Presented at 12th National British Hydrological Society Symposium. Birmingham, September 2014

Hurstwood reservoir in spring 2010 © United Utilities

What do we talk about when we talk about drought?

Jamie Hannaford and the Historic Droughts team

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What do we talk about when we talk about floods?

METRO

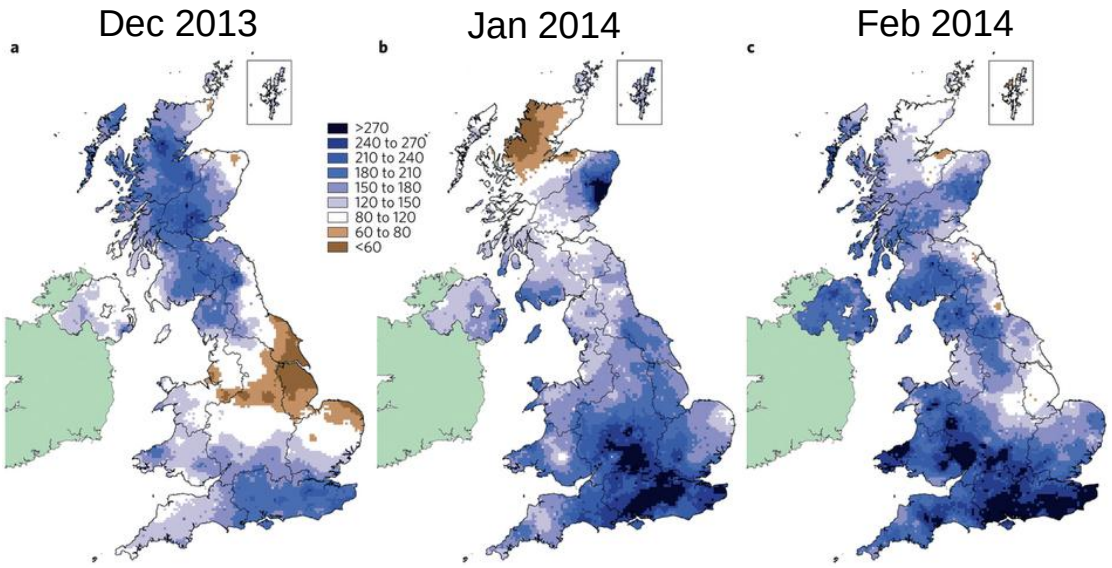
News Sport Guilty Pleasures Entertainment Life & Style

News UK World Weird Tech

A message from 10 Drowning St: Cameron says money 'no object' in flood relief effort

Tuesday 11 Feb 2014 11:06 pm

234 Share on Facebook Share on Twitter



Huntingford et al. 2014

See our poster on the winter floods!

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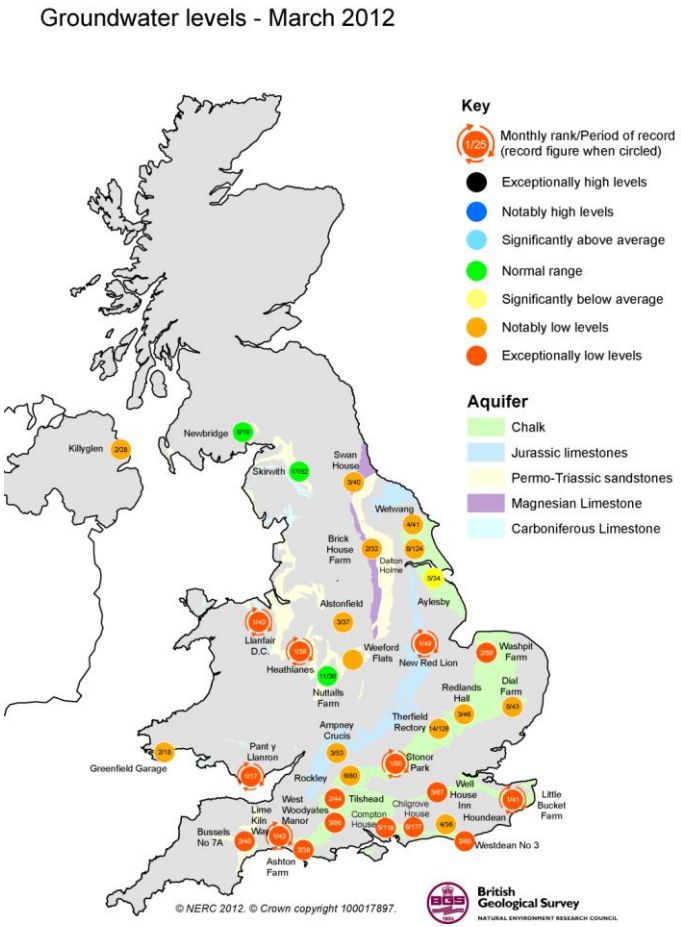
What do we talk about when we talk about drought?



