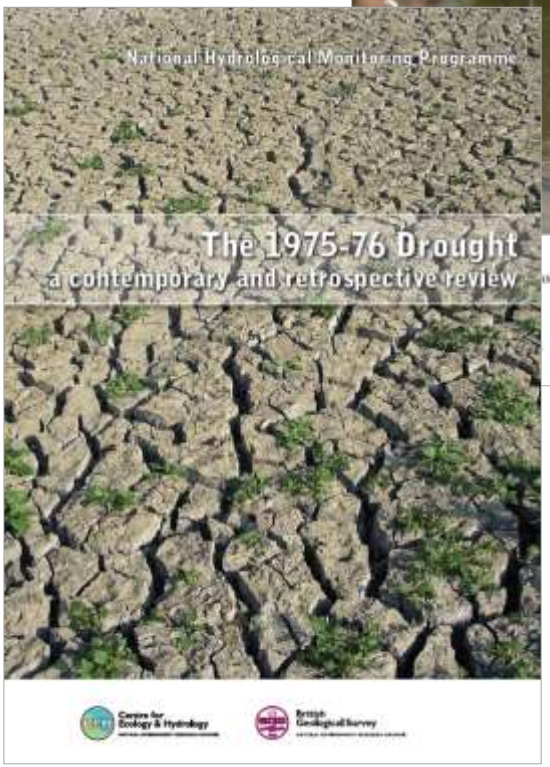

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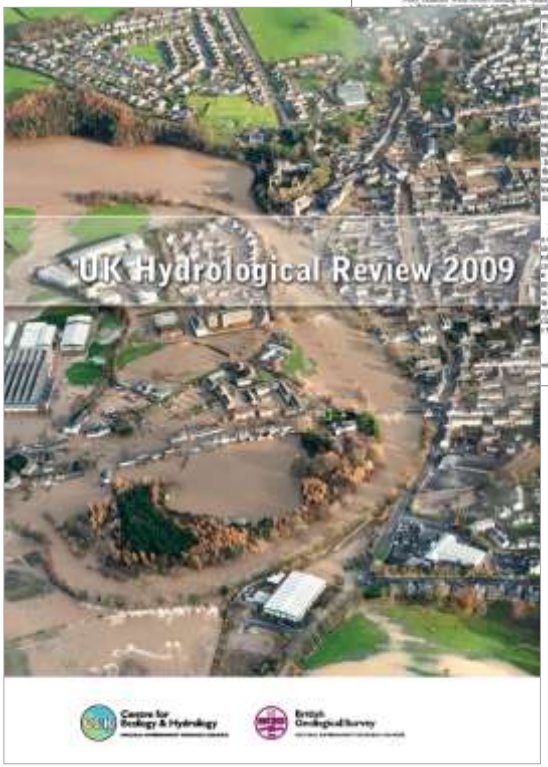

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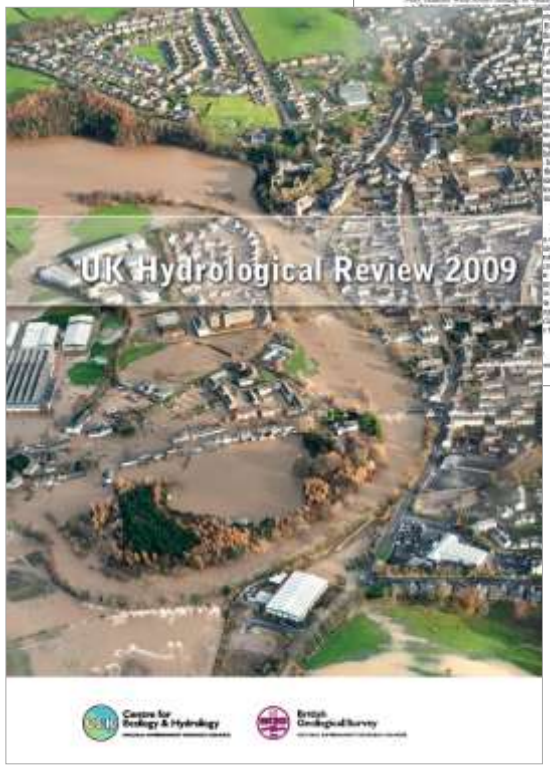
Future:

- Ecological impacts
- International context



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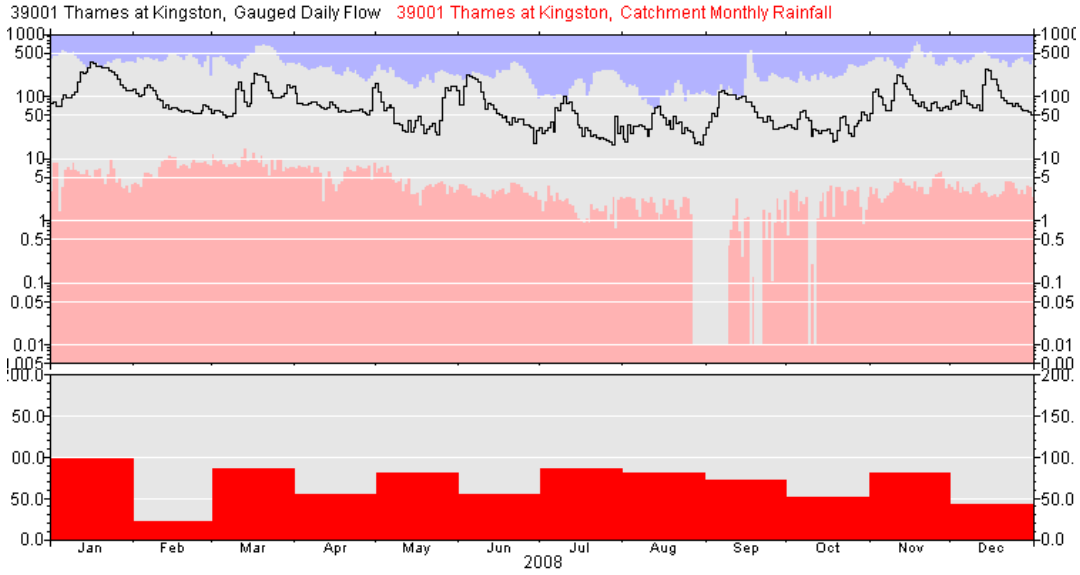
Information Dissemination

