Public Agenda Pack

Notice of Meeting of

SCRUTINY COMMITTEE - CLIMATE AND PLACE

Friday, 26 April 2024 at 1.30 pm

John Meikle Room, The Deane House, Belvedere Road, Taunton TA1 1HE

To: The members of the Scrutiny Committee - Climate and Place

Chair: Councillor Martin Dimery
Vice-chair: Councillor Adam Boyden

Councillor Steve Ashton
Councillor Bente Height
Councillor Henry Hobhouse
Councillor Dave Mansell
Councillor Harry Munt
Councillor Alan Bradford
Councillor Edric Hobbs
Councillor Marcus Kravis
Councillor Matthew Martin
Councillor Tom Power

For further information about the meeting, including how to join the meeting virtually, please contact Democratic Services democraticservicesteam@somerset.gov.uk.

All members of the public are welcome to attend our meetings and ask questions or make a statement **by giving advance notice** in writing or by e-mail to the Monitoring Officer at email: democraticservicesteam@somerset.gov.uk by **5pm on Monday, 22 April 2024**.

This meeting will be open to the public and press, subject to the passing of any resolution under the Local Government Act 1972, Schedule 12A: Access to Information.

The meeting will be webcast and an audio recording made.

Issued by (the Proper Officer) on Thursday, 18 April 2024

AGENDA

Scrutiny Committee - Climate and Place - 1.30 pm Friday, 26 April 2024

3 Public Question Time (Pages 5 - 6)

The Chair to advise the Committee of any items on which members of the public have requested to speak and advise those members of the public present of the details of the Council's public participation scheme.

For those members of the public who have submitted any questions or statements, please note, a three minute time limit applies to each speaker and you will be asked to speak before Councillors debate the issue.

We are now live webcasting most of our committee meetings and you are welcome to view and listen to the discussion. The link to each webcast will be available on the meeting webpage, please see details under 'click here to join online meeting'.

4 Overview of the nutrient pollution problem on the Somerset Levels and Moors designated sites (Pages 7 - 24)

To receive a presentation from Natural England.

Further reading:
Predicting Lemna growth based on climate change and eutrophication in temperate freshwater drainage ditches

Restoration management of phosphorus pollution on lowland fen peatlands: A data evidence review from the Somerset Levels and Moors (sciencedirectassets.com)

5 Citizen Scientist research from the river catchments and the Ramsar sites (Pages 25 - 36)

To receive a presentation from Dr Andrew Clegg

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Scrutiny Climate and Place 26th April 2024 – Public Questions

	Annexe A – Public Questions
Name of person submitting	**Questions**
David Orr	It is ironic that we are meeting today to discuss "Water Quality in Somerset" when this Council does not have a formal policy for that. A senior planner advised me I had made the common mistake of thinking that "nutrient neutrality" was about getting our world-renowned moors and levels into a good condition. She stated that "*Nutrient neutrality is a national approach to provide a solution to a legal requirement"*. Cornwall Council recognised that the "Competent Authority" planning role in nutrient neutrality was a community leadership role. Cornwall decided to make clean rivers and building social and affordable housing their top priorities. There have been no negative outcomes or legal threats, from their 2023 decision in Bodmin, to count sewage treatment works upgrades. In Somerset, we are using the Natural England nutrient neutrality guidance as "rules for the following of", rather than emulating Cornwall in prioritising water quality and community benefits. Somerset has 18,000 held-up homes with insufficient numbers of social and affordable homes being built; with negative impacts on the 5-year land supply, which knocks out local development plans, encouraging some developers to make speculative planning applications. If nutrient neutrality is only actioned via the planning system, then the burden narrowly falls upon new homes, while existing homes, current and past agricultural practice and climate change impacts are ignored. Worse still, is that this outdated and unevidenced policy will not, I believe, get our precious levels and moors back into a favourable condition by 2030. For example, the Somerset phosphate calculator assumes that 100% of waste water from a new home finds its way, even after modernised wastewater treatment, on to the moors and levels, when scientific research shows it doesn't. The calculator than adds another 20% to that 100%! Why can't that 20% super-precautionary buffer now be removed from the calculator, to lower phosphate credit costs by 17%, with immediate effect? I am sceptical that the claims for Batch Reverse Osmosis and the grant funding will remove the 18,000 held-up homes backlog by 2030, as there is no financial case to demonstrate viability. Somerset needs a nutrient neutrality policy that is evidence-led, targeted at improving the condition of the moors and levels and supports the economic and social well-being of Somerset. I strongly urge this Scrutiny Committee to recommend that the Council conducts an urgent and independent review of the current nutrient neutrality policy and develops a formal policy for "Water Quality in Somerset".

Scrutiny Climate and Place 26th April 2024 – Public Questions

Response	**Lead officer verbal response to be given at the meeting.** **Full written response to be distributed within 5 working days of the meeting**

An overview of nutrient pollution on the Somerset Levels and Moors

Evidence and framework for restoration

Dr Mark Taylor

Senior Water Advisor, Wessex Area, Natural England

Somerset Council Scrutiny Committee – 26th April 2024

Outline of Presentation

- Overview of the ecological problem
- Summary of phosphorus pollution evidence
- Link to climate change impacts
- Proposed way forward for restoration

Important features of the Ramsar wetland, SPA and SSSIs

Breeding birds: national importance for breeding waders

Wintering birds: most important inland site in the UK (by population)

Aquatic plants and invertebrates of the ditch system

21% (largest area) of lowland wet grassland in England

Breeding birds

Wintering birds (SPA)

