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Making Space for Water: Nature Based Solutions with Beavers

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1 Introduction: Return of the Beaver

- Beavers being reintroduced to Great Britain after an absence of ca 400 years.
- Beavers are known as the epitome of keystone species and ecosystem engineers.
- Devon Wildlife Trust and University of Exeter have been working together since 2013 developing management expertise and scientific evidence to inform beaver reintroduction strategy.
- Includes the River Otter Beaver Trial, first licenced wild beaver release in England.
- Wild beavers are now present in multiple river catchments in Devon and increasing number of locations across England, Wales and Scotland.

2 Nature-based Solutions

Beaver: Nature's Ecosystem Engineers

Geomorphic Impacts

- Beaver damming limited to small streams
- Drives transition in sediment dynamics from erosional net depositional
- Changes in channel planform, longitudinal profiles, slope, increased sinuosity.

Water Quality Impacts

- Suspended sediment and nutrients are deposited
- Ponds become large sediment and nutrient stores.
- Increased water availability, raised water tables and increased interaction with aquatic and riparian vegetation all shown to impact upon biogeochemical cycling and nutrient fluxes.

Hydrological Impacts

- Can reduce longitudinal (downstream) connectivity, whilst simultaneously increasing lateral floodplain connectivity.
- Increased surface water storage and elevated water table.
- beaver dam sequences and wetlands can attenuate flow during high and low flow periods.

Aquatic Ecology Impacts

- Extending wetlands aids aquatic plant recruitment, abundance and diversity.
- Nutrient rich beaver meadows support diverse plant life.
- Multitude of benefits for fish, invertebrates and amphibians.
- Salmonid species can navigate beaver dams.
- Upstream fish movement may be reduced in low gradient, low energy systems.

Human-Beaver Impacts

- Real opportunities for humans provided by beavers, as well as real potential conflicts
- opportunities may be obtained by different people to those who incur the costs in certain contexts.
- Effective management strategies should consider beneficiaries and cost-bearers in a holistic manner, bridging the distinctions within a closed loop management system.
- Management strategies require clear communication.

A growing suite of research demonstrating that the return of beavers to British landscapes can have a positive environmental impact and that beaver wetlands can act as a Nature-based Solution (NbS).



Scan for River Otter Beaver Trial Science and Evidence Report.

University of Exeter Published Research

- Hydrology and Geomorphology**
 Puttock et al., 2017: DOI:10.1139/ljvs-2015-0005
 Puttock et al., 2021: DOI:10.1002/hyp.14017
 Graham et al., 2022: DOI:10.1002/hyp.14735
 Puttock et al., 2018: DOI:10.1002/esp.4398
- Geospatial/Surveys/Mapping/Modelling**
 Graham et al., 2020: DOI:10.1007/s10344-020-01379-W
 Graham et al 2022: DOI:10.1002/2688-8319.12168
 Bradbury et al., 2023: DOI:10.1002/rra.4082
 Campbell-Palmer et al., 2020: DOI:10.1002/rra.3755
 Puttock et al., 2015: DOI:10.1139/ljvs-2015-0005
- Ecology**
 Puttock et al., 2023: DOI:10.59927/GONJ2514
- Social Science/Human Dimensions**
 Auster et al., 2019: DOI:10.1111/area.12576
 Auster et al., 2020: DOI:10.1080/09640568.2020.1837089
 Auster et al., 2023: DOI:10.1111/ifr3.12789
 Auster et al., 2023: DOI:10.1111/rec.13899
 Auster et al., 2023: DOI:10.1002/pan3.10503

3 A Sustainable Path Forward

- Successful beaver reintroductions and population expansions demonstrate that beavers can thrive in a modern British landscape.
- However, in addition to benefits beavers can conflict with existing land use and infrastructure. Renewed coexistence is required.
- Pragmatic management strategies exist from beaver projects across Europe, North America and increasing expertise building in GB too.
- However, beaver management and making space for wetlands does require financial support.
- As beaver become normalised challenge in maintaining financial support. A classic challenge in both the environmental and research sectors as funding often prioritises the 'new' and 'novel'.
- Long term funding and sustainable management policies required.

Policies and funding support required for management that maximises the benefit and minimises the conflicts associated with the return of beavers.

4 Geospatial Targeting

- Beaver Network: geospatial data for beaver habitat and beaver dam capacity across GB.
- Hydrological modelling has quantified scenarios of water storage and impacts on downstream flow regimes.
- Beaver Network analysis can identify beaver suitable sites and opportunity zones for habitat enhancement to make areas 'beaver ready' and increase the chances of damming and wetland creation.
- Detailed spatial understanding of land use, infrastructure, designations, flood risk etc. can inform opportunity-risk mapping.
- **Geospatial analysis, on the ground expertise and stakeholder engagement are being used to prioritise sites where NbS benefits of beavers may be greatest and direct opportunities exist for least risk.**
- Pilot catchments where maintenance of current beaver sites and making other sites beaver ready could deliver habitat enhancement and flow attenuation to flood prone downstream communities.

5 Funding

- Project building collaborative partnerships with funders wanting to see the benefits from healthy nature-rich river corridors.
- Seeking to implement a green finance programme where public and private finances are blended to deliver multiple benefits.
- The project is supporting pilot schemes to incorporate beavers into existing funding mechanisms.
- An example includes the Farming in Protected Landscapes programme (FIPL): supported an extensive beaver wetland storing ca 12 million litres of water. Grant funding for projects that support nature recovery.
- Other directions being explored include ELMS, DEFRA NFM funding, Insurance Companies, Philanthropic and BNG.

Further information on the making space for beavers programme:
<https://www.devonwildlifetrust.org/making-space-beavers>