Core datasets:

Time Series

- Gauged Daily Mean Flows
- Naturalised Flows (some)
- Catchment monthly rainfall



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Basic Metadata

- Location, Catchment area, Station type
- Photos


NRFA Gauging Station Information Sheet

Thames at Kingston

Daily Flow Hydrograph

Flow Duration Curve

Flow Statistics

Rainfall and Runoff

Station and Catchment Characteristics

Station and Catchment Description

Factors Affecting Runoff

Summary of Archived Data

Gauged Flows and Rainfall

Naturalised Flows

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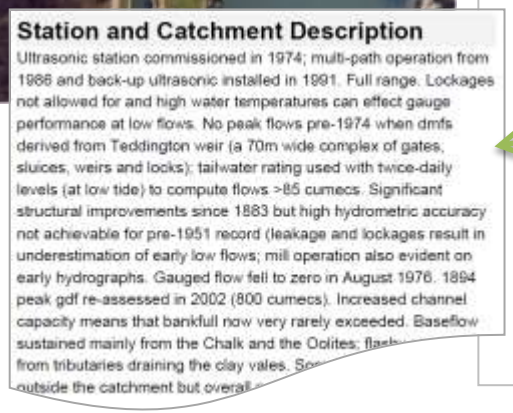

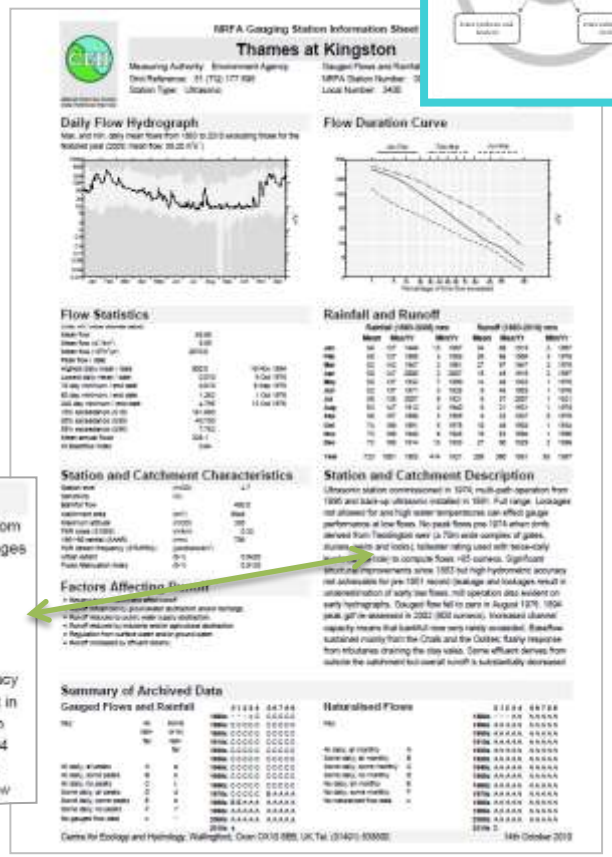

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Catchment Metadata

- Elevation, Geology, Land use

Maintaining metadata is a vital part of data stewardship

Station and Catchment Description

Ultrasonic station commissioned in 1974; multi-path operation from 1986 and back-up ultrasonic installed in 1991. Full range. Lockages not allowed for and high water temperatures can effect gauge performance at low flows. No peak flows pre-1974 when dmfs derived from Teddington weir (a 70m wide complex of gates, sluices, weirs and locks); tailwater rating used with twice-daily levels (at low tide) to compute flows >85 cumecs. Significant structural improvements since 1883 but high hydrometric accuracy not achievable for pre-1951 record (leakage and lockages result in underestimation of early low flows; mill operation also evident on early hydrographs. Gauged flow fell to zero in August 1976. 1894 peak gdf re-assessed in 2002 (800 cumecs). Increased channel capacity means that bankfull now very rarely exceeded. Baseflow sustained mainly from the Chalk and the Oolites; flash
from tributaries draining the clay vales. So
outside the catchment but overall

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Information Dissemination

Main dissemination routes:

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  Yearbooks (1935-1995)
  Hydrometric Register (Latest 2008)
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- **UK contributions to international data centres:**
  - WMO Global Runoff Data Centre
  - UNESCO IHP-FRIEND European Water Archive