Wetland plants and invertebrates

Grasslands

Blooms of algae and floating plants on the Somerset Levels and Moors

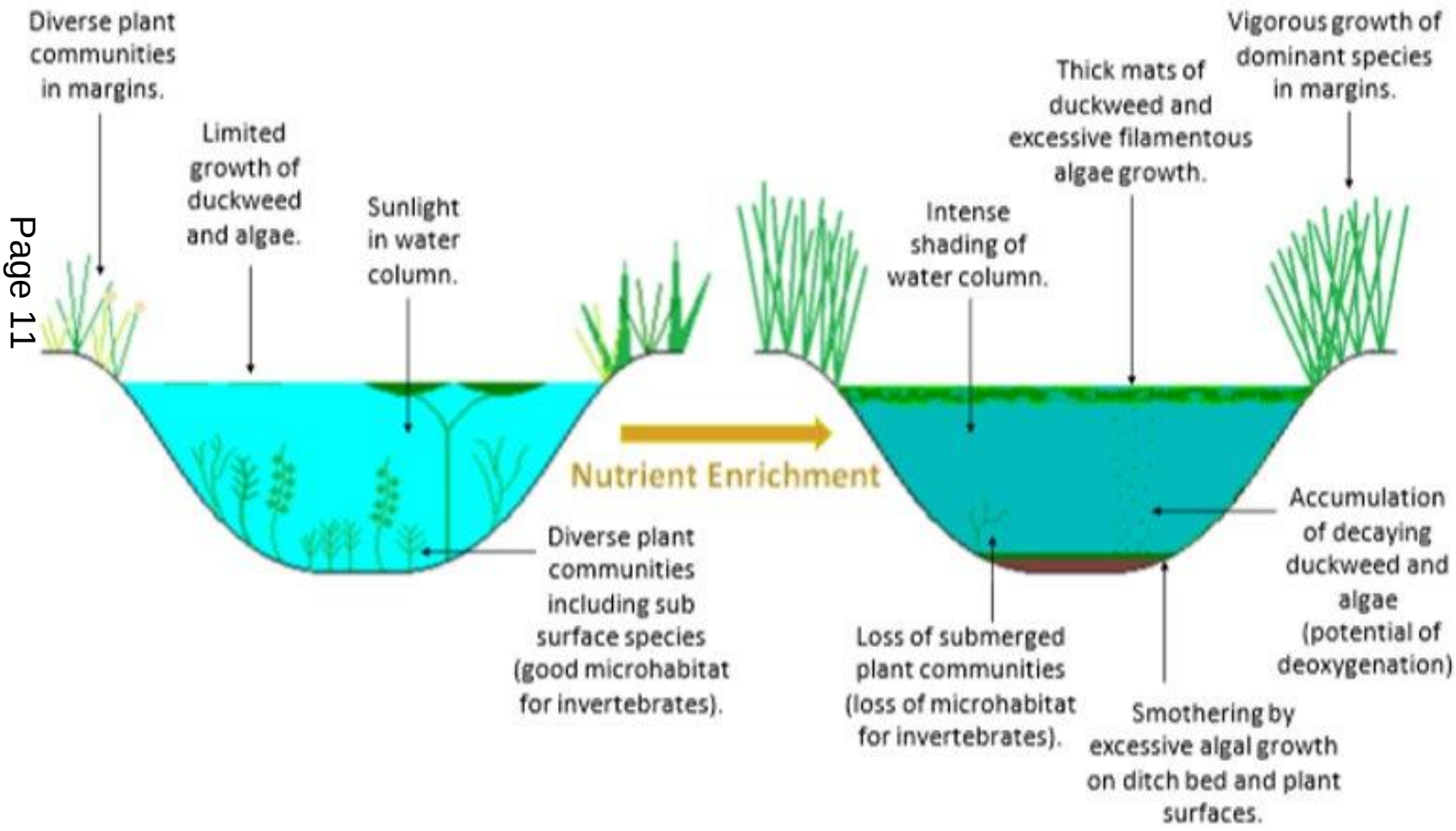
Surface filamentous algae

Lemna overgrowth

Epiphytic and epibenthic filamentous algae

Azolla overgrowth

Consequences of nutrient enrichment on ditch ecology



Wider ecological impacts

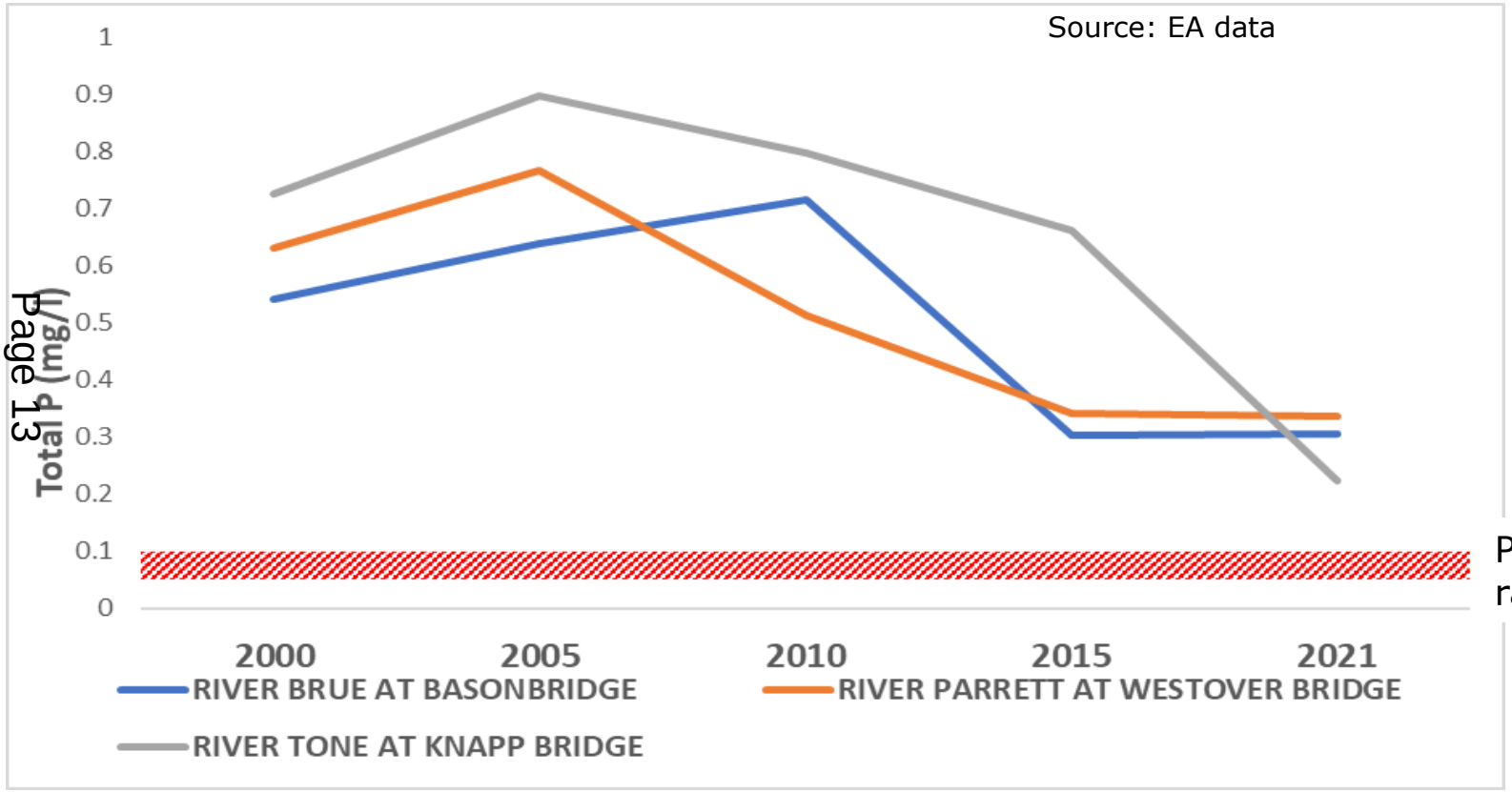
Adverse effects on fish-eating birds

Greater risk of fish kills

Rapid infilling of ditches with vigorous plant species

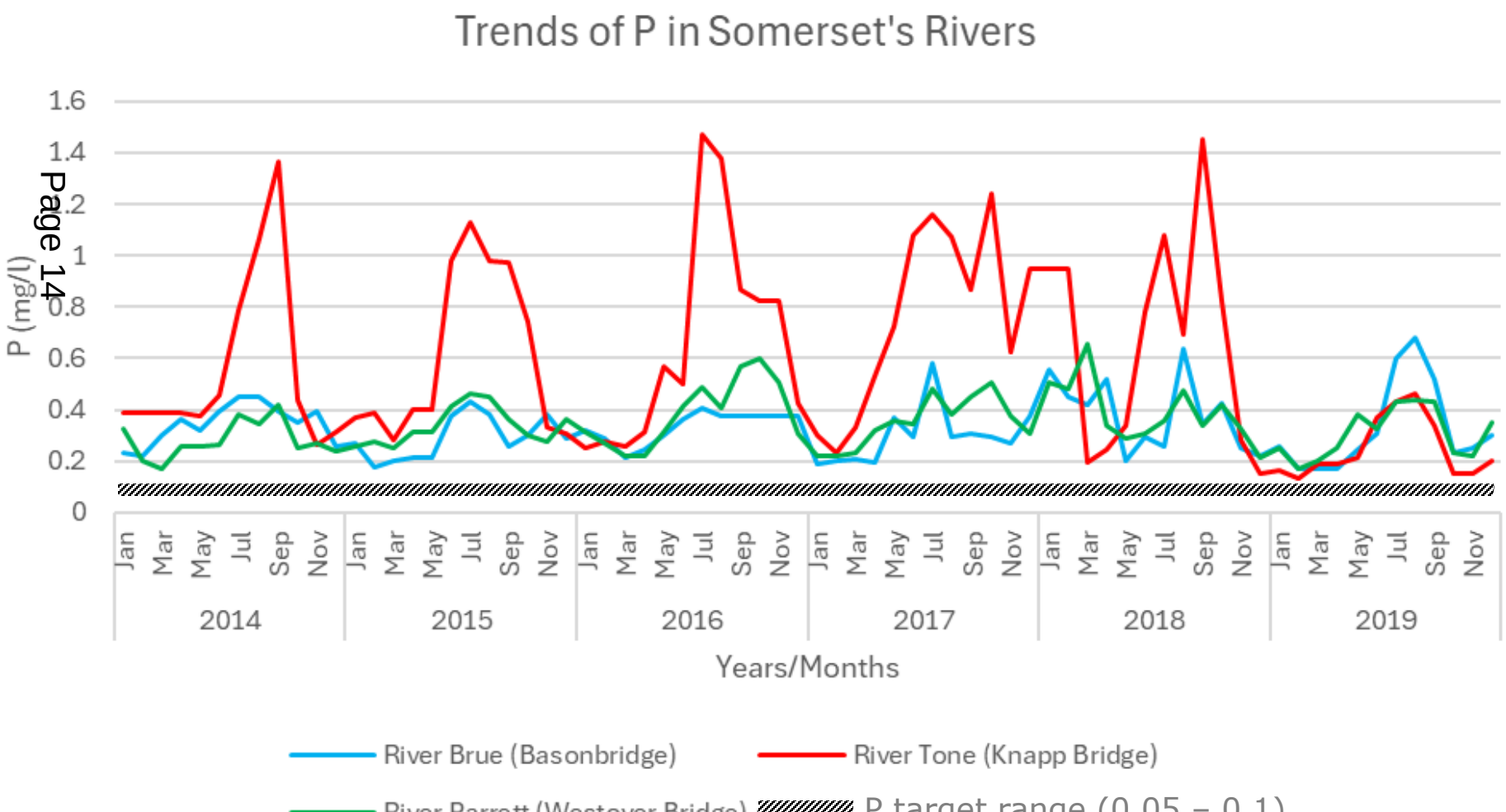
Methane production from Lemna choked ditches

