Searching for clarity

Does habitat enhancement work?

A naturally fallen tree in the Bure, the target conditions of the restoration. Underwater, this structure is extremely complex

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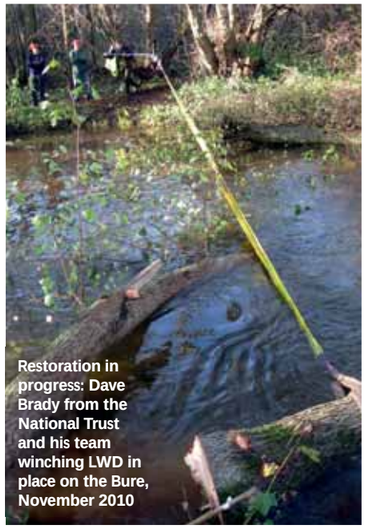
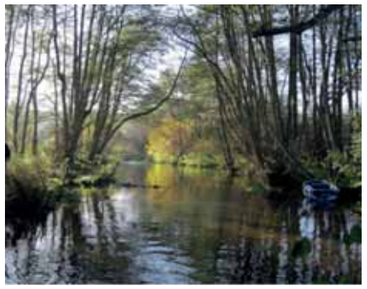
Rivers have many guises. They are inherently alluring, a source of food and they act as navigation routes. However, rivers are also conduits for waste and pollution and they have long been over-exploited and degraded. In fact rivers have been manipulated to such an extent, the natural and the man-made have become entwined, making these new hybrid environments hard to define. Despite this, over recent decades we have become increasingly concerned with restoring rivers.

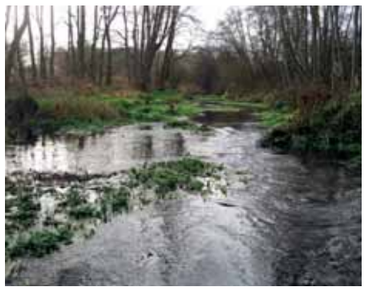
One current vogue in river management is to attempt to restore large woody debris, a feature previously seen as an obstruction and has thus been routinely removed. We aim to investigate the effect of this type of restoration on fish and their diets, riverfly populations and the ecosystems they live in.

It is important to understand our influence upon rivers, both positive and negative. The impacts of climate change and the effects of pollution have been the subject of intense investigation, yet we know little about the effects habitat enhancement have upon river fauna and flora. This may be disputed by some but the fact remains that where ecological impacts have been monitored many restoration schemes reveal equivocal results. Furthermore, methods of assessment often lack before and after monitoring and may be based upon a single site and a particular species or group of interest providing little reliable information to progress river restoration science. This is not to say all restoration is failing, but rather, evidence is not collected in a coherent manner hindering our ability to demonstrate or interpret success.



Restoration in progress: Dave Brady from the National Trust and his team winching LWD in place on the Bure, November 2010





The impact site on the Bure in November 2010 (above) and January 2012 (below)

Although each river is to some extent unique, there are sufficient similarities among them (e.g. chalk rivers contain distinctive and recognisible species) to identify general characteristics, enabling us to measure their responses to restoration using scientific methods.

In our investigation we sampled algal, insect and fish abundance and diversity, and fish diet together with river characteristics including water chemistry, velocity, silt, gravel, wood and plant volume. These measurements were taken before and after restoration in five chalk streams including the Test in Hampshire and Bure in Norfolk. On each river at least two sites were sampled: a control site without woody debris and an impact site into which, after initial monitoring, complete trees were felled mimicking natural tree-fall. On four of the rivers there was natural woody debris nearby which meant we were also able to study well-established reference sites. This experimental design will enable us to deduce what biological effects can be ascribed to woody debris, the habitat changes it brings, and whether woody debris introduced as a management tool recreates the effects of natural tree-fall.

A minnow found in the mouth of a salmon parr\. We will investigate fish diet before and after restoration

"Our analysis will provide unique insights into the longstanding concerns of fishermen that riverfly populations are in decline"

Our analysis will provide unique insights into the longstanding concerns of fishermen that riverfly populations are in decline and what might be causing this. To address this issue we will employ a novel approach to monitoring and measure the body-size of the sampled organisms. It may seem ridiculous to measure microscopic algae or midge larvae, but the size of an organism relates to its abundance and thus, typically, as species get larger they become rarer. This relationship can be used to test whether a species or group of species, like riverflies, are less abundant than we might expect. In turn such information will help to elucidate the mechanisms underpinning population sizes of the species we encounter.

Our early findings are in line with other current restoration studies, which suggest that poor water quality may be limiting the ability of riverfly to respond to restorations at particular sites. Our study has been enhanced by the work of Vicky Warren whose MSc project at Queen Mary University London has focused on this premise. She has surveyed a further 15 chalk streams across a large water-chemistry gradient, and sampled two sites on each river, one with and one without woody debris. The combination of our research will provide insights into how the effect of habitat is limited by the effects of pollution, crucial evidence when diagnosing a river's health before restoration is contemplated.

Understanding the effectiveness of habitat enhancement is critical because restoration of high quality natural environments has the potential to mitigate future degradation and to sustain healthy populations of salmonids, riverfly and the ecosystems they thrive in, and on which we are all reliant.

We therefore intend to make the results of this research widely available while continuing to build on our knowledge, incorporating new projects in order to progress restoration science. When data from this current study has been fully analysed the findings will be presented in a future edition of Salmo Trutta.

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