

Quantifying the multiple, environmental benefits of reintroducing the Eurasian Beaver

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Beavers are ecological engineers with an ability to modify the structure and flow of fluvial systems and create complex wetland environments with dams, ponds and canals. Consequently, beaver activity has potential for river restoration, management and the provision of multiple environmental ecosystem services including biodiversity, flood risk mitigation, water quality and sustainable drinking water provision. With the current debate surrounding the reintroduction of beavers into the United Kingdom, it is critical to monitor the impact of beavers upon the environment. We have developed and implemented a monitoring strategy to quantify the impact of reintroducing the Eurasian Beaver on multiple environmental ecosystem services and river systems at a range of scales.

First, the experimental design and preliminary results will be presented from the Mid-Devon Beaver Trial, where a family of beavers has been introduced to a 3 ha enclosure situated upon a first order tributary of the River Tamar. The site was instrumented to monitor the flow rate and quality of water entering and leaving the site. Additionally, the impacts of beavers upon riparian vegetation structure, water/carbon storage were investigated. Preliminary results indicate that beaver activity, particularly the building of ponds and dams, increases water storage within the landscape and moderates the river response to rainfall. Baseflow is enhanced during dry periods and storm flow is attenuated, potentially reducing the risk of flooding downstream. Initial analysis of water quality indicates that water entering the site (running off intensively managed grasslands upslope), has higher suspended sediment loads and nitrate levels, than that leaving the site, after moving through the series of beaver ponds. These results suggest beaver activity may also act as a means by which the negative impact of diffuse water pollution from agriculture can be mitigated thus providing cleaner water in rivers downstream.

Secondly, the River Otter Beaver Trial will be discussed. In 2015 Natural England granted a five year licence to monitor beavers living wild upon the River Otter, Devon. The River Otter, ca. 280 km², is a dynamic, spatey system with downstream areas exhibiting poor ecological status, primarily due to sediment and phosphorus loading, which both impact on fish numbers. The impacts of Eurasian Beaver upon English river systems are currently poorly understood, with the outcome of this pilot study having significant implications for river restoration and management. This project, the first of its kind in England, is monitoring the impacts of beavers upon the River Otter catchment with three main scientific objectives: (1) Characterise the existing structure of the River Otter riparian zone and quantify any changes during the 2015-2019 period; (2) Quantify the impact of beaver activity on water flow at a range of scales in the Otter catchment; (3) Evaluate the impact of beaver activity on water quality.

Finally, lessons learnt from these monitoring programs will be discussed in light of the need for more natural solutions to flood and diffuse pollution management. We conclude that whilst our work demonstrates multiple positive benefits of Beaver reintroduction, considerably more, scale-appropriate monitoring is required before such results could be extrapolated to landscape scales.