Trends in Annual Mean Total Phosphorus in Somerset rivers feeding the SLMs

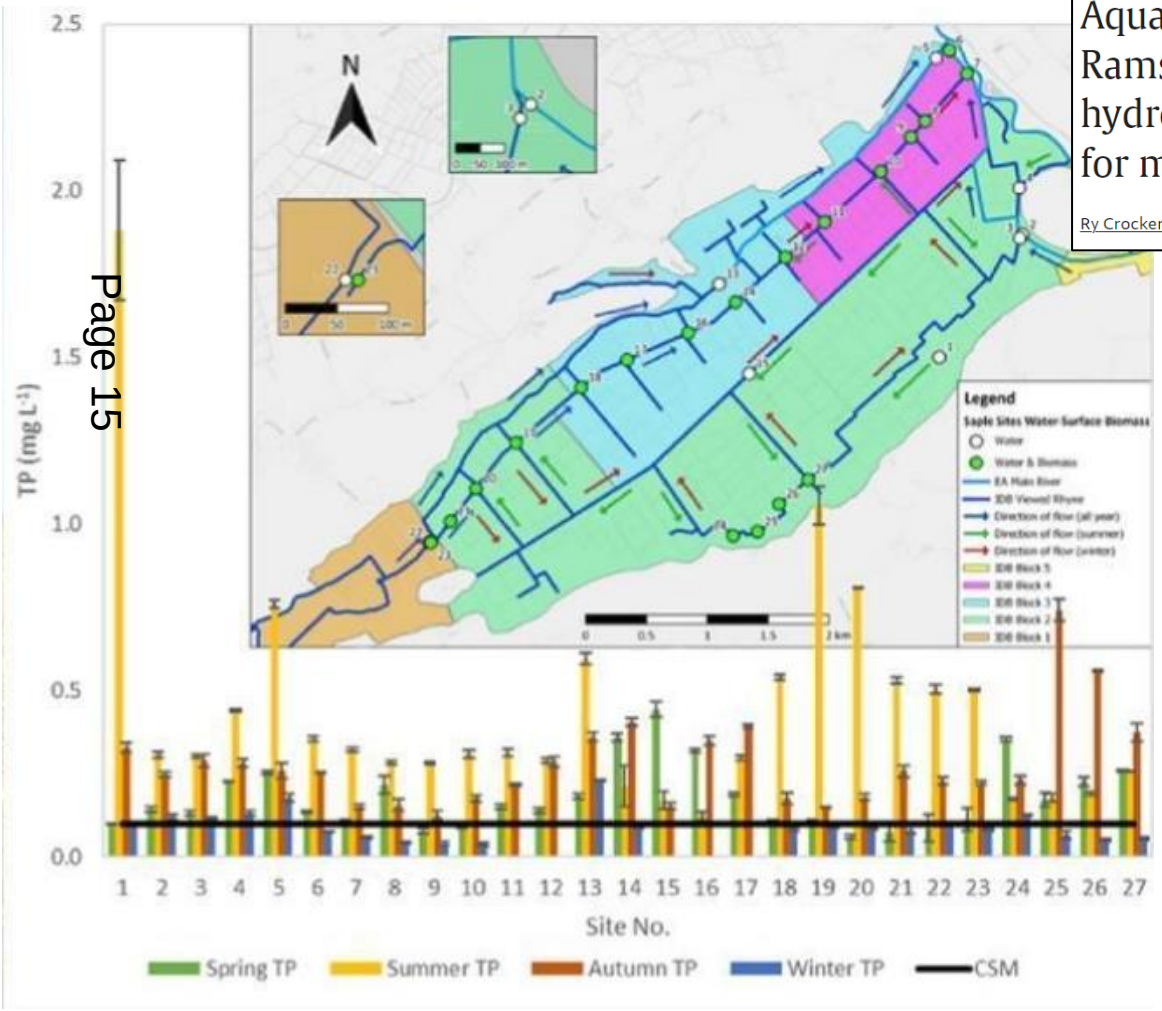


Data shows that Phosphorus levels in the rivers have decreased, but the duckweed and algae problem is getting worse

Month by month trends in Total Phosphorus in Somerset rivers feeding the SLMs



Total Phosphorus levels in the ditch systems at West Sedgemoor SSSI

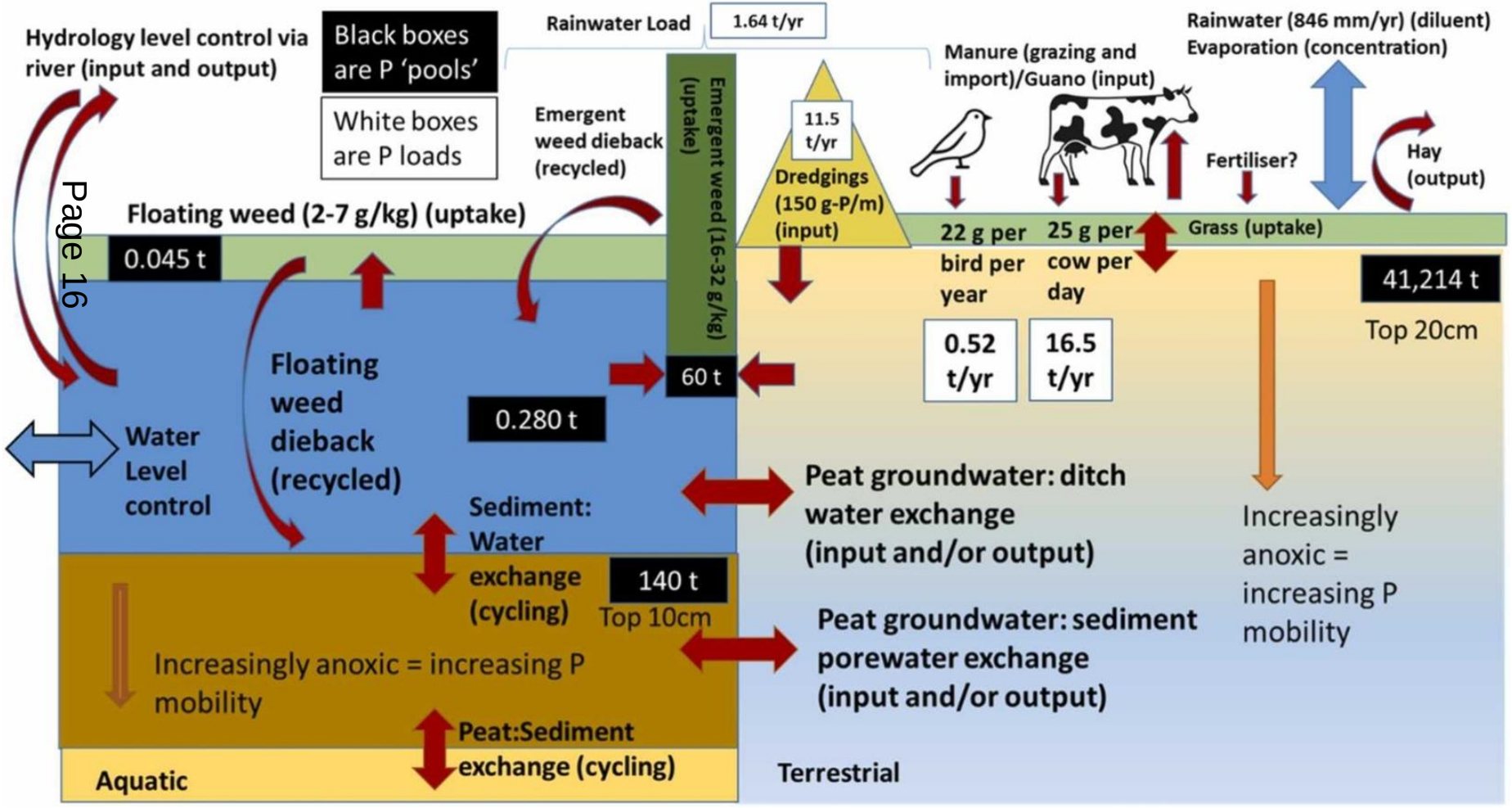


Aquatic phosphorus behaviour within a UK Ramsar wetland: Impacts of seasonality and hydrology on algal growth and implications for management

