NRFA/NGLA 30th Anniversary Meeting

22nd October 2013, CEH, Wallingford

HYDROMETRIC DATA: THE LONG VIEW

User Perspective #2

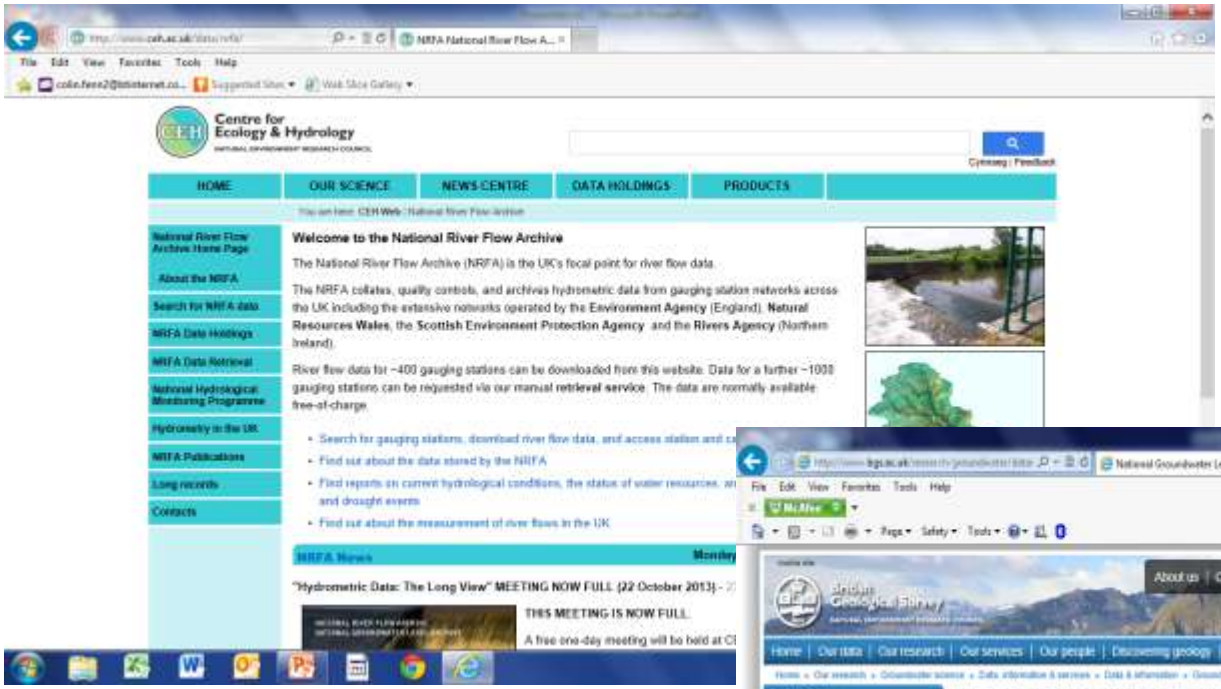
How NRFA/NGLA data support the needs of the UK water sector

Dr Colin Fenn
MD, Hydro-Logic Services LLP

Chair, CIWEM Water Resources Panel; SAGA Committee Member

How NRFA/NGLA data support the needs of the UK water sector:

AN INDISPENSIBLE RESOURCE ….



How NRFA/NGLA data support the needs of the UK water sector:

SUPPORTING REAL , PRESSING & GROWING NEEDS ACROSS THE UK WATER SECTOR ….

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

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

What does the NRFA do?

The NRFA underpins hydrological research and water-management activities in the UK, and delivers data and expertise to UK Government and international organisations. The NRFA:

- Acts as the main focal point for hydrometric data in the UK
- Provides access to river flow data from over 1,500 gauging stations across the UK
- Offers independent, authoritative commentary on current hydrological conditions
- Supports the hydrometric monitoring activities of our partner organisations

How do we do it?

We integrate national hydrometric data from partners in the UK measuring agencies and provide long-term stewardship for national hydrometric data assets.

We operate the National Hydrological Monitoring Programme, to enable us to assess current water resources status and to examine evidence for change in long-term hydrological datasets.

We also:

- Validate river flow data to enhance quality and completeness
- Guide the evolution of the UK hydrometric network
- Develop and improve operational practices for hydrometric data management
- Design software for processing, visualisation and analysis of hydrological data
- Help UK Government meet water resources reporting obligations
- Deliver UK data to international data-sharing initiatives

Centre for Ecology & Hydrology

What can we offer?

NRFA delivers hydrometric data and analysis to a wide range of users, including UK government departments, academia, consultancies and the water industry. NRFA services include:

- Daily mean flow data for rivers across the UK
- Catchment rainfall and spatial information to support river flow interpretation
- A Hydrometric Register and web-based portal cataloguing gauging stations on the NRFA
- Monthly Hydrological Summaries for the UK and Annual Hydrological Reviews
- Reports on major floods and droughts
- Information on long-term hydrological trends in the UK
- Advice on hydrometric data management practices
- Hydrological expertise and advice for the general public and media

How to access the NRFA

- The NRFA website http://www.ceh.ac.uk/data/nrfa/ provides access to data, reports and other services
- A data-retrieval and enquiries service offers access to data and hydrological advice by 'phone (+44 (0)1491 692599) or email (nrfa@ceh.ac.uk)

Who are our partners?

The NRFA is steered by a network of hydrometric stakeholder organisations, comprising:

- Natural Environment Research Council (including the Centre for Ecology & Hydrology and British Geological Survey)
- Defra and the devolved administrations
- UK hydrometric and meteorological measuring agencies: EA, SEPA, Rivers Agency, Met Office
- British Hydrological Society/CIWEM
- UK Water Industry

www.ceh.ac.uk/data/nrfa +44 (0)1491 692599 nrfa@ceh.ac.uk

How NRFA/NGLA data support the needs of the UK water sector:

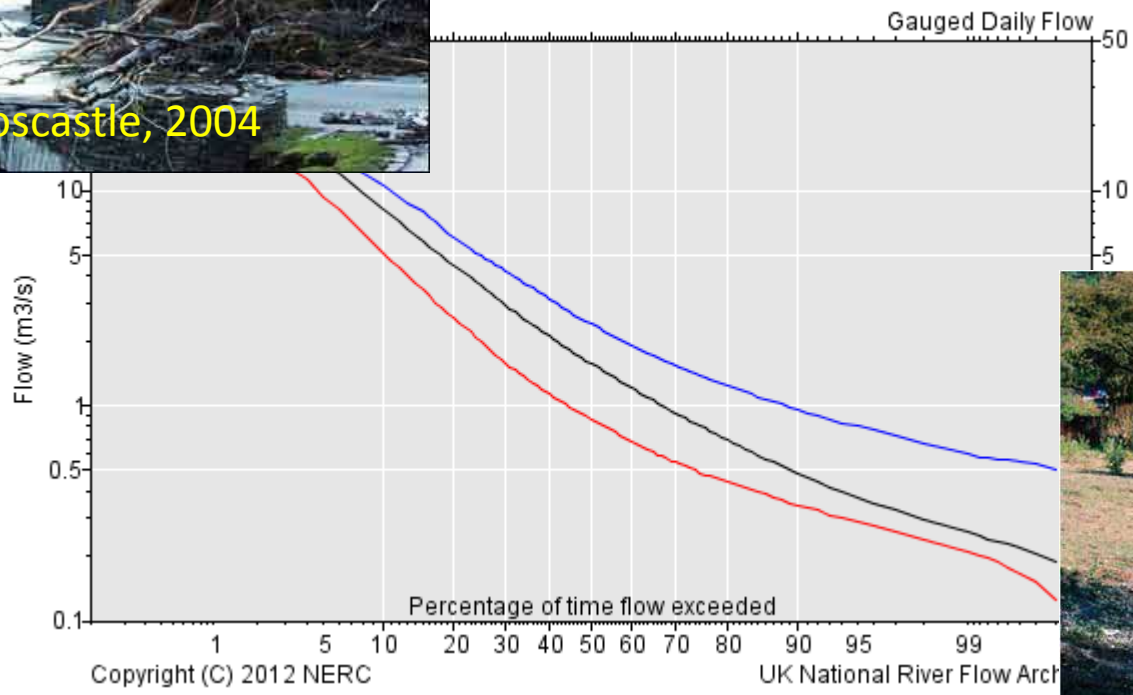
THE WATER SECTOR INCLUDES …

The Water Sector:	WRM	FRM	WQ	WWM	UD	DWq
Water & sewerage companies	y	y	y	y	y	y
Water only companies	y		y			y
EA	y	y	y	y	y	y
Ofwat	y	y	y	y		y
DWI						y
Contractors	y	y	y	y	y	y
Product manufacturers						
Consultants	y	y	y	y	y	y
Researchers	y	y	y	y	y	y
Defra	y	y	y	y	y	
DECC	y	y				
dCLG	y	y		y	y	
Local government		y		y	y	
NGOs	y	y	y	y	y	
Environmental groups	y	y	y	y	y	
Households	y	y				y
Business	y	y	y	y		
Agriculture	y	y	y	y		
Power	y	y	y	y		

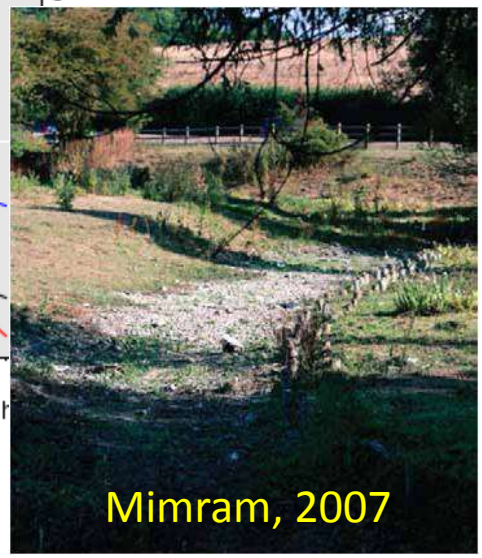
How NRFA/NGLA data support the needs of the UK water sector:

WHERE NRFA/NGLA DATA COME IN ….

Hi-Flows + FEH/WINFAP + ReFH
+ NRFA for context, catchment data



NRFA for gauged & naturalised flow data, NGLA for gw level data



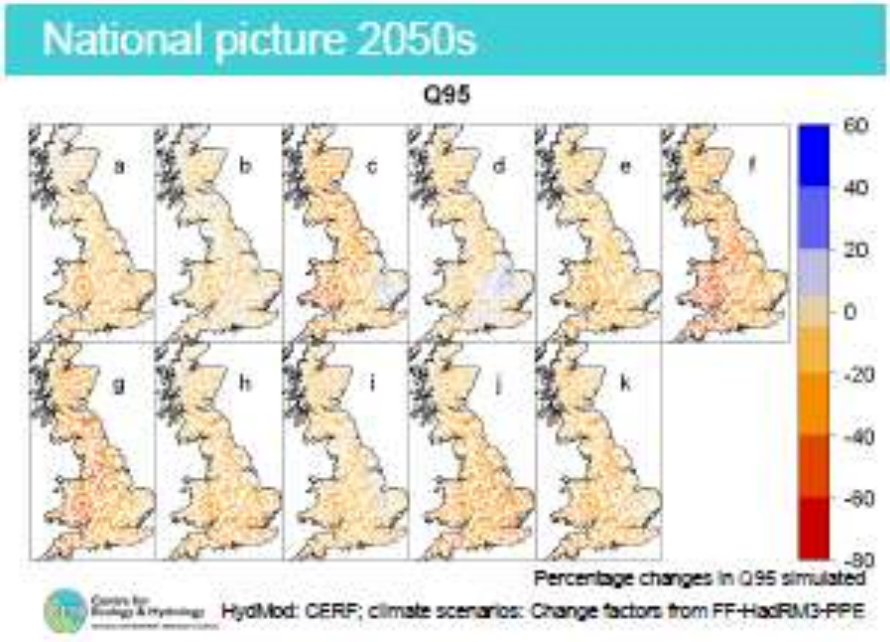
Providing essential data - accessible, downloadable on-line, free
Complementary data from other sources

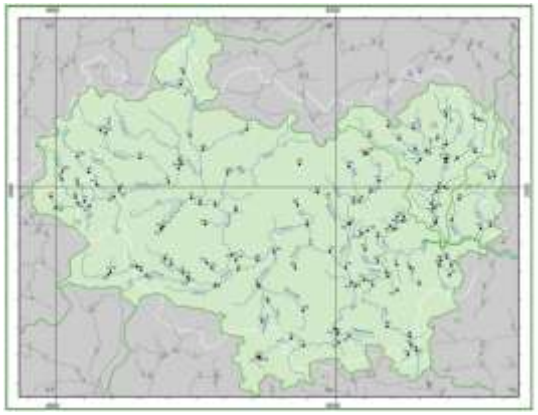
How NRFA/NGLA data support the needs of the UK water sector:

THE WATER SECTOR'S GOALS , NEEDS, ISSUES …

How NRFA/NGLA data support the needs of the UK water sector:

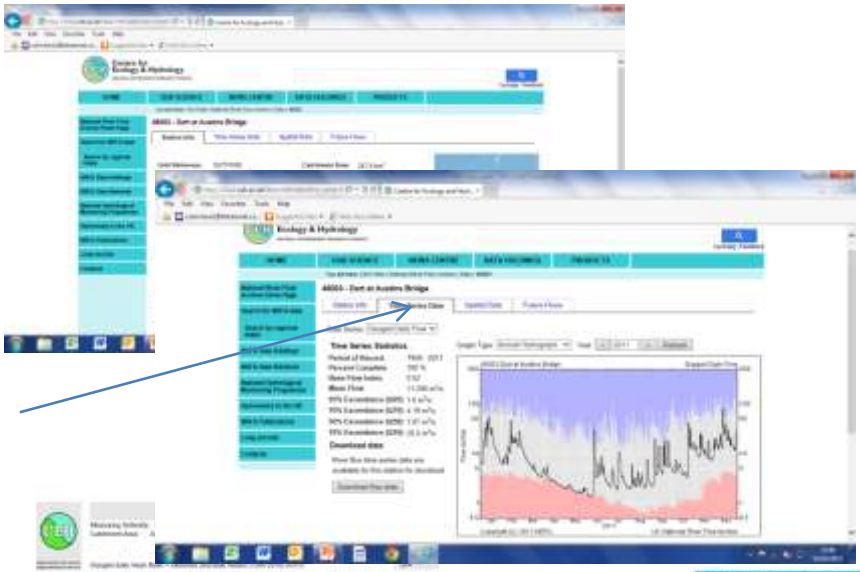
INFORMING & ENABLING: REGIONAL DATA...

