Dr Jo Dixon
Senior Monitoring Officer
Westcountry Rivers Trust

Phosphate in our rivers.

PHOSPHATES IN OUR RIVERS

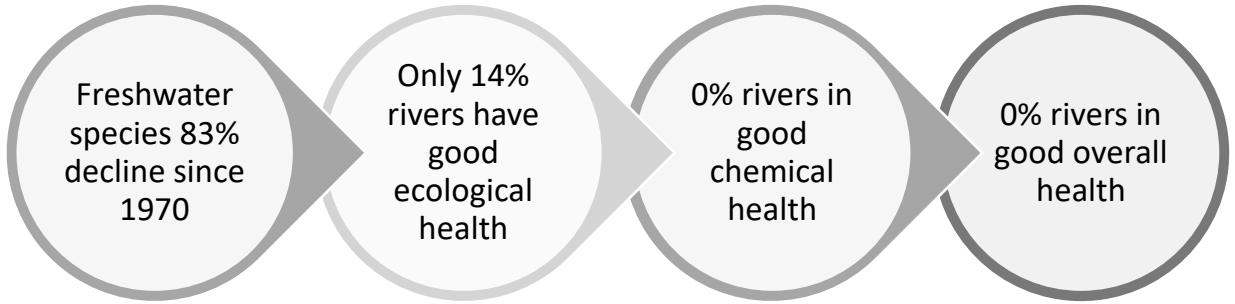
jodixon@wrt.org.uk

wrt.org.uk

Why is PO_4 a problem in our rivers?

'too much nutrient causing excessive growth of algae and plants'

- Eutrophication
  - causes the loss of sensitive plants and animals (biodiversity) in rivers and lakes
  - adversely affects angling, water sports and other recreational activities
  - increases the cost of drinking water abstraction and treatment

