# Reintroductions and Conservation Translocations: Case studies from the UK

## Volume 1

Published September 2023

Natural England Research Report NERR125

www.gov.uk/natural-england

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Catalogue code: NERR125

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## Keywords

Reintroductions, Case studies, Conservation

## Acknowledgements

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Jim Foster, Amphibian and Reptile Conservation Trust

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## Citation

Wells, P J & Heydon, M (eds). 2022. Reintroduction and Conservation Translocations: Case studies from the UK. Volume 1. NERR125. Natural England.

# Executive summary

The aim of this publication is to provide case study summaries of selected reintroductions and conservation translocations carried out in the United Kingdom. These case studies are provided to accompany and inform use of the 'Reintroductions and other conservation translocations: code and guidance for England'[1] published in May 2021. While the case studies in this volume were conducted prior to publication of the code and guidance, they all observed international guidelines[2] for reintroductions, the standard upon which the English code and guidance are based, published by the International Union for the Conservation of Nature (IUCN).

The case studies are presented in a similar format to that used by the International Union for the Conservation of Nature (IUCN) in their series of *Global Reintroduction Perspectives: case studies from around the globe*[3].

We hope this publication will provide an insight into the challenges facing reintroduction and translocation projects trying to restore biodiversity and a useful source of reference for future projects.

We plan to publish further editions and welcome the submission of further case studies[4]. As the aim is to help inform future projects, we are equally interested in case studies of projects that faced difficulties or even failed, as these will provide useful insights into the challenges of reintroducing species. While the case studies included are all for terrestrial species we would also welcome studies for marine species.

The views expressed in this publication do not necessarily reflect those of Natural England or the contributing organisations. We are only presenting summaries of the projects to highlight lessons for other projects.

All photos and images included within the case studies have been provided by the authors and contributors of the case studies and are included with their permission.

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[1] Defra. 2021. Reintroductions and other conservation translocations: code and guidance for England. Version 1.0. https://www.gov.uk/government/publications/reintroductions-and-conservation-translocations-in-england-code-guidance-and-forms [Accessed 11 October 2021]

[2] IUCN. 2013. Guidelines for reintroductions and other conservation translocations: version 1.0. Gland, Switzerland: IUCN Species Survival Commission. https://portals.iucn.org/library/node/10386

[3] SOORAE, P.S. (ed). 2018. Global Reintroduction Perspectives: 2018. Case studies from around the globe. IUCN/SSC Reintroduction Specialist Group, Gland, Switzerland and Environmental agency, Abu Dhabi, UAE. https://portals.iucn.org/library/sites/library/files/documents/2018-006-En.pdf

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# Contents

Case studies ..... 7

Red and Green listing ..... 8

Invertebrates ..... 9

I1 - Reintroduction of the chequered skipper into Rockingham Forest, Northamptonshire ..... 9

I2 – Reintroduction of the netted carpet moth *Eustroma reticulatum* to Derwentwater, The Lake District, Cumbria, England, 2006 to 2008 ..... 16

I3 – Restoring Freshwater Mussel Rivers in England – Release of propagated freshwater mussels into the River Irt, Cumbria ..... 21

I4 - Tansy Beetle Habitat Creation Project - River Ouse Washlands, North Yorkshire ..... 26

Amphibians ..... 31

A1 – Reintroduction of the pool frog to Norfolk ..... 31

Birds ..... 37

B1 – Reintroduction of white-tailed eagle to southern England as a breeding species after an absence of 240 years ..... 37

Mammals ..... 43

M1 – The trial reintroduction of Eurasian beaver into the River Otter in Devon ..... 43

M2 – Restoring Ratty – Bringing the water vole back to Kielder, Northumberland ..... 50

M3 – Pine marten translocations to mid-Wales ..... 56

Plants ..... 62

P1 – North-West Rare Plant Initiative (NWRPI): lesser bladderwort ..... 62

References ..... 67

I1 - Reintroduction of the chequered skipper into Rockingham Forest, Northamptonshire ..... 67

I2 – Reintroduction of the netted carpet moth *Eustroma reticulatum* to Derwentwater, The Lake District, Cumbria, England, 2006 to 2008 ..... 69

I3 – Restoring Freshwater Mussel Rivers in England – Release of propagated freshwater mussels into the River Irt, Cumbria ..... 69

I4 - Tansy Beetle Habitat Creation Project - River Ouse Washlands, North Yorkshire ...70

A1 – Reintroduction of the pool frog to Norfolk ....70

B1 – Reintroduction of white-tailed eagle to southern England as a breeding species after an absence of 240 years ....71

M1 – The trial reintroduction of Eurasian beaver into the River Otter in Devon ....73

M2 – Restoring Ratty – Bringing the water vole back to Kielder, Northumberland ....74

M3 – Pine marten translocations to mid-Wales ....74

P1 – North-West Rare Plant Initiative (NWRPI): lesser bladderwort....74

# Case studies

The case studies are presented below include studies for mammals, invertebrates, molluscs, birds and plant species. The examples are spread across the whole of England and Wales (see Figure 1).

Each case study documents the feasibility, implementation and monitoring phases, along with information on the aims (goals) and indicators that would determine if the reintroduction or translocation had or would be successful. The success of each project has been categorised where possible. At the time of publication some of the case studies were still within the monitoring phase and the outcome has not yet been determined.


**Figure 1 Location of case studies (Contains, or is derived from, information supplied by Ordnance Survey. © Crown copyright and database rights 2017. Ordnance Survey 100022021)**

# Red and Green listing

For each species, the IUCN red listing has been identified at a global, national and regional scales where these have been assessed. The red list categories are:

- Data Deficient
- Least Concern
- Near Threatened
- Vulnerable
- Endangered
- Critically Endangered
- Extinct in the Wild
- Extinct

These are present in a table within each case study with shading identifying the relevant category. In the future we propose that case studies also indicate the green list status of species, but this has not yet been established for any species included in this volume.

For more details see the IUCN Green List species webpage.

# Invertebrates

## I1 - Reintroduction of the chequered skipper into Rockingham Forest, Northamptonshire

### Intervention type[5]: reintroduction (for England)

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### Conservation status

IUCN Red List: Global – Least Concern
IUCN Red List: Great Britain – Endangered
IUCN Red List: England – Extinct
IUCN Red List: Scotland – Endangered
IUCN Red List: Wales – Unassessed
IUCN Green List - Unassessed

### Introduction

The chequered skipper *Carterocephalus palaemon* is a butterfly species that occurs across Europe, Asia and North America (Collier & Emmet 1990). It is declining in several European countries and is included on European Red Lists (Heath 1981a). It is endangered in some countries outside Europe (*e.g.* Japan) and was listed as a globally threatened species (IUCN 1991).

In the 1960s it was locally common in the East Midlands of England in damp woods and fens but following a rapid contraction it died out here in 1976, probably through neglect of

[5] The categorisation here follows the definitions for conservation translocation types given in the Defra 2021

its habitat (Heath, Pollard & Thomas 1984). At this point the species became extinct in England. The known history of the species in Scotland, where it is primarily a woodland edge and scrub butterfly, is short, not having been documented here until 1942 (Mackworth-Praed 1942). It currently occurs in between 30 and 50 discrete colonies centred around Fort William in Argyll.

Although initially fully protected under the Wildlife and Countryside Act 1981, as the species was extinct in England, it's protection was reduced to a prohibition on sales only in 1989. The species remains fully protected in Scotland.

## Goals

- Goal 1: To establish a population of chequered skipper into a woodland site in England where it had previously been present;
- Goal 2: To establish a second population into a woodland site in the close vicinity;
- Goal 3: To establish a functioning meta-population consisting of several populations in one of 5 identified areas of Rockingham Forest in Northamptonshire that contain suitable sites for long term persistence;
- Goal 4: To establish a second functioning meta-population within several closely connected woodlands within Rockingham Forest; and
- Goal 5: To establish healthy populations of chequered skipper in England.

**Figure 2 Chequered skipper by Dave James. © Butterfly Conservation, reproduced with permission.**

## Success indicators

- Indicator 1: Establishment of a population in a site for 5 years
- Indicator 2: Establishment of a second population for 5 years
- Indicator 3: Sites being established independently of human intervention within the first area of establishment, indicating a functioning meta-population within 10 years of first translocation
- Indicator 4: Sites being established independently of human intervention within the second area of establishment, indicating a second functioning meta-population within 20 years of first translocation
- Indicator 5: Diseases detected in chequered skipper through post-release disease surveillance are insufficient to affect population viability and abundance.

## Project summary

### Feasibility

Research into the feasibility of re-establishing the chequered skipper into England began in the early 1990's and by the mid 2000's attention had shifted to the Rockingham Forest landscape, once the core of the English distribution. Woodlands within this landscape had undergone significant changes in management. For example, over 10km of rides were widened and new glades created principally by partners Forestry England prior to the initial reintroduction in 2018, resulting in a much greater extent of open space habitat. Qualitative assessments of potential chequered skipper habitat (e.g. presence of larval hostplants, vegetation structure, extent of open space) were undertaken and suitable patches mapped. Opportunities for further enhancement through additional woodland management were also identified and mapped. These assessments did suggest the Rockingham Forest landscape may well have the potential to support functioning meta-populations of the chequered skipper once breeding populations of the butterfly had been established (Field, 2010). However, further and more detailed investigations were required to compare the Rockingham Forest landscape with occupied landscapes in northwest Europe which might provide donor populations.

Butterfly Conservation, working with Belgian and Dutch colleagues, undertook species distribution models using similar environmental variables to the modelling in Scotland. These were used to determine potential source regions in northwest Europe for its reintroduction to England. The possible impact of climate change was also assessed, by comparing present-day climate data in northwest Europe and modelling the probability of occurrence in the Rockingham Forest landscape by the year 2070. Encouragingly, future climate conditions are predicted to be favourable for the species allowing for expansion in range and abundance.

A disease risk analysis (DRA) for this planned wild-to-wild conservation translocation was carried out between 2016 and 2017 in order for the project to meet best practice guidelines in conservation translocation (IUCN 2013). The DRA was carried out on the proposed translocation using established and recognised methods (Sainsbury and

Vaughan-Higgins 2012; Bobadilla et al 2017) which have contributed to international guidelines (OIE and IUCN 2014). The risks from disease in undertaking translocation were considered to be acceptably low (Jaffe & Sainsbury, 2017). A disease risk management (DRM) and post-release health surveillance (PRHS) protocol was produced to provide more detailed guidelines on managing and mitigating risks from disease identified in the DRA. The protocol also set out recommendations for post release health surveillance to be carried out on the new population and other at-risk Lepidoptera populations at the release site (Donald & Sainsbury, 2018).