Archives at a national level make international collaboration easier

friend

GRDC

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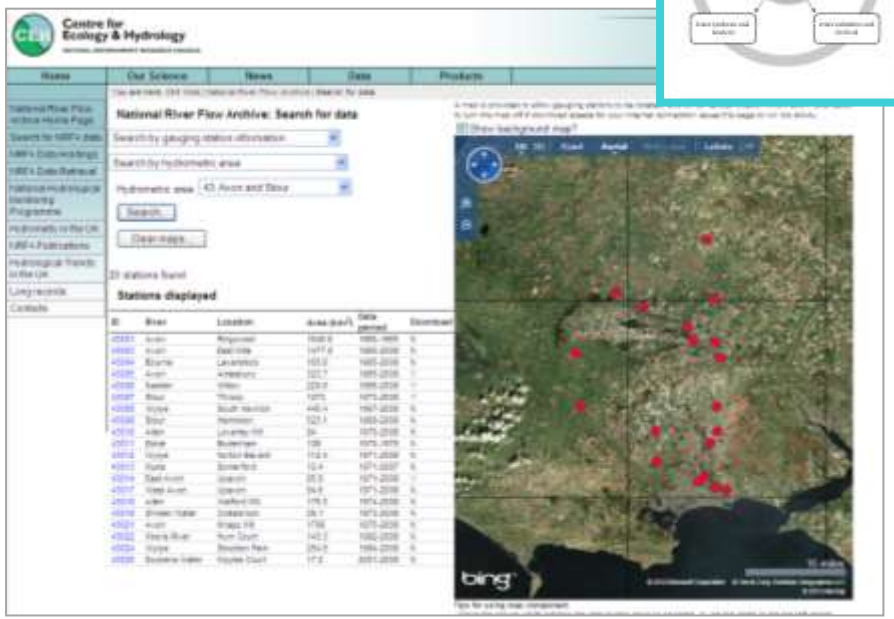
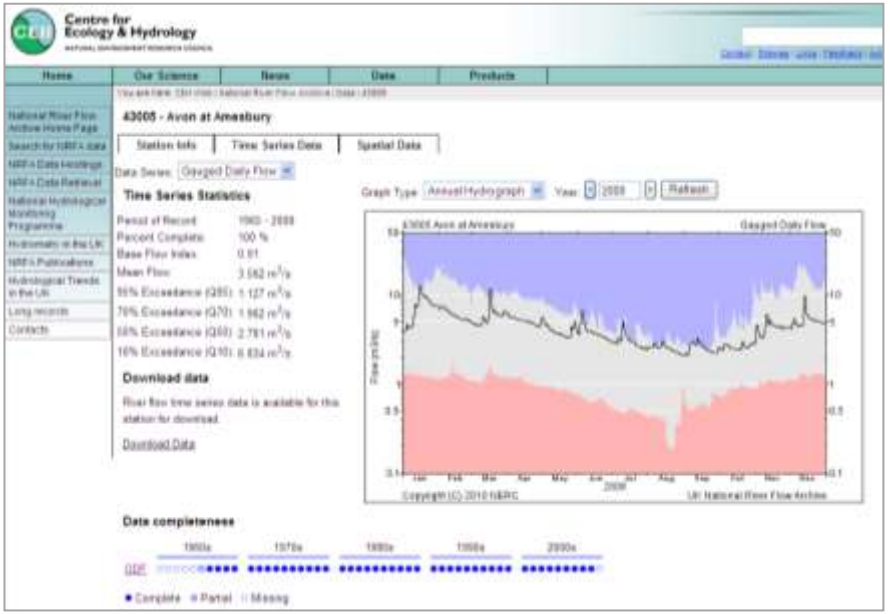
Information Dissemination

Recent:

Website developments:

- **Discovery:** map and metadata based searching
- **Viewing:** Dynamic time series graphing and metadata comparison
- **Download:** Currently ~ 200 stations





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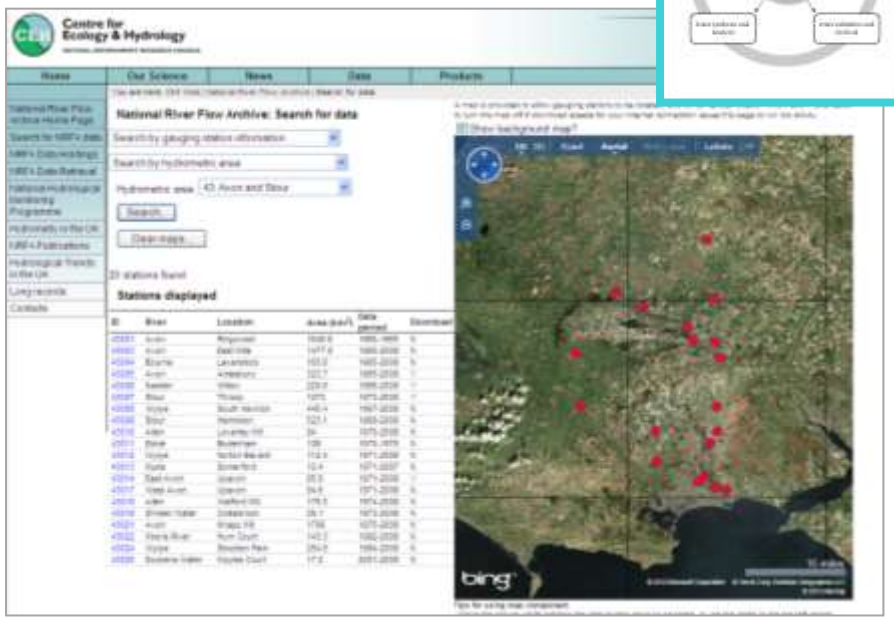