Situation in March 2012 from the Monthly Hydrological Summary

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My own conception of drought

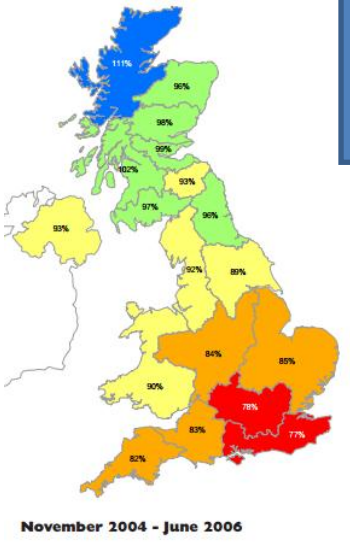
1993

"To the red country, and part of the gray country of Oklahoma, the last rains came gently, and they didn't even cut the scarred earth"

(Steinbeck, Grapes of Wrath, 1939)

2014

1998



2006

What is a drought?

Theor Appl Climatol (2014) 117:607–611
DOI 10.1007/s00704-013-1025-7

ORIGINAL PAPER

The impracticality of a universal drought definition

Benjamin Lloyd-Hughes

Received: 21 March 2013 / Accepted: 30 September 2013 / Published online: 19 October 2013

Abstract This paper demonstrates the impracticality of a comprehensive mathematical definition of the term 'drought' which formalises the general qualitative definition that drought is 'a deficit of water relative to normal conditions'. Starting from the local water balance, it is shown that a universal description of drought requires reference to water supply, demand and management. The influence of human intervention through water management is shown to be intrinsic to the definition of drought in the universal sense and can only be eliminated in the case of purely meteorological drought. The state of drought is shown to be predicated

The Oxford English Dictionary (2011) defines drought as follows:

1. The condition or quality of being dry; dryness, aridity, lack of moisture.
2. Dryness of the weather or climate; lack of rain.

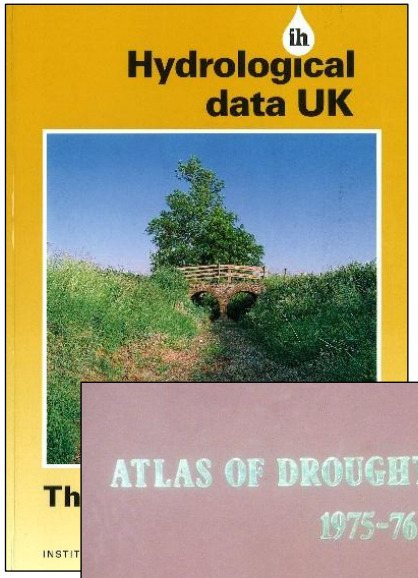
Unfortunately, the conflation of dryness with aridity and weather with climate serves more to confuse than illuminate. The World Meteorological Organization (1992) glossary provides a slightly better definition of drought as the following:

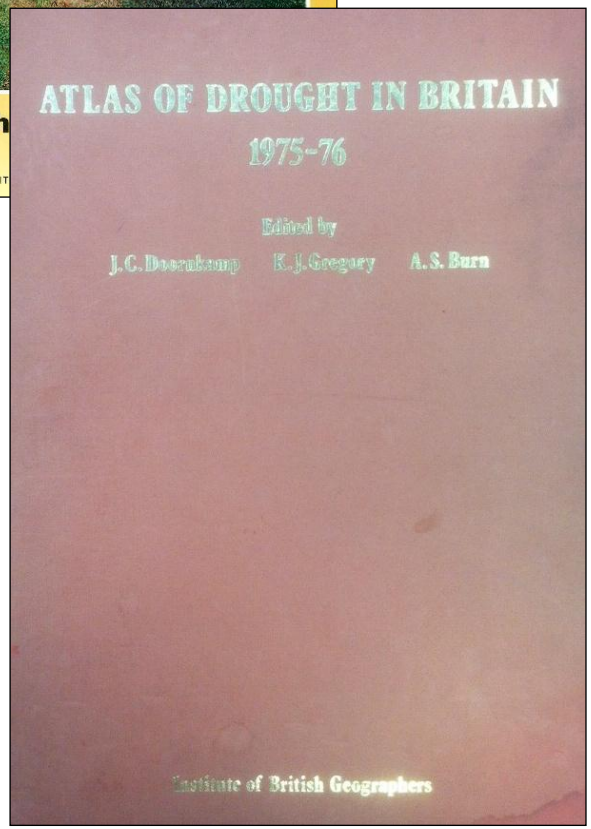
Past work on historic droughts in the UK

Major Water Resources Droughts in E & W

(Marsh et al. 2007)

- 2010 - 12
- 2004 – 6
- 1995-97
- 1990-92
- 1975-76
- 1959
- 1933-34
- 1921
- 1890-1909
- 1887-88
- 1854-60
- 1798-1808





Privatising water, producing scarcity: the Yorkshire Drought of 1995
"As an emblem of crisis in privatized water management, and as a potential signal of climate change, the 1995 drought has motivated change in water regulation and management. In this paper I challenge conventional interpretations of the 1995 water supply crisis as a natural hazard or as a result of managerial ineptitude"
Karen Bakker, 2000

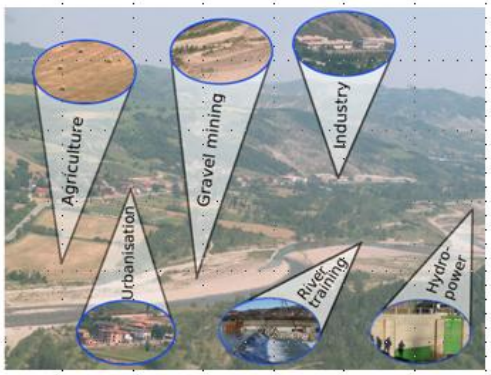
The human factor

This sociobiological aspect is implicit in the very term *drought*; otherwise we would be concerned merely with the lower tail of the statistical distribution of water on the land surface. In the interest of accuracy it should be noted that only the latter problem constitutes the subject matter of hydrology. Strictly speaking, drought is not a hydrological phenomenon; for hydrology, drought is an *effect* of low states of water on some nonhydrologic system, specifically on some life-supporting process that is in some way important to mankind.

Vit Klemeš, 1987

From: The Hydro-Social Cycle (Linton and Budds, in press)

Change is the result of Natural Variability, Uncertainty, and Interaction and Feedbacks between Hydrology and Society



Interactions between hydrology and society are diverse and heterogeneous.

Rivers and water bodies in general are the corridors where the interaction takes place.