**Implementation**

In May 2018 the first translocation of chequered skipper butterflies took place and 42 adult individuals, 32 females and 10 males were health examined and then successfully translocated from the Ardenne forests in Belgium to a site in Rockingham Forest. For the wild-to-wild conservation translocations, adults were chosen from Belgium rather than Scotland as the Belgian chequered skippers inhabit similar landscape to Rockingham Forest and share the same caterpillar foodplants, false brome *Brachypodium sylvaticu*m and wood small-reed *Calamagrostis epigejos*.

A second translocation of 24 chequered skipper butterflies took place in May 2019 using the same source populations (but different individual woodland sites) in Belgium to the same release site in Rockingham Forest. The health of chequered skippers during these two translocations is reported separately (Jaffe & Sainsbury 2019; Shadbolt & Sainsbury 2020).

In 2020 a planned third translocation to a second site near the original release site was cancelled due to the global coronavirus (COVID-19) pandemic and re-scheduled for 2021.

Over 10km of rides were widened by partners, Forestry England prior to 2018 and a further 5km of ride widening took place between 2018-2020 on their estate. Since 2017, the National Lottery Heritage funded Back from the Brink project has enabled 6.5km of rides to be widened across several Rockingham Forest woodlands (owned/managed by Forestry England, Bedfordshire, Cambridgeshire & Northamptonshire Wildlife Trust, Natural England), as well as 20km (20ha) of ride management and the creation of glades and temporary clearings further enhancing the area of open space habitat. These changes help to enable rotational mowing and thus maintain habitats in suitable condition. A further 10ha of ride are managed through Countryside Stewardship by the Boughton Estate.

**Post-release monitoring**

In 2018, Butterfly Conservation staff and volunteers monitored the chequered skipper adults at the release site from the moment the nets were removed on the morning of 24 May. The last adult to be observed post-release was seen on 6 June, so 14 to 15 days after collection in Belgium on 22 May. Though female egg laying behaviour (searching for suitable sites) was observed, no eggs could be detected amongst the dense vegetation.

Individual adults were not marked in this first year of translocations, meaning identification of individuals was only possible for one or two individuals who had distinctive wing wear. Sightings of butterflies indicated the dispersal of the released butterflies through the wood, with movement over 700 metres detected and regular movement over a 300-metre radius.

In 2019, population monitoring of adult butterflies during the flight period was again carried out by Butterfly Conservation staff and volunteers over a 40-day period from May to June. Figure 3 shows the distribution of butterfly sightings during the recording period. On 26th May 2019 24 butterflies translocated from Belgium were released at the site in Rockingham Forest. These were all marked with a red fine-tipped permanent marker pen to separate the two populations.

During the 2019 monitoring, there were a total of 124 sightings of un-marked chequered skipper butterflies, including 87 sightings of males, 25 of females and 12 of undetermined sex. A total of 34 sightings of marked chequered skippers from the 2019 release, including 23 of males, 10 of females and 1 of undetermined sex. In addition, there were 6 sightings of chequered skippers for which country of origin and sex could not be confirmed.

A maximum number of sightings on a single day was recorded on 30th May 2019 during which there were 12 un-marked butterfly observations, 13 marked butterfly observations and two observations of a butterfly of unknown origin. During the monitoring period there were no recorded health abnormalities, and no carcasses were submitted for post-mortem examination (Jaffe & Sainsbury 2019; Shadbolt & Sainsbury 2020). The butterfly had successfully spread throughout the ride network of the site, occupying approximately 3 kms of ride.

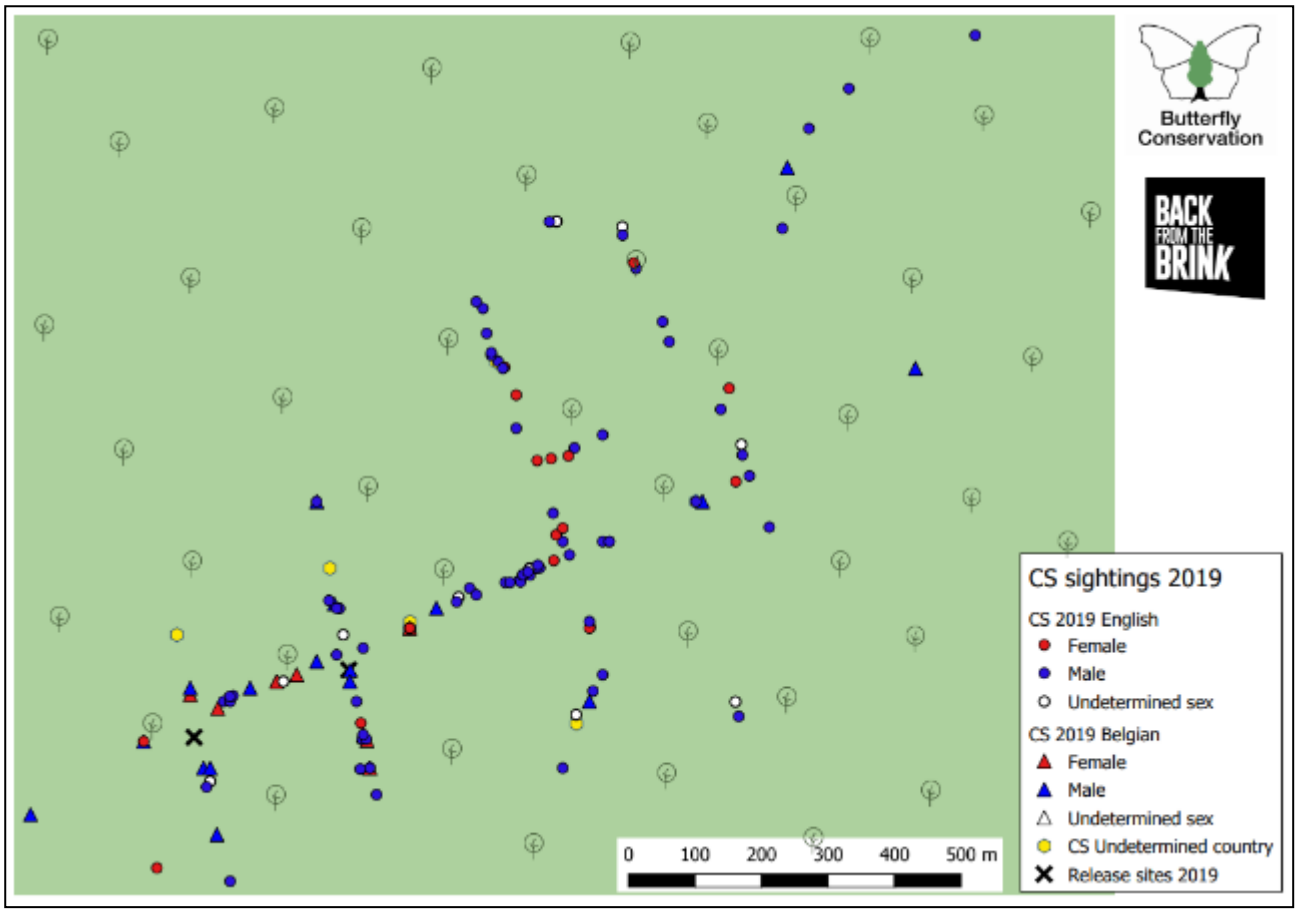


**Figure 3 Distribution map showing sightings of adult chequered skipper butterflies during the monitoring period May to June 2019 provided by Butterfly Conservation. © Butterfly Conservation, reproduced with permission.**

In 2020, restrictions due to COVID-19 prevented monitoring until the middle of May. The first sighting was on May 15th and the last sighting on May 31st. While overall numbers were lower, the peak count, 13 on the 19th, was higher than in 2018. The peak was also very soon after the first sighting. This and the short flight period observed during monitoring indicate that the butterflies had emerged much earlier than in 2019 and that emergence had been missed due to the limitations on monitoring. The lower number of male sightings also strongly suggests that the early part of the flight period was missed as males emerge before the females.

The distribution of adult butterflies throughout the introduction site, despite the lower numbers shows a similar area of occupancy in 2020. Although the monitoring was heavily impacted by the COVID-19 restrictions it does suggest, at least tentatively, that in order to secure goal 2 a further introduction will be required in the short term and, in the long term, surrounding forestry should be opened up with wider rides to facilitate the species dispersal.

The habitat management works undertaken for chequered skipper within Rockingham Forest have provided a wide range of biodiversity benefits through providing a more varied

woodland structure and allowing light into the woodland benefitting plant and insects found in woodland edge habitats.

Monitoring of the chequered skipper population will continue long-term as part of the UK Butterfly Monitoring Scheme.

## Major difficulties faced

- Sufficient and long-term funding for the project to achieve all its goals
- Public interest in the project leading to interest in the location of the release site at a point when the population had yet to establish and would be potentially vulnerable to disturbance
- COVID-19 restrictions on field-work activity and on capacity of partners organisations to participate
- Delays in habitat management work due to wet weather and poor ground conditions

## Major lessons learned

- The reintroduction sites selected so far appear to be suitable with the butterfly utilising the areas predicted
- Our understanding of future management needs has been greatly improved and is being researched further through the project
- The need for further forestry management at a landscape scale has been further emphasised by the provisional results
- Transport of live specimens much improved since initial reintroduction attempts in 1990s leading to greater survival.

## Success of project

Partially successful.

**Reasons for success/failure:**

- Detailed scientific rationale underpinning the reintroduction
- Significant investment in habitat restoration before reintroduction
- Strong partnership between state conservation organisation (in Belgium and England), universities, environmental NGOs and land managers
- Investment in disease risk analysis
- Detailed monitoring and science protocols
- Effective management and support of volunteer effort
- Project is still in its infancy and needs further investment to move from initial goal 1 to goals 2 to 6.

# I2 – Reintroduction of the netted carpet moth *Eustroma reticulatum* to Derwentwater, The Lake District, Cumbria, England, 2006 to 2008

## Intervention type: reintroduction (Derwentwater); reinforcement (The Lake District and England)

John Hooson, National Trust

## Conservation status

IUCN Red List: Global – Least Concern
IUCN Red List: Great Britain – Unassessed
IUCN Red List: England – Unassessed
IUCN Red List: Scotland – Unassessed
IUCN Red List: Wales – Unassessed
IUCN Green List – Unassessed

## Introduction

The netted carpet moth *Eustroma reticulatum* is one of the rarest moths in the UK. The species is classed as vulnerable in the Red Data Book 2 (Shirt 1987) and considered 'of greatest concern' in the UK Biodiversity Action Plan (UK BAP 2002). Within the UK, this moth is now restricted to a series of localities in only five 10 km² grid squares in The Lake District of northwest England. The yellow-green larvae feed on only one plant: touch-me-not balsam *Impatiens noli-tangere*. The balsam itself is nationally scarce, is the only native UK balsam, and it too has its stronghold in the Lake District. Preferring damp, shaded woodland it thrives in areas with some soil disturbance and open, competition free ground for germination.