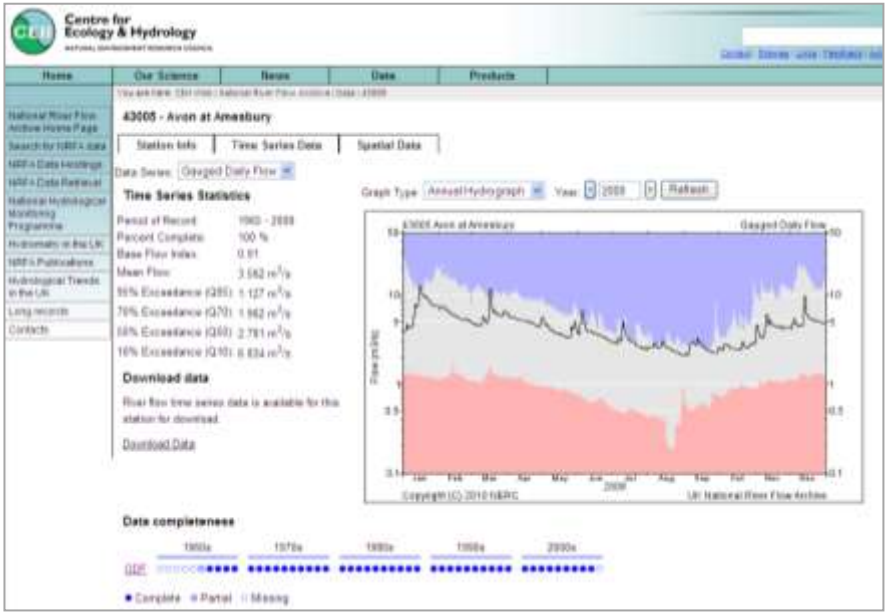

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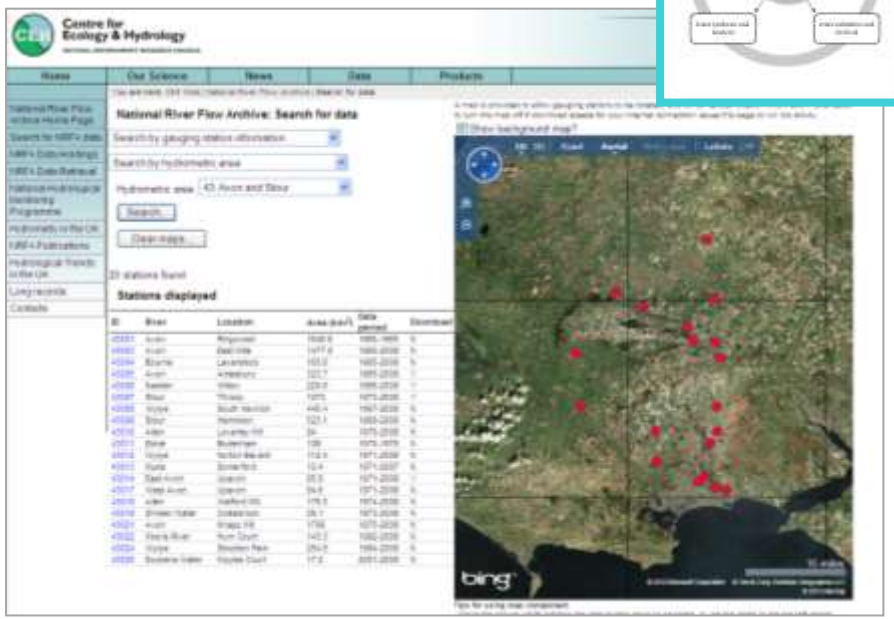
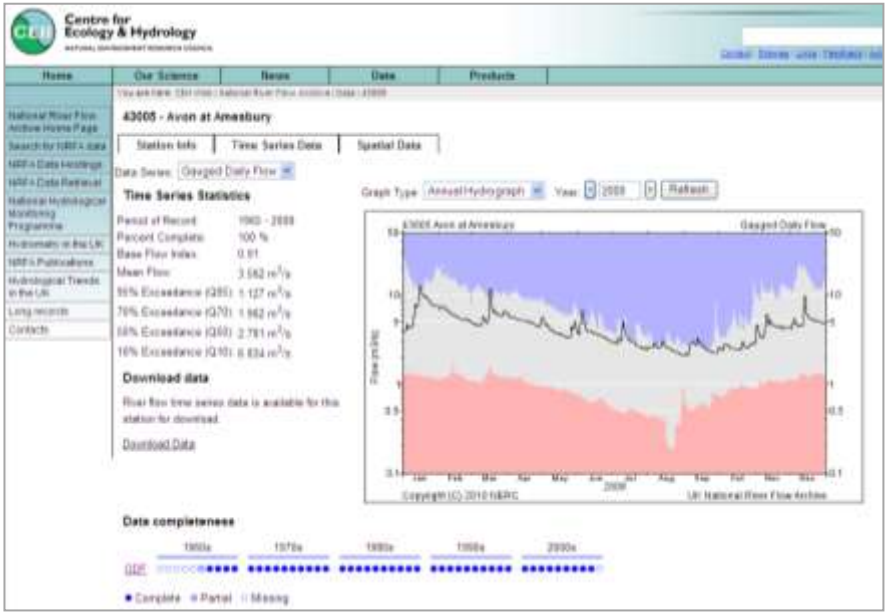
Future:

- **Catchment 'explorer' tools**
- **'Trends' website**
- **Other technological opportunities**





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Information Use

User community:

Current:

- Direct Users
- Indirect users through:
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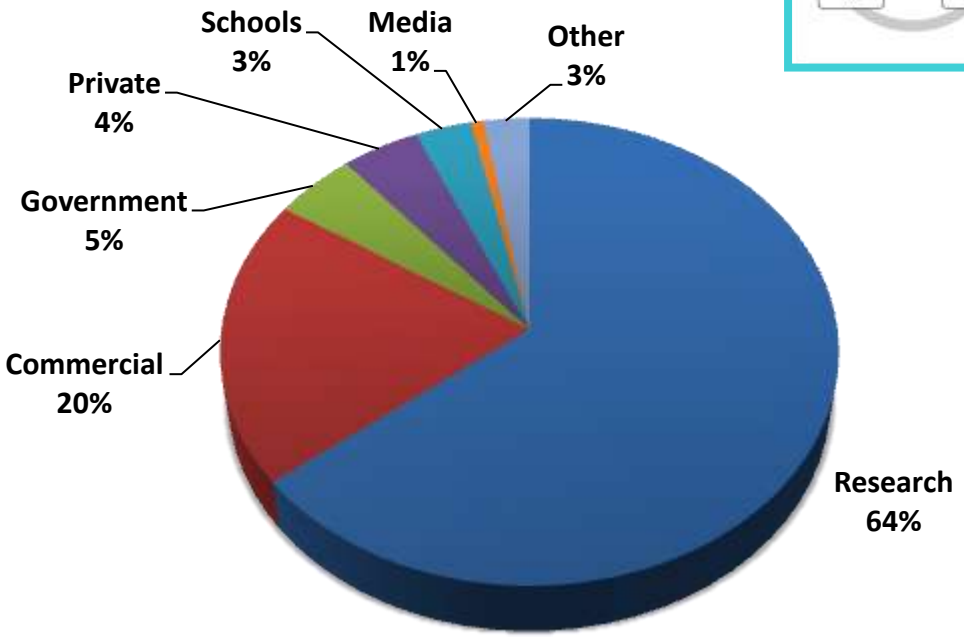
  - Media
  - Other data centres
- Measuring Authorities