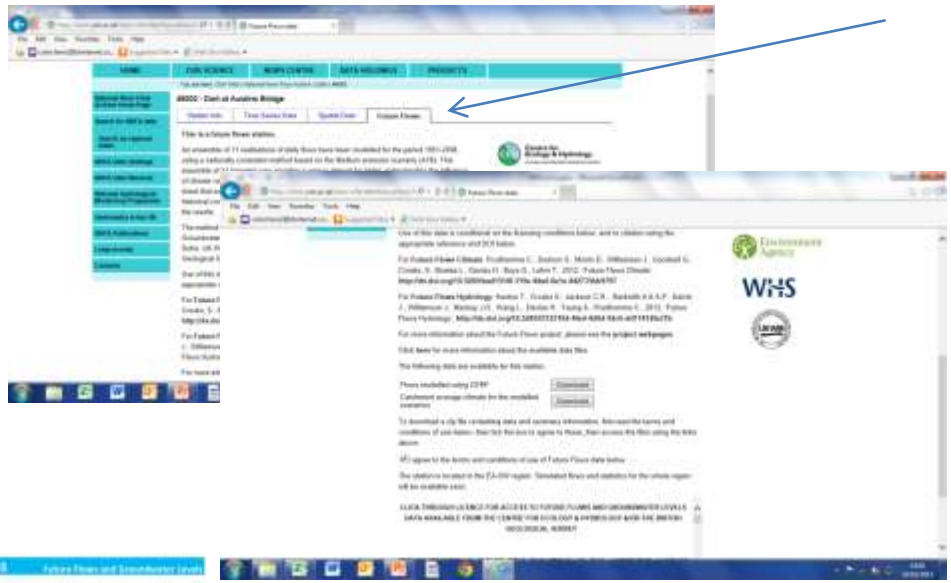


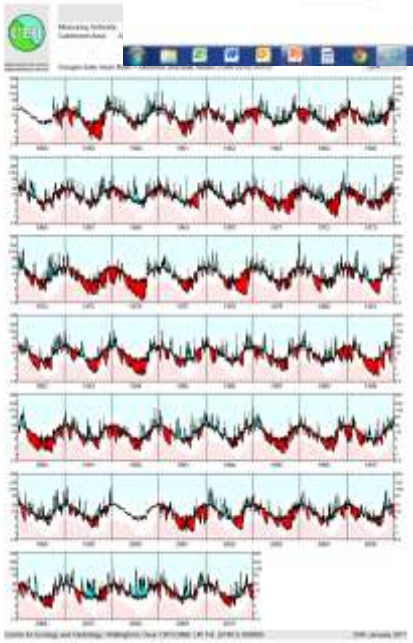


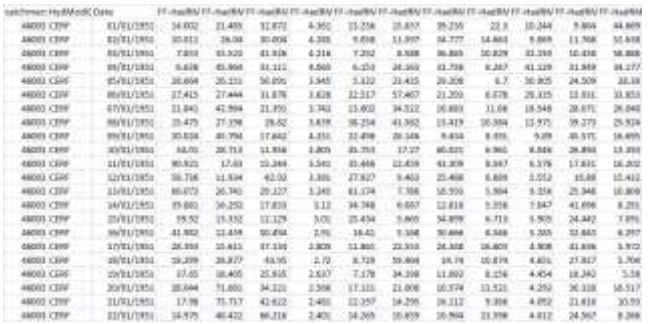
How NRFA/NGLA data support the needs of the UK water sector:

INFORMING & ENABLING: SITE SPECIFIC DATA....









EVIDENCE FROM THE PAST

change factors

PROJECTIONS FOR POSSIBLE FUTURES (FF&GWL, 11 models)

daily estimates, 1951 to 2098

How NRFA/NGLA data support the needs of the UK water sector:

GROUNDWATER, TOO….

How NRFA/NGLA data support the needs of the UK water sector:

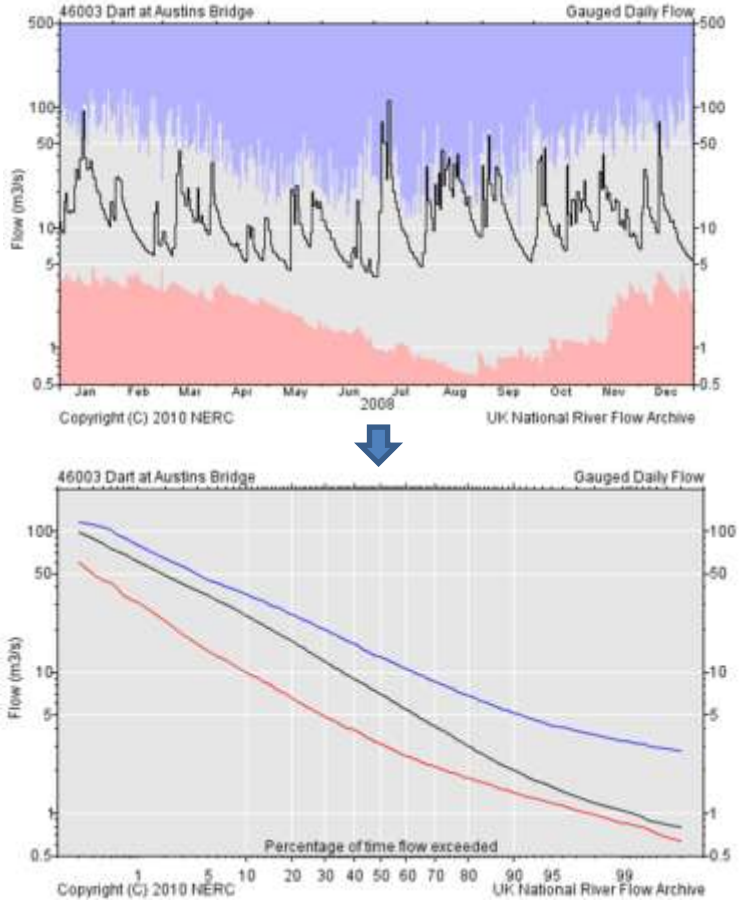
ILLUSTRATIVE APPLICATIONS OF THE USE OF NRFA/NGLA DATA IN THE UK WATER SECTOR

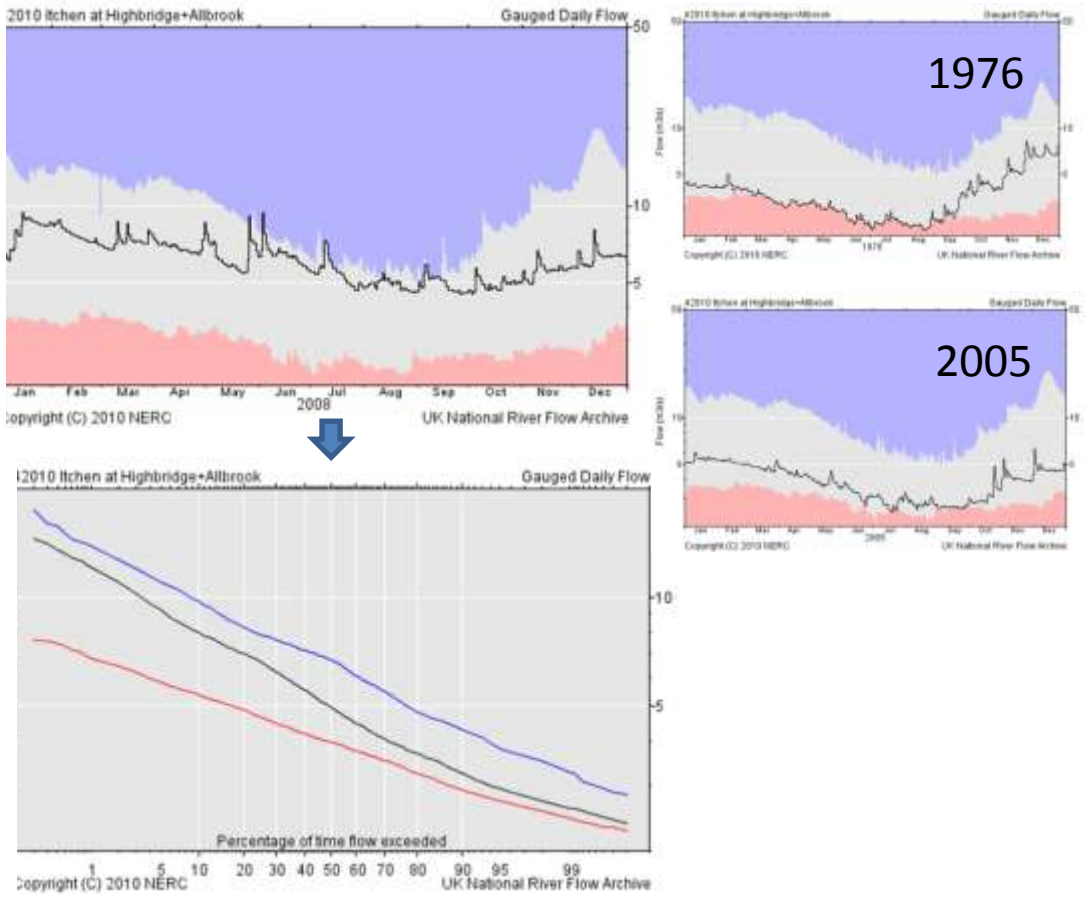
1. Variability
2. Yield (Deployable Output) determinations
3. Environmentally-sensitive abstraction management (AIM)
4. Drought management
5. Water Resources Policies for the future

How NRFA/NGLA data support the needs of the UK water sector:

VARIABILITY

1





Dart at Austins Bridge

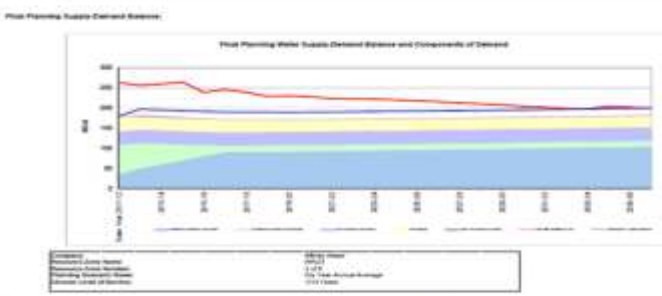
Itchen at Highbridge & Allbrook

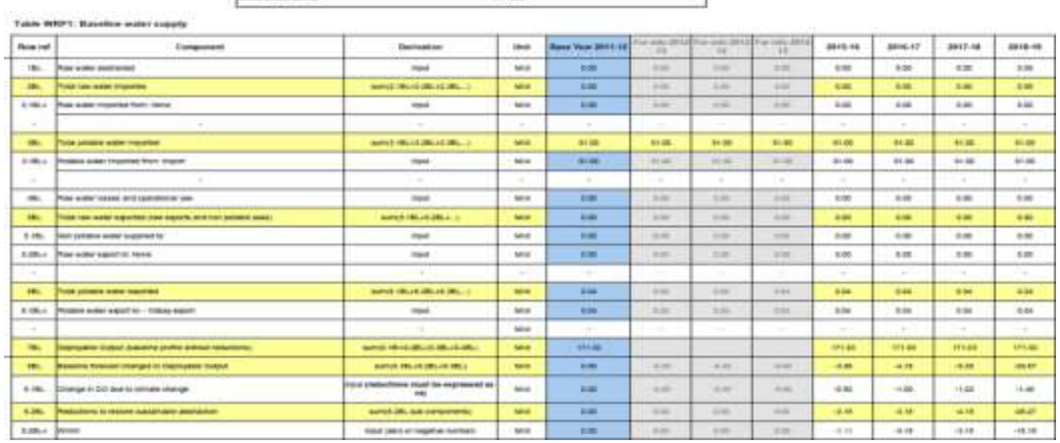
How NRFA/NGLA data support the needs of the UK water sector:

VARIABILITY

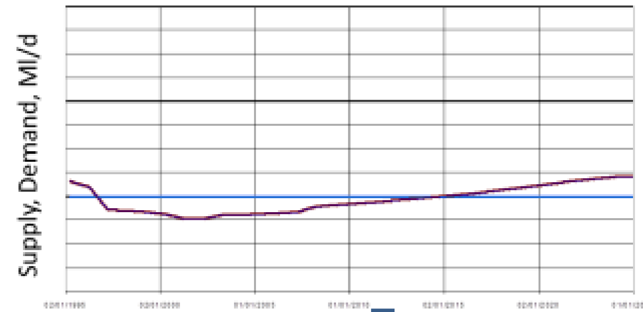
1

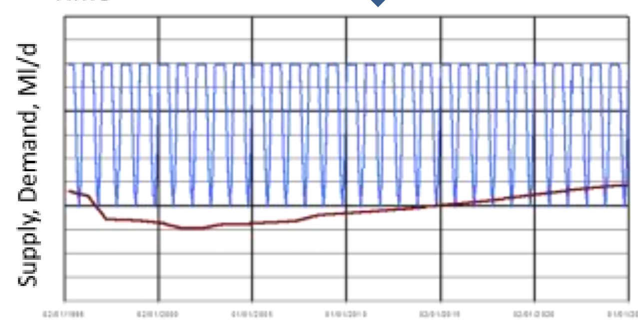
Water resources planning is based on a series of recurrent dry years – a synthetic scenario
Reporting tables show one (dry year annual average) value for each year
Which does not mean that there is no variability around that mean value ......
Data showing how values vary can be illuminating to decision- & policy-makers ....