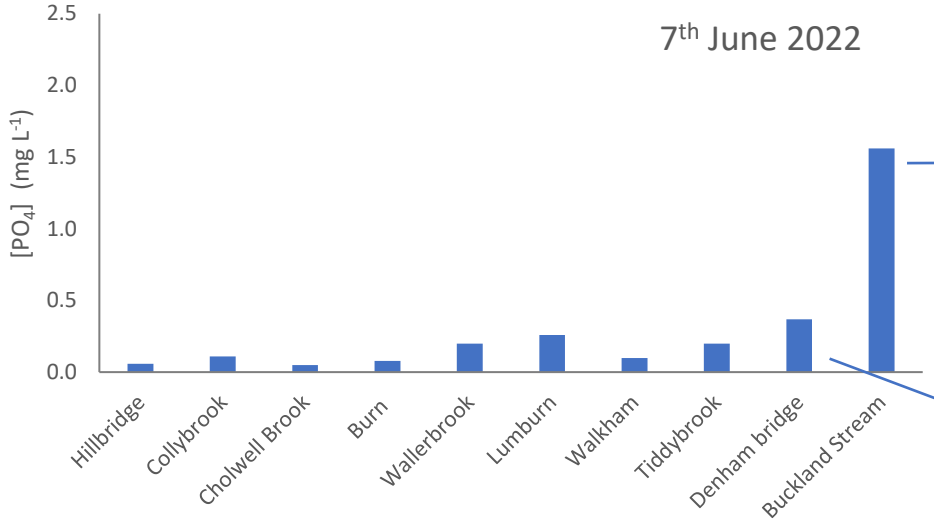


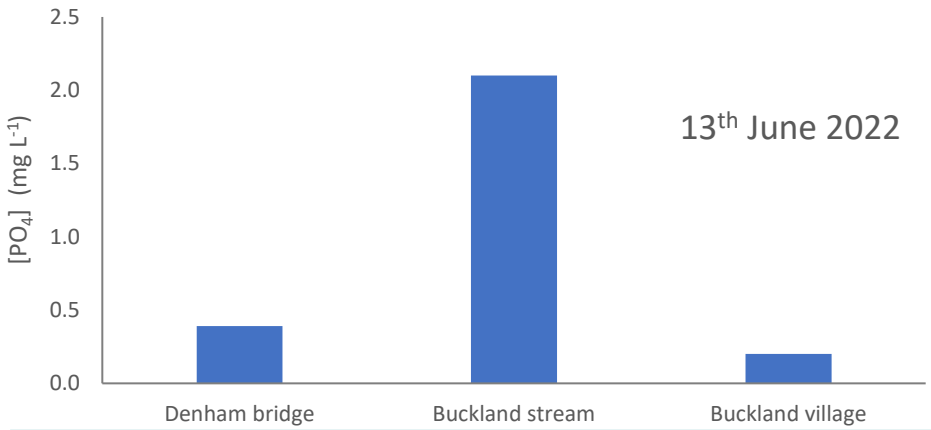
Phosphorous is the most common cause of water quality failures under the WFD in England (number one reason for water bodies not achieving good ecological status)

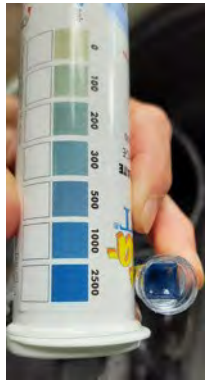
'Phosphorus and freshwater eutrophication: challenges for the water environment' EA report. Date: October 2021

Small case study: Tavy (Green Recovery)

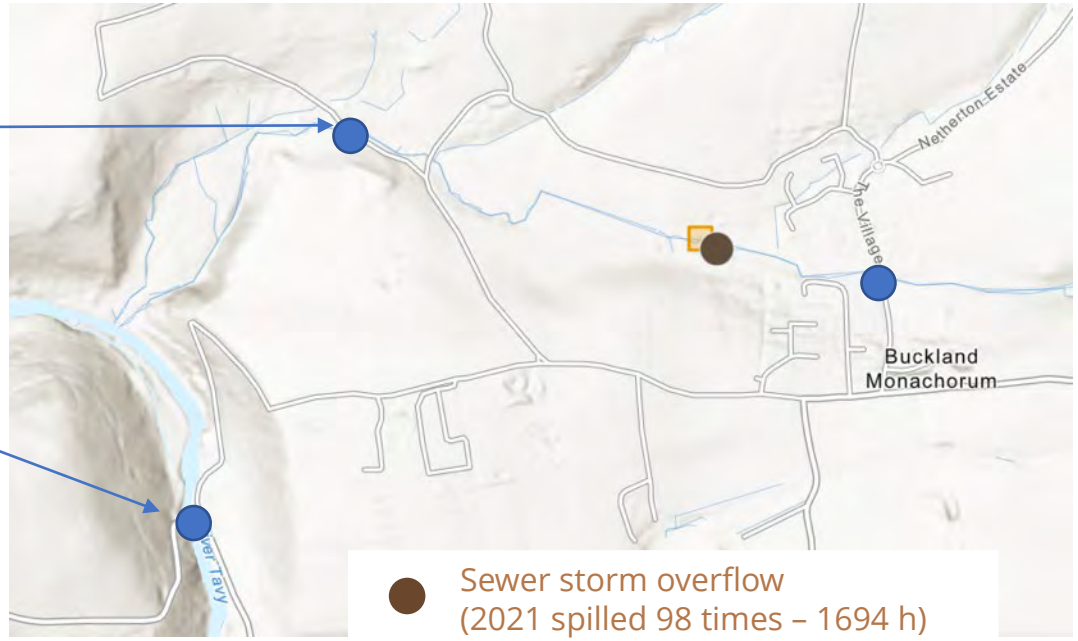
'Further attention should be given to tackling small rural sewage sources, particularly in the headwaters of catchments'