The Derwentwater colonies of netted carpet were among the earliest reported in Britain (c.1897) and they were recorded intermittently until the 1990's. Since the late 1980's there was a 56% decline in stands of the larval foodplant, probably related to a run of very mild winters leading to poor germination. Reduction in the abundance of Touch-me-not balsam inevitably led to a crash of netted carpet moth numbers and, despite annual searches, none had been seen at this location since 1999. The Derwentwater colony was highly isolated (15 km from any other), and almost certainly became locally extinct because of the extreme food shortages. The moths were unlikely to naturally recolonise Derwentwater because it was so isolated. Following the disappearance of the population of moths at Derwentwater the touch-me-not balsam successfully regenerated to its previous levels. No moths were subsequently found. The locality was believed to be prime netted carpet moth habitat again, and in 2006 it was judged suitable to consider a reintroduction to Derwentwater.

## Goals

- Goal 1: Restore a self-sustaining population of netted carpet moth to its historic sites near Derwentwater.
- Goal 2: Have no deleterious impact on the viability of the donor population from near Coniston, Lake District.

## Success indicators

- Indicator 1: Healthy numbers of netted carpet larvae counted at the reintroduction site during subsequent autumn larval monitoring;
- Indicator 2: Healthy number of larvae counted at the reintroduction site persisting into the future.

**Figure 4 Netted carpet moth by Graham Jones. © National Trust, reproduced with permission.**

## Project summary

### Feasibility

Feasibility was discussed by the then Netted Carpet Steering Group which comprised representatives of the landowner (National Trust), experts in the field (Butterfly Conservation, University of Reading), local knowledgeable enthusiasts, and the government conservation agency (English Nature[6]). The IUCN guidelines on re-introductions were considered and followed. The proposed reintroduction was externally scrutinised and endorsed by the National Trust's expert Natural Environment Advisory Board. The necessary legal permissions were obtained from English Nature.

### Implementation

Having monitored the known Derwentwater site (through larval counts) throughout the 1990's and noted very few individuals in 1999, the monitoring of the apparent extinction continued each year until 2005 when it was concluded that the moth was no long present nor going to recolonise unaided. Coniston water was the only potential donor site as larval counts over many years revealed healthy and stable numbers. A protocol was established whereby between 20 and 30 larvae could be removed from Coniston but only if this comprised <15% of the larvae counted beforehand. In autumn 2006, it was deemed possible to remove 30 larvae and large 3$^{rd}$ or 4$^{th}$ instar individuals were preferentially taken, usually with the piece of balsam plant they were sitting on. The larvae were quickly transported to the Derwentwater receptor site which had previously been surveyed and still no netted carpet moth found. The 30 larvae were carefully transferred to healthy balsam plants, usually with the aid of a soft paintbrush.

[6] Statutory nature conservation agency for England and predecessor to Natural England

**Figure 5 Late instar larva by G Broome. © National Trust, reproduced with permission.**

**Post-release monitoring**

In 2007, monitoring at Derwentwater disappointingly found no larvae, possibly a consequence of the low number introduced. It had previously been agreed to repeat the reintroduction process if this were the situation. The donor site was thriving, and it was judged acceptable to remove 150 larvae and transfer to the new site. Monitoring in 2008 found a small number of larvae present indicating successful breeding. The population was reinforced by a third translocation of 150 larvae.

Both the donor and receptor sites have been monitored every year subsequently, until 2020. At Derwentwater the moth has become established and has also colonised other nearby areas of touch-me-not balsam. The donor site moth population remains very strong.

## Major difficulties faced

- Maintaining the annual monitoring effort which was vital to observe the initial decline and extinction of the population, to assess progress reintroducing the moths and to confirm the reintroduction had led to long-term recovery. Organising and resourcing this survey each year is challenging.

## Major lessons learned

- The value of detailed monitoring over a long period of time – in this case nearly 30 years.
- If the first attempt doesn't work, evaluate why not, and if appropriate to continue to try and adapted the approach.
-

## Success of project

Highly successful.

**Reasons for success/failure:**

- Collaboration and commitment between a number of partners together with enthusiastic individuals.
- Detailed monitoring of the donor population giving confidence that it was thriving and increasing and thus could tolerate removal of larvae for the reintroduction project.

# I3 – Restoring Freshwater Mussel Rivers in England – Release of propagated freshwater mussels into the River Irt, Cumbria

## Intervention type: reinforcement

Chris West* and Louise Lavictoire+

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## Conservation status

IUCN Red List: Global – Endangered
IUCN Red List: Great Britain – Unassessed
IUCN Red List: England – Unassessed
IUCN Red List: Scotland – Unassessed
IUCN Red List: Wales – Unassessed
IUCN Green List – Unassessed

## Introduction

The River Irt in West Cumbria is home to a population of freshwater mussels *Margaritifera margaritifera,* which are in decline. Previously boasting a population of several hundred thousand individuals, their decline is in part due to habitat degradation which prevents the completion of at least one part of the complicated life cycle of the mussel. As a result, there is no evidence of recruitment over the past 60 years, which puts the population at high risk of being lost from the catchment. To prevent this from occurring, the Freshwater Biological Association (FBA), in partnership with the Environment Agency and Natural England, have been propagating mussels from the River Irt and a number of other mussel rivers in England since 2007. To complement the propagation work, efforts to restore the habitat within the catchment have been underway since 2015. In 2017, a section of the river was identified as potentially suitable for mussel releases and the first cohort of propagated individuals from the River Irt were considered to be ready for release.

## Goals

- Goal 1: Rear juvenile mussels in captivity.
- Goal 2: Increase area of suitable habitat within catchment.
- Goal 3: Release juvenile mussels into suitable habitat.
- Goal 4: Refine release methodology and monitoring techniques to benefit future releases.

## Success indicators

- Indicator 1: Juvenile mussels reared in sufficient number to allow releases in the wild.
- Indicator 2: Areas of suitable habitat within the catchment are identified and restored.
- Indicator 3: Juvenile mussels persisting within the release site.
- Indicator 4: Revisions to release and monitoring methodologies are produced.

**Figure 6 Two propagated juveniles with a wild adult freshwater pearl mussel by West Cumbria Rivers Trust. © Environment Agency, reproduced with permission.**

## Project summary

### Feasibility

Visual assessments of potential release sites were undertaken in 2016 throughout the catchment. Consideration was given to the amount of physical modification, adjacent land use, water quality and substrate suitability (requirements are clean but stable substrates). Observations of conditions during high and low flows were undertaken to ensure areas were suitable during all flow conditions to be expected. As a result of these investigations, the most favourable potential site was selected for further investigations of interstitial conditions, which are particularly important for juvenile mussels. Dissolved oxygen levels were assessed using specialist equipment. The assessment results concluded the site conditions were suitable to consider releasing juvenile mussels.

**Implementation**

Juvenile mussels of circa 33 mm in length (nine years old) were individually numbered using Hallprint tags and superglue. Mussels were transported to the reintroduction site following best practice guidelines (Killeen and Moorkens, 2016). Seventy mussels were released directly into the substrate in three patches within the site by hand placement into the substrate. No protective or enclosure systems were used. Care was taken to ensure a period of low flow was expected following the release to allow the juveniles to habituate before encountering high flows.

**Figure 7 Release site on the River Irt by West Cumbria Rivers Trust. © Environment Agency, reproduced with permission.**

**Post-release monitoring**

Visual surveys of the release site using bathyscopes were undertaken at regular intervals as river levels allowed. Tracking of individuals was achieved using the individually numbered tags. Almost immediately after release, it was apparent that the juveniles were displaced away from the placement sites and into the wider area. Due to the size of the release site and abundance of suitable habitat this was not considered to be an issue. It is suspected that this was caused by flow displacement (likely due to movement of mobile gravels where juveniles were originally placed) rather than mussels choosing to move. Nevertheless, juveniles continue to be found within the site three years after placement. Juveniles are typically observed in very small pockets of sandy gravel which are protected by larger cobbles and boulders. All juveniles have increased in size since release.

## Major difficulties faced

- This was the first release of juvenile mussels undertaken by the FBA from the rearing facility and thus little was known about how to undertake the release and how long it would take juveniles reared in captivity to habituate to the more variable water flow conditions and the different water chemistry and water quality within the catchment.
- Environmental monitoring within rivers can be challenging especially when investigating the interstitial environment which requires highly specialised techniques.
- Relying upon a visual count of juvenile mussels after release has been challenging. Juvenile mussels bury deeply within the substrate making visual checks difficult and thus under-counting is often a problem. Small mussels can become dislodged and visual assessment of stress is impossible. This means that on any given survey day only a low percentage of the released mussels (typically 10%) may be observed. However, by keeping records of the tag numbers encountered over time, we are confident that over a third of individuals initially released still persist within the site.
- The accuracy of grid references generated by Global Positioning System (GPS) devices used as part of the post release surveys was found to be inadequate precluding its use in generating digital mapping of surveys via geographic information system (GIS) software.

## Major lessons learned

- Communication with other practitioners/researchers working on the same or similar projects is key. Do not be afraid to admit to struggling with an element of the project. Others working within the same field are probably experiencing the same frustrations and pooling experience and ideas can help solve the problem.
- Passive Integrated Transponders (PIT) tags could have been applied to the juveniles. This technology would have assisted post-release surveying and resulted in a more accurate record of distribution throughout the site and enabled a better estimation of the success of the project. This technique is being used as part of a subsequent release research project.

## Success of project

Success.

**Reasons for success/failure:**

- Adequate assessment of release site: Habitat within the release site is considered to be in good condition and suitable for mussels as demonstrated by juveniles persisting for three years during which both high and low flows have been encountered.

- Size of released individuals: the size and age of the juvenile mussels released meant that they were sufficiently robust to cope with stress of translocation and habituating to new conditions.
- Monitoring and adaptive management: Monitoring juvenile persistence and movement within the site has identified where methods could be improved which will help us increase the success of future releases.