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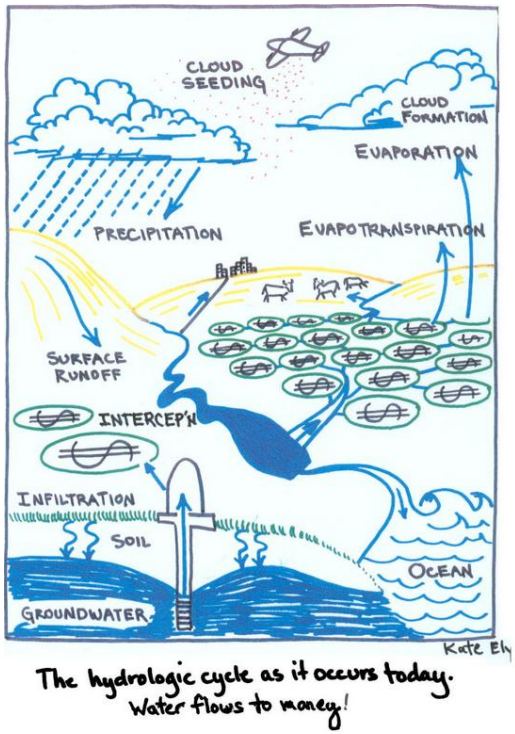
Panta Rhei
IAHS
AISH
Everything Flows



Challenging Drought Theory and Practice

The HISTORIC DROUGHTS Project

Analysis of historic droughts and water scarcity: a systems-based study of drivers, impacts and their interactions

2014 – 2018, Funded by NERC/RCUK (one of the £13m Droughts Programme projects: more info at end)

We aim to:

- Develop a systems-based conceptual understanding of drought from a range of different perspectives (meteo, hydro, env, agric, water resource, social,...)
- Develop a Drought Inventory - a knowledge base of past drought characteristics, impacts and drivers - by integrating across these perspectives
- Use the evidence from past droughts to inform improvements in drought management and communication in future

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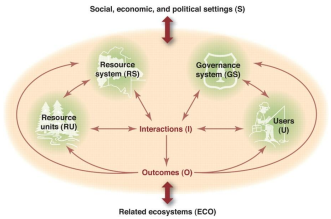
Project Overview

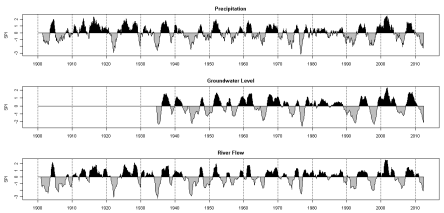
A common conceptual understanding (naive approach)

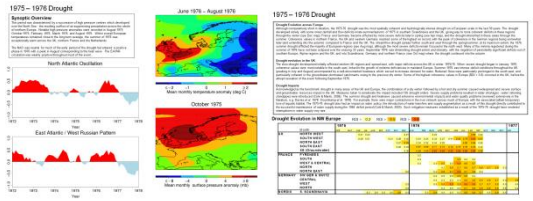
Conceptual Framework



Data gathering from sectoral perspectives: Timelines of drought indicators and Narrative chronologies

- Hydromet (CEH, BGS, MO)
- Environment (CEH)
- Water Resources (HRW)
- Policy and Regulation (Ox)
- Agriculture (Cran)
- Social (Ex, Lancs)
- Media (Ex, Lancs)