CSI kit ~ 2500 ppb = 2.5 mg L^{-1}



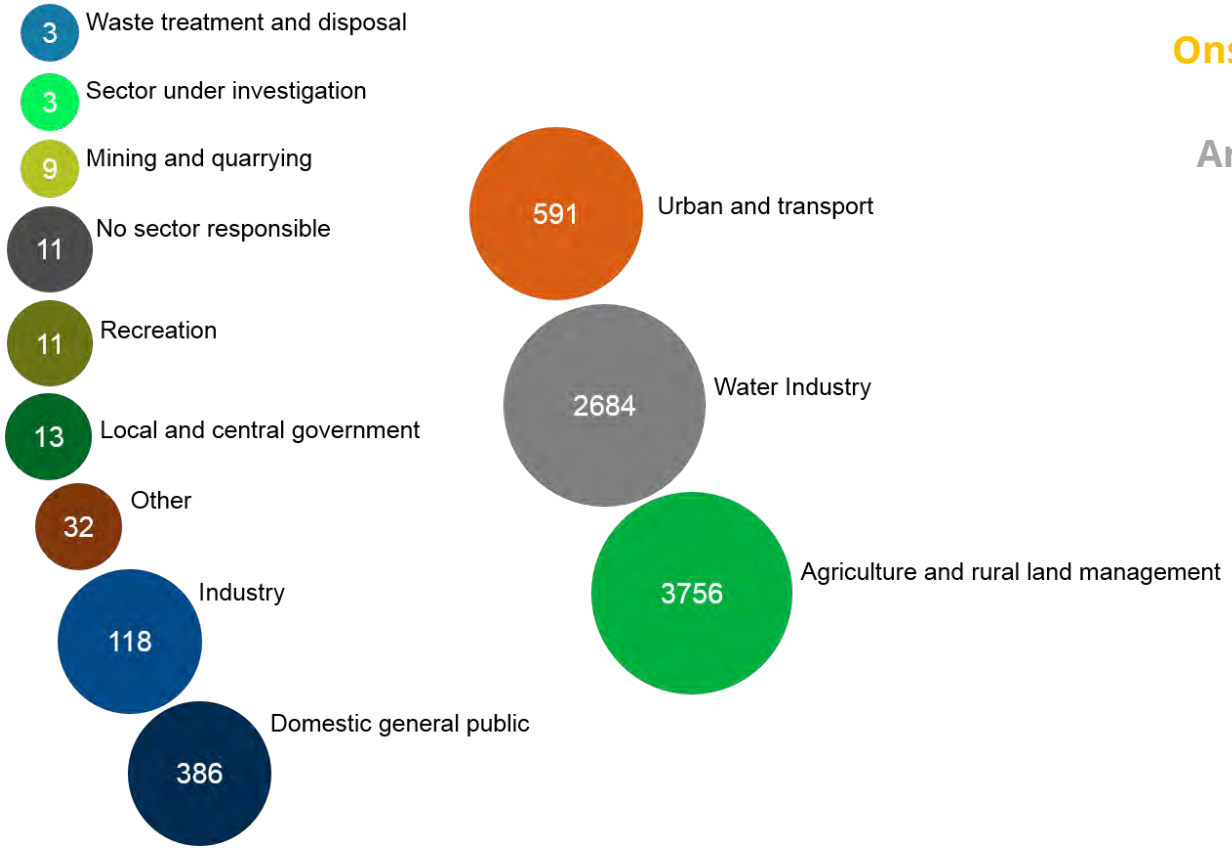
Sewer storm overflow
(2021 spilled 98 times – 1694 h)

