

Ash and Martock Nature - Phosphate Survey

Report 9

Parrett phosphate load. April 2024

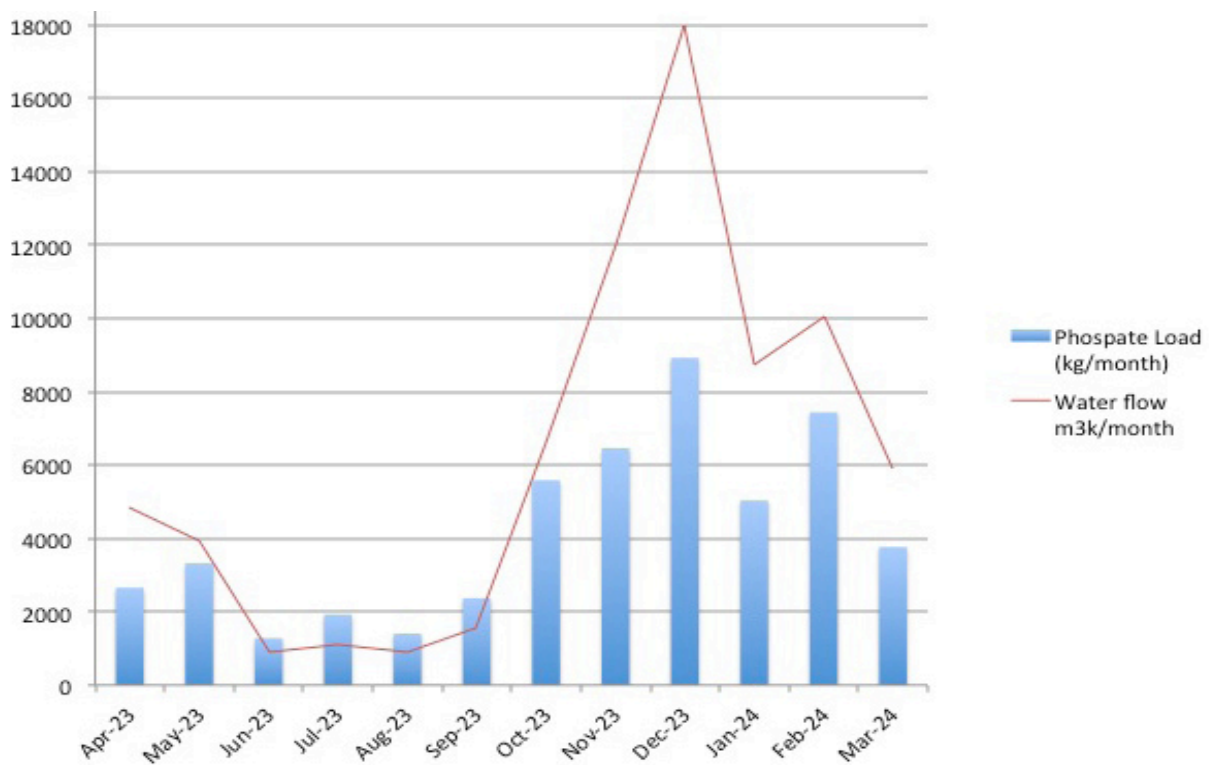
Knowing the concentration of phosphate in a watercourse does not tell us how much phosphate is flowing along it. To find that we also need to know the flow rate of the water. How much phosphate is flowing is called the phosphate load (for a definition of 'phosphate', please see endnote).

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)



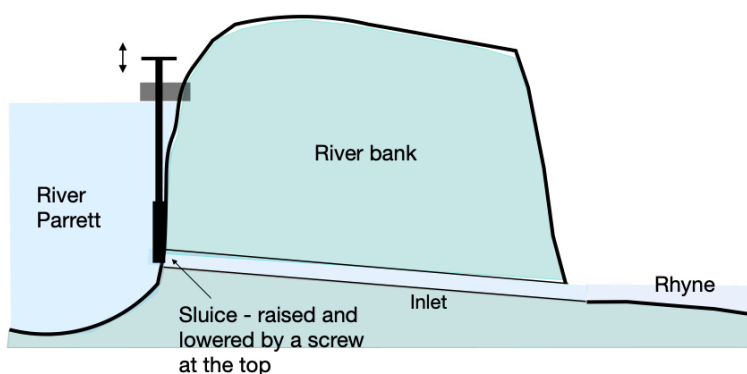
Noteworthy points emerging from these data are:

- 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 through 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 downloaded¹

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>