Integration of timelines and narratives into common knowledge base

Drought Inventory

Systems-based analysis of drought

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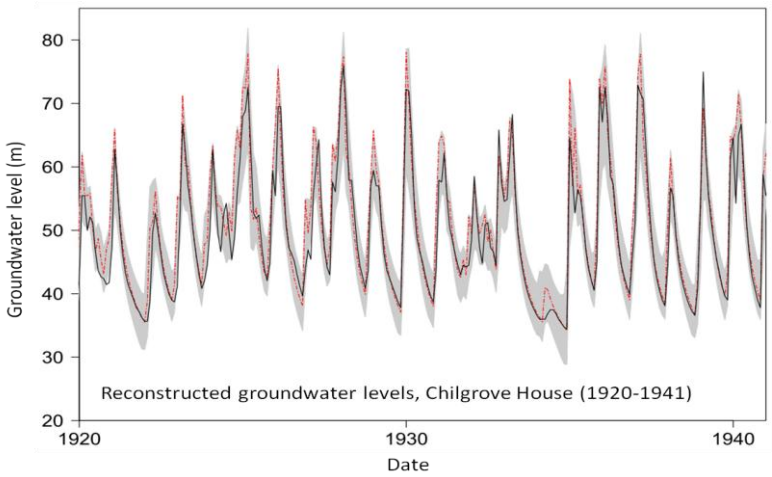
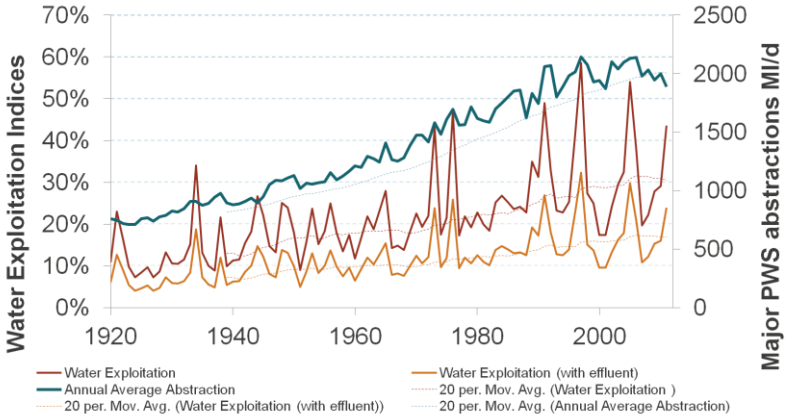
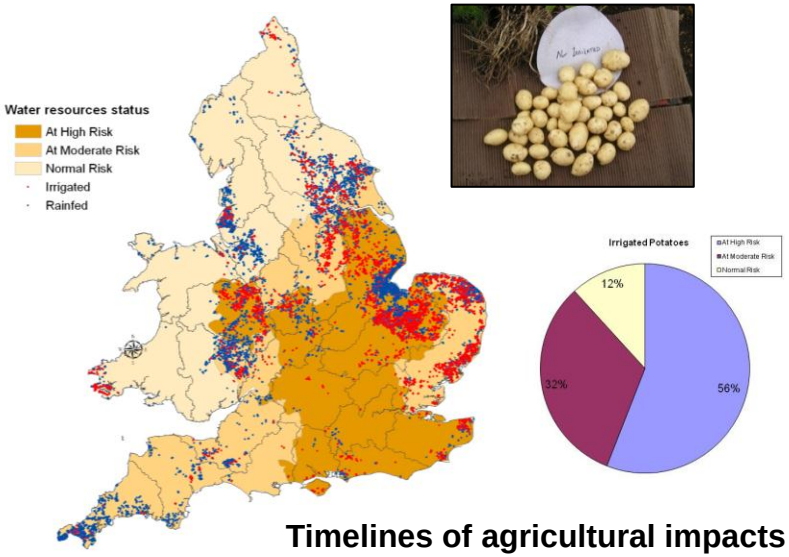
Quantifying past droughts: sectoral perspectives



Flow and Groundwater reconstructions from 1870s to present



Timelines of historical abstraction, water infrastructure and management interventions



Timelines of agricultural impacts based on yields, prices and other proxies

Timelines of regulatory changes and milestones in policy and legislation

What do we talk about when we talk about drought?

Interviews with key actors in droughts: farmers, water managers, regulators, policymakers

100 Oral Histories in drought-affected communities to collate narratives (stories!)

"They were taking out the bath plugs in holiday residences and then the visitors were going out and buying plugs – human ingenuity"

"…builders' merchants locally quickly sold out of plastic dustbins. People were buying them and in a time when they were trying to get them to reduce [their water use], they were filling from the taps these bins!"

"Now, some people opened up the stopcocks in the road and poured rubble down so when the Water Board came along, they didn't have time to pick all that out so they left that stopcock on…."

Thames Water · Severn Trent Water · NFU · UK · Scottish Water (Always serving Scotland) · anglianwater · AHDB · SEPA (Scottish Environment Protection Agency)

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What do we talk about when we talk about drought?