Buckland Monachorum WwTW
Final/treated Effluent

theriverstrust.org/sewage-map

Freshwater sources of P

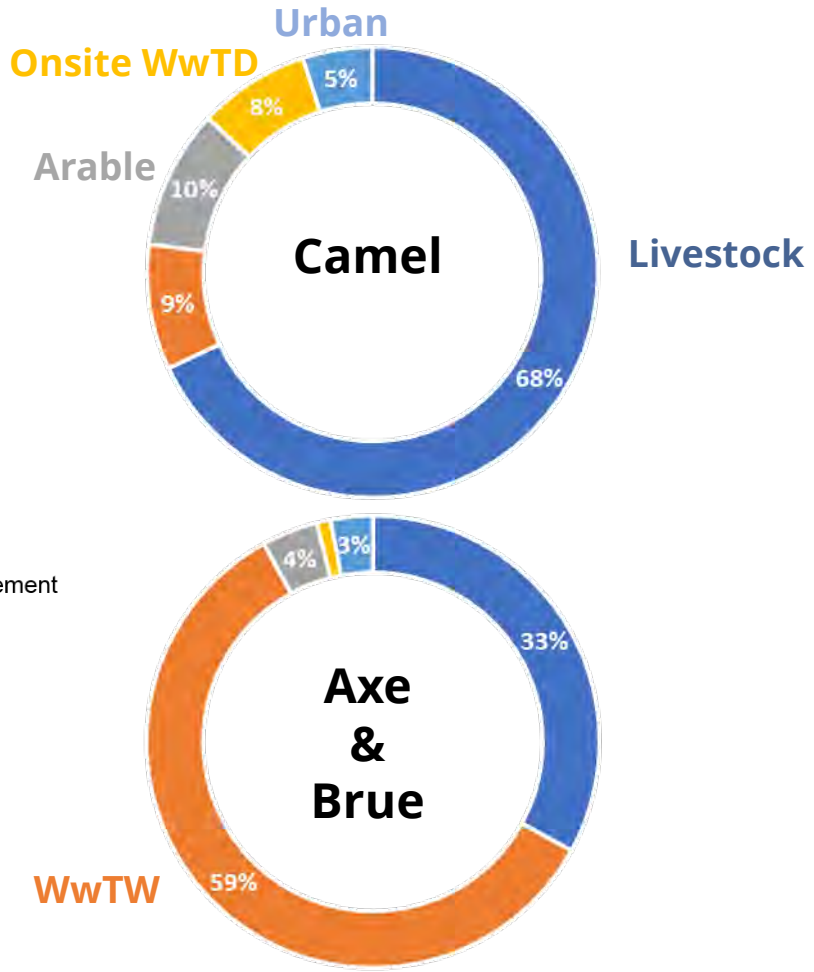
National overview 2019



Reasons for Not Achieving Good Status (RNAG)
(not numbers of water bodies)