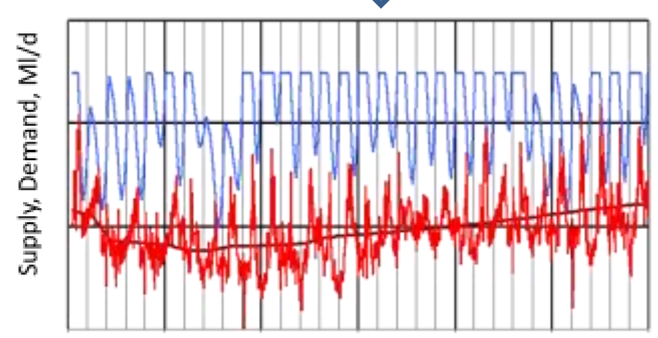




Dry Year Annual Average Values



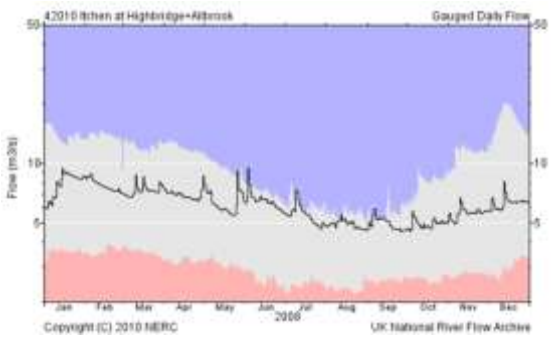


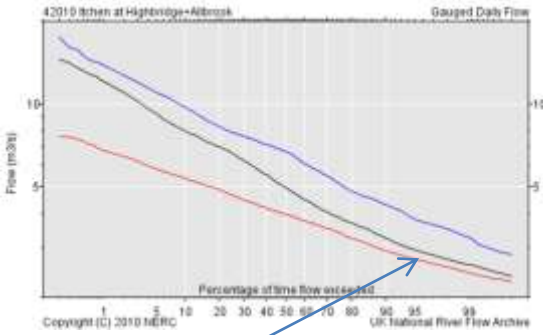


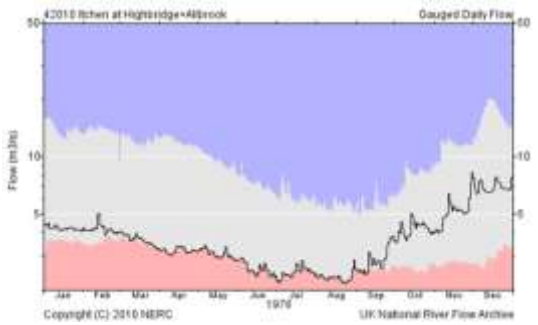
Daily Values

How NRFA/NGLA data support the needs of the UK water sector:

YIELD & DEPLOYABLE OUTPUT DETERMINATION 2







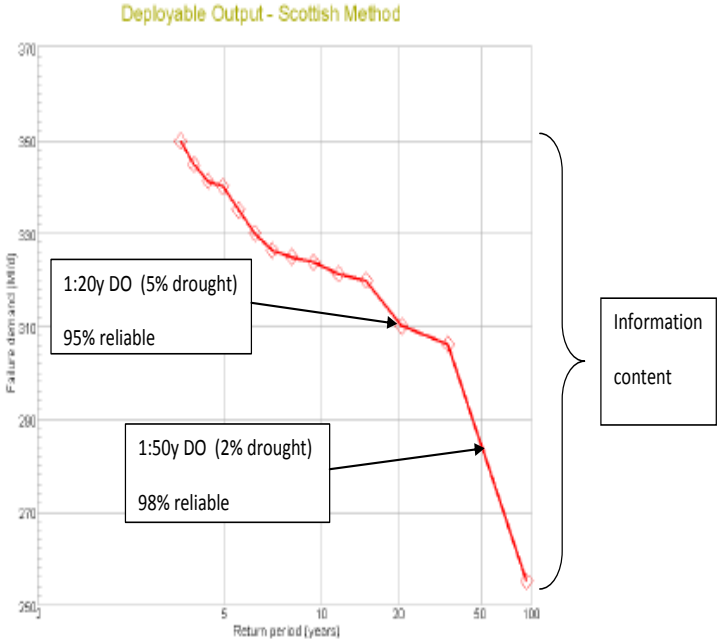
First estimate of hydrological yield (for the source)

DO varies with drought severity – should be reported for a range of Return Periods

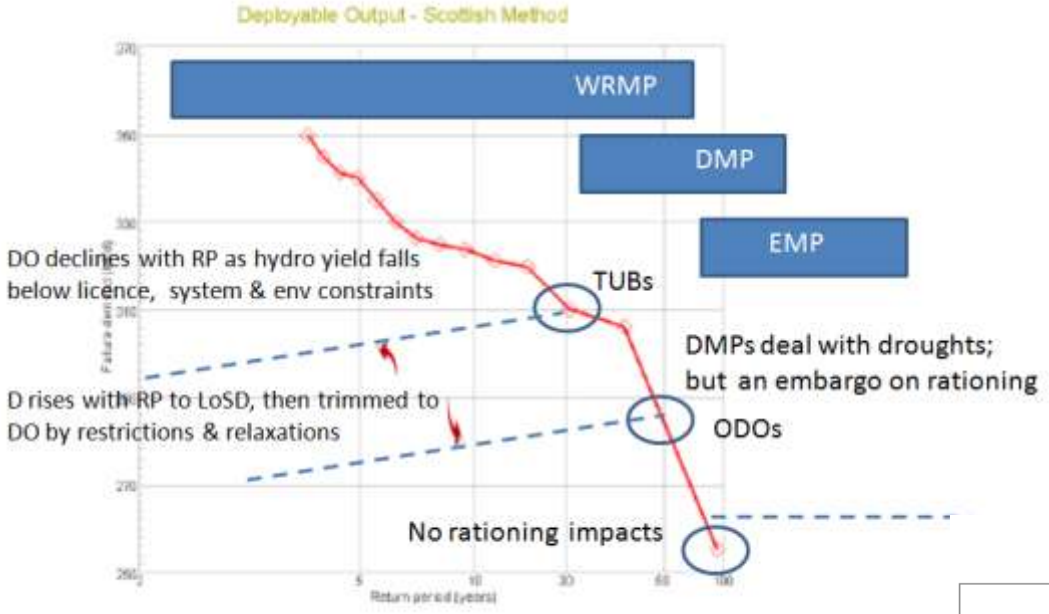
Integrated (conjunctive) DO of all sources in WRZ,
across a range of RPs, taking account of system, licence etc constraints, & use of demand restrictions & licence relaxations

Determined by WR system models (Aquator, Miser, WRAPsim)

Start:	1955		
End:	2006		
Duration (y):	52		
Return Period of failure	DO		Reliability %
y	Ml/d	p LT (%)	p GE (%)
5	339.3	20.0%	80.0%
10	332.9	10.0%	90.0%
20	310.5	5.0%	95.0%
30	307.0	3.3%	96.7%
40	296.2	2.5%	97.5%
50	284.4	2.0%	98.0%
60	275.3	1.7%	98.3%
70	267.9	1.4%	98.6%
80	261.7	1.3%	98.8%
90	256.5	1.1%	98.9%