Water authority warning of drought this summer

By PETER CHIPPINDALE

The paper that stands for REAL VALUES and gives you REAL VALUE for money

DAILY EXPRESS

AND PROUD OF IT

The simple changes that can make us all live years longer

ONLY 30P

TODAY AND EVERY WEEKDAY

BRITAIN RUNS OUT OF WATER

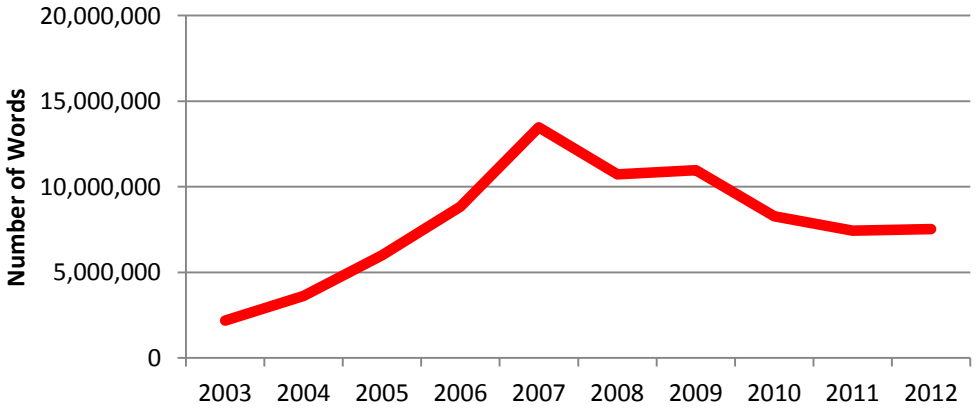
Worst drought for a century

They're hopping mad over Camilla's rabbit fur scarf

Quantitative analysis of discourse on drought in the news media, 1800s - present

Social Media analysis of the 2010 – 2012 Drought

Frequency of term "Climate Change" in all UK newspapers



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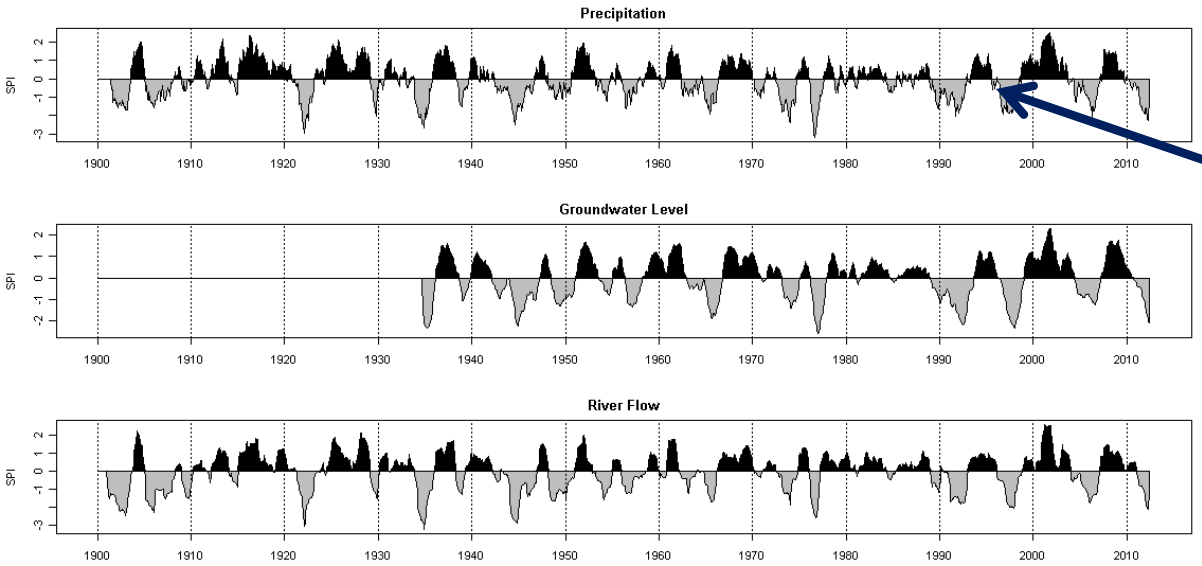
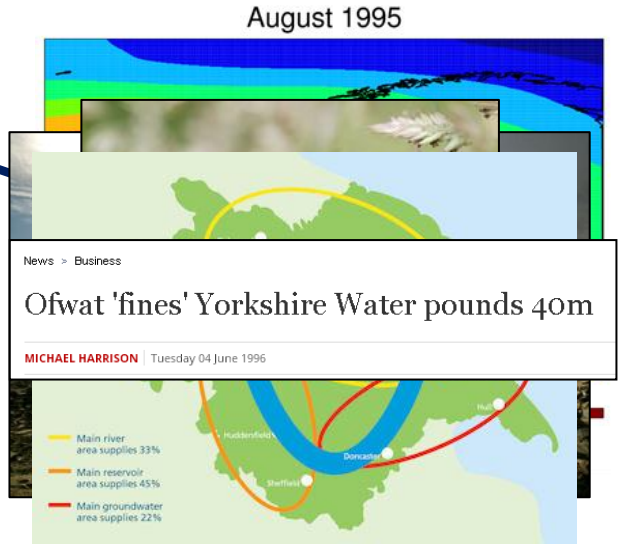
Bringing it all together: the Drought Inventory