Environment Agency. Phosphorus-challenges-for-the-water-environment. Oct 2021

Regional variability

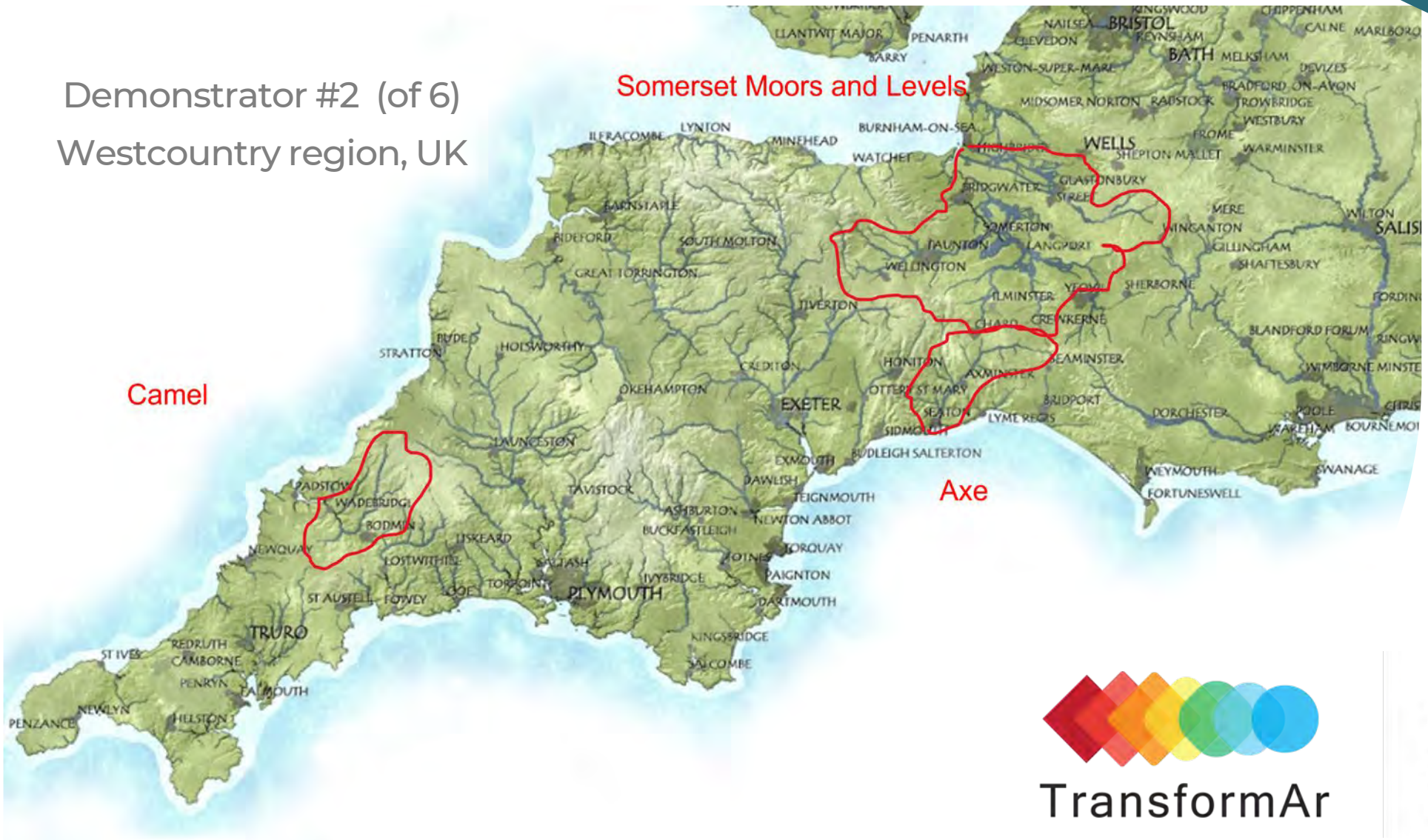


SAGIS modelling (royalhaskoningdhv.com)

Accelerating and upscaling transformational adaptation in Europe: demonstration of water-related innovation packages

Demonstrator #2 (of 6)

Westcountry region, UK



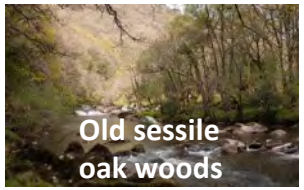
'nutrient trading solutions'

TransformAr

Czech University of Life Sciences Prague

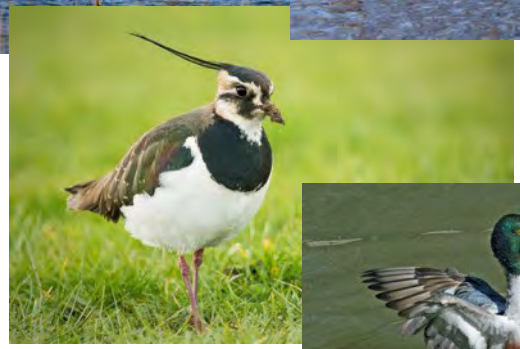
Why these catchments?

River Camel (SAC)



River Axe (SAC)

Somerset Levels & Moors (Ramsar & SSSI/SPA)



the flood plains of the Rivers Axe, Brue, Parrett, Tone & tributaries

Real world consequences

A recent landmark ruling in the European Court of Justice known as the Dutch Nitrogen Case ruled that where an internationally important site (i.e. SACs, SPAs and Ramsar Sites) is failing to achieve condition due to elevated nutrient (phosphorus and nitrogen) concentrations then planning permission cannot be legally granted until a development can be proven to be **nutrient neutral**. This has resulted in greater scrutiny of planning applications that are likely to increase nutrient loads to internationally important sites