# I4 - Tansy Beetle Habitat Creation Project - River Ouse Washlands, North Yorkshire

## Intervention type: reinforcement

Authors: Richard Jennings, Kathryn Lillistone and Robin Jennings

Environment Agency (Yorkshire Area)

## Conservation status:

IUCN Red List: Global – Unassessed
IUCN Red List: Great Britain – Unassessed
IUCN Red List: England – Endangered
IUCN Red List: Scotland – Unassessed
IUCN Red List: Wales – Unassessed
IUCN Green List – Unassessed

## Introduction

The tansy beetle *Chrysolina graminis* is nationally rare within the UK and Red listed by the IUCN as Endangered. Its range is restricted to roughly 90 km along the banks of the River Ouse centred on York, North Yorkshire, although the beetle was recently rediscovered at Woodwalton Fen, Cambridgeshire in 2014[7] having been last recorded in the East Anglian Fens in the late 1980s at Wicken Fen. It was also discovered (for the first time) at the WWT's Welney Reserve, West Norfolk, in 2018. The species is not found in Scotland or Wales.

The Yorkshire Ouse population of tansy beetle eats predominantly tansy but also is found on, and eats, Marsh Woundwort; the populations in the Fens do not eat tansy. The beetles are only able to disperse a maximum distance of about 200m, usually moving along the ground to new patches of the tansy, rather than flying. The Tansy Beetle Action Group (TBAG) was established in 2008 to coordinate river corridor management for the beetle; in 2016 it produced a five-year conservation plan. The Species Recovery Trust website is now where the most up to date information can be found.

Along the River Ouse, patches of tansy are becoming more scattered due to changes of land use, livestock grazing pressure and competition with invasive plants. Individual patches are also vulnerable to the effects of flooding.

[7] https://www.gov.uk/government/news/critically-endangered-tansy-beetle-re-discovered-at-woodwalton-fen-nnr-after-a-40-year-absence

The TBAG has undertaken a range of measures to protect the tansy beetle including removing willow *Salix sp.* and Himalayan balsam *Impatiens glandulifera* from the banks of the River Ouse, working with landowners to reduce grazing pressure, undertaking annual beetle surveys of the River Ouse, and promoting similar monitoring of the Fenland populations.

In addition, the TBAG aims to create 'ark sites' away from the river to safeguard the population in case of a catastrophic event, such as severe summer flooding which can lead to high mortality. The ark sites will hold independent, non-flooding insurance populations.

Given the dependency of the tansy beetle on its food plant, efforts to establish ark sites have focused on improving habitat quality, the abundance of tansy plants within potential sites and ensuring that they are in locations which will not be flooded. This case study therefore represents a scenario where a species is translocated for the benefit of another, ecologically dependent, species.

## Goals

- Goal 1: To cultivate tansy plants from seed
- Goal 2: To introduce tansy to a new site at Acomb Landing.

## Success indicators

- Indicator 1: Successful germination and cultivation of tansy plants
- Indicator 2: Successful reintroduction of tansy at the new site
- Indicator 3: Colonisation of Acomb Landing by tansy beetle

**Figure 8 Tansy beetle by The Deep. © Environment Agency, reproduced with permission.**

## Project summary

### Feasibility

Every summer, population surveys are carried out by volunteers from the Tansy Beetle Action Group across 90km of riverbank along the River Ouse around York. These surveys had estimated that the population around York comprised approximately 40,000 beetles in 2016, which was 60% high than the population reported in 2015.

Although the population appears to be increasing, further work was needed to safeguard the future of the population and increase the number of ark sites where beetles are present to protect it from catastrophic events such as flooding.

Acomb Landing was selected as the area was devoid of vegetation following flood alleviation works by the Environment Agency. In addition, there was an active presence of volunteers removing Himalayan Balsam in the area. The land is owned by City of York Council and there are known sites for the beetle approximately 1.6km upstream of Acomb Landing.

**Implementation**

Phil Robinson from the Deep, collected a large number of seeds in October 2016 from the site at Fulford Ings, before undertaking the arduous task of processing the seeds and separating them into small bags with growing instructions. The instructions were “The seeds can be started off in spring under cover (on a windowsill or in a conservatory or greenhouse) in something like a yoghurt pot, a seed tray or root trainers (sometimes garden centres give these away). The plants can then be slowly acclimatised to being outdoors when the plants are a few inches tall. The plants like the sun and regular watering.”

In 2017, The Deep Aquarium in Hull recruited volunteers to help grow tansy plants, the tansy beetles’ food plant. Large numbers of staff from The Deep, local schools, the Environment Agency, and The University of Hull took seeds from March 2017 and subsequently grew them on.

Although germination rates of tansy are usually rather poor, the number of seeds planted meant that a total of 400 useable plants were produced. When the plants were about 30cm tall, the trays were collected by members of the project team, who took them to Acomb Landing and planted them.

The seedlings were planted at the end of July 2017. The section of riverbank at Acomb Landing is not managed or grazed so the plants are unlikely to be disturbed, although the site is not protected.


**Figure 9 Tansy seedlings and plants being transported to receptor site by The Deep. © Environment Agency, reproduced with permission.**

**Post-release monitoring**

Acomb Landing is one the range sites surveyed each year by the Tansy Beetle Action Group. As a result of this work the surveys have seen beetle populations increasing, demonstrating the effectiveness of habitat management in species recovery programmes. There are now several very

large clumps of established tansy plants at Acomb Landing. Beetles have been recorded in this area with numbers averaging around 30 at the site.

## Major difficulties faced

- Finding suitable Ark sites in areas that will not be flooded.

## Major lessons learned

- Volunteers are an effective resource to cultivate plant material. Involvement of a number of volunteers is, however, crucial, so if one batch of seeds fails to germinate, then there is a good chance other batches will succeed.

## Success of project

Success.

**Reasons for success:**

- The germination rate of tansy is usually rather poor, which is why many seeds needed to be sown, however this meant that a large number of plants were produced
- A willing group of volunteers to help raise plants
- A suitable translocation site owned by a sympathetic landowner
- Proximity to existing tansy beetle populations

# Amphibians

## A1 – Reintroduction of the pool frog to Norfolk

### Intervention type: reintroduction (UK)

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### Conservation status

IUCN Red List: Global – Least Concern
IUCN Red List: Great Britain – Critically Endangered
IUCN Red List: England – Critically Endangered
IUCN Red List: Scotland – Unassessed
IUCN Red List: Wales – Unassessed
IUCN Green List – Unassessed

### Introduction

The pool frog *Pelophylax lessonae,* is found though much of central and northern continental Europe. Its global IUCN Red List category is Least Concern. However, some populations in the far north of the range have been found to be genetically and phenotypically distinct, representing a northern clade. This form was once found in England but was generally considered to be an introduction. It was only in the late 20th century that its status was investigated thoroughly, and in the early 2000s compelling evidence emerged to demonstrate that the species was in fact native. By this time the last known population, at Thompson Common in Norfolk, was extinct. A reintroduction was subsequently proposed and planned to take place at a confidential location in Norfolk, using northern clade stock collected in the wild from Sweden. At the time of reintroduction planning, the species was listed as a national biodiversity priority in England, and it remains so. It is now legally protected under Schedule 2 of the Conservation of Habitats and Species Regulations 2017, but it was not protected at the time of reintroduction. The reintroduction is a rare example of a vertebrate being reintroduced to England after having gone nationally extinct, and unusual in that it was a species previously considered to be non-native.

## Goals

- Goal 1: To establish a viable population of northern pool frogs in the UK at a suitable site within their UK historical range.
- Goal 2: To assess the effectiveness of amphibian reintroduction using wild-to-wild translocation.

## Success indicators

- Indicator 1: Early indicators: Survival of eggs/larvae through to metamorphosis, survival of adults, and breeding activity
- Indicator 2: Long-term indicators: Adult population size of at least 50 and ideally at least 100; mixed population structure in terms of demography; progressive colonization of multiple ponds by dispersing frogs.
- Indicator 3: Co-existing species and habitats are not negatively impacted, and ideally are enhanced, by the reintroduction of pool frogs.

**Figure 10 A female pool frog at the first Norfolk reintroduction site by Jim Foster. © Amphibian and Reptile Conservation Trust, reproduced with permission.**

## Project summary

### Feasibility

An investigation into the desirability and feasibility of reintroduction concluded that establishing a population in the UK would represent a significant gain for national biodiversity, as well as a contribution to its European status, given that the northern populations are scarce and often imperilled. The main reasons for decline and extinction were thought to be a reduction in water levels due to abstraction, and substantial deterioration in habitat condition. All of these issues were thoroughly investigated, and a reintroduction strategy was produced following consultation with experts in amphibians and reintroduction methods (Buckley & Foster, 2005). Goals and indicators of success were set out in that document, and further developed in documentation supporting the releases, in particular to ensure compliance with IUCN reintroduction guidance. Much effort was put into early liaison with site managers and regulatory authorities (chiefly Natural England's predecessor, English Nature) to ensure that the more complex challenges were considered and addressed well before the releases were due to occur. Efforts to restore habitat for a receptor site involved examination of habitat characteristics at historic pool frog sites in the UK and existing sites in Sweden. It was decided to keep the precise location of the receptor site confidential to reduce the chance of collection of frogs, for what would become the rarest UK amphibian after reintroduction.

### Implementation

The reintroduction was achieved by wild-to-wild translocation, using founders from Sweden (a close genetic match and where populations were robust enough to tolerate some removals). Early discussions with the Swedish authorities were important, because of the need to carefully assess potential impacts, and legal issues relating to capture, export from Sweden and import to the UK. Frogs were caught during four annual visits from 2005 to 2008, flown to the UK and released at a specially prepared receptor site. Following a population viability analysis, a mix of adults, juveniles, spawn and larvae was imported. Mortality during import was minimal, with a loss of <5 larvae per year, and no mortality of post-metamorphic animals. Head-starting was used in addition to hard release in some years, with mixed success. Early discussions with veterinary experts (the Institute of Zoology, Zoological Society of London) were important, to ensure that we implemented a full disease risk assessment, disease risk management, and post-release health surveillance (Sainsbury et al., 2016). An advisory group, comprising species experts, landowners and regulatory authorities, assessed progress with the reintroduction by reviewing progress reports, undertaking site visits and providing additional advice on methods. Funding was generously provided by a range of organisations, including Anglian Water and Natural England, with in kind support from the Forestry England.