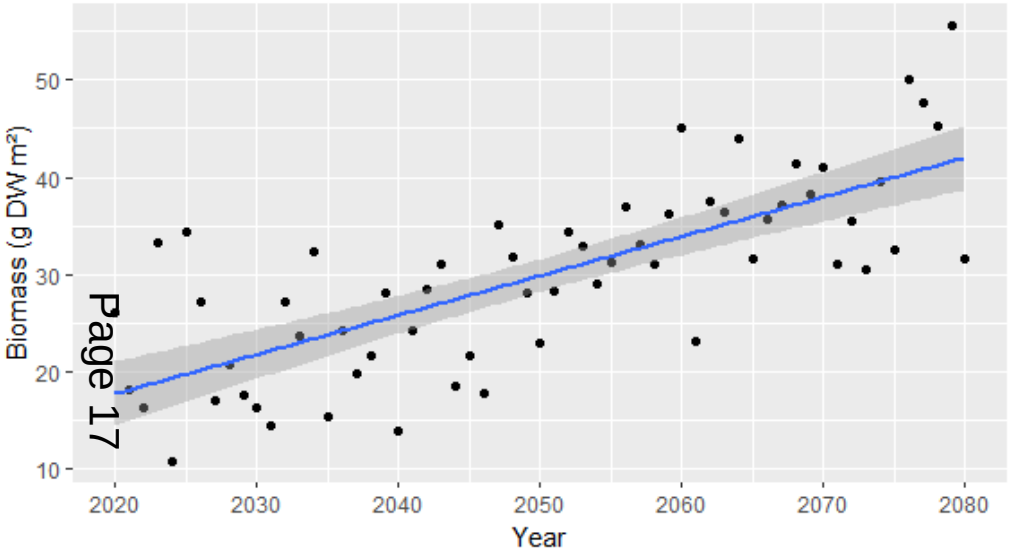
Ry Crocker, William H. Blake, Thomas H. Hutchinson, Sean Comber

https://www.sciencedirect.com/science/article/abs/pii/S0048969723032278

Phosphorus inputs and reservoirs estimated to exist within West Sedgemoor



Effects of climate change on duckweed growth



Predicting *Lemna* growth based on climate change and eutrophication in temperate freshwater drainage ditches

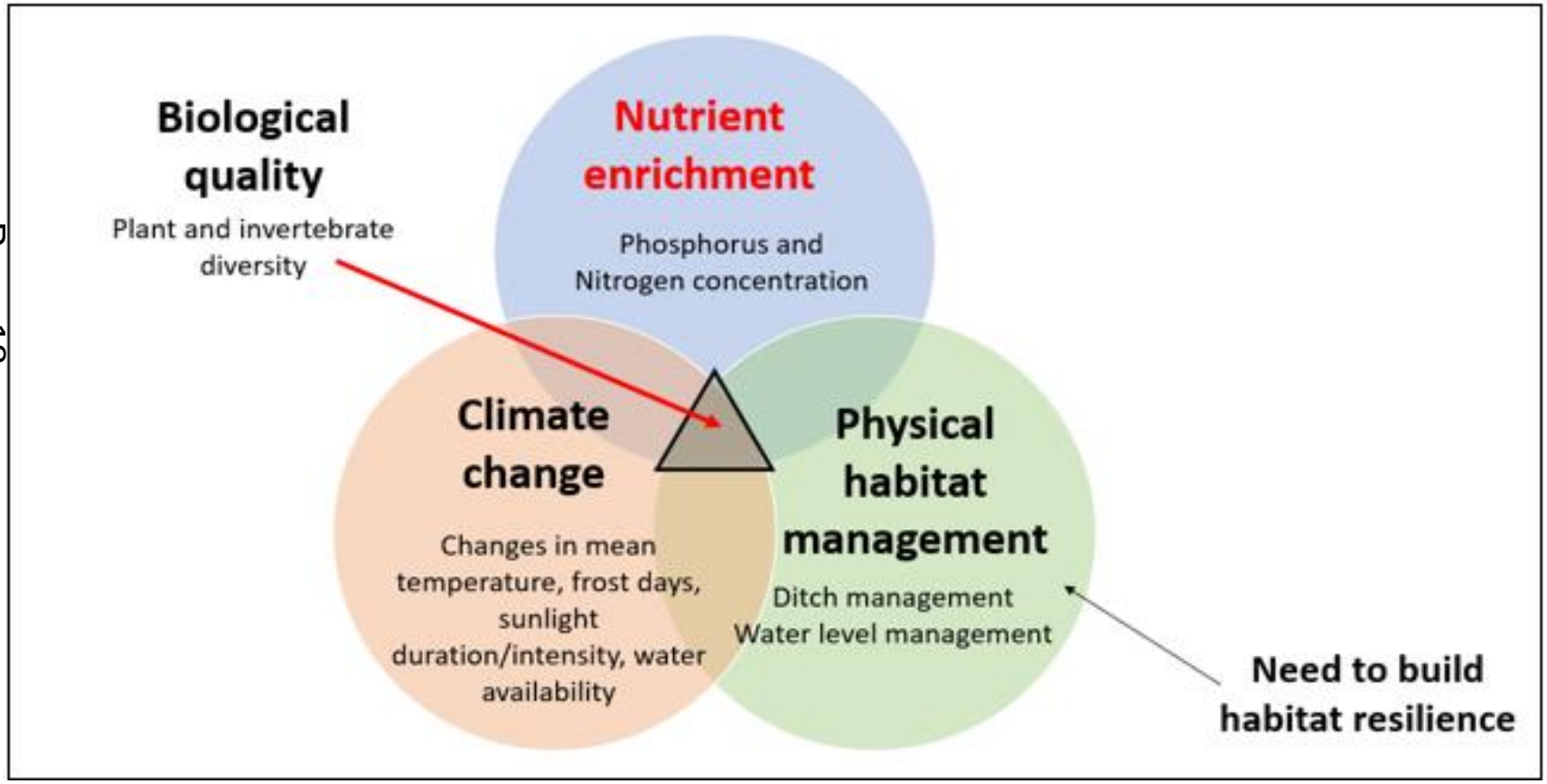
Jared Feller · Mark Taylor · Paul Henry Lunt

https://link.springer.com/article/10.1007/s10750-024-05477-7

Using the simulated data, the model predicted an **83% increase** in biomass from the 2020's to the 2070's if nutrients do not change.

To offset the impact of climate change on duckweed biomass, nutrient levels will need to **decrease by more than 50%** by 2080.

The need for a holistic approach



Interactions that determine the biological quality of ditches on the Somerset Levels and Moors – appropriate site management is critical to mitigating negative effects, as well as reducing the nutrient inputs

An integrated approach to restoration

Reduce inputs at source – nutrient load entering the system must be reduced

Reduce pollution pathways – slow the flow of water, reduce soil loss, increase nutrient interception

Manage the floodplain and designated sites more sustainably – increase ecological resilience and export of nutrients

Our overarching goal is a resilient, healthy, freshwater wetland ecosystem within the SLMs floodplain

Implement remediation actions where adequate evidence and mechanisms exist

Address information gaps and develop novel approaches (test and trial)

Wider benefits – importance of water for people and nature

Soil conservation

Sustainable flood and water level management

Farming resilient to climate change

Peat restoration

Carbon sequestration

Improved drinking water resources

Enhanced and resilient biodiversity

Enhanced recreational opportunities

A way forward

- Reduce nutrient inputs, driven by existing legal requirements and based on balance of evidence. Environmental Improvement Plan targets:
  - *Reduce phosphorus loadings from treated wastewater by **80% by 2038** against a 2020 baseline, with an interim target of **50%** by 31 January 2028.*
  - *Reduce nitrogen, phosphorus and sediment pollution from agriculture into the water environment by at least **40% by 2038**, compared to a 2018 baseline, with an interim target of **10%** by 31 January 2028, and **15%** in catchments containing protected sites in unfavourable condition due to nutrient pollution by 31 January 2028*
- Provide further support and advice to the farming community and consider new schemes (e.g. manure export schemes)
- Continue to develop our understanding of key sources of nutrients – their relative proportional contributions and pathways to the designated sites – to inform ongoing actions
- Trial new approaches to export nutrients from the designations (e.g. paludiculture, green harvesting)
- Trial modifications to drainage channel and water level management
- Trial new wetland habitat outside of the ditch network

Work happening now

- Ongoing research by academia (Universities of Plymouth and Lancaster) and Citizen Scientists (e.g. Dr Andrew Clegg)

- PR24 schemes and investigations led by Wessex Water (PR29 including Levelling Up and Regeneration Act requirements)

- New agri-environment scheme options and pilot projects (eg. FWAG / RSPB-led Paludiculture Exploration Fund)

- Landscape Recovery projects – Greater Sedgemoor Landscape Recovery Project (Round 2 – led by RSPB) and Adapting the Levels (Round 1 – led by Somerset Wildlife Trust)

- NE have produced a framework to guide the restoration of the Somerset Levels and Moors which will be shared to facilitate and structure discussion of the proposed Technical Advisory Group

Proposal for a SLMs Nutrient Technical Advisory Group

- The purpose of the proposed group is to:
  - review available evidence and data to help consolidate our current understanding on sources of nutrients, exposure pathways, remediation actions, identify key knowledge gaps
  - better co-ordinate ongoing relevant investigations and research
  - agree and implement key further investigations that are required

- We have in principle support from Wessex Water and the Somerset Catchment Partnership (SCP).
- The SCP has indicated that they are happy for the group to sit as a subgroup of the main SCP. Funding will need to be secured to enable SCP to provide secretariat services
- Academics with relevant expertise already engaged with research on the SLMs will be invited on to the group over the coming months, along with technical representatives from local partners
- Terms of Reference to be agreed with SCP

Thank you for listening

Questions?