Development pauses

Cornwall Council – one and all • onen hag oll

East Devon District Council

South Somerset District Council

Mendip District Council

Somerset West and Taunton

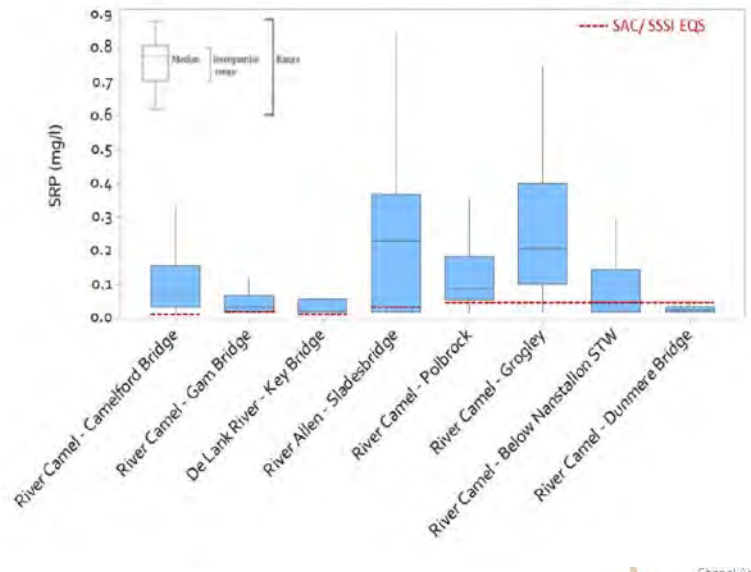
Sedgemoor District Council

River Camel (SAC/SSSI)

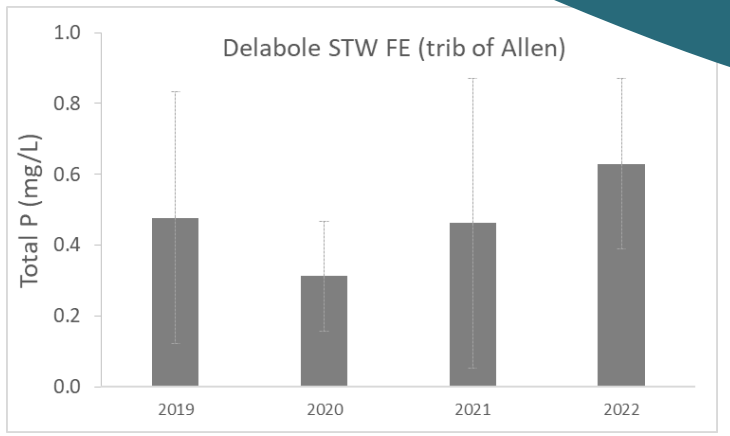
River Axe (SAC)

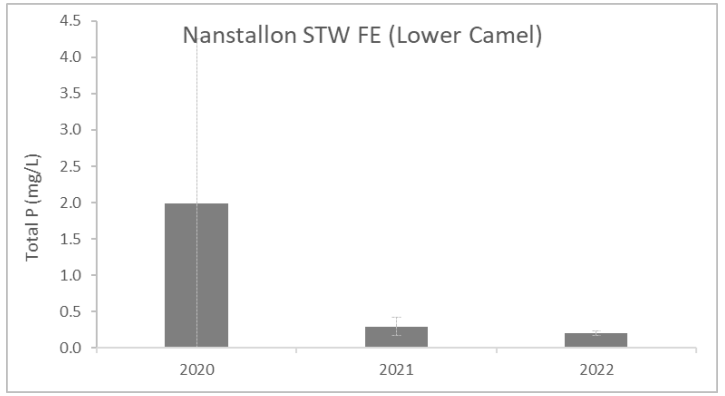
Somerset Levels & Moors (Ramsar site/SPA Internationally important wetlands/SSSI)

The Camel Catchment



Royal HaskoningDHV report PC2704-RHD-ZZ-XX-RP-Z-0001, September 2021





Technically Achievable Limit for P reduction at STWs to be tightened 0.5 mg P/L to 0.25 mg P/L (PR19).

The Camel Catchment

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'interesting maps'