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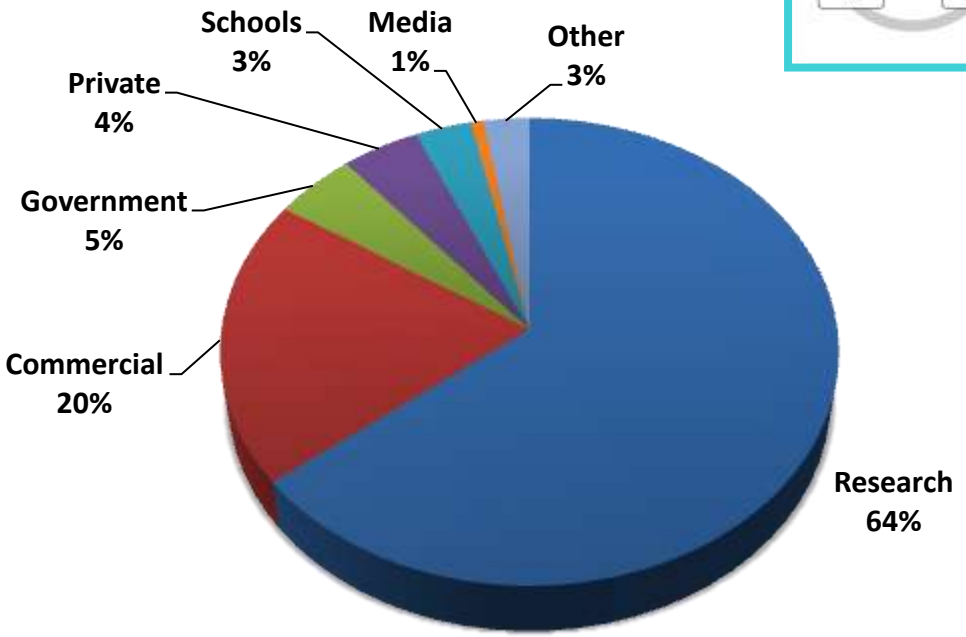

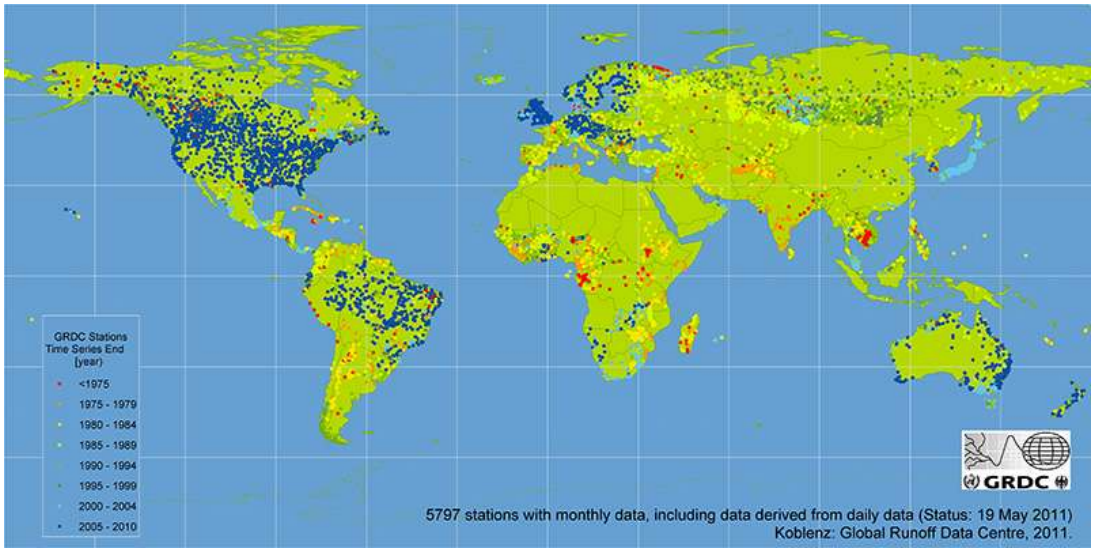

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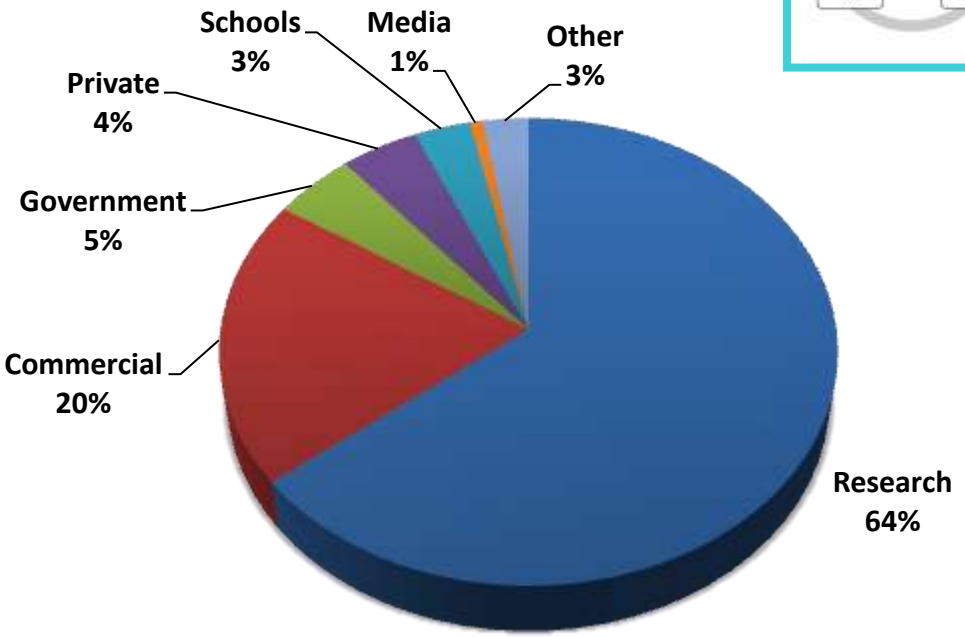
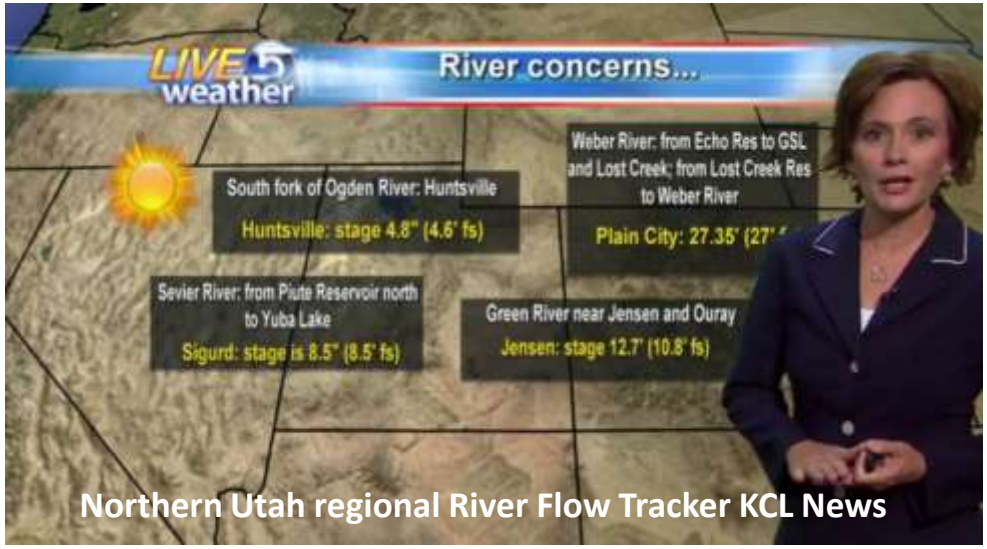
- Increased international users
- Increased public awareness
- New user communities

We don't know who tomorrow's users will be!