Phosphate Load in the Parrett-Yeo system

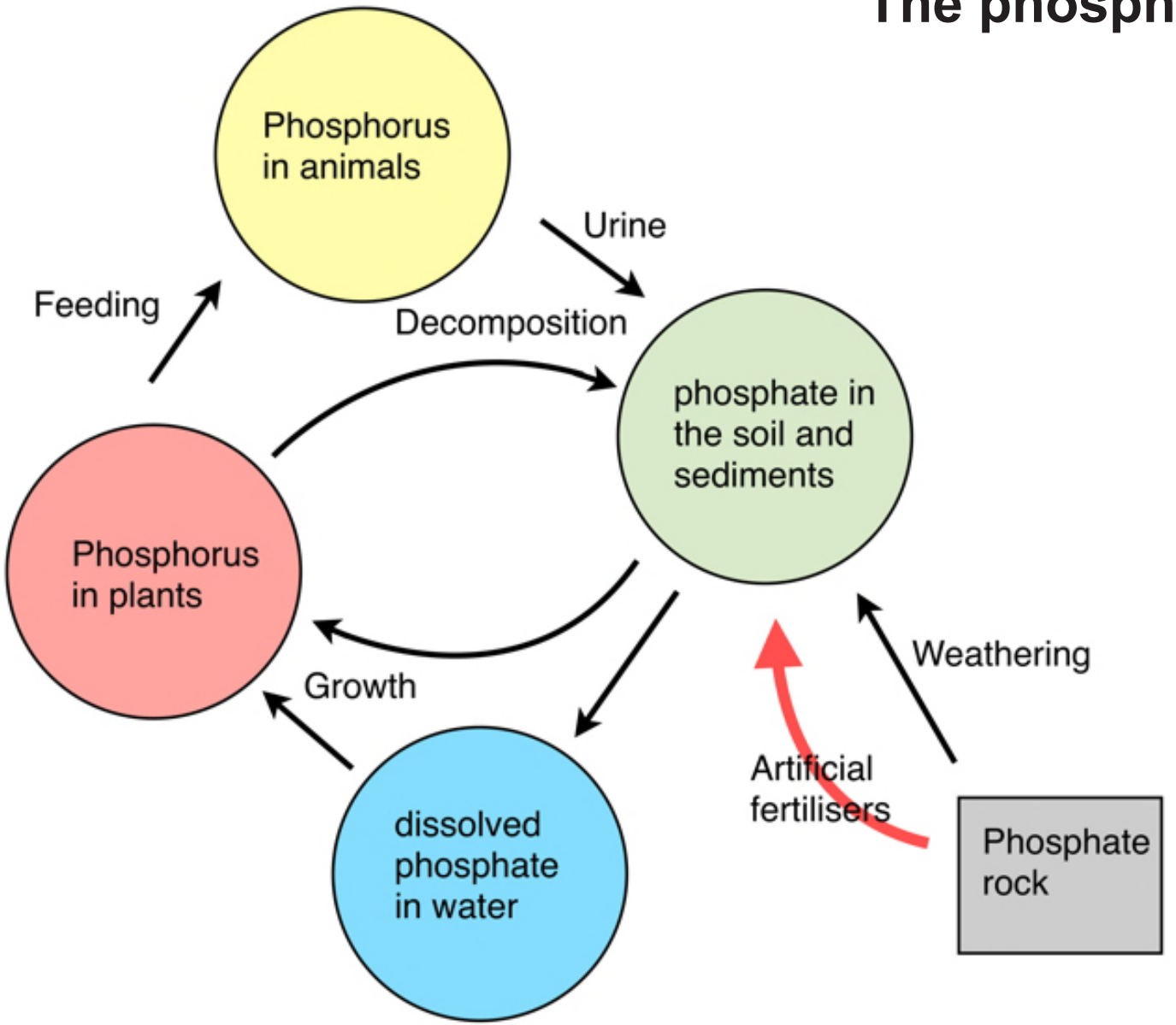
Andrew Clegg

Acknowledgements

- Natural England, Wessex Water, RSPB, Internal Drainage Board and the Environment Agency for help and advice with the science, the research processes, data collection and management
- Wessex Water for Total P sample analysis
- The Parish or Town Councils of Langport, Huish Episcopi, Martock, Merriott and Haselbury Plucknett for their support and encouragment
- My group of colleagues in Langport and Huish for help with sampling

April 2024

The phosphorus cycle



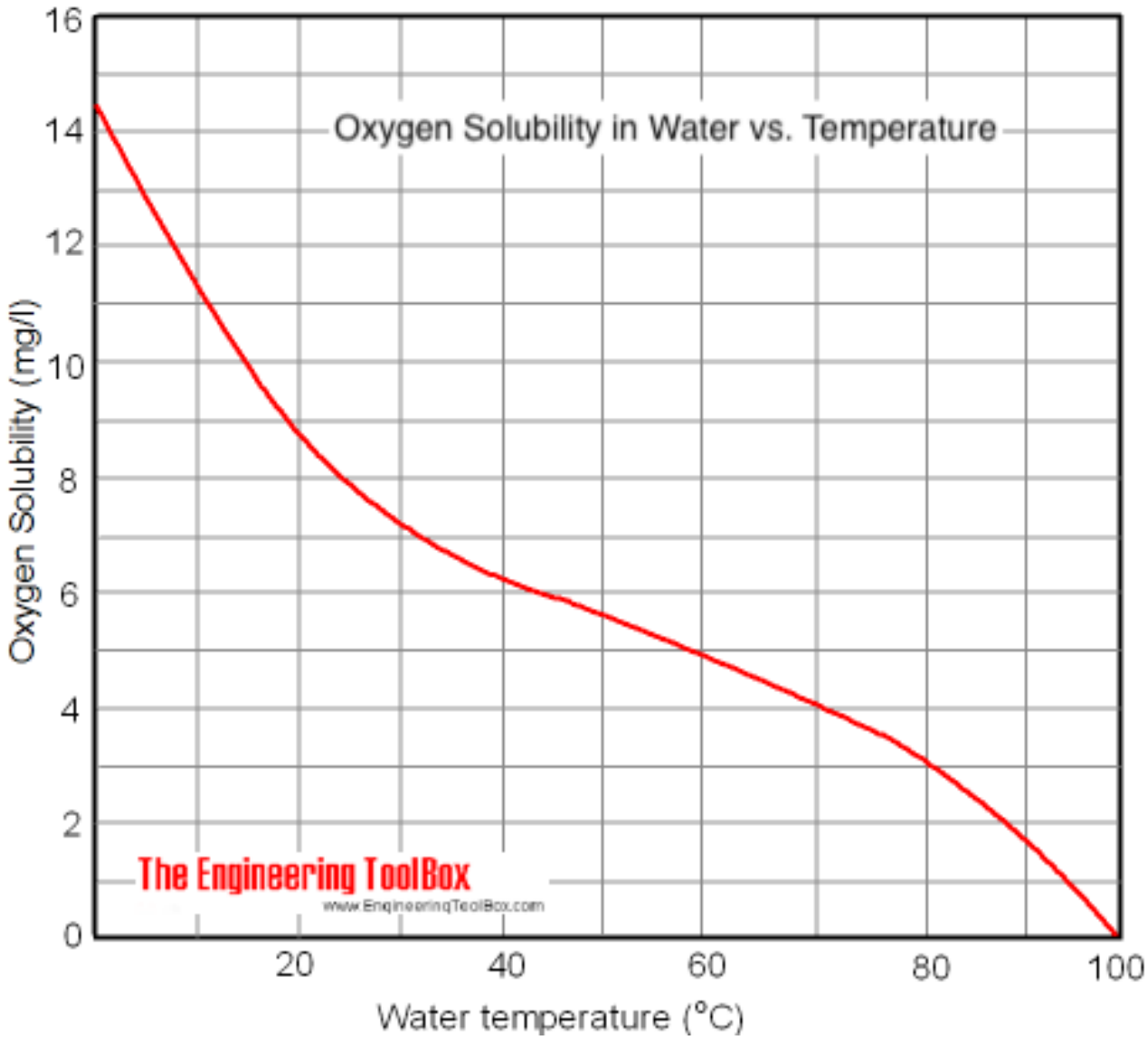
The solubility of oxygen in water

The solubility of gases in water decreases with temperature

(not like sugar in your tea)

Water organisms find it increasingly hard to survive as the water warms.