Storm overflows with Event Duration Monitoring

Counted spills using 12-24h counting method

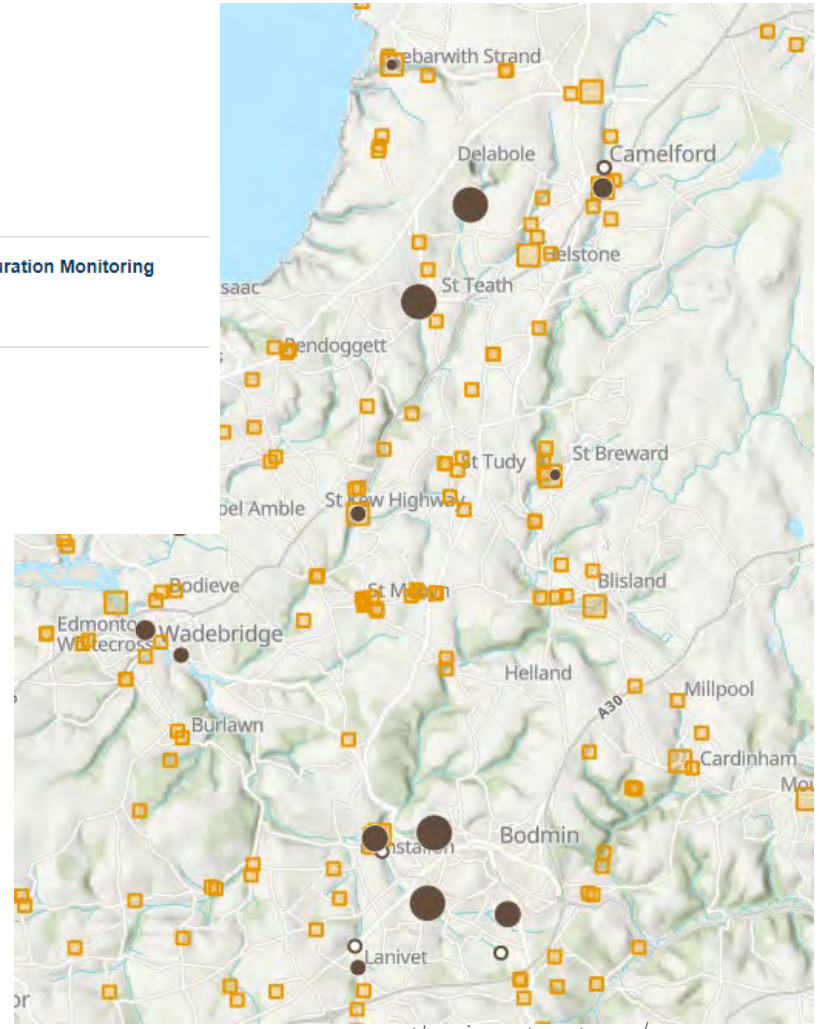
- 100 +
- 60 - 99
- 40 - 59
- 20 - 39
- 1 - 19
- 0

Storm overflows without Event Duration Monitoring

Treated sewage discharges

Type

- Water company
- Not water company



theriverstrust.org/sewage-map

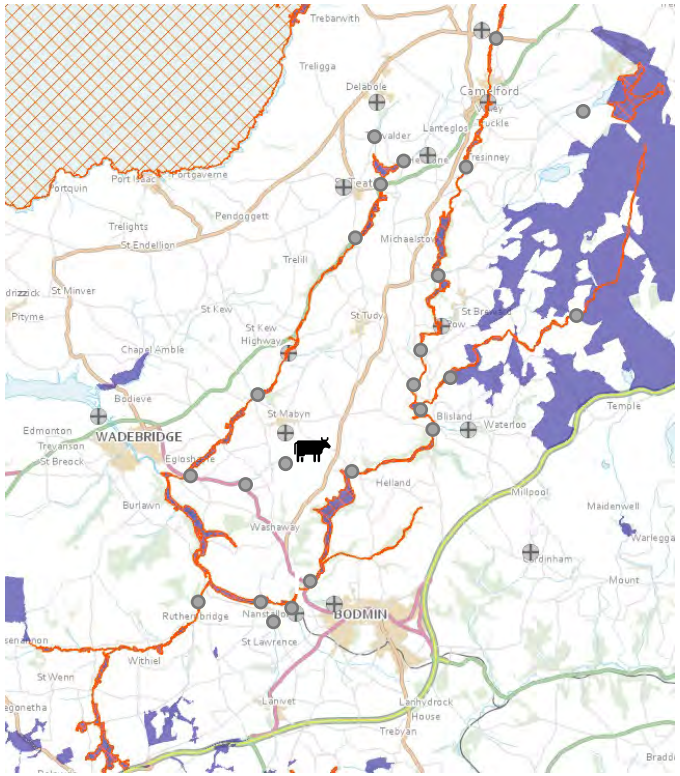
https://storymaps.arcgis.com/collections/