Northern Utah regional River Flow Tracker KCL News

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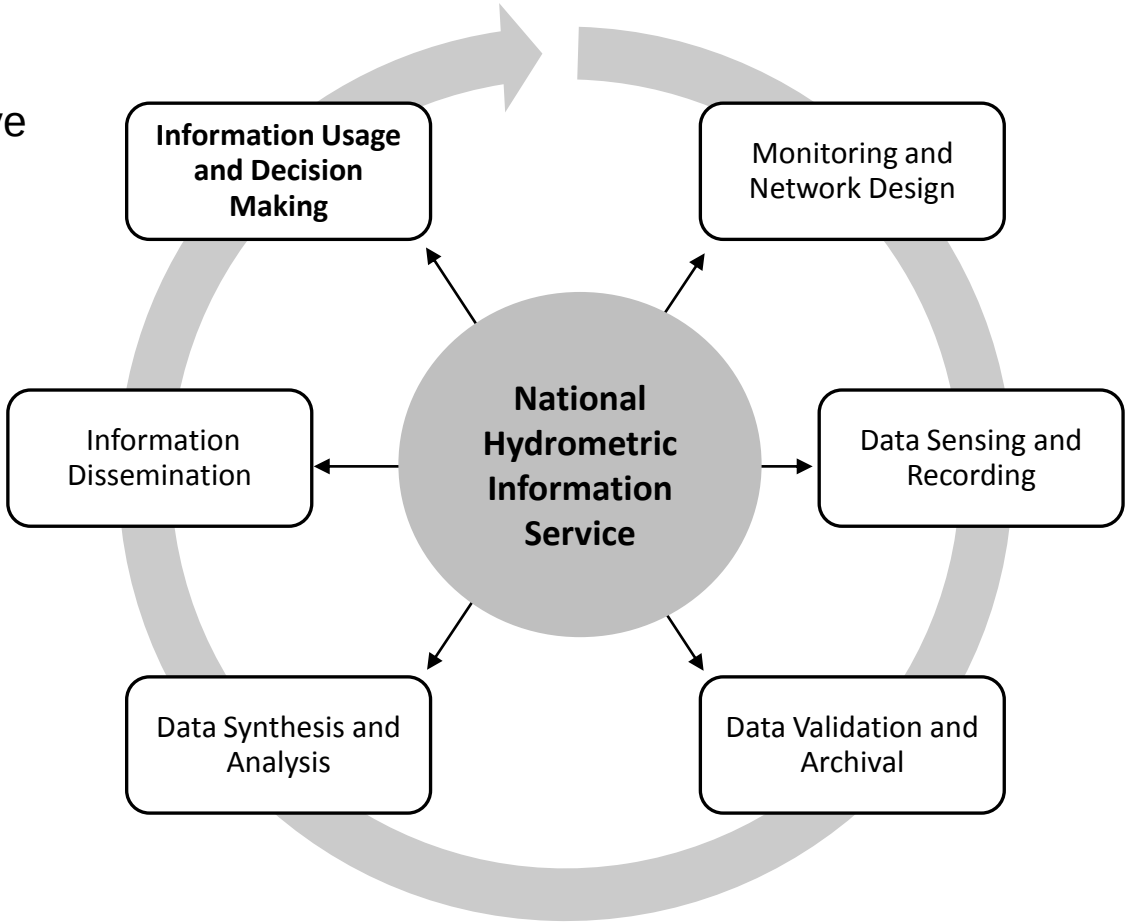
Conclusions

Improving national hydrometric data for the user:

1. Delivering an efficient and effective hydrometry service should be seen as a cycle of connected stages



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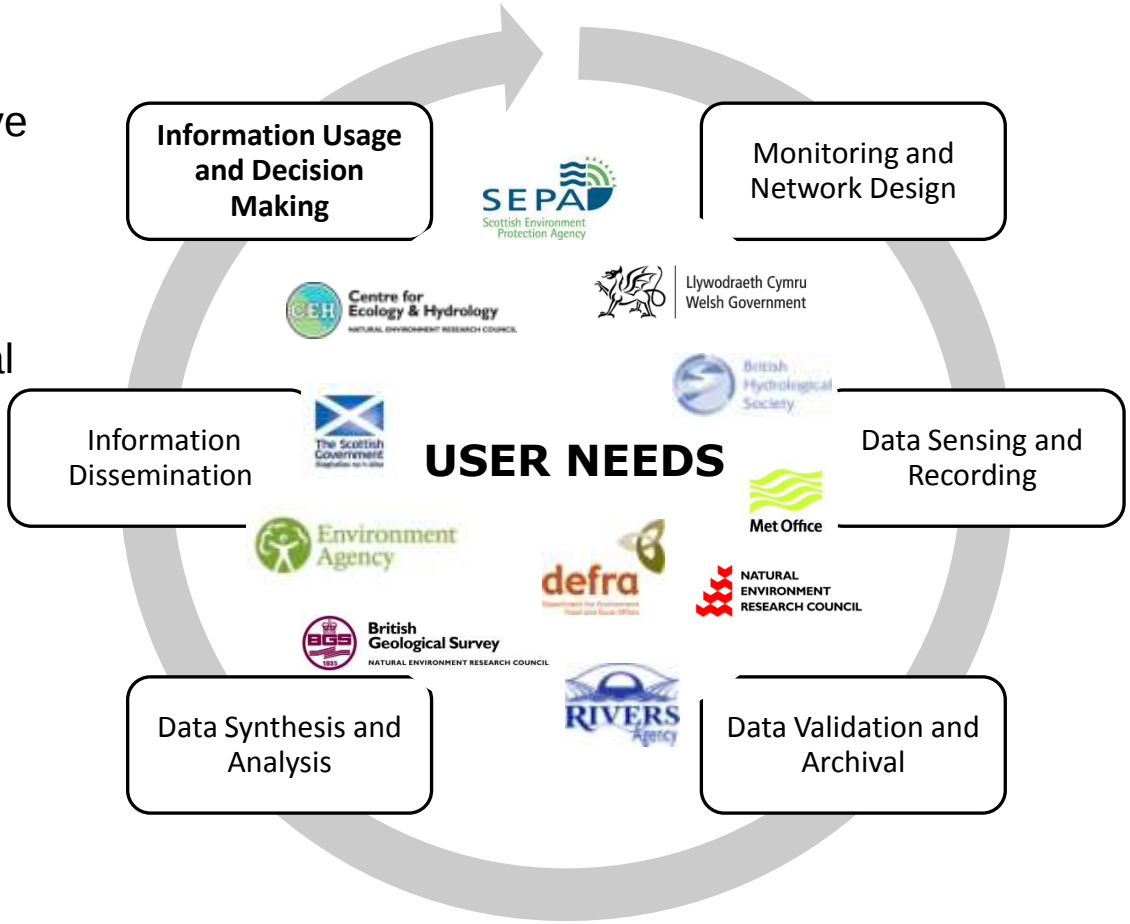