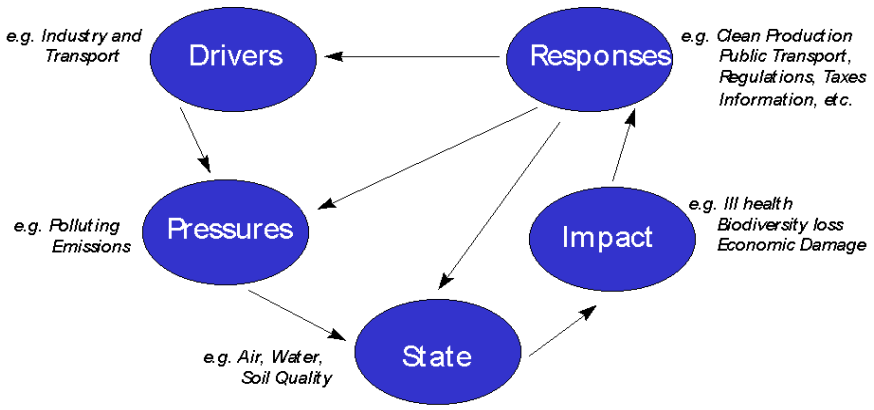


Timelines of Hydrometeorological Drought

A typology of drought and water scarcity for the UK

The Drought Inventory for the UK - an evidence base that will provide a common reference for policy makers and regulators, water supply companies, and UK business

A systems approach to understanding drought



Ostrom, 2009

Research Questions:

Are there commonalities in the systems interactions in D&WS episodes?

Are there changes over time in these system interactions?

Are there thresholds in system interactions?

A comprehensive systems-based understanding of drought in the UK: a universal definition may prove elusive but can we develop a common language?

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Improving management through stakeholder engagement

Which factors which confer resilience to water resource supply systems, or create vulnerability?

How are agricultural impacts moderated by farm, regional or national-level interventions?

What are the strengths and weaknesses in key regulatory tools for D&WS management?

Thames Water · Severn Trent Water · NFU · UK · Scottish Water (Always serving Scotland) · anglianwater · AHDB · SEPA (Scottish Environment Protection Agency)