Ecological health

- Bad
- Poor
- Moderate
- Good
- High
- Not assessed

Our plans

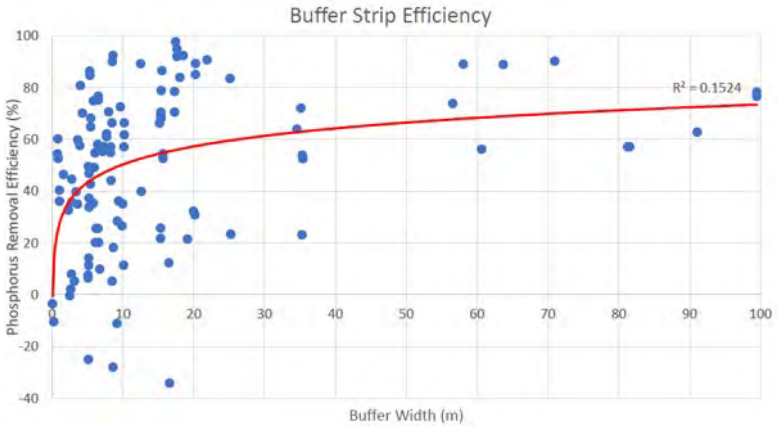
Water Quality monitoring



Evidence of effectiveness of interventions

Interventions (Nature Based Solutions)

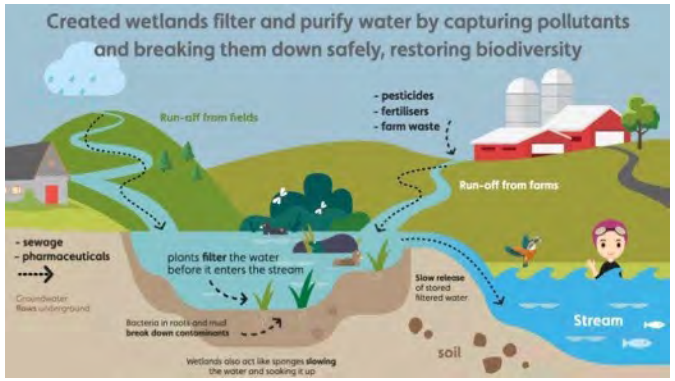
Riparian Buffer Zones



- 15-25m width most favourable
- Woody vegetation zones have high (99.9%) efficiency of removal nitrogen and phosphorus.
- Grasses did not show as good removal efficiency for phosphorus (61.6%).

Anguiar et al., 2015

Restoring wetlands



With potential for

- Cessation of activities e.g., fertilizer/slurry spreading)
- Planting of cover crops e.g., miscanthus

Ideas for future postgraduate projects

TRACE METALS

Contrasting Mn/Fe cycling in key SW rivers (MSc/MPhil?)

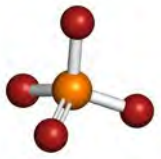
- Total & dissolved
- Fowey focus (Mn issue for SWW) – but could extend to Tavy, Camel etc

NUTRIENTS

Phosphorus cycling in SW catchments: sources, transformations and remediation

(PhD UoP/WRT/PML ARIES DTP?)

- Total P, organic and SRP (for upland river SSSIs/SACs, organic phosphorus is a major source of P in catchments with significant coverage of peat).
- Effects of NBS on controlling/remediating P riverine P inputs
- Camel/AXE/Tavy/Dart?

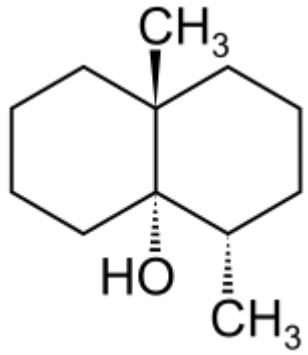


VOLATILE ORGANICS

Understanding sources, sinks and microbial transformations of key taste & odour volatile organics in freshwater

(PhD UoP/UEA/WRT ARIES DTP?)

- Geosmim
- Methyl-isoborneol (MIB)
- Fowey/Tavy/Camel/Axe



Thank You

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