**Figure 11 Adult female pool frog captured in Sweden, shortly before translocation to England by Jim Foster. © Amphibian and Reptile Conservation Trust, reproduced with permission.**

**Post-release monitoring**

Monitoring comprised three main strands: (1) monitoring of released pool frogs via individual identification and counts of all detectable life stages; (2) monitoring of co-existing amphibians, reptiles and habitat condition; (3) monitoring of health status of pool frogs and other amphibians. In summary, we found:

(a) a breeding population of pool frogs has been established, with an estimated adult population size ranging between 55 (95% CI = 52-62) and 123 (95% CI = 82-244) during the period 2015 to 2018 (reliable estimates were not possible in 2019 and 2020, though breeding has been confirmed); there is a good demographic profile, with regular breeding, though in some years counts of metamorphs or juveniles have been low; pool frogs have colonized and breed in multiple ponds;
(b) common frogs (*Rana temporaria*) appear to have increased substantially, while the status of newts has not noticeably changed (there are issues with detectability, but no decline is evident); habitats appear to be providing excellent conditions for a range of other wildlife, including aquatic beetles, reptiles and mammals;
(c) pool frogs and other amphibians appear to be in good health condition and there is no evidence of co-introduction of serious infectious disease. Interestingly, *Batrachochytrium dendrobatidis,* a fungal pathogen, has now been detected in the Swedish founder populations, whilst the pathogen is apparently not present in the English population arising from the reintroduction. Ecological monitoring has been undertaken by a contractor working to a specification provided by the project

leaders, and health monitoring has been undertaken by the Institute of Zoology. Annual reviews ensure that monitoring goals and methods remain appropriate and take account of changing constraints.

## Major difficulties faced

- Given that population establishment takes many years and there is a background of fluctuating reproductive success, establishing meaningful short-term indicators is difficult.
- Understanding patterns and causes of mortality in reintroduced frogs and, especially, their progeny.
- Uncertainty over interpreting the significance of potential threats such as shifting habitat condition or increase in predator abundance.
- Deciding how to balance resources available for pool frog conservation between (1) ensuring activity at the first reintroduction site progressed adequately and (2) establishing additional populations to ensure a more resilient national population of pool frogs (releases for a second reintroduction site started in 2015).
- Securing continuity of funding for implementing reintroduction activity.

## Major lessons learned

- Given the inherent uncertainty in the outcomes of reintroduction activity, flexibility in implementation was crucial, based on monitoring and adaptive management of the reintroduction programme.
- Detailed ecological knowledge about the target species was key to planning the reintroduction.
- Setting a clear objective and indicators of success helped to plan monitoring.
- Planning the reintroduction required substantial lead-in time and consultation with a range of authorities, and this effort required significant co-ordination and funding.
- Project management takes time and needs clear governance, especially where there are risks relating to legal and procedural issues, and where implementation requires flexibility to deviate from agreed plans.

## Success of project

Success

**Reasons for success/failure:**

- Careful planning, implementation, documentation and resourcing of the reintroduction.
- Selection of an appropriate receptor site with resource reasonably guaranteed for long-term management.
- Development of a thorough evidence base on which to plan the reintroduction, notably on pool frog status, monitoring methods, ecological requirements and decline factors.

- Advice from an inclusive partnership of researchers, practitioners, site managers and government agencies.

# Birds

## B1 – Reintroduction of white-tailed eagle to southern England as a breeding species after an absence of 240 years

### Intervention type: reintroduction as a breeding species (England); reinforcement (UK)

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### Conservation status

IUCN Red List: Global – Least Concern
IUCN Red List: Great Britain – Unassessed
IUCN Red List: England – Unassessed
IUCN Red List: Scotland – Unassessed
IUCN Red List: Wales – Unassessed
IUCN Green List – Unassessed

### Introduction

The white-tailed eagle *Haliaeetus albicilla* is distributed as a breeding species over the northern Palearctic from Japan, Kamchatka and the Bering Strait in the east, to Germany, Scotland and Iceland in the west, extending to Greenland in the Nearctic zone (BirdLife International 2021). It suffered severe population declines across much of its range during the latter part of the 19th century and beginning of the 20th century due to direct persecution and pollution with heavy metals and especially organochlorine pesticides such as DDT which led to eggshell thinning and subsequent breeding failures (Helander et al., 2002). Since the 1980s, many populations have recovered dramatically, with population growth rates commonly exceeding 10% per annum (Krüger et al 2010). The white-tailed eagle is now regarded as an important environmental sentinel (Helander et al 2008) as well as a flagship species for wetland species across Europe (Sandor et al 2015).

The white-tailed eagle is listed globally as of Least Concern, but it remains absent from much of its former range, particularly in western and southern Europe (BirdLife International 2021). Although immature white-tailed eagles are known to range widely during their first two years, strong natal philopatry and conspecific attraction limits geographical expansion away from core areas (Whitfield et al 2009). As such reintroduction can be an effective means by which to restore lost populations.

The white-tailed eagle was formerly widespread across the United Kingdom (Evans et al 2012) but intense persecution resulted in it becoming extinct as a breeding species by the early 20th century. The last pair English pair bred on the Isle of Wight in 1780, and they were extinct in Scotland by 1918 (Love 2006). The species has since been re-established in Scotland by a series of reintroductions using Norwegian birds, beginning on Fair Isle in 1968 (Whitfield et al 2009) and the population now stands at approximately 140 breeding pairs, principally in western areas (D Sexton pers. comm. 2020). Similarly, a reintroduction project in Ireland, translocated 100 chicks from Norway between 2007-2012 with a maximum of ten pairs breeding to date (Mee 2017).

This project sets out to restore a breeding population of white-tailed eagles in southern England and is led by the Roy Dennis Wildlife Foundation and Forestry England.

## Goals

- Goal 1: A viable breeding population restored to southern England.
- Goal 2: The eagles become a flagship species for wetland and coastal conservation in the most densely populated region in the United Kingdom.
- Goal 3: Acceptance of the return of an apex predator that has been absent for more than two centuries following human persecution.
- Goal 4: Enhance meta-population connectivity between European populations of white-tailed eagle and those in Scotland and Ireland.

**Figure 12 Juvenile white-tailed eagle by Ainsley Bennett. © Forestry England, reproduced with permission.**

## Success indicators

- Indicator 1: Successful release of translocated birds over 5yr period.
- Indicator 2: First pair establish and breed.
- Indicator 3: First wild-fledged bird breeds in southern England.
- Indicator 4: Establishment of 6-8 breeding pairs from the translocated population.
- Indicator 5: Positive or at least neutral attitude towards White-tailed Eagles from all stakeholder groups.
- Indicator 6: First continental fledged bird breeds as part of a re-established English population.

## Project summary

**Feasibility**

An analysis of place names interpreted as indicating the presence of white-tailed eagles indicates that the species was likely to have bred across the whole of the south coast, from Cornwall to Kent (Evans et al. 2012) before they were hunted to extinction. Despite the success of the reintroduced Scottish and Irish populations natural recolonisation of the South Coast of England was considered unlikely for many decades and potentially longer as the young birds tend not to travel far from their area of hatching (Whitfield et al. 2009).

The landscape of southern England has changed significantly since the species last bred in the eighteenth century, but all of the ecological requirements of this generalist predator are met. The nearby Netherlands is geographically closest to the Solent and Isle of Wight, it holds similar ecological features and a rapidly expanding population of white-tailed eagles, within the most densely populated country in western Europe. White-tailed eagle diet during the breeding season in the Netherlands consists predominantly of waterbirds (58%) and fish (28%), though fish is preferred when available and likely underrepresented in prey remains (van Rijn and Dekker 2016). Waterbirds also constitute an important part of the diet through the winter, with large numbers of wildfowl and waders congregating in the Netherlands (van Rijn et al 2010). The Solent region supports seasonally abundant fish populations, particularly in estuaries where three species of grey mullet are numerous and widespread (IFCA 2017). It also holds internationally important numbers of wintering waterbirds (Frost et al. 2017) and resident wildfowl such as coot *Fulica atra*, mallard *Anas platyrhynchos*, greylag goose *Anser anser* and Canada goose Branta canadensis are also abundant year-round.

Based on evidence from Europe, it was concluded that there was a high natural prey availability and ample breeding habitat in southern England, which would enable a self-sustaining population of white-tailed eagles to become established if they were reintroduction (Dennis et al 2019). In addition, the risk of conflict with socio-economic interests was considered low due to the abundance of natural prey in the region.

Nevertheless, the project team also committed to work closely with all stakeholders from the outset. This included setting up a steering group and project monitoring and evaluation group with a broad range of groups represented, and a proactive approach to meeting concerned or interested stakeholders on a more individual basis.

**Figure 13 White-tailed eagle chicks in aviary prior to release by Ainsley Bennett. © Forestry England, reproduced with permission.**

**Implementation**

Techniques for bird of prey translocation and hacking are well developed, and the Roy Dennis Wildlife Foundation has extensive experience of this, including the ongoing reintroduction of osprey *Pandion haliaetus* to Poole Harbour in Dorset, southern England. The Scottish population of white-tailed eagle is large enough to act as a donor population for the project and the licence issued by Scottish Natural Heritage permits the collection of a single chick aged approximately seven-ten weeks from a brood of two or three. The project aims to collect up to 12 chicks per year from Scotland, which following a health check are transported to the Isle of Wight. During the first year these birds were transported by road but in the second year and in the future a light aircraft pilot has generously offered to help transport the chicks to the Isle of Wight – the shorter journey time being less stressful for the birds. Prior to release, the fully developed juveniles are checked by a vet and fitted with GPS transmitters and VHF radio transmitters.

**Post-release monitoring**

The project team devised a comprehensive monitoring and evaluation plan. All the juveniles released as part of the project are fitted with Ornitela GPS-GSM transmitters, to

enable the project team to monitor the birds on a day-to-day basis remotely. This is supplemented whenever possible by field monitoring by project staff and volunteers. County bird recorders across England have been helpful in coordinating monitoring of widely dispersed immature birds which have ranged extensively during their first two years. In addition, national organisations such as Natural England, Forestry England, RSPB and Countryside Police often have enthusiastic and dedicated staff willing to help monitor the birds in their locality. Academic institutions are assisting in providing more scientific studies on white-tailed eagle behaviour, movements and diet. Although the project is still in its infancy considerable data has already been collated, and this will continue over the next decade as a breeding population hopefully becomes established.

Satellite tracking has shown that the immature white-tailed eagles have dispersed extensively during their second calendar year in particular. Individual birds have ranged up to 600 km from the release site before returning to the Isle of Wight. One bird covered 4904 km during 17 months of exploratory flights. Survival of released eagles during their first year is 77% to date.

White-tailed eagles do not reach breeding age until approximately four or five years old and, as such, breeding is not expected until at least 2022/23. However, the project team has started erecting artificial nests in areas of the Isle of Wight favoured by birds released in 2019, as a means of facilitating initial settlement. Staff at the Roy Dennis Wildlife Foundation and Forestry England have considerable experience in monitoring and safeguarding bird of prey nests.