DO DETERMINATION

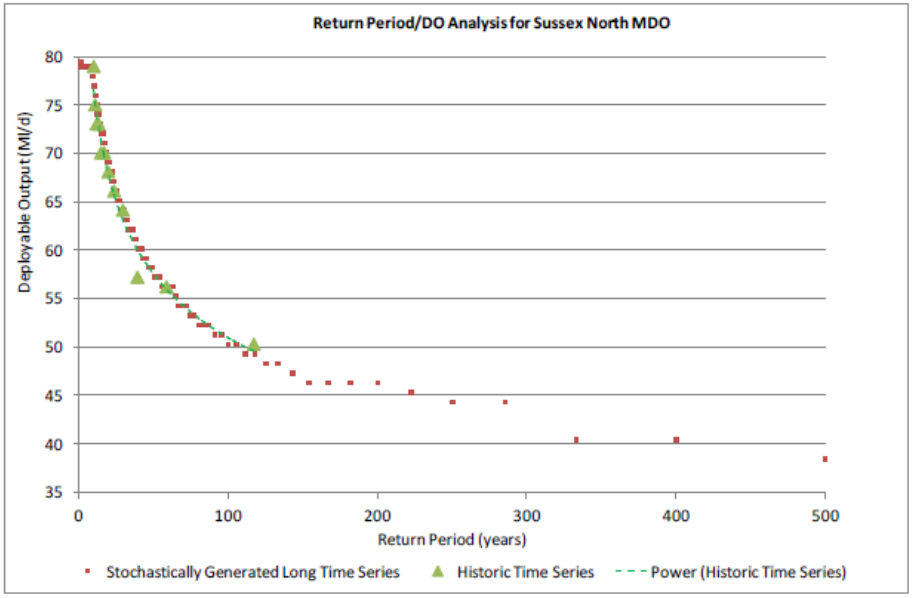


Long run historical data used to determine WR System DO for different RPs and LoS

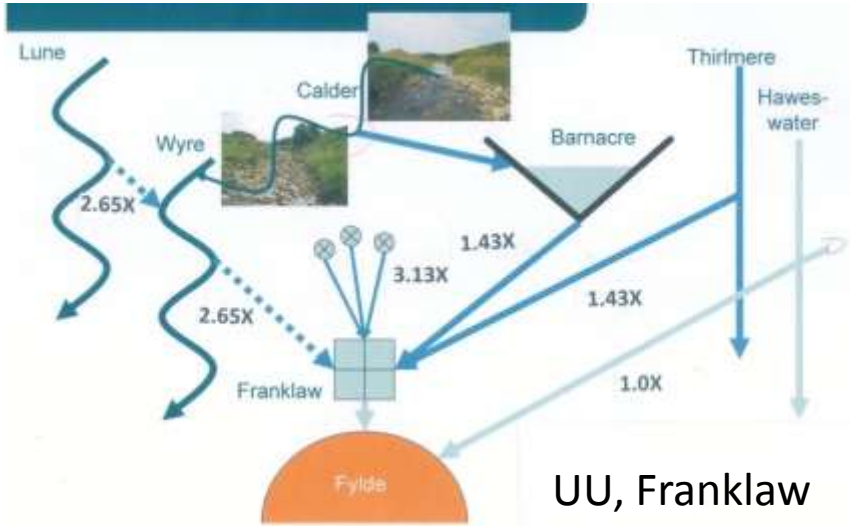
SOUTHERN WATER, dWRMP 2013

Stochastic analysis of long run historical data used to generate extended series to determine system DO under extreme droughts, for resilience assessment

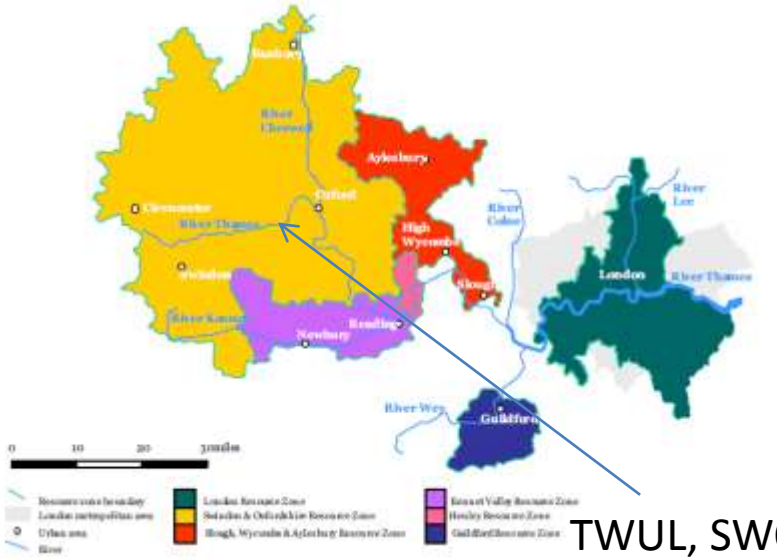
Figure 3.3 Example of historic versus stochastically generated droughts



ABSTRACTION POLICY ANALYSIS: TESTING THE AIM FOR OFWAT



UU, Franklaw



TWUL, SWOX

(a) United Utilities:

Franklaw sub-zone of Integrated Zone (Aquator)

- Wyre @ Garstang, 1927-2010 (84y)

(b) Thames Water:

SWOX RZ (WARMS-VBA)

