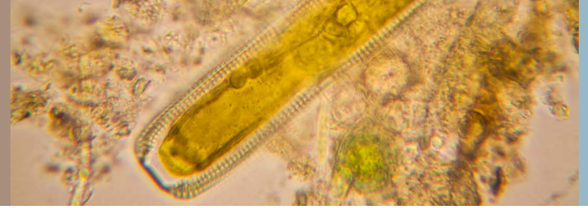

Opportunities for Policy and Practice

Different sources of freshwater pollutants have different impacts on freshwater life. Some, such as slurry, can have multiple impacts at one site. Pollutants can interact with each other creating a more complex picture which we need to untangle. Consequently, we need to use as much evidence as we can to make a confident assessment of the sources of issues that diffuse pollution imposes on freshwater organisms.

Key messages:

- Some tools for monitoring freshwater life are more reliable than others.
- The recovery of biological life in the watercourses can be rapid, but only to a point.
- The extent of the damage determines the speed at which the freshwater life can recover.
- The biological and chemical components of freshwaters differ in the length of their recovery period from a pollution event.

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Further Resources

Collins, AL, Haygarth P, Barker P, Hiscock K, Lovett A, Lloyd CEM, Freer JE, Johnes PJ & Jones JI (2015) Summary of emerging evidence from the Demonstration Test Catchments (DTC) Platform. Defra.

Acknowledgements

The Demonstration Test Catchment (DTC) project (Defra projects WQ02010, WQ2011, WQ02012 and LM0304) is a multi-partner collaborative research programme comprising academics, farmers, industry experts, environmental organisations and policymakers. DTC explores solutions to improving water quality in agricultural landscapes. The effects of different mitigation measures have been monitored from 2010/11 - 2017 in four river systems: Eden (Cumbria), Avon (Hampshire, Wiltshire), Wensum (Norfolk) and Tamar (Devon/Cornwall). As these catchments represent major UK soil/rainfall combinations found on typical English and Welsh farms the data collected from this work can be applied to other locations.

Waterlife vectors created by Freepik.

Demonstration
Test
Catchments

More Information

Visit: **www.demonstratingcatchmentmanagement.net**

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Demonstration
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SCIENCE, POLICY AND PRACTICE NOTE 3

Assessing the impacts of pollutants on freshwater ecology

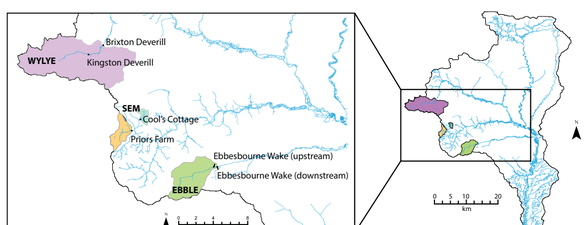
2019SS0009

The issue

Freshwater pollution, in the form of organic matter, nutrients, sediments and other contaminants, can create multiple pressures on freshwater life. As freshwater flora and fauna can respond in a similar way to several different pressures, it can be difficult to separate out which of these individual or collective contaminants are responsible for any impacts. To make things more complicated, one pollutant can cause several problems. For example, slurry entering water courses acts as organic pollution by removing oxygen from the water and suffocating water life. The slurry particles also create sediment, another pollutant. As the slurry breaks down, it releases additional pollutants in the form of nutrients, which have detrimental effects on freshwater organisms. Consequently, interpreting changes to the ecology of rivers in order to identify the cause of problems is challenging, as the effects of measures to mitigate one pollutant may be masked by the impact of other water impurities.

Our work has highlighted that more corroborative evidence is needed, that incorporates a greater understanding of how different pollution stressors interact and the subsequent impact this has on freshwater life. This will enable a more accurate interpretation of how pollution from agriculture causes changes in freshwater fauna and flora.

Recent research involving survey data from the Demonstration Test Catchments (DTC)



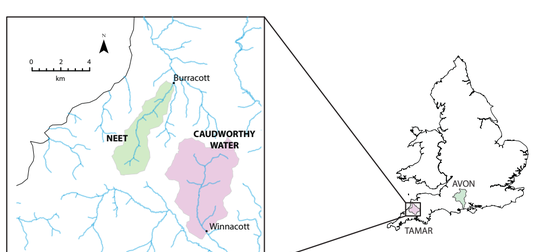


Figure 1: Monitoring sediment and nutrient pollution in the River Avon and Tamar DTCs. These sites reflected different farming practices and soil types: intensive cereal cropping/mixed farming on chalk soils (Avon) and intensive livestock/mixed farming on clay soils (Tamar).