## Major difficulties faced

- Concerns were expressed during the project's public consultation relating to potential impact of white-tailed eagles on SPA birds through disturbance within the Solent region, particularly in view of considerable existing recreational pressure. Initial evidence has demonstrated that there is no issue in this regard, given that white-tailed eagles favour the sit-and-wait method for searching for food (Nadjafzadeh et al. 2016). Satellite tracking has shown that they spent >90% of diurnal time perched.
- There has been objections to the project from the farming community over fears of livestock predation. Evidence from Ireland and continental Europe suggests that conflict with livestock is unlikely. The proactive approach taken by the project in term of consultation within the farming community has been welcomed, and there has been no conflict to date.
- Working at a national scale during the public consultation was difficult, particularly in terms of in-person meetings with groups, given limited resources. The project took the approach of working with key stakeholders with a national remit. This has its drawbacks as national teams do not always communicate well to their local teams, particularly the case in voluntary groups. Nevertheless, media support and online presence helped spread the messages to the general public. There were still some individuals who commented that they had not heard about the project before it began.

- Difficulty in finding a secure and confidential location for release on the Isle of Wight. The release site chosen has proved highly suitable to date and there have been no major issues with unauthorised access.
- The global COVID-19 pandemic started in 2020, and ongoing at the time of publication. Rules and regulations surrounding movements made the translocation process and monitoring more challenging. Use of volunteers during this period was not possible due to safety issues.

## Major lessons learned

- Effective and meaningful stakeholder engagement, including individual conversations and qroup meetings.
- The importance of generating public support for a project. Online surveys and a big social media presence helped spread the messages to the general public about the project and its merits. This was important to provide a balance to opposing views expressed publicly.
- The availability of carrion (including gamebird carcasses) in the wider landscape is a significant food resource for juvenile white-tailed eagles in their first winter, but this potentially exposes birds to lead shot. This may have implications in the long term, but a clear preference for second calendar year birds to favour live prey, and particularly fish, reduces the likely impact in the long term.
- The ability of white-tailed eagles to catch fish throughout the year on the South Coast of England. This high natural prey availability is likely to facilitate greater survival of young birds in comparison to previous reintroduction projects in Scotland.

## Success of project

Not yet available.

**Reason(s) for success/failure:**

- It is still too early to judge the overall success of the project, but initial signs are encouraging. Annual survival of reintroduced birds is currently greater than expected and diet analysis indicates an abundance of natural prey.
- There has been a great deal of public interest in the project, with national media reporting on the project in an increasingly positive manner. Anecdotal evidence suggests this is helping to change perceptions about how apex predators, such as white-tailed eagles can coexist with humans in a highly anthropogenic landscape.
- The project team have been proactive in engaging with groups opposed to or concerned about the reintroduction of eagles, making every effort to consider any concerns raised, and adapting project methodology where possible. Engaging with individuals on a one-to-one basis or in small groups has been the most effective means of working with these groups.

# Mammals

## M1 – The trial reintroduction of Eurasian beaver into the River Otter in Devon

### Intervention type: reintroduction (England); reinforcement (UK)

Mark Elliott

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### Conservation status

IUCN Red List: Global – Least Concern
IUCN Red List: Great Britain – Least Concern
IUCN Red List: England – Critically Endangered
IUCN Red List: Scotland – Vulnerable
IUCN Red List: Wales – Unassessed
IUCN Green List – Unassessed

### Introduction

Eurasian beavers *Castor fiber* are ecosystem engineers, and as a 'keystone species', are a vital component of our ecosystems. When still widespread across Britain and Europe, Eurasian beavers would have created extensive dynamic floodplain and headwater wetlands and wide complex watercourse corridors comprising braided channels, dams, pools and riffles, providing habitats for a wide range of other species.

Their reintroduction into Britain has been the subject of decades of debate, and a feasibility study into their reintroduction published by Natural England in 2009 (Gunnell, 2009) which concluded that the evidence shows that it is feasible to reintroduce beavers into England and that many benefits are likely to accrue, not least the potential of beaver to assist with river and floodplain restoration. Moreover, that the success of reintroductions elsewhere in Europe has demonstrated the feasibility of putting in place measures to deal with any possible adverse consequences.

The release of beavers into the wild in Britain is unlawful without a licence, so following the discovery of a escaped population living wild on the lower reaches of the River Otter in 2013, the Department for Environment, Food and Rural Affairs (Defra) originally proposed to remove them. A campaign by local residents to 'save their beavers' resulted in a compromise being negotiated between Devon Wildlife Trust (DWT) and Defra, and the 5-year River Otter Beaver Trial (ROBT) was conceived. The existing presence of the beavers on the River Otter meant that this project was not able to comply fully with IUCN guidelines for reintroductions.

Goals

The following goals were established by the ROBT partnership and laid out in the licence application to Natural England:

- Goal 1: To establish a healthy population of Eurasian beavers into a lowland English river catchment.
- Goal 2: To demonstrate that beavers will have a positive impact on the ecological health of the river system and associated riparian land.
- Goal 3: To demonstrate that the beavers and their impacts will, on balance, be regarded by the local community and stakeholders as tolerable / positive.

**Figure 14 A beaver being re-released into the River Otter at the start of the Trial in 2015 by Nick Upton. © Devon Wildlife Trust, reproduced with permission.**

## Success indicators

- Indicator 1: The impacts of the free-living beavers on the River Otter, its wildlife, the local economy and local people are recorded and assessed to provide a solid evidence base on which the future of the population can be decided.
- Indicator 2: The value of beaver reintroduction and their influence on the provision of key ecosystem services is understood by key decision makers.

- Indicator 3: The impacts of beaver reintroduction are successfully managed and cause minimal local disruption. An understanding is secured of the nature and frequency of conflict and the costs / benefit analysis.
- Indicator 4: The dispersal and population dynamics of beavers in lowland UK river systems is better understood.

## Project summary

### Feasibility

Due to the unorthodox context for this project, feasibility work to justify the River Otter catchment as a location for the reintroduction of this species was carried out retrospectively. Some initial work was carried out by the partners to support the licence application, but the majority of the research work was conducted during the 5-year trial period. This included detailed modelling work by the University of Exeter who developed a Beaver Dam Capacity model to identify the capacity of different watercourses to support beaver dams, and the Beaver Habitat Index which brought together a range of parameters to identify those parts of the catchment most suited to supporting beavers throughout the year. (Brazier et al, 2020).

### Implementation

Ecologists from the Animal and Plant Health Agency trapped five of the beavers, including the four adults and tested them for a taenid tapeworm *Echinococcus multilocularis* citing concerns that it could have been accidentally imported from mainland Europe where it is present in some beaver populations, including the population from which these beavers most likely originated. Three different tests were conducted by specialist vets from the Royal Zoological Society for Scotland (RZSS) including a laparoscopic examination of the liver under anaesthetic, but all the test results were negative. DWT also funded RZSS to conduct other tests to determine the health status of the beavers prior to their eventual re-release in the same territories from where they had been trapped in March 2015, following the granting of a licence to DWT under the Wildlife and Countryside Act 1981 to re-release the beavers.

The licence was issued with conditions that included a detailed study of their effects in this productive lowland English landscape, the mitigation of any negative impacts, and reparations for any damages incurred. The research was co-ordinated by a Science and Evidence Forum chaired by Professor Richard Brazier from the University of Exeter. The River Otter Beaver Trial was a highly complex partnership and stakeholder engagement exercise that ran alongside the management and monitoring of the animals and the wider research work undertaken to investigate their effects.

The project Steering Group consisted of representatives from national stakeholder organisations reflecting the national significance of the Trial. This group was responsible for annually assessing the project against a number of criteria that had been set to trigger the project's Exit Strategy.

The Steering Group also convened the Beaver Management Working Group who were responsible for drawing up the Beaver Management Strategy Framework which outlined how the beavers would be managed in the catchment after the end of the Trial in the event they were permitted to remain. (Devon Wildlife Trust, 2019)

The Science and Evidence Forum was chaired by Professor Richard Brazier from the University of Exeter. This group was responsible for overseeing the delivery and publication of the research work that accompanied the Trial. The Forum published the final Science and Evidence Report independently of the Steering Group, along with a wide range of supporting appendices. (Brazier et al, 2020)

**Post-release monitoring**

The five original beavers were given subcutaneous PIT tags that could be scanned when trapped, and ear tags which helped with their identification when seen in the wild. These ear tags enabled an understanding of their lodges and ranges to be recorded, with the assistance of incidental sightings by ROBT staff and members of the public. Camera trapping and high-resolution permanent cameras were also used to monitor the family structure and interactions on some sites.

However, the most useful way of monitoring the extent of the population, and the dispersal into different parts of the catchment was annual systematic winter surveys of feeding signs on woody bankside plants. Surveys were conducted between January and March each year, and any signs of feeding on trees and shrubs were mapped, and categorised as high, medium or low impact (Brazier et al, 2020). This enabled heat maps to be produced which, along with sightings records, allowed an approximation of the territories to be made, providing an annual snapshot on the size of the population.

Throughout the Trial period, traps were set in the known breeding family groups to capture and tag kits born during the Trial period. This was a condition of the licence. Basic health monitoring was also undertaken, and faecal and blood samples analysed for disease monitoring and a detailed assessment of the findings of this work was published as part of the Science and Evidence Report (Campbell-Palmer and Girling, 2019)