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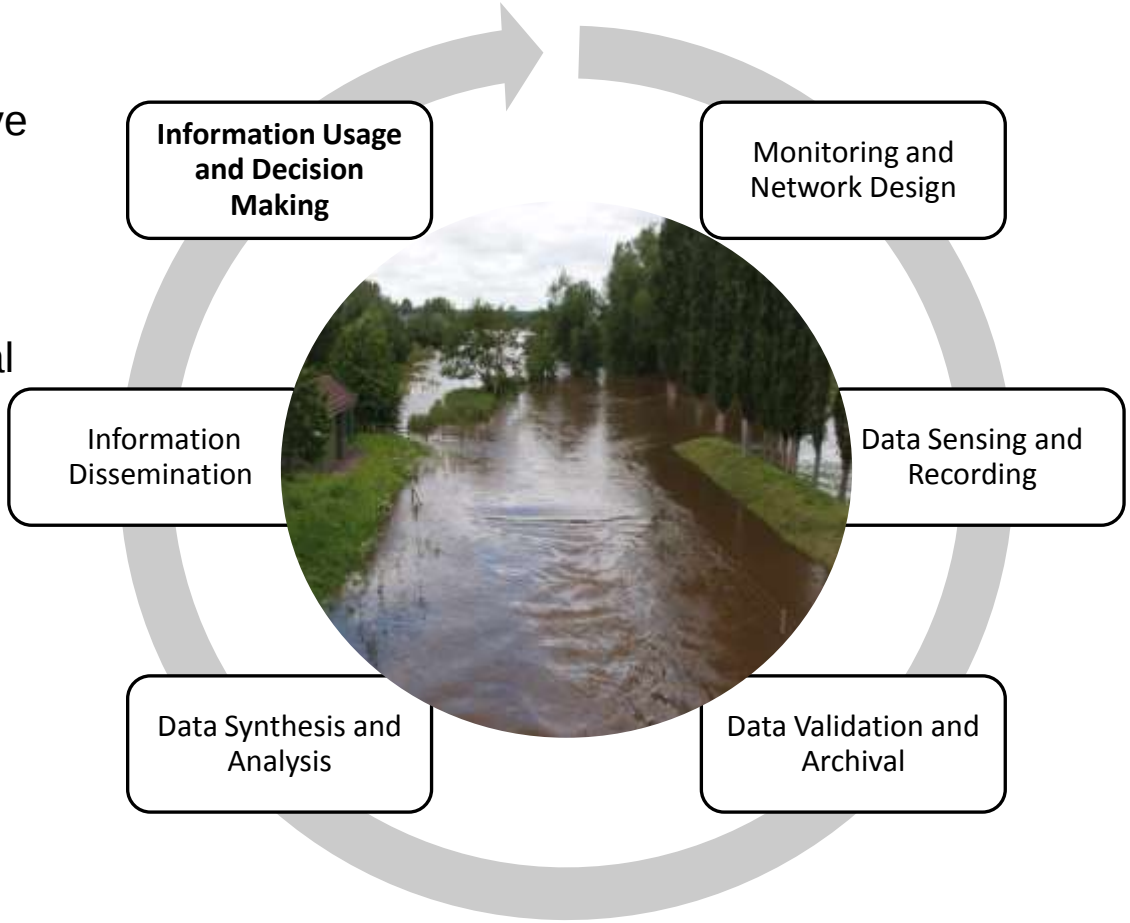

28052: River Sow at Great Bridgeford – June 2007
Photo: Richard Severn (EA Midlands)