They need the help of under-water plants to make oxygen in the water during the day



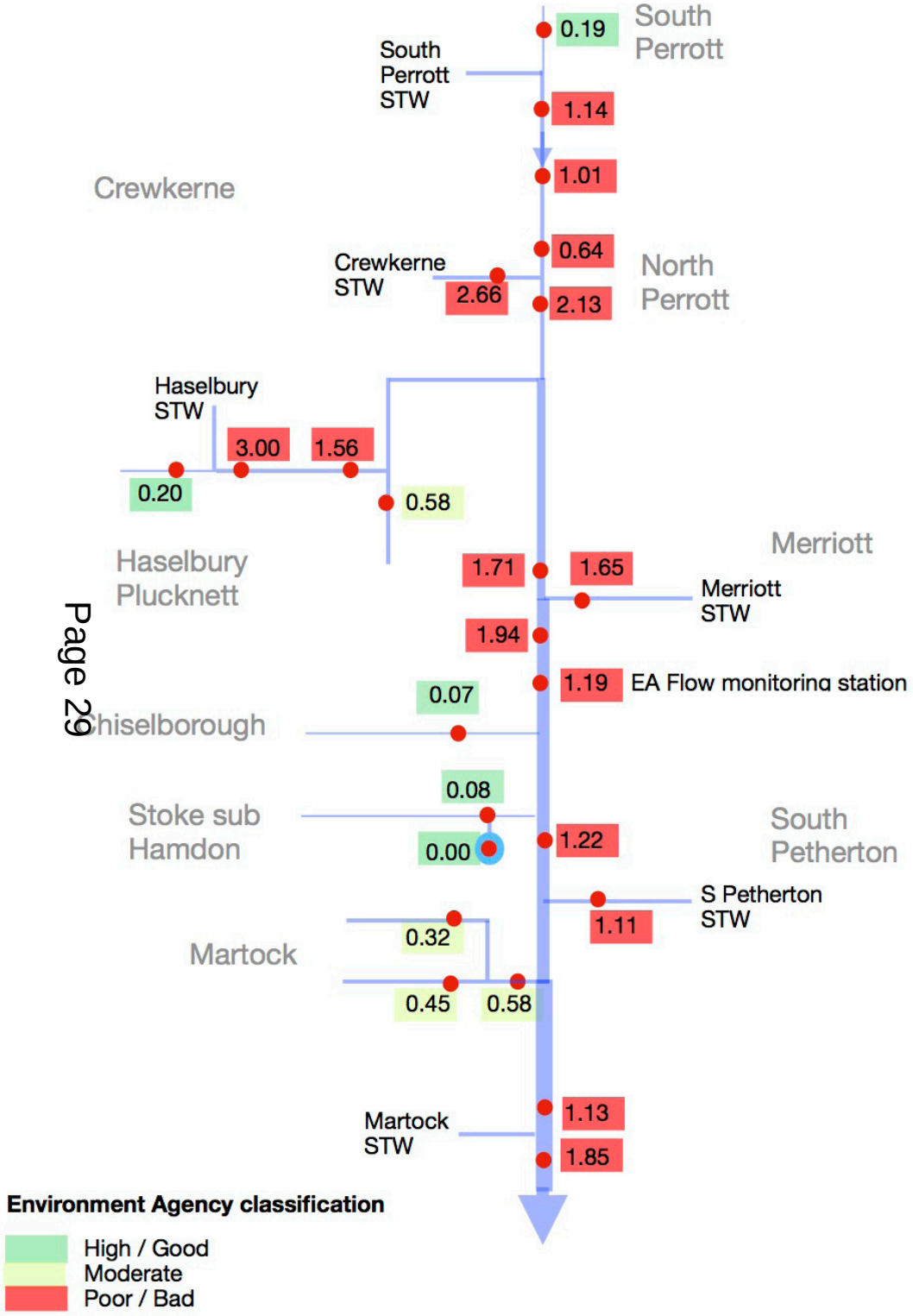
Stourhead Lake, July 2018

Blanket alga growing in nutrient-rich water prevents light from reaching underwater plants

The water and organisms underneath are starved of oxygen

Caused by a prolongued period of hot weather with no rain and little air and water movement

Made worse when the alga dies and uses oxygen when decomposing (eutrophication)



