

# WATER AND RIVER LIFE RESEARCH IN THE TERN CATCHMENT, SHROPSHIRE

## The Natural Environment Research Council's Lowland Permeable Catchment Thematic Research Programme (LOCAR)

### Introduction

LOCAR is a new intensive research programme to study key water resource issues in the lowlands of the English Midlands and the chalklands further south. It examines surface and groundwater supplies, changes in water quality and their impacts on fisheries and wetlands. Possibly drier summers and wetter winters, changes in farming, urban expansion, new industrial sites and road building all alter water flows and water chemistry, as well as increasing competition between rural, urban and ecological water demands.

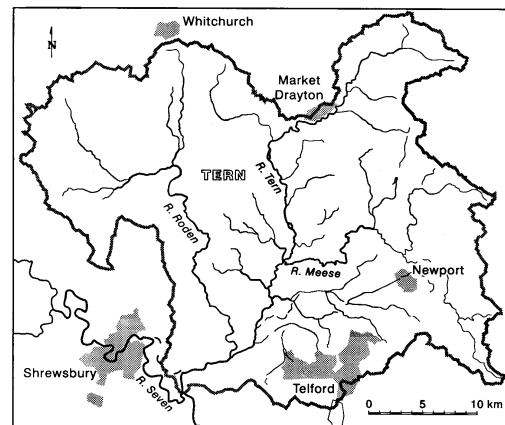
Good scientific understanding of the relationships between rainfall, recharge of groundwater stores, and runoff to rivers is needed to manage water for the benefit of all the community. Detailed knowledge of the precise ways chemicals move through the river drainage and groundwater system, at what time and by what pathway, is required. These substances in turn influence the micro-organisms, the insects, water plants and fish that live in the rivers and wetlands. We need to understand the precise impacts of changes in water level, increases in sediment in streams and variations in the chemical composition of stream water on the living things in streams and wetlands.

To help provide the basic and applied science needed to achieve this better management of water resources, and river and wetland life, the Natural Environment Research Council (NERC) has initiated the five-year LOCAR programme of intensive research in three areas, the Pang and Lambourn catchments in Berkshire, the Frome and Piddle catchments in Dorset and the Tern catchment in Shropshire. The emphasis of this programme is on the interactions between surface water and groundwater, and between groundwater and rivers, and the effects of these interactions on the fish and other organisms in the rivers.

### The LOCAR Programme in the Tern area

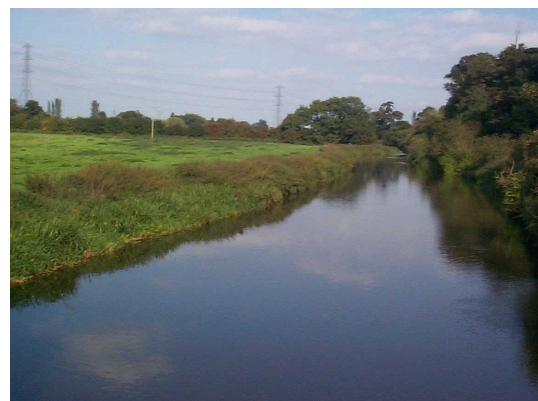
The programme involves establishing a set of instrumented sites within the study catchments to measure rainfall, evaporation, infiltration, groundwater levels and river flows so that all the components of the water cycle can be measured automatically. Samples of water will be taken at regular intervals and during storms to monitor the movement of chemicals and sediments. The new

instrumentation adds to the existing data collection system operated by the Environment Agency. As a result, the Tern, along with the other two areas, will be among the best understood rivers in the country.



*The Tern Catchment*

Annual surveys of the habitat conditions in the rivers and land use changes in the catchments will reveal changes that affect conditions in the river. A catchment service team based at the University of Birmingham, with local facilities at Harper Adams College, collects the data and makes the annual surveys.



*A lowland reach of the Tern*

Research teams have been awarded grants to carry out specific detailed investigations until early 2006. A competition was held to ensure that the best possible research expertise was brought together in the study catchments. Each year progress in every LOCAR project will be discussed with international experts at an annual programme meeting to ensure that the highest possible standard of science is being done. Consultations with local communities

will inform people of the outcomes of the work and inform scientists about the water, rivers and wetland issues of concern to local people.

### **The five research projects in the Tern area**

Two projects deal with river flows, the movement of chemicals, including pesticide residues and phosphorus, and transport of sediment; one with how the vegetation in the river affects the deposition of fine sediment and seeds and other plant propagules along the river; one with how water moves from the ground surface through the soil and underlying glacial deposits to the sandstone aquifers below; and one examines how fish use the side streams and other parts of the flood plains during periods of high water. In addition to using the LOCAR programme instruments, projects will all carry out additional field investigations.

The first project examines how infiltrating water carries chemicals into the soil and groundwater, the way groundwater emerges along and underneath the stream beds, the mixing of groundwater and surface waters and the complex chemical changes that then occur. This mixing of waters greatly affects river life. Computer models developed elsewhere will be tested on data from the Tern.

A second study complements the water chemistry work by examining how fine sediment carries chemicals into the rivers, gets stored in the channel or floodplain, and what happens to the chemicals attached to the sediments. The resulting sediment budgets help in sediment and pollutant management.

A third project examines how vegetation along the Tern affects the quantity, pattern, quality and species composition of deposited fine sediment, seeds and vegetative fragments in the channel. It helps in understanding the best ways of managing vegetation in rivers and help in planning river restoration.

The fourth investigation examines deposits left behind by the ice sheets that covered the areas some 20,000 years ago. These deposits overlie the geologically complex rocks beneath the Tern catchment. Detailed geological mapping has revealed the nature of these deposits, but little is known about how they effect the movement of rainwater reaching the ground surface into the soils and the underlying aquifers containing Shropshire's important groundwater resources. The data obtained will help understand how the groundwater resource can be managed sustainably and develop new, more reliable ways of calculating how much water is added to the aquifer of different periods of time.

A fifth project will test findings on how fish use side channels and the floodplain during high flows and increase our understanding of fish breeding and behaviour. The reactions of fish to changes in wetlands are important for biodiversity and wildlife in the area.



*The Norton-in Hales wetland study area*

### **Project outcomes**

While operationally separate, these five projects interlink to provide detailed understanding of how water, sediment and chemicals move through the Tern catchment. They provide inputs for sound water resources management and understanding of the impacts of land use changes. They will be able to assist in the management of fisheries and the ecologically important wetlands along the river and will help in understanding future risks of droughts and floods.

The LOCAR project team members are anxious to communicate with all interested parties about the project and about ways in which the results can be used. Ways of ensuring the effectiveness of that communication are being discussed with appropriate organisations.

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