Why monitor freshwater ecology?

Between 2010-2019, our monitoring programme assessed how freshwater flora and fauna respond to changes in agricultural diffuse pollutants. Society gains a variety of benefits from the natural environment. By monitoring the freshwater ecology which includes the plants and animals, we can understand the health or condition of the environment and its ability to provide these benefits. Regularassessment of the freshwater ecology also provides anintegrated measure of the impact of pollutants over time. This is particularly useful if pollutants arrive in a pulse. With chemical measurements, unless we catch the pulse we will not know it happened, but it will leave a lasting mark on the ecology. The plants and animals we monitor respond to a wide range of pollutants, not just those we measure with standard techniques. If there is a problem, it will show up in the ecology. The challenge is to understand what is causing the problem.

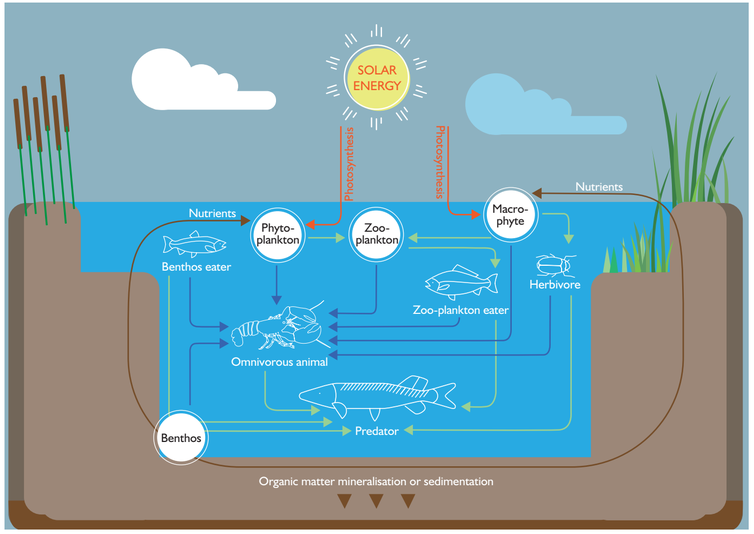


Figure 2: Ecological interactions in freshwaters.

What we learnt

- **Some tools for monitoring freshwater life are more reliable than others.** Some tools are influenced by factors other than the pollutants they are supposed to measure. Consequently, they require additional observations to support their conclusions. A more holistic approach is required that incorporates a range of different parameters. We also need to be clearer about what we are trying to measure and how we do this.
- **The recovery of biological life in the watercourses can be rapid, but only to a point.** After this, the rate of recovery will depend on the characteristics of the surrounding landscape. For example, freshwater invertebrates are most sensitive to low levels of oxygen in the water. Given the right conditions, the invertebrates can recover from low oxygen in as little as two weeks. Subsequently, the level of recovery is more complex as it is dependent on how quickly organisms can recolonise the site from elsewhere.
- **The extent of the damage determines the speed at which the freshwater life can recover.** If the surrounding landscape has suffered significant environmental damage, the recovery of biological life will be much slower compared with a landscape that still retains some of its natural flora and fauna.
- **The proximity of the environmentally damaged area to other water resources with freshwater life, is important.** Sites that are close to clean or less polluted water resources are described as 'well connected', particularly if there are routes for organisms to travel along. Because they are close to other populations, freshwater species can move into the previously damaged water course once conditions for supporting life have been obtained.
- **The mobility of the species is also important.** Insects that can fly can move to new habitats much more quickly than plants that are dependent on other mechanism for transport (wind, flowing water or animals).
- **The biological and chemical components of freshwater differ in the length of their recovery period from a pollution event.** Because of the need for species to recolonise damaged sites, the chemical composition of the water frequently recovers more swiftly than the fauna and flora.
- **The value of long-term biological and chemical monitoring to provide robust evidence** that can underpin effective policy.

Figure 3: A sample of invertebrates collected from one of the DTC monitoring sites.