



Water Resilience: What is it & do we have it..?

Nick Paling - WRT

bouncebackability

resilience:

“an ability to recover from or adjust easily to misfortune or change.”

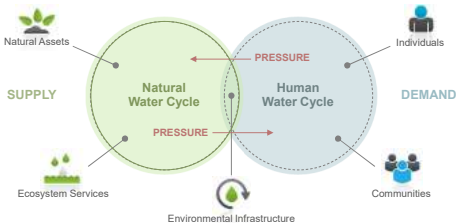
People, communities & nature are all incredibly resilient...
...but only to a point. Everything has its limit.

As stress reduces resilience, vulnerability increases.



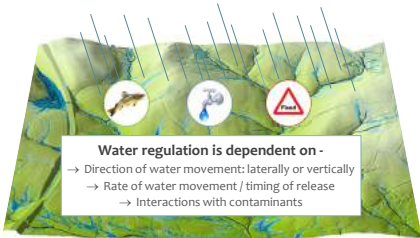
What is water resilience...?

Understanding resilience requires taking a whole-system approach...



The Natural Water Cycle

A fundamental processes we depend on ... when the landscape is healthy & functioning...



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A fundamental processes we depend on ... when the landscape is healthy & functioning...



Soil type & condition/practices

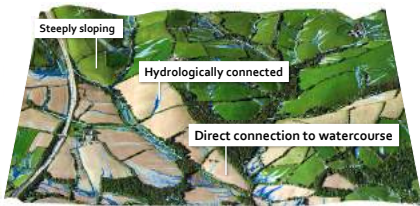


The Natural Water Cycle

A fundamental processes we depend on ... when the landscape is healthy & functioning...

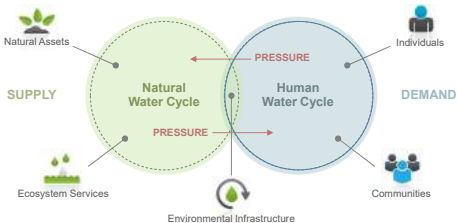


Location, topography & hydrological connectivity



What is water resilience...?

Understanding resilience requires taking a whole-system approach...





64% DART



THE
BIOREGIONAL
LEARNING
CENTRE



DRINKING WATER



FLOOD PROTECTION

WASTE DISPOSAL





IRRIGATION



HEALTH &
WELLBEING

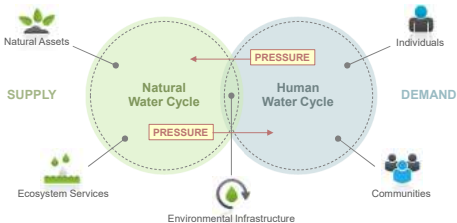




WILDLIFE

What is water resilience...?

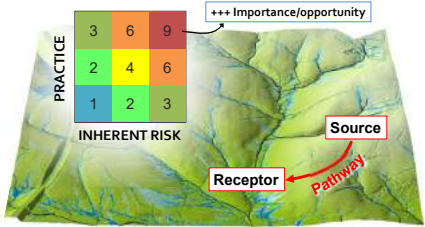
Understanding resilience requires taking a whole-system approach...





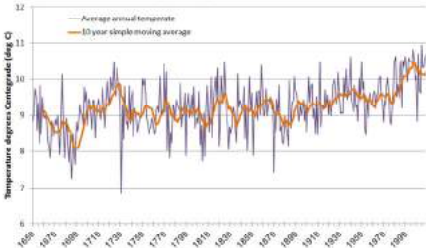
Anthropogenic Pressure - ▲ stress ▼ resilience

Human behaviour (such as land management or water use) impacts the water cycle...





Central England Temperature record 1659-2018



Source: Met Office Hadley Centre, Parker D.F., T.R. Legg, and C.K. Folland 1999. A new daily Central England Temperature Series, 1772-1991. *Int. J. Clim.*, Vol. 12, pp.317-342 (<http://www.metoffice.gov.uk/hadobs/hadcrut/index.html>). Chart created by Chris Cookes (www.chriscookes.net) March 2013.