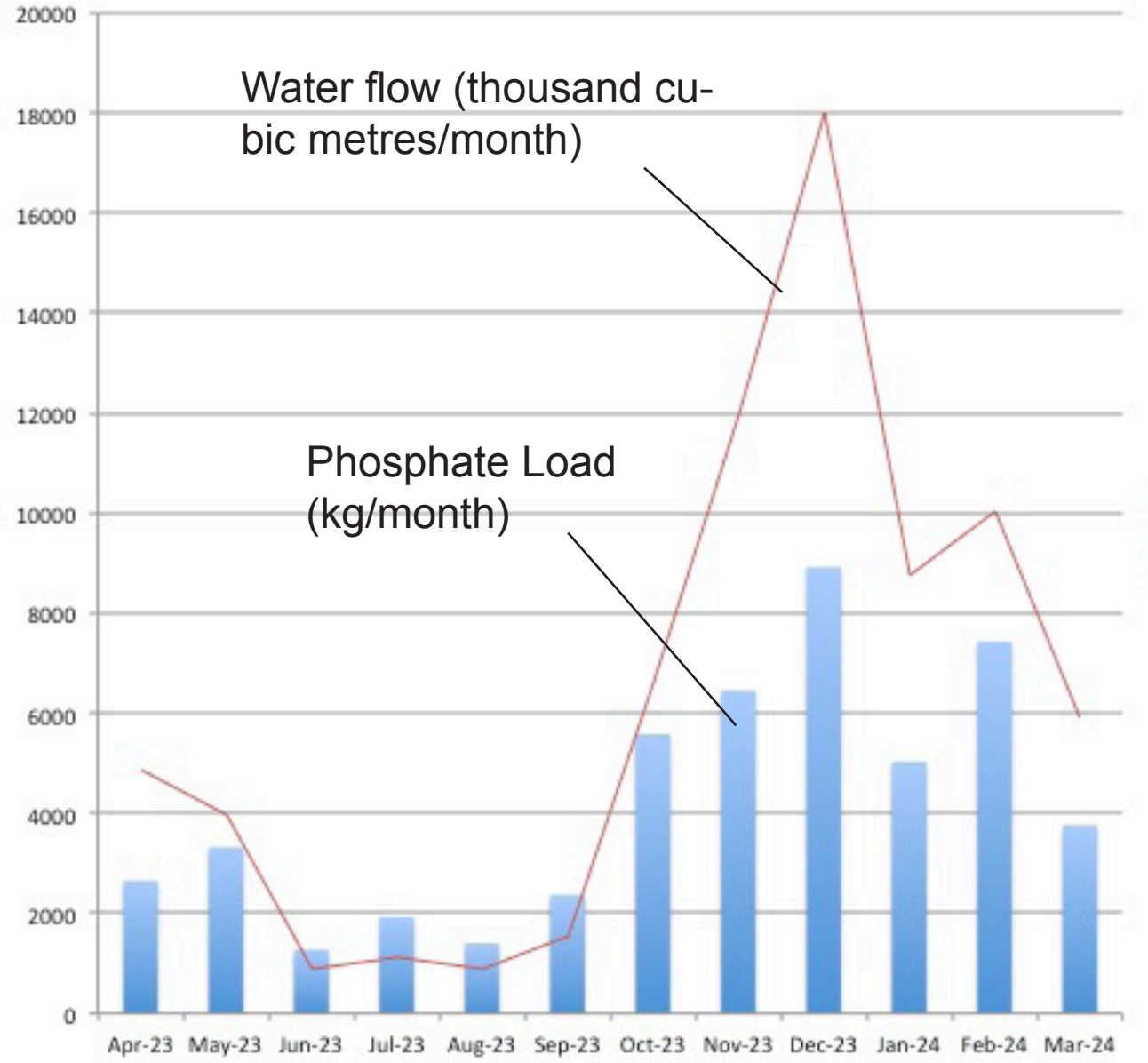
River Parrett - summer 2022 drought

- Almost all the water and phosphate (red) came from sewage treatment outflows

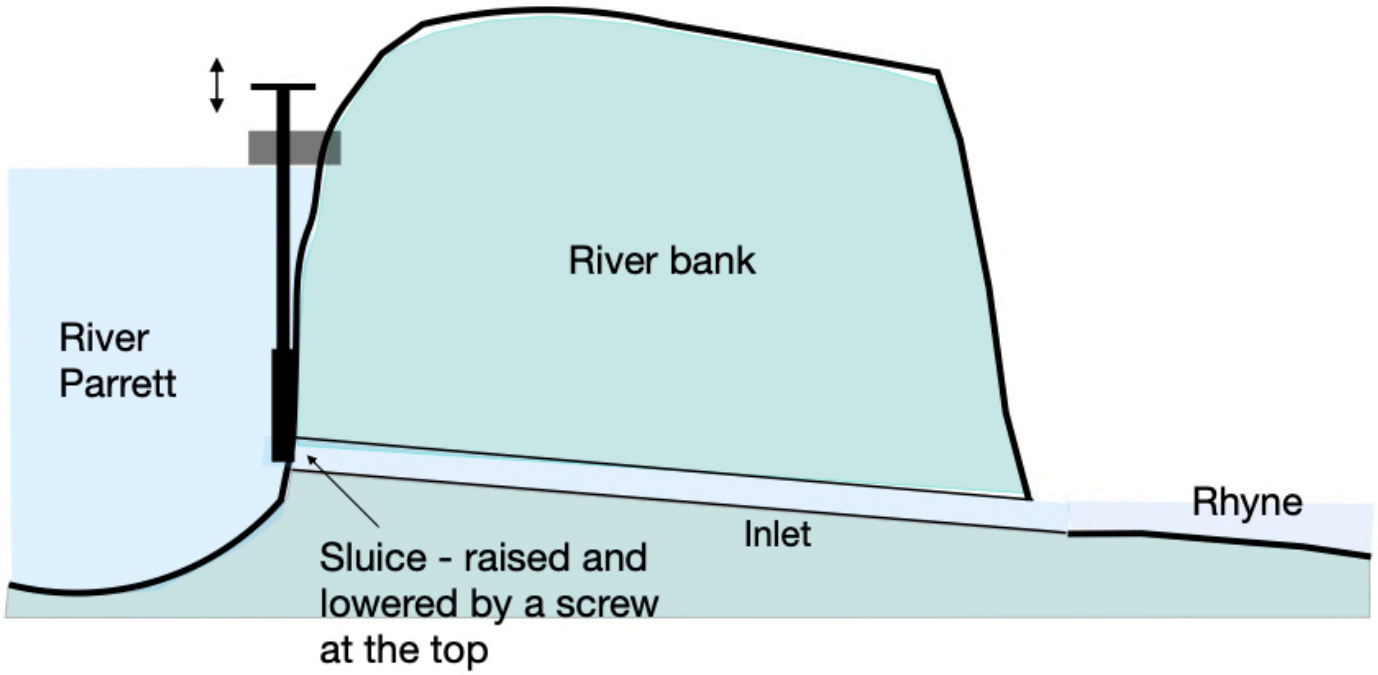
Phosphate load at Chiselborough EA monitoring station, May23-Apl24

Load = Concentration x water flow

During winter floods the concentration of phosphate remained constant at around 0.5ppm but the flow rate varied as much as 50 times



Summer Inlets from the Parrett to the Moors



Some approximate statistics

- **2.** Usual number of working inlets per Moor
- **160 000 kg**. Annual Parrett-Yeo phosphate load
- **30 kg**. Annual inlet phosphate load
- **99%**. Proportion of Parrett phosphate reaching the Bristol Channel annually

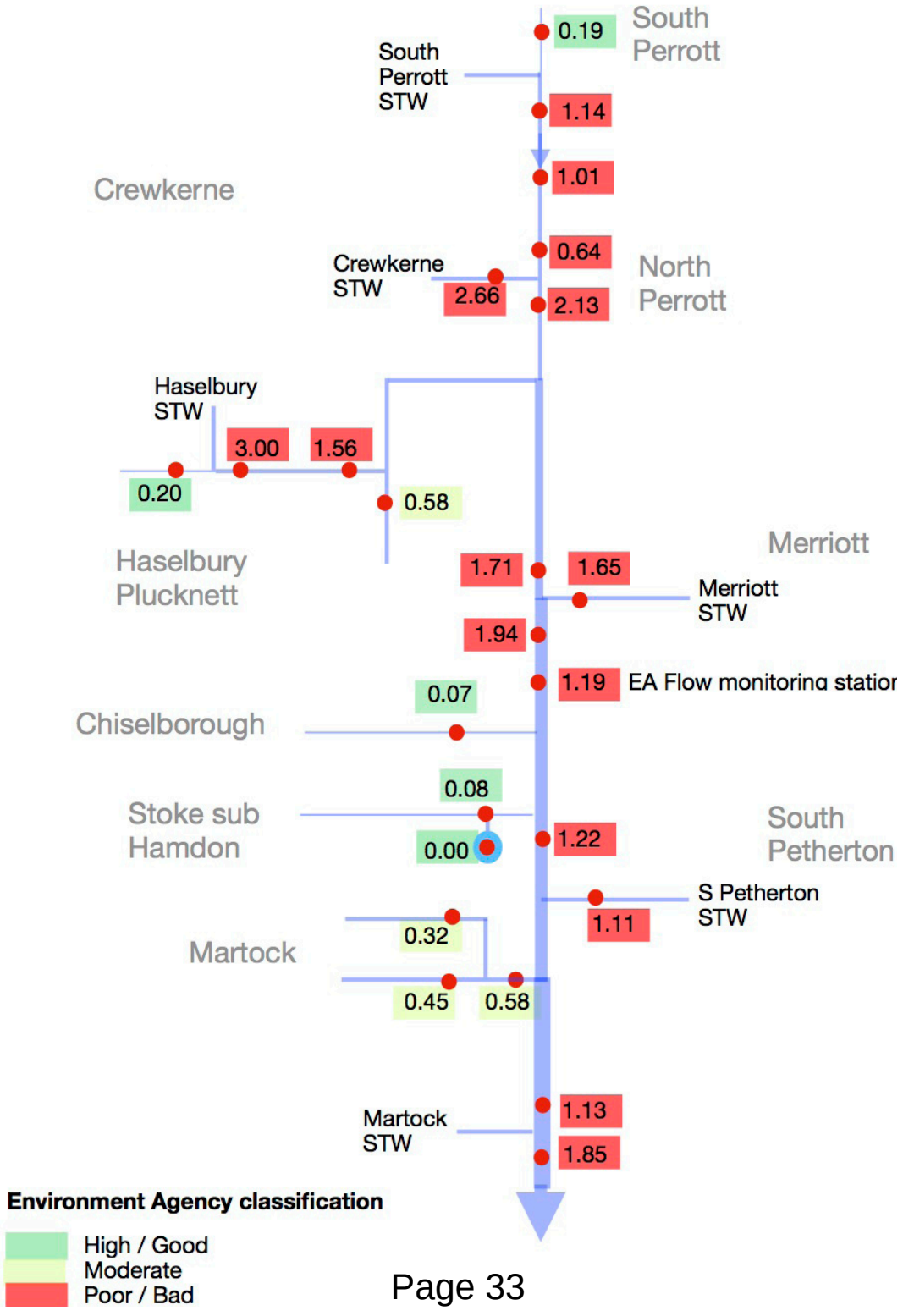
Thank you for your attention

Ash and Martock Nature - Phosphate Survey

Report 6

Parrett midsummer snapshot, June23

We have had a period of dry weather and the Parrett flow, measured by the Environment Agency at Chiselborough has reached a usual summer low of around 0.4 m^3/s. A survey was carried out on June 21/22 of the whole river from South Perrott to Gawbridge near Martock where it begins to enter the Levels between artificially raised banks. The results are shown (in mg/l) in this schematic diagram of the Upper Parrett. They are colour coded based on the Environment Agency classification



The samples were taken, access permitting, up and downstream of significant confluences. The flow rate was low, about 0.3m3/s at the EA station at Chiselborough bridge. Most of the flow was generated sewage treatment plant effluent. The picture is very similar to that of the survey carried out in the summer of 2022.

The values shown for phosphate concentration are mg/litre (or ppm) phosphate (PO_4, not P). The table below shows the Environment Agency categories for the West Sedgemoor Parrett. Note that the diagram shows phosphate concentrations and not elemental phosphorus concentrations which is now the national academic standard. We have not adopted this standard yet as our US-made colorimeters are calibrated in phosphate units.

EA Category	**Phosphate concentration (mg/l, PO_4). Used in this report.**	**Elemental phosphorus concentration (mg/l, P). Used by EA**
High	< 0.15	< 0.05
Good	0.15 - 0.27	0.05 - 0.09
Moderate	0.28 - 0.66	0.10 - 0.22
Poor	0.67 - 3.33	0.23 - 1.11
Bad	> 3.33	> 1.11

Conclusions

1. The main source of phosphate, by far, is Sewage Treatment Plants (STWs), none of which, in the Parrett catchment, have phosphate removal stages.
2. In between injections of phosphate by STWs, the concentration in the river gradually falls, suggesting routine absorption by river plants and sediment.
3. There is some evidence of agricultural phosphate in streams such as Broad Brook, at Frog Lane in Haselbury, and the streams through Martock, but these are classified as moderate.
4. There is no evidence of significant agricultural point source phosphate (this has been seen in the past from a farm near Haselbury Plucknett).
5. A caveat. The test does not reveal organic phosphate–phosphate chemically bound to organic compounds–which we know exists but cannot detect or assess.

