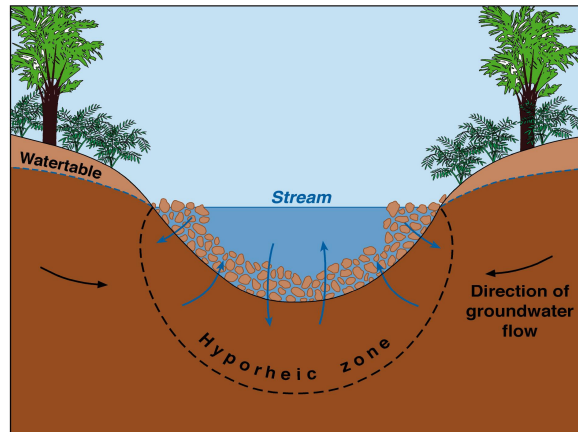


Environment Agency research on hyporheic zone attenuation

The Environment Agency has recently established a **research programme** on groundwater – surface water interactions, with specific focus on **pollutant attenuation processes** at the interface of groundwater and surface waters, which is known as the **hyporheic zone**. This research is needed to provide understanding of the processes that control water flow and pollutant flux between groundwater (aquifers) and surface waters (principally rivers and streams) and is, in part, a response to new legislation that requires a more integrated approach to the management of the aquatic environment.



Schematic hyporheic zone (after USGS 1998)

Objectives of the research programme

Most regulatory and management approaches to environmental protection have traditionally focussed on particular environmental compartments, or industry/activity sectors. As a result, past research has largely focused on understanding the behaviour of water and pollutants in either aquifers, rivers, lakes or estuaries. Rivers and aquifers were often considered as separate, essentially unconnected systems. The Water Framework Directive changes the emphasis for environmental protection and establishes a requirement for a more holistic approach to integrated catchment management.

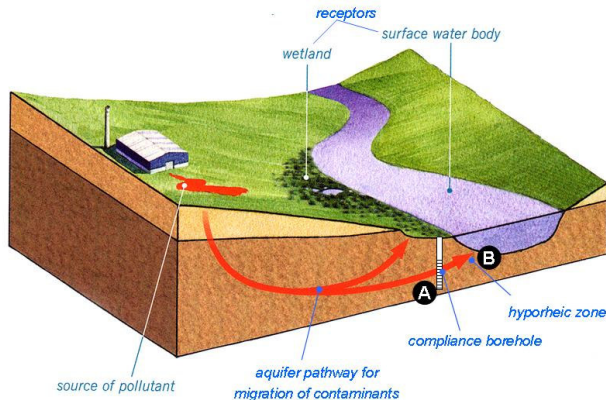
Whilst we have a reasonable understanding of flow and pollutant behaviour within surface and groundwater systems as separate entities, our knowledge of processes that occur at the interface of these systems is poor. The Agency's research on the hyporheic zone seeks to establish fundamental understanding of the controls on flow and pollutant behaviour at the interface of groundwater and surface waters. Subsequently it will translate that knowledge into tools that will help catchment managers to develop more effective programmes of measures to improve our environment.

The term 'hyporheic zone' is used to refer to the zone beneath and adjacent to a river or stream where groundwater and surface water mix, however, there is no agreed definition of what a hyporheic zone is. In developing a conceptual model of hyporheic zone processes, the Agency's research programme will focus on integrating the key attenuation processes occurring in the hyporheic zone; these include hydrological, geochemical, microbiological and ecological processes and functions. The objective is to build a platform that will aid the various workers from different scientific disciplines with an interest in processes occurring at the groundwater - surface water interface to better interpret the resulting impacts on hydrochemistry, sediment dynamics and invertebrate and fish ecology.

The Agency's programme will develop and translate cutting-edge science into practical tools and methods that will help river basin managers to design more effective and efficient programmes of measures to restore polluted water bodies. The research priorities for this programme will reflect:

- identified gaps in the fundamental science regarding hyporheic zone attenuation processes;
- a need to better understand the nature and magnitude of interactions between rivers and groundwater in the major British aquifers;
- investigation of the processes controlling the flux of the principal pollutants that have already been identified as being the main threats to meeting WFD objectives;

- a need to better integrate hydrogeological, hydrological, ecological and geomorphological research on the hyporheic zone;
- a requirement to develop management tools and methods for selecting effective programmes of measures that will help deliver a better environment.



Hyporheic processes are commonly overlooked in environmental risk assessments, but hyporheic and riparian zone attenuation reduces pollutant fluxes to some rivers.

The research project is led by an Environment Agency Hyporheic Zone Research Fellow, who is supported by a multi-disciplinary team from the Universities of Sheffield, Birmingham and Lancaster, and the Environment Agency. The fellow is building and will manage a programme of field-based and laboratory studies and model development. Where possible, the programme will be aligned with other relevant research (e.g. research council initiatives such as the NERC LOCAR programme and core science programmes at BGS and CEH) and will meet the needs of the Agency and other land and catchment managers in the UK. Initially the project will run for three years, but it is hoped that through bids for additional funding it will continue after that date.

A series of workshops will be organised during the project to engage other workers and disseminate results. Further information can be found at (www.hyporheiczone.org.uk) and we are keen to hear from potential collaborators working in this area.

Further reading

Environment Agency, 2005. *Groundwater – surface water interactions in the hyporheic zone*. Science report SC030155/1, Environment Agency, Bristol.

United States Geological Survey, 1998. *Ground water and surface water: a single resource*. USGS Circular 1139.

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