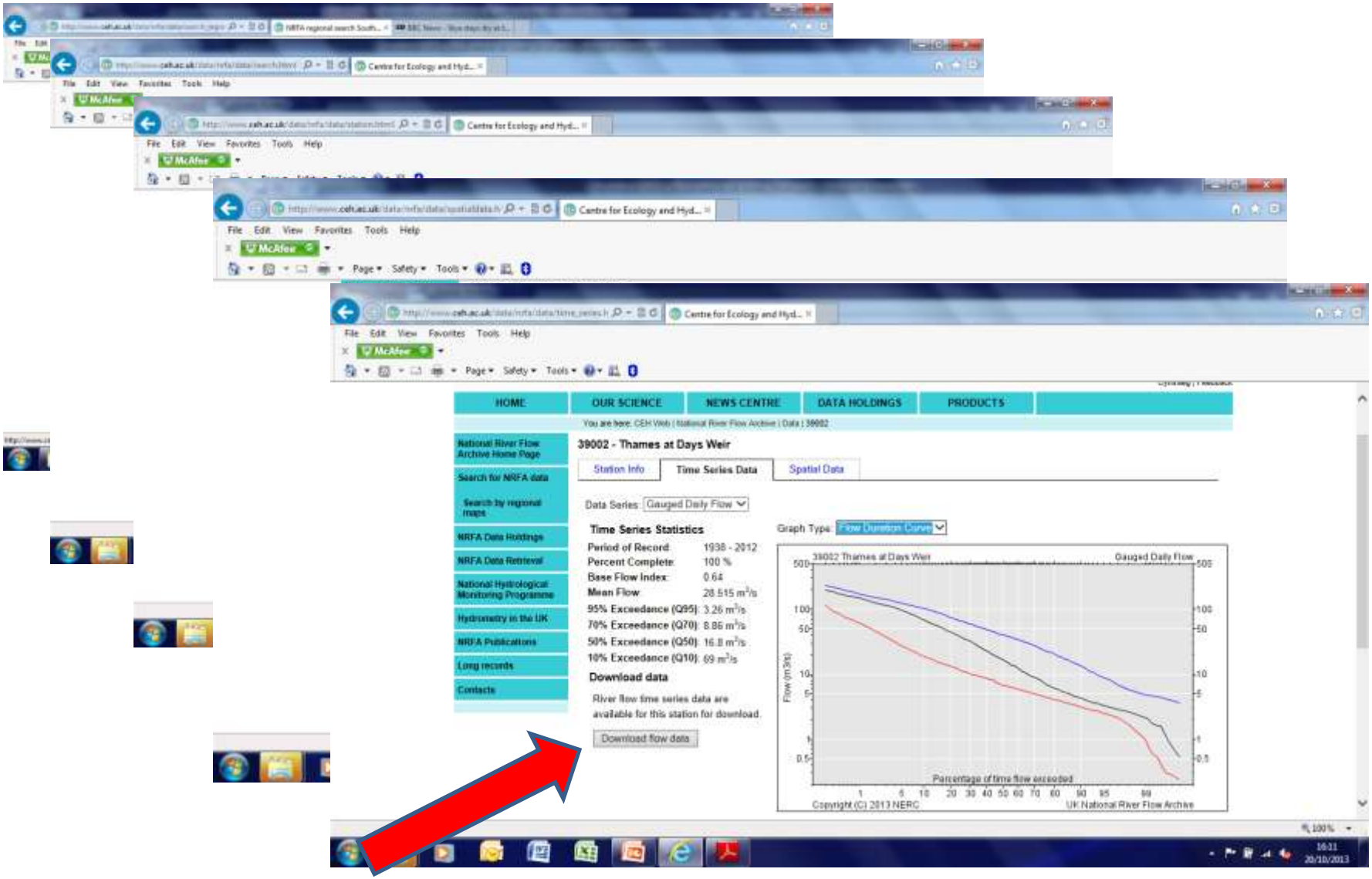
Aquator platform

- Thames @ Days Weir, 1938-2010 (73y)

How NRFA/NGLA data support the needs of the UK water sector:

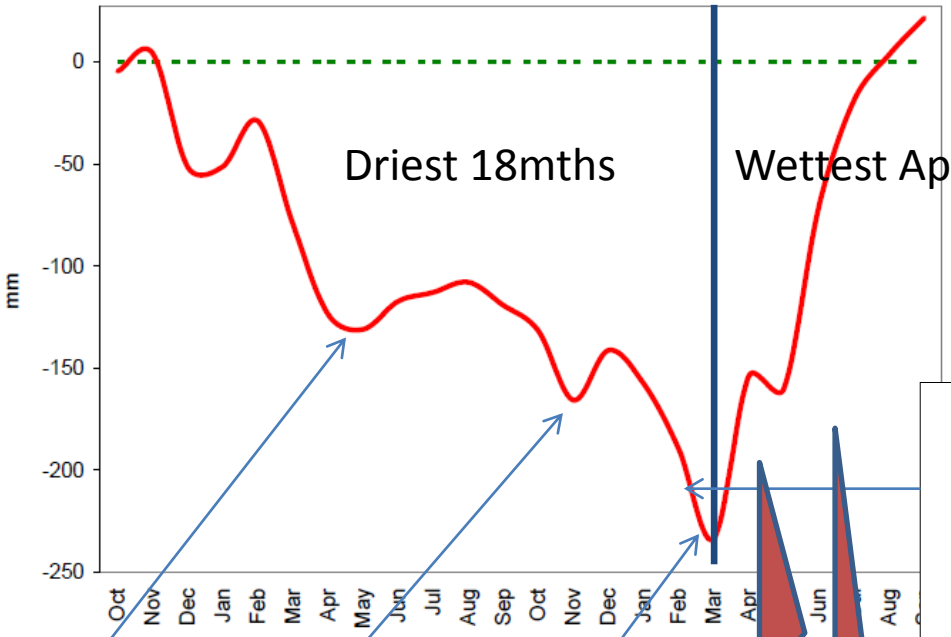
SOURCING DATA FOR ABSTRACTION POLICY MODELLING

3



DROUGHT MANAGEMENT

Figure 3.5 - Cumulative rainfall deficit plot from October 2010 to September 2012 relative to the 1961-1990 long term average for England and Wales[1]

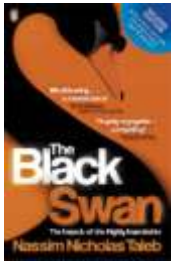


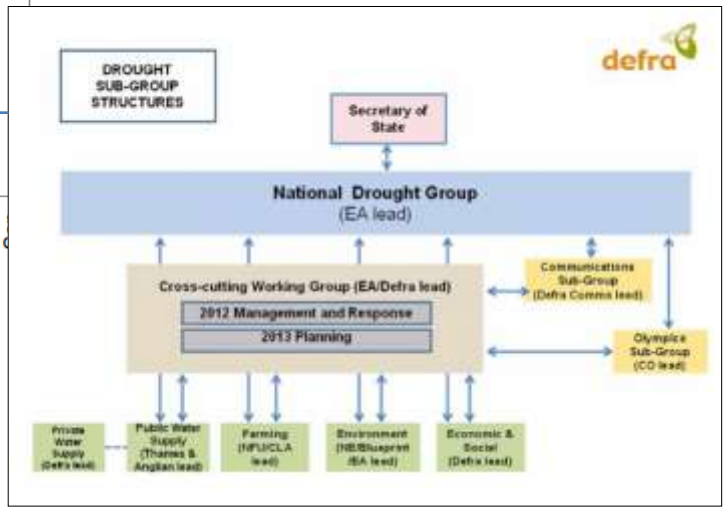
E&W: 8-12y
MIDS: 15-20y
ANG: 5-10y
TMS: 10-15y
WSX: 20-30y

E&W: 10-15y
MIDS: >100y
ANG: 35-50y
TMS: 15-25y
WSX: 10-15y

E&W: 30-45y
MIDS: >100y
ANG: 70-100y
TMS: 50-70y
WSX: 70-100y

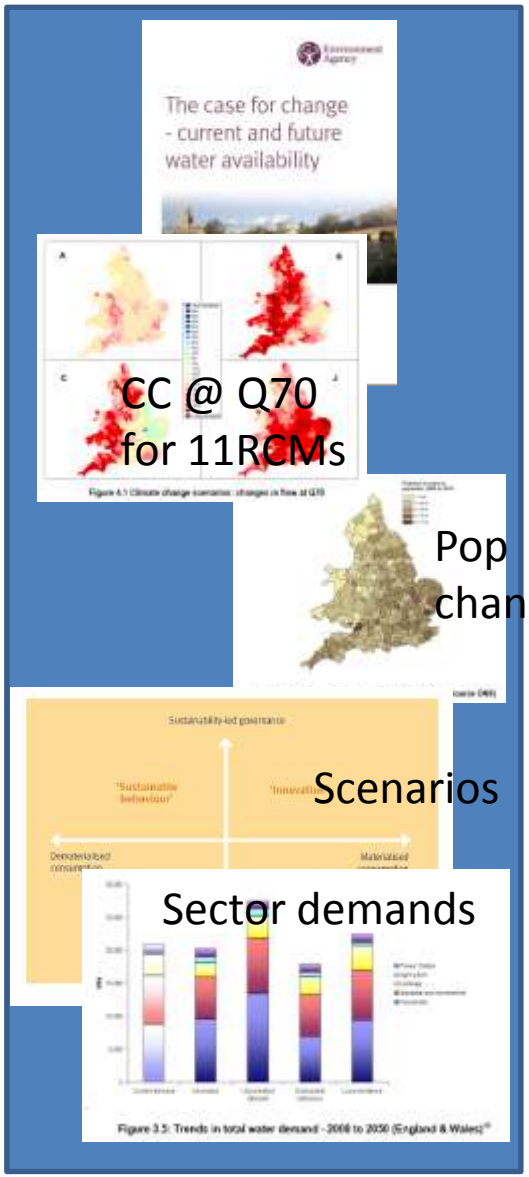
A positive Black Swan for WRM; a negative one for FRM