Phosphate flow through the Chiselborough EA Station

The EA station at Chiselborough - roughly in the centre of the diagram - collects real-time data of the flow rate[1]. Measuring the concentration at the station allows the calculation of the phosphate flow rate there; it is currently about **40kg/day**.

This seems to be a baseline value below which the river does not fall and, as such, probably represents the input from the Parrett STWs as this must be assumed to be fairly constant through the seasons and be independent of weather conditions.

The river is being sampled for phosphate weekly at the EA station and the concentration of phosphate varies little over time. This means that the phosphate flow rate mirrors the river flow rate and varies by an order of magnitude according to the weather. The source of the phosphate in the sediment is debatable but this survey suggests that at least some, and probably most, is additional phosphate from STWs. This issue will be looked at in greater depth in Report 7.

Andrew Clegg
3/7/23

1 http://environment.data.gov.uk/hydrology/explore

Ash and Martock Nature - Phosphate Survey

Report 9

Parrett phosphate load. April 2024

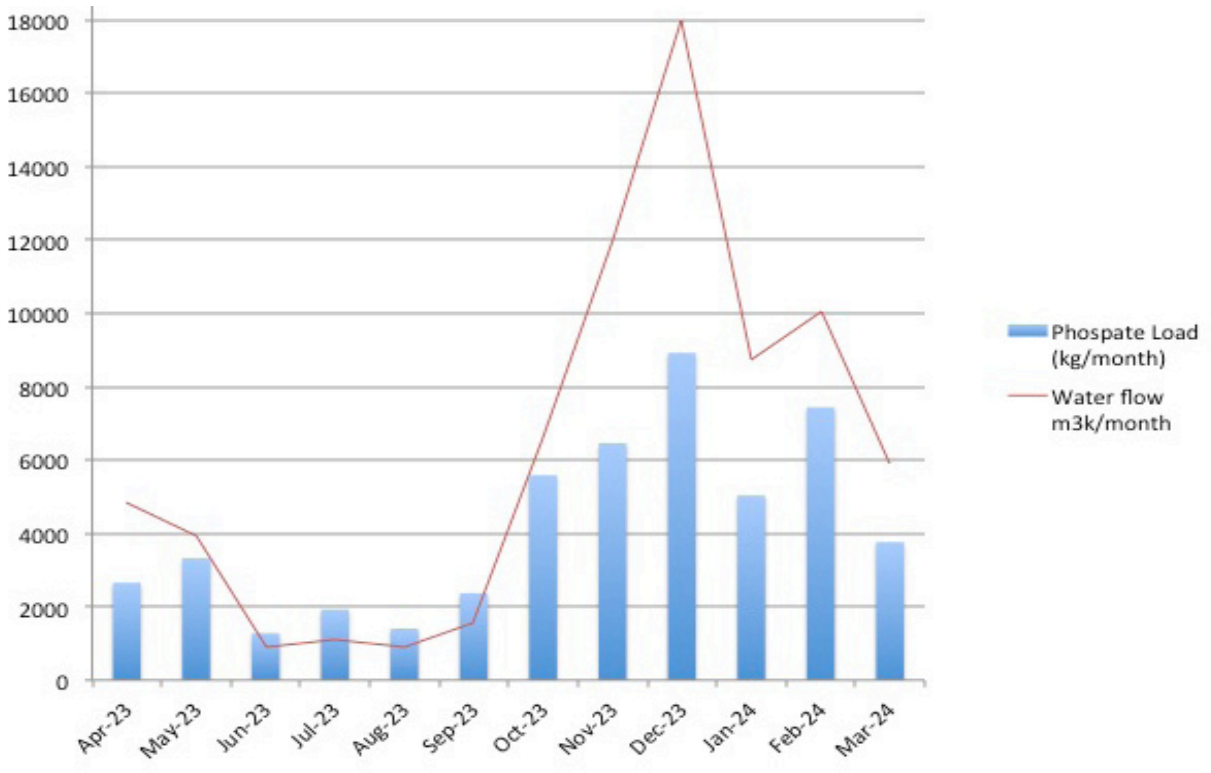
Knowing the concentration of phosphate in a watercourse does not tell us how much phosphate is flowing along it. To find that we also need to know the flow rate of the water. How much phosphate is flowing is called the phosphate load (for a definition of 'phosphate', please see endnote).

This paper looks at two ways of measuring the river Parrett phosphate load, one at the EA monitoring station at Chiselborough, roughly half way along its course, and the second at inlets from the river to Somerset Moors.

1 Phosphate Load at Chiselborough EA station April 2023-March 2024

The Environment Agency (EA) has an online automatic flow rate monitoring station on the Parrett at Chiselborough, about half way down its flow. Phosphate concentrations were checked weekly at this point and the daily average flow rates provided by the EA were used to obtain average monthly phosphate loads in the Parrett at Chiselborough.

Results for the year April 23-March 24 are shown below, the bars show monthly phosphate load in kilograms and the line indicates the change in river flow (thousands of cubic metres)



Noteworthy points emerging from these data are:

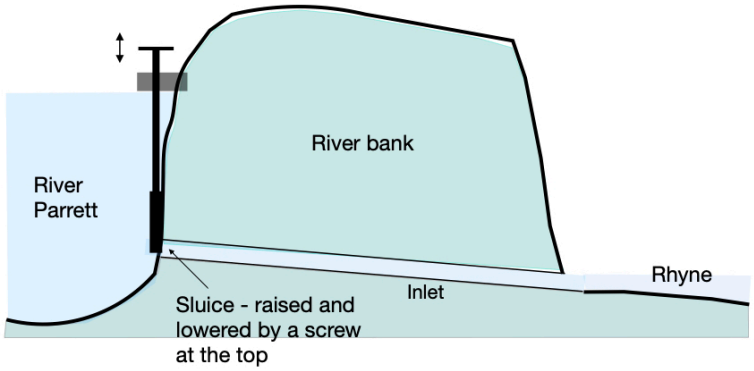
1 The summer phosphate load is fairly constant at about 40kg/day. Because land ditches were dry, the flow was almost entirely due to outflows from sewage treatment plants and this phosphate came almost entirely from households.

2 There is a dramatic rise in phosphate load in winter to about 4x the domestic output. This raised the question of where did the excess come from?

3 The phosphate concentration (in contrast to the load) was remarkably constant throughout the year albeit somewhat lower in winter than summer. This suggests that the main source of the excess winter load was mobilisation of phosphate in the river sediment. The original source of this 'legacy' phosphate remains unclear.

2 Phosphate load movement from the Parrett to the Moors

Under ideal conditions the Parrett flows in a channel above the Levels Ramsar site to the sea with a small controlled amount of water entering individual Moors through manually operated inlets during the summer season. They are controlled by the Internal Drainage Board. No water normally flows from the Parrett to the Moors in winter. Almost all the water flowing into each Moor comes, not from the Parrett, but from local higher land.



How Moor inlets work

This sketch shows a Moor inlet though the raised bank of the river. The inlet pipes tend to be about 30 cm in diameter but only a small segment is usually opened; 2 to 5 cm high, less than one fifth of the pipe diameter.

There are typically one to three inlets controlling the flow onto each Moor.

How much of the Parrett phosphate flows through the Moor inlets?

The inlet flow–and hence the inlet phosphate load–is determined solely by the cross section area of the opened sluice and the head of water (the depth of the sluice below the river surface). This is easily and accurately calculated and a Excel tool for doing so can be downloaded[1]

Here are results typical of West Sedgemoor (two inlets)

	Winter (Oct-Mar)	Summer (Apr-Sep)	Whole year
Total river phosphate load (kg)	140 000	50 000	190 000
Total inlet phosphate load (kg)	0	72	72

See endnote

The proportion of the total river phosphate load entering the Moors through each inlet is insignificant, less than 0.02% of the overall river load. We can reasonably assume perhaps 10 operational inlets over the total course of the Parrett. This leaves the remaining 99.8% of the Parrett phosphate to flow uninterrupted across the Levels between high levees, direct to the estuary.

3 The impact of flooding on Levels phosphate load

This is a complex issue currently being investigated further. Initial observations suggest that flooding may be effective at removing accumulated phosphate from the Moors through a process of mobilisation of accumulated soil phosphate by the floods, followed by supplemented pumping.

Andrew Clegg, April 2024

Technical endnote. 'Phosphate' in this report, refers to the phosphate ion (PO_4^{3-}). To convert data to elemental phosphorus, divide by 3.06.

1 The inlet tool can be downloaded from http://www.somersetlevelsphosphate.org.uk/2022Data/2022%20Surveys.html