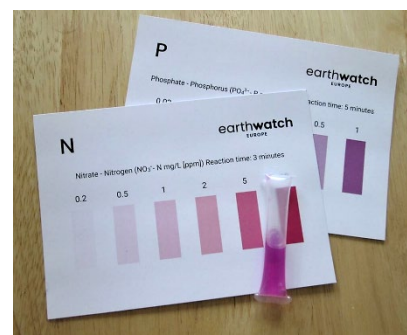


What are nitrates and phosphates?

Nitrates and phosphates are natural components of the nitrogen and phosphorus cycles in our environment. As nutrients, they are essential for plant life and thriving freshwater biodiversity. Natural concentrations of these two nutrients can vary due to climate, hydrology, vegetation and mineral composition of soil and rock.

Nitrate ($\text{NO}_3\text{-N}$) is the form of nitrogen most commonly found in soil and fresh water. Aquatic plants absorb nitrate, which is produced naturally by bacteria during an oxidising process known as nitrification. In a healthy waterbody, the amount of nitrogen used by plants is balanced by the capture of atmospheric nitrogen in soil or water by nitrogen-fixing bacteria.

In the UK, a common guideline for ecologically impacted surface waters is 1.0 mg $\text{NO}_3\text{-N/L}$. Polluted freshwater bodies showing high concentrations above 10 mg $\text{NO}_3\text{-N/L}$ are where preventative measures need to be taken.



Phosphate ($\text{PO}_4\text{-P}$) is naturally rare in freshwater environments, however artificial sources of phosphate are often found in fertilisers and our domestic wastewater. Run-off from agricultural land, soil erosion, and improperly managed sewage treatment works can have devastating effects on the health of our waterbodies.

Government guidance recommends that rivers should not exceed annual mean phosphate concentrations of 0.1 mg $\text{PO}_4\text{-P/L}$. Readings that are above 1 mg $\text{PO}_4\text{-P/L}$ evidence severely compromised freshwater.

Why are high levels of nitrates and phosphates such a problem?

Despite being natural components in our environment, too much nitrate or phosphate can cause excessive algae and plant growth. The dominance of specific species can drastically change the delicately balanced functioning of the ecosystem and the optimum habitat conditions for aquatic life. Most importantly, when this algae and excess vegetation dies, the bacteria that degrade the vegetation through decomposition end up consuming a large quantity of oxygen from the water. The result of these reduced oxygen levels is known as the process of 'eutrophication', where fish and other freshwater species can no longer survive.

Agricultural practices and incomplete treatment of sewage are still considered to be the main contributors of water pollution in UK waterways, despite efforts made by catchment management programmes to reduce fertiliser use, increase application efficiency, reduce run-off, and efforts to improve wastewater treatment.

How can the situation be improved?

Improvements in the management of agricultural fertilisers and urban wastewater treatment will make a huge difference. 'Catchment-based approaches' are favoured, as they involve partnerships between local governments, River Trusts, water companies and local communities making decisions together, using combined local knowledge and expertise. This tackles the drivers of pollution at their source.

A community-based approach is able to evaluate the impact of management practices, using valuable citizen science and dedication of volunteers on the ground, whether it's through regular monitoring of a small river restoration project or measuring the impact of a larger catchment-scale enhancement plan.

These solutions require **robust data** to make **evidence-based decisions** and to inform policy changes, and that is where FreshWater Watch volunteers continue to play an essential role.