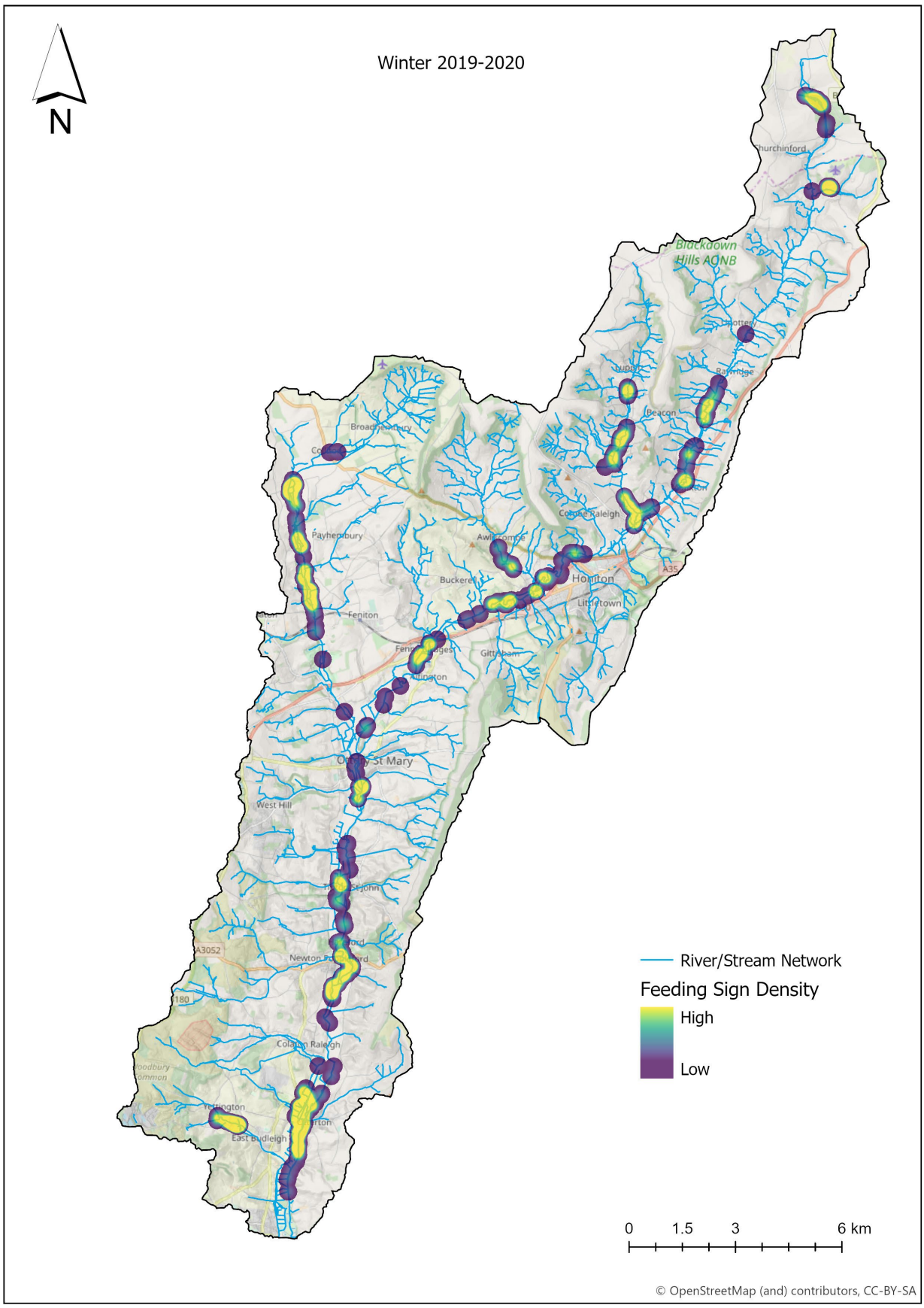


**Figure 15 Beaver status of River Otter in March 2020 showing extent of beaver colonisation by end of the Trial period, suggesting up to 15 territories throughout the catchment. © Devon Wildlife Trust, reproduced with permission.**

The trial concluded in August 2020 when a decision was made by Minister for the Environment, Rebecca Pow MP, that the River Otter beavers would be permitted to remain and spread naturally into adjacent catchments. This landmark decision marked the first reintroduction of an extinct mammal back into the English countryside and followed a similar decision by the Scottish government on the conclusion of the Scottish Beaver Trial in 2016.

## Major difficulties faced

- There are numerous myths associated with beavers resulting from their absence from the British landscape for many centuries. It has been necessary to provide accurate information to stakeholders and professional partners to alleviate concerns. This was particularly the case at the start of the project, but with some groups this is an ongoing need.
- Due to the absence of government funding to run the trial, a significant fundraising effort was needed by the Wildlife Trusts and University of Exeter to resource the Trial and the associated research.
- Unless females are obviously lactating, beavers are impossible to sex without catching them, and they are generally impossible to distinguish from one another in the field. Catching beavers is difficult and comes with significant risks, both to the people involved and the beavers themselves.

## Major lessons learned

- Meeting the insatiable demand for information about the beavers and their ecology is a huge opportunity, and one that must be adequately resourced as part of any high-profile reintroduction project.
- Accurate and pragmatic advice on beaver management must be available immediately to impacted landowners and stakeholders to maintain trust and confidence in the reintroduction, and to avoid issues escalating.
- Detailed stakeholder involvement throughout the trial largely prevented the debate about the beavers on the River Otter becoming polarised, as has occurred elsewhere.
- The ability to take prompt action to resolve conflicts (e.g. removing dams) was important to maintaining the support of landowners (at the time of this project the beaver was not legally protected in England).

## Success of project

Highly successful.

**Reasons for success/failure**

- The three goals identified at the start of the project were met, and the evidence collected during the course of the Trial enabled Defra to conclude that the species

could be permitted to remain in the wild in perpetuity, marking the first reintroduction of a native mammal back into the English landscape.

- Detailed public perception work carried out by the University of Exeter towards the end of the Trial showed 90% of those questioned supported the reintroduction of beavers, up from 86% identified two years previously.

# M2 – Restoring Ratty – Bringing the water vole back to Kielder, Northumberland

## Intervention type: reintroduction (Kielder); reinforcement (UK)

Graham Holyoak and Kelly Hollings

Restoring Ratty Project Officers, Northumberland Wildlife Trust (www.nwt.org.uk)

## Conservation status

IUCN Red List: Global – Least Concern
IUCN Red List: Great Britain – Endangered
IUCN Red List: England – Endangered
IUCN Red List: Scotland – Near Threatened
IUCN Red List: Wales – Endangered
IUCN Green List – Unassessed

## Introduction

The water vole *Arvicola amphibius* is the UK's fastest declining mammal, with a 97% range loss over the last 30 years. This is largely due to predation by the introduced American mink *Neovison vison*. Remaining populations of water voles are fragmented and geographically isolated. Before the launch of 'Restoring Ratty', the only remaining population of water voles in Northumberland was in the North Pennines. Although present within living memory in Kielder, water voles became locally extinct in the 1980s.

Covering an area of 60,000 hectares and straddling the Northumberland-Cumbria boundary between the Scottish border and Hadrian's Wall, Kielder Forest is the largest forest in England and one of the largest planted forests in Europe. Kielder Water & Forest Park (KWFP) forms part of the Tyne catchment. The North Tyne rises above the forest in the southern Cheviot Hills and flows through the KWFP and the Northumberland National Park to, eventually, join up with the South Tyne just to the west of Hexham. The Restoring Ratty project, launched in July 2016, is working to establish a sustainable population of water voles within KWFP and on the upper catchment tributaries of the Kielder Burn and North Tyne (above Kielder Reservoir).

To achieve this, the project is carrying out a programme of captive breeding and reintroduction of water voles to areas with suitable riparian habitat where no American mink are present. The project is delivered by a partnership of Northumberland Wildlife Trust (NWT), Forestry England (FE) and Tyne Rivers Trust and is funded by National Lottery Heritage Fund (NHLF).

## Goals

- Goal 1: Create a sustainable population of water voles in Kielder Water & Forest Park
- Goal 2: Ensure that no mink settle in the project area
- Goal 3: Create a 10km mink monitoring network from nearest water vole population
- Goal 4: Work towards the long-term aim of connecting new population to donor population in the North Pennines

**Figure 16 One of the first re-introduced water voles at Keilder Forest by Lyle McCalmont. © Northumberland Wildlife Trust, reproduced with permission.**

## Success indicators

- Indicator 1: Water voles spread from release sites and established in wider environment exhibiting normal meta-population dynamics.
- Indicator 2: Mink monitoring network set up with points approximately every 2km within a 10km radius from water vole populations. Mink numbers are known to be low through intensive mink monitoring and control.
- Indicator 3: Donor populations are still sustainable after vole removal.

## Project summary

### Feasibility

Significant preparatory planning was undertaken before it was judged appropriate to begin to reintroduce water voles to KWFP.

Surveys and data collection in the 1990s and 2000s demonstrated the decline of the water vole in the north east of England. Water vole conservation in this region took a significant step forward from 2008 with the formation of the North East Water Vole Working Group and the production of the North East Water Vole Conservation Strategy (O'Hara, 2012). This recommended the reintroduction of water voles into habitats which are highly suitable and where strategic mink management on a catchment or local scale is practical. Such an exercise could also contribute to national and regional conservation strategies for this species. A feasibility study identified the most appropriate area for this action was within the bounds of the Kielder Forest on the headwaters of the North Tyne river catchment.

In 2012, the Forestry England, Northumberland Wildlife Trust and Tyne Rivers Trust came together to form the Kielder Water Vole Partnership. This led to a two-year project (2013-2015), funded by National Heritage Lottery Fund, with the aim of gathering information to: a) establish where mink were absent or at low level and b) assess public appetite for water vole reintroduction. Over 40 mink rafts were installed and monitored in the area. Only one possible mink footprint was recorded.

In 2015, further funding was received from NHLF to develop the 5 year Restoring Ratty project. Mink monitoring continued as well as assessments of water vole populations in the North Pennines, which could serve as donor sites for captive breeding. The Restoring Ratty project launched in June 2016. It widened the mink monitoring network as well as assessing the Kielder Water & Forest Park for suitable water vole release locations.

The degree of planning which went into this project is a lesson in best practice. After the local demise of water voles, riparian habitat was restored by improved forestry practices. The resulting forest restructuring and sympathetic management in the following decades created a network of riparian habitat ideally suited to water voles.

Long before any water voles were released, habitats were assessed for suitability, exhaustive checks were made to ensure no mink were present, local communities were engaged, expertise identified for breeding and animal welfare and release sites selected. Genetics were carefully considered, using breeding stock from Scottish, North Yorkshire and North Pennine populations to give resilience in a changing climate.

### Implementation

Water voles were captured from the North Pennines, North Yorkshire and the Trossachs in 2016 and 2017 to establish a captive water vole breeding programme to supply releases into Kielder. This part of the project was delivered by Derek Gow Consultancy, experts in the field with experience from several reintroduction projects.

Voles were caught in late summer and only those under 160 grams, which are considered unlikely to survive the winter, were taken for the reintroduction project to avid negatively impacting the donor population. A series of suitable release locations were identified in KWFP, with good food supply and abundant burrowing material. As far as possible, release locations were no more than 2-3km apart to allow meta-population dynamics to form. Two releases were conducted annually from 2017 in the months of June and August. By 2020, a total of 1762 voles had been released. A standard soft release method was used, with water voles placed in breeding pens for a few days before baffles were taken off. Some voles were hard released into good habitats where access was too difficult to use soft release pens.

Mink monitoring is ongoing and is largely done by project staff and volunteers, due to the remote nature of the area. The majority of the rafts are on FE land, but when a raft is on private land, we endeavour to pass ownership onto the landowner, who then monitors the raft and sends in records.

The Restoring Ratty project also delivers an education and engagement programme to complement the practical delivery of the project.