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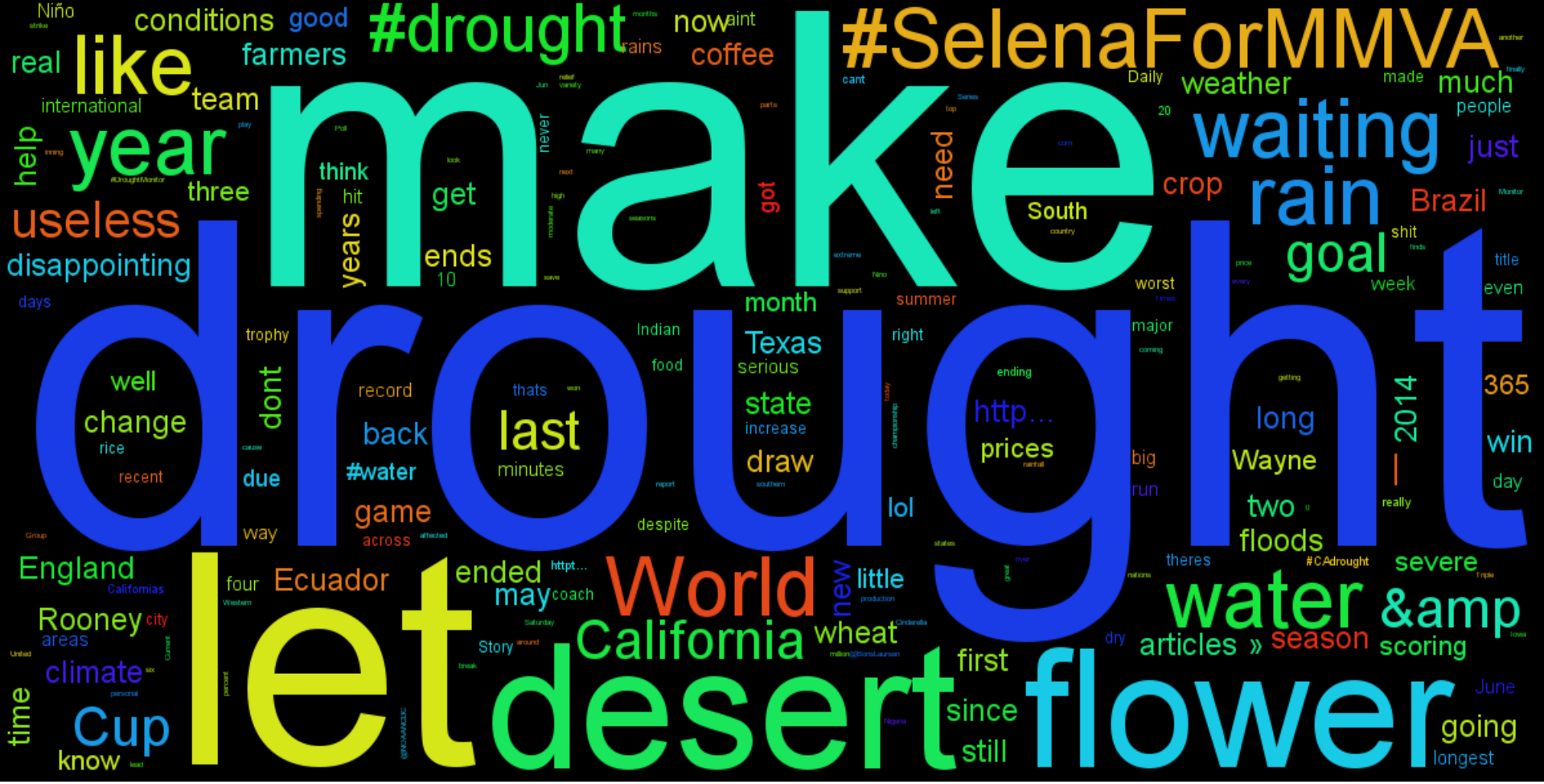
Plus.....?

NERC Science of the Environment



Thank you!

Thanks Ben Lloyd Hughes for Twitter word cloud

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More Information

- Project website coming soon
- Project Team Leads:

CEH (Hydrology/Environment): Jamie Hannaford

BGS (Hydrogeology): John Bloomfield

Met Office (Meteorology): Mark McCarthy

HR Wallingford (Water Resources): Chris Counsell, Ralph Ledbetter, Steven Wade (now at MO)

Cranfield (Agriculture): Ian Holman

Oxford (Regulation/Policy): Bettina Lange

Exeter (Social): Stewart Barr, Rebecca Pearce

Lancaster (linguistics, Social Media): Tony McEnery, Matthew Rowe

- Droughts Programme: nerc.ac.uk/research/funded/programmes/droughts/