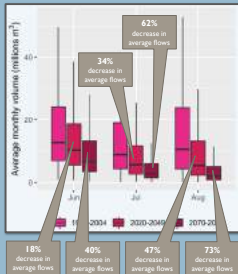
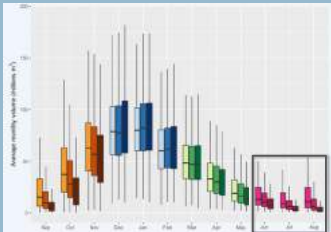


Central England Temperature 1659-2100 (UKCP18 projections)



Source: Met Office Hadley Centre - Parker, D.E., T.P. Legg, and C.K. Folland, 1992. A new daily Central England Temperature Series, 1772-1981. *Int. J. Clim.*, Vol. 12, pp. 317-342 (<http://www.met.rdg.ac.uk/~atmos/had/hadindex.html>). With UKCP18 (<http://www.met.rdg.ac.uk/research/collaborator/ukcp18proj/index.html>) and a 30 year long term average. [Low \(RCP2.6\)](#) & [High \(RCP8.5\)](#) emissions scenarios. Chart created by Chris Beale (www.chrisbeale.net) March 2016.

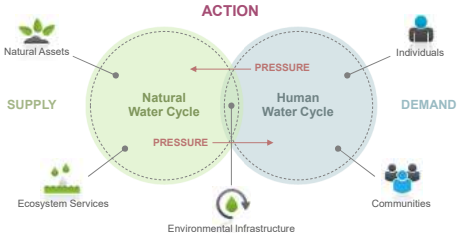
River Exe at Thorverton



...based on the High Emissions Scenario (RCP8.5)

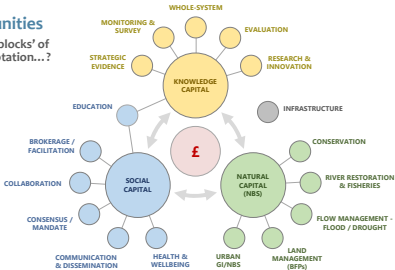
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Building Water Resilient Communities

What are the 'building blocks' of water resilience & adaptation... ?



Riverkeepers

Coaching people from across the watershed to succeed

Stewardship

The Riverkeepers program is a community-based approach to water stewardship that empowers local citizens to take action on water quality issues. Riverkeepers are trained to monitor water quality, report violations, and advocate for water quality improvements. They also work to educate the public about water quality issues and the importance of protecting our water resources.

Training, Support & Legal

Riverkeepers receive comprehensive training and ongoing support from the Riverkeepers program. This includes training on water quality monitoring, reporting, and advocacy. Riverkeepers also receive ongoing support from the Riverkeepers program, including access to resources, technical assistance, and legal support.

Environmental Restoration

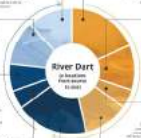
Riverkeepers are trained to identify and report water quality issues, such as illegal dumping, erosion, and sedimentation. They also work to restore degraded waterways through activities such as stream bank stabilization, riparian zone revegetation, and debris removal. Riverkeepers also work to educate the public about water quality issues and the importance of protecting our water resources.

Iconic Species Protection

Riverkeepers are trained to identify and report water quality issues that may affect iconic species, such as the American River shiner and the American river darters. They also work to protect and restore habitat for these species through activities such as stream bank stabilization and riparian zone revegetation.

Citizen Science

Riverkeepers are trained to collect water quality data and report it to the Riverkeepers program. This data is used to monitor water quality trends and identify areas that need further attention. Riverkeepers also work to educate the public about water quality issues and the importance of protecting our water resources.



Watershed Charter

The Watershed Charter is a document that outlines the shared values and goals of the watershed community. It is developed through a collaborative process involving local citizens, businesses, and government agencies. The Watershed Charter serves as a guide for water quality management and protection in the watershed.

Relationship with Police

Riverkeepers work closely with local law enforcement agencies to report and investigate water quality violations. This includes reporting illegal dumping, erosion, and sedimentation. Riverkeepers also work to educate the public about water quality issues and the importance of protecting our water resources.

Alignment with Balanced Efforts

Riverkeepers work to ensure that water quality protection efforts are balanced with other watershed management goals, such as economic development and recreation. This includes working with local businesses and government agencies to identify and address water quality issues that may affect other watershed values.

The Arts as Catalyst

Riverkeepers use the arts as a catalyst for water quality protection efforts. This includes organizing art installations, performances, and other creative activities that raise awareness about water quality issues and the importance of protecting our water resources.

Bring your wellies!