**Figure 17 Release pen on site by Zoe Webb. © Northumberland Wildlife Trust, reproduced with permission.**

**Post-release monitoring**

The project surveys all release sites twice a year as well as good water vole habitat within a reasonable dispersal distance, using standard methodology from the Water Vole Handbook (Strachan et al, 2011). With an upland habitat, the length of survey is based on length of suitable habitat. A mixture of staff and volunteers conduct the surveys. Based on our experiences from surveying, we suspect that the voles are using the wider habitat

away from the watercourses which affects our detection abilities. We are currently developing an occupancy model to help us assess the meta-population more accurately. We also use camera traps and mink rafts to monitor for the presence of water voles and mink in the wider landscape. The project is also working with Imperial College London on using eDNA for water vole detection, with a particular focus on investigating the rates of dispersal from reintroduction sites.

## Major difficulties faced

- Difficulty in surveying water voles in rough ground away from watercourses has led us to reassess our survey methods.
- Volunteering has been greatly affected by the COVID-19 pandemic. This has impacted on our ability to carry out as many surveys as we would normally aim for.
- There are additional challenges to working in a remote, upland landscape at the scale of Kielder. Bad weather, difficult access and hard terrain are just a few of the issues.

## Major lessons learned

- The project has benefited from a broad partnership of highly skilled and experienced individuals, consultancies, organisations and academics. This broad range of knowledge has been vital to help us with any challenges we have faced.
- Mink are highly mobile and occupy large territories. There is a need to remain vigilant for their presence even if there haven't been sightings for several years. The sudden presence of reintroduced water voles can attract mink to an area. Permissions and processes to allow timely response to a sighting therefore need to be in place before the start of a release project.
- A strong partnership with good communication between the organisations involved is key. A great example of this has been demonstrated during releases. Staff and volunteers from each organisation all brought complementary knowledge and skills to this complex logistical task.
- It is important to recognise a core area to focus resources. As the project has developed and we have established a 10km buffer of mink monitoring around release sites. We know that this is a manageable area to cover.
- The remoteness of Kielder means that local communities are small and fragmented, and as such it has proved impossible to find enough local volunteers to carry out all the monitoring. Committed Wildlife Trust volunteers, many of whom travel considerable distances to KWFP, have been essential to the success of this project. Although it is desirable to have private landowners monitoring for mink rather than project staff and volunteers, it takes a lot of work and constant communication to ensure that it is being done and recorded.

## Success of project

Success.

**Reasons for success/failure:**

- Water voles are present in many of the release sites and suitable habitat in surrounding areas. We are working to develop an occupancy model to help us further understand the success of this project.
- In the seven years of monitoring for mink over a wide area we have caught 9 individuals, mainly during the annual dispersal period. This indicates that mink numbers are at a low level.
- A mink monitoring network is set up over an 800km$^2$ area. A new project to control mink in the wider River Tyne catchment started in January 2021 which will help protect the Kielder population further.
- There is landowner support outside the core project area that could allow water voles to disperse out of KWFP area.

# M3 – Pine marten translocations to mid-Wales

## Intervention type: reinforcement

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## Conservation status

IUCN Red List: Global – Least Concern
IUCN Red List: Great Britain – Least Concern
IUCN Red List: England – Critically Endangered
IUCN Red List: Scotland – Least Concern
IUCN Red List: Wales – Critically Endangered
IUCN Green List – Unassessed

## Introduction

The European pine marten *Martes martes* is a small carnivore, from the family *Mustelidae,* native to most of the British Isles and continental Europe. Pine marten were once common and widespread in Britain, but loss of woodland habitat coupled with intensive predator control led to severe declines during the 18$^{th}$ and 19$^{th}$ centuries. By the beginning of the 20$^{th}$ century remaining pine marten populations were confined to the northwest highlands of Scotland and a few small, remote upland areas in northern England and Wales. With increases in afforestation, and legal protection since the 1980s, the pine marten population in Scotland has been increasing and expanding its range. However, repeated surveys and research up until 2010 found no evidence, beyond occasional sightings, to suggest that viable pine marten populations persisted elsewhere (Birks & Messenger 2010). The conclusion was that intervention would be needed to restore viable populations of martens to suitable parts of their former range in southern Britain (Jordan 2011).

## Goals

- Goal 1: Translocate and release pine martens in sufficient numbers to restore a viable population to Wales.
- Goal 2: Establish a community-wide level of support and community ownership of the Welsh pine marten population.
- Goal 3: Long term persistence, increase and expansion of the pine marten population in Wales.
- Goal 4: Develop a robust, transferable protocol for pine marten translocations.


**Figure 18 A pine marten emerging from the release cage at night by Nick Upton. © Vincent Wildlife Trust, reproduced with permission.**

## Success indicators

- Indicator 1: (short term) Translocate and release a minimum of 40 adult pine martens over two years with no loss or injury during captivity.
- Indicator 2: (short term) Stable home ranges established and recorded adult annual mortality ≤30%
- Indicator 3: (short term) Evidence of successful breeding by some translocated females in the first year following release; survival of site native young.
- Indicator 4: (throughout) Minimal conflicts and widescale community involvement.
- Indicator 5: (medium to long term) Persistence, increase and range expansion of the pine marten population in Wales.

## Project summary

### Feasibility

From 2014 to 2015, a feasibility study was carried out in accordance with IUCN guidelines (IUCN 2013) to identify potential regions for pine marten translocations. The results of habitat suitability modelling and analyses of other factors likely to impact on post-release survival, establishment and spread of pine martens showed that the large areas of well-connected forests throughout the Cambrian mountains in Wales were highly suitable (MacPherson *et al.* 2014).

Detailed discussions were held with the communities, stakeholders and other land users in prospective release areas to gauge local levels of support for the project and identify any specific issues. Field surveys were carried out to evaluate both structural and species diversity of woodlands, and to look at the extent of ground cover and denning sites and the availability of prey and other food. Following this work, release sites in an extensive forested area of north Ceredigion were selected. A disease risk analysis and an evaluation of potential impacts of pine martens on the conservation interests of other species present in release areas were also undertaken as part of the feasibility study.

Another consideration in these translocations was to minimise the potential for negative impacts on the donor population in Scotland. Research was carried out to investigate candidate source sites, identified on the basis of woodland cover, altitude and known length of occupancy by martens. Field surveys were carried out to confirm a number of donor sites where the removal of two to four adults at the end of the breeding season was unlikely to have an impact on population viability, based on site specific marten density estimates and population modelling.

**Implementation**

The translocation plan included an assessment of the number, age classes and sex ratio of animals that would maximise the likelihood of the translocations achieving the objectives. Capture methods, holding, transportation and release protocols were designed to maintain the highest standards of animal welfare (Macpherson 2017). Pine martens were trapped under licence in Scotland in early autumn of 2015, 2016 and 2017. This is outside the period when females may still have dependent young, and after the peak mating season (July-August), maximising the likelihood of translocating females that had been mated.

Releases were completed well before blastocysts (early-stage embryos) begin to implant (January to March), and all translocated animals were released during the autumn when fruit is available and small mammals are at highest densities, ensuring maximum food availability for pine martens on release. Cage traps certified for trapping pine martens under the Agreement on International Humane Trapping Standards were used. Captured animals were given a full health screening under light anaesthesia by an experienced wildlife veterinarian, samples taken, and biometric data collected.

Pine martens that were not of breeding age or surplus animals of either sex were released back at their capture site once they had recovered from the anaesthetic. Those that were suitable for translocation were microchipped and fitted with a VHF radio collar, incorporating a mortality sensor to monitor post-release survival. Collars of a subsample of (larger) animals also included a GPS tracker. Combined collar and transmitter weights were within 3% of each animal’s bodyweight. They were then transferred to individual travel crates and monitored throughout recovery, after which they were transported to the release area overnight in a vehicle adapted for the purpose. Large (3.6 x 2.3 x 2m) pre-release pens were constructed by Chester Zoo and put up at each release site prior to the start of trapping.

On arrival at the release site, each animal was held singly in a pre-release pen for a maximum of seven nights, to acclimatise to the site and until the results of serology tests were received. During this time, they were monitored remotely by camera as well as being checked and provisioned once a day. Following release, supplementary food was provided at each site for as long as it continued to be taken. A total of 51 pine martens were translocated and released over three years.

**Post-release monitoring**

After release, all of the animals were radio tracked intensively until their ranging behaviour had stabilised, after which efforts were made to locate them once a week (McNicol *et al.* 2020). From the early spring following release, there was a further period of intensive radio tracking of females to locate possible breeding den sites. Throughout the project mortality was monitored and retrieved carcases sent for post-mortem examination and ongoing health surveillance. Overall, 12-month post-release survival of the translocated animals was high (70% for tranche 1, 95% for tranche 2, and 92% for tranche 3). Almost 90% of the martens were re-trapped, most before transmitter batteries expired (at approximately 12 months), to check them and remove the collars.

Since radio-tracking ended, non-invasive monitoring methods have been used. Trail cameras have been deployed by staff and volunteers both in and beyond the release areas at baited stations, den sites and artificial den boxes. These have continued to provide confirmation of marten presence and of breeding success of a number of females every year to date. Between 2016-2019, breeding was confirmed for 10 (out of 23) translocated females, with breeding by a further two females suspected but not confirmed. Four females are confirmed to have bred at least twice, with their second litter having resulted from a mating in Wales, as opposed to a Scottish mating before translocation. At least 38 site native young have been born in total between 2016 and 2020, although the true number is likely to be higher than this. Hair samples have been taken from kits for DNA analysis and parentage assignment if possible. In 2019, a systematic scat survey was carried out by staff and volunteers across an area extending 30km beyond the core release sites and those 10km squares where martens had been recorded in 2018. Survey and monitoring results show that there is now a core breeding population of pine martens established in and around the original release areas and there has been some range expansion in line with predictions from earlier modelling. Pine martens have increased their range north of the release area up into southern Snowdonia and southwards so that they now have a relatively contiguous distribution along the Cambrian mountains chain.

The communities local to the original release sites continue to support the project, with a number of people volunteering their time for surveys or using cameras to monitor pine martens in their neighbourhood. Regular updates have been provided throughout, as well as opportunities to talk with people about their experience of living alongside pine martens. So far, we have hosted or been involved in 24 community meetings and events, that have been attended by more than 300 local people. Several local businesses and community hubs have provided space and/or resources for pine marten interpretation boards. In 2018, ‘The Pine Marten Den’ information and visitor centre were opened in partnership with the

Vale of Rheidol Steam Railway in the release area (The Pine Martin Den). This celebrates the recovery of the pine marten in Wales and is filled with interactive information.

**Figure 19 Volunteers from the local community unveiling a pine marten sculpture in the release area by Vincent Wildlife Trust. © Vincent Wildlife Trust, reproduced with permission.**

## Major difficulties faced

- The terrain in the release area, along