National Drought Group est. Feb 2012

WATER POLICIES FOR THE FUTURE: WATER RESOURCES ARE UNDER INCREASING PRESSURE



Met or Unmet Demand, 2050s, Q70

As sufficiency of water for environment & abstraction

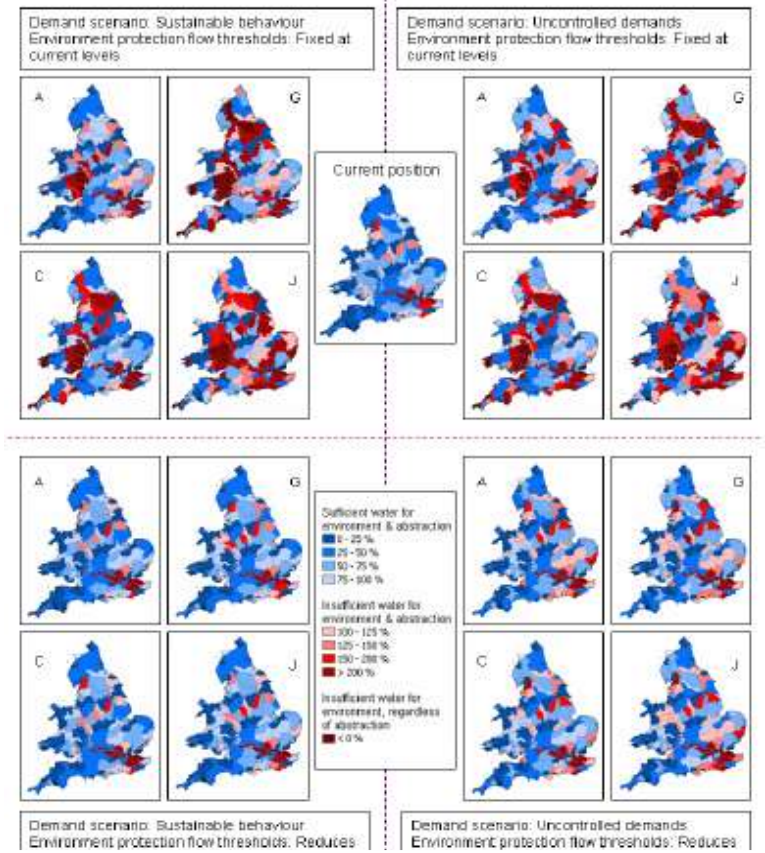
Large Diff

Fixed Q

Prop

Env Mgt

Little Diff



Sus Bhvr (110 lhd) UnC Dem (165 lhd)

Demand Management

Prospect is: chronic shortage not just acute shortage

How NRFA/NGLA data support the needs of the UK water sector:

WATER POLICIES FOR THE FUTURE: WATER RESOURCES ARE UNDER INCREASING PRESSURE

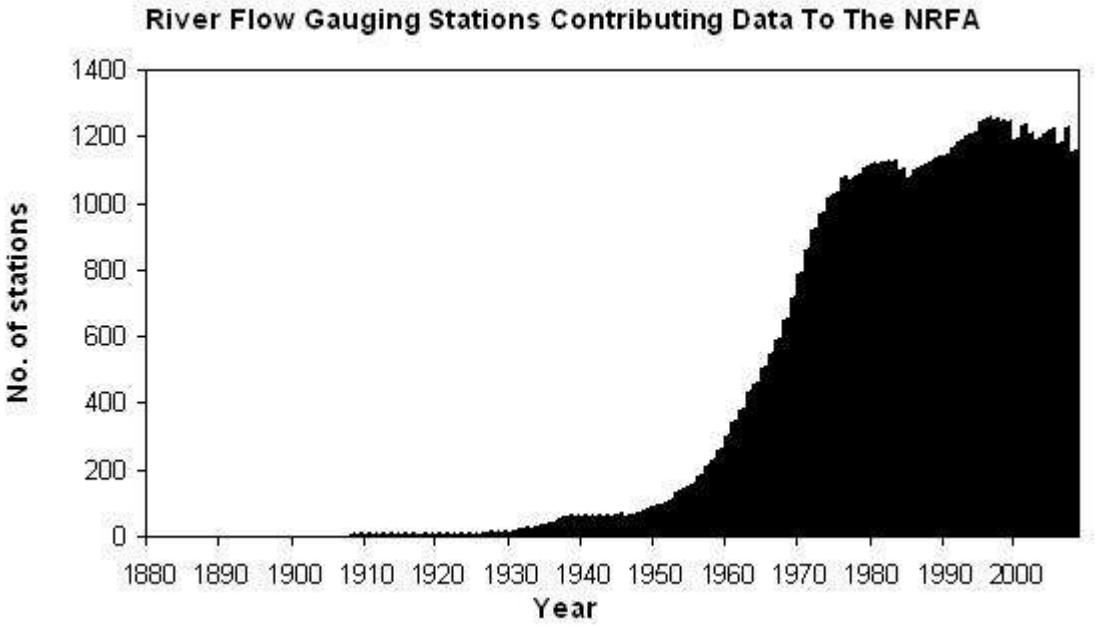
5

As water becomes more scarce, it becomes more valuable

even in the Hydro-Nation ....

and the need for reliable data becomes greater, in all sorts of ways ...

SUMMING UP ….. PERSONAL OPINIONS



- **THE WATER SECTOR RELIES ON GOOD DATA**
- **WE ARE GOING TO NEED MORE – NOT LESS – TO MANAGE THE CHALLENGES WE FACE**
- **MAKING DECISIONS ON INADEQUATE DATA IS UNWISE – ECONOMICALLY, ENVIRONMENTALLY, SOCIALLY & SCIENTIFICALLY**
- **VOLUNTEERING /CITIZEN SCIENCE DATA HAS A PLACE – BUT CAREFUL DESIGN & VALIDATION IS NECESSARY**

AND FINALLY ….

Continuity, longevity and quality all count

Some things improve with age

HYDROMETRIC DATA: THE LONG VIEW

Questions?

Dr Colin Fenn
MD, Hydro-Logic Services LLP

Chair, CIWEM Water Resources Panel; SAGA Committee Member