Meet us on the Dartington estate
for a day of fun and learning

BOOK NOW



Love the River Dart?

Begin your journey to
become a Citizen Scientist
on the Dart

Saturday morning
10am-12:30pm
16th March or 13th April

Join us on the Dart for a day of fun and learning

Join the community of Citizen Scientists living a more sustainable lifestyle. You'll get to see the Dart from a new perspective and learn about the environmental issues that affect us all.



Book your place: www.dartington.org/riverkeepers





SPONGE 2020 LOCAL ACTION PROJECT

Using nature-based solutions to reduce surface water flooding & deliver multiple benefits

“...Developing a comprehensive, practice based Toolbox and Guidance Pack for effective participatory climate adaptation through community based co-creation pilots...”



inferring
2020
SPONGE 2020
Local Action Project

WESTCOUNTRY WOMEN WORKING WITH WATER (5W)

We are working with a group of engineers to inspire school children in Taunton to understand a little more about water management in their town. We will then use the everything the students have learnt to get their help designing SuDS to be built in both the schools. 5W is a project funded by The Royal Academy of Engineers under their Ingenious program. We are working with two primary schools in Taunton to co-create raingardens...and inspire young people, especially girls, about engineering and the problems engineering can help to solve.



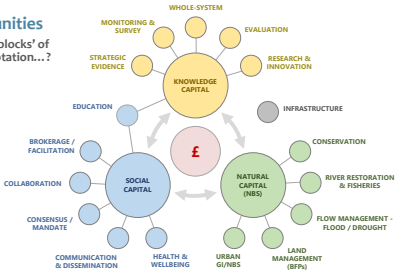
TRADITIONAL DRAINAGE vs SuDS

These interactive boards were used to demonstrate the difference between traditional water management systems and sustainable drainage systems. In the board to the left, water goes down a gutter, onto some hard paving, down a drain and into the 'river' below. The water ran through the system very quickly, eventually flooding the Lego house below! On the right, the water went into a bucket (acting as a water butt), through some permeable paving, into a grassy swale and then into a raingarden. The water moved more slowly, plus the board looks a lot more green and interesting!



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What are the 'building blocks' of water resilience & adaptation... ?



Co-creating a community NBS & GI Plan for Millbrook



- Millbrook River Catchment, Cornwall
- 2016-2018
- Community engagement
- Evidence review
- Interactive flood modelling
+ a 'Serious Game'



Co-creating a community NBS & GI Plan for Millbrook



Co-creation and trialling the Millbrook Serious Game -

- ⇒ Developed by Centre for Water Systems at Exeter University
- ⇒ Interactive, educational 'game' that illustrates movement of water through catchment and village over time
- ⇒ Ability to change land use and investment to drainage infrastructure within different parts of the catchment
- ⇒ Trialled by local stakeholders



Paper published in December 2018

<http://www.mdpi.com/2073-4441/10/12/1885/pdf>



CASE STUDY

Studying Water Resources Management

Interreg 
2 Seas Mers Zeeën
PROWATER


**South West
Water**



 **Upstream Thinking**

DRINKING WATER PROVISION PROCESS



Chemicals
Assets Sludge
Energy



0.0043p



RISK: treatment **failure** leaves pollutants in final water

SOURCE: Some pollutants are natural – some can be **reduced**

10mg



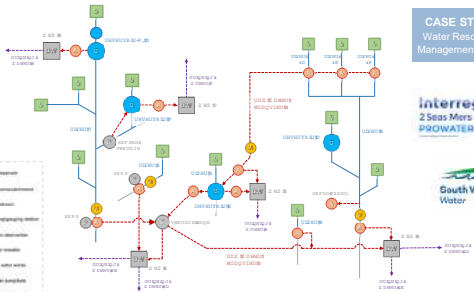
Soil
Algae
Pesticides
Colour

COSTS: some costs are fixed
– some are **variable**

CASE STUDY

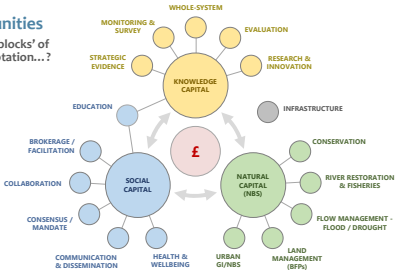
Water Resources Management 'Loop'

Interreg 
 2 Seas Meren Zeeën
 PROWATER



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