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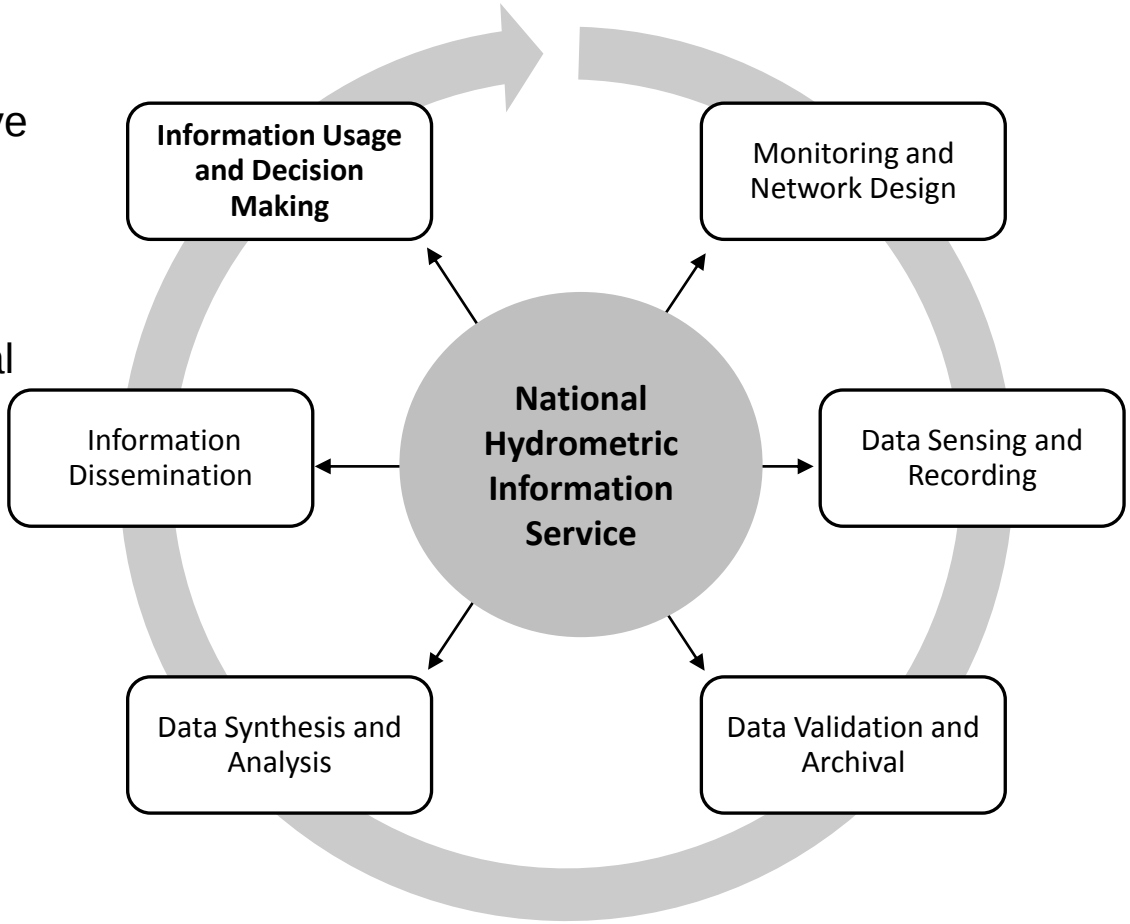

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3. Communicating caveats in data should be improved at all stages
4. Need to keep up with changes in technology
5. Feedback is vital - It's not actually a neat cycle!

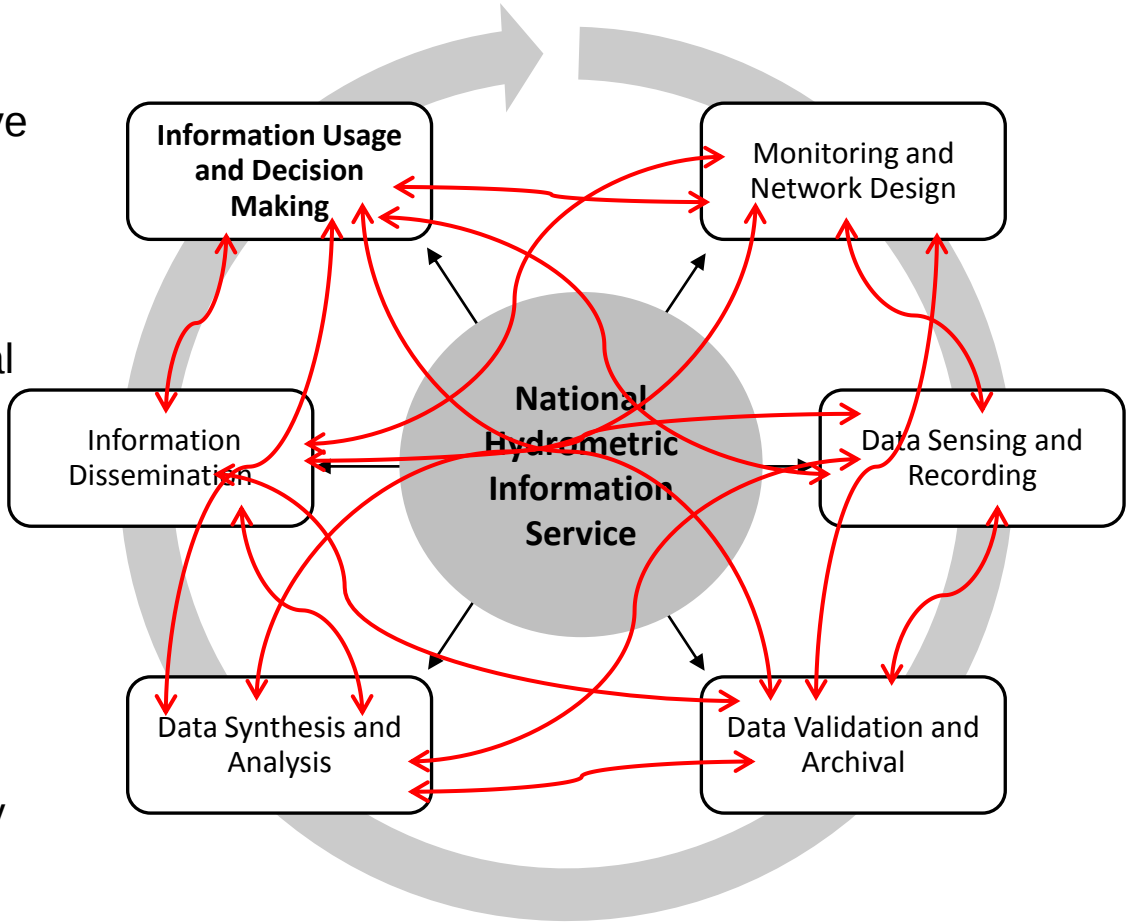

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Photo - Shuttersock

WHY: DOES THE UK STILL NEED A NATIONAL RIVER FLOW ARCHIVE?

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WHY: DOES THE UK STILL NEED A NATIONAL RIVER FLOW ARCHIVE?

BECAUSE: ACCESS TO COHERENT NATIONAL HYDROMETRIC DATA IS VITAL FOR EFFECTIVE WATER RESEARCH AND MANAGEMENT

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Thank you

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nrfa@ceh.ac.uk
01491 692599

Details of references can be found at:
http://www.ceh.ac.uk/data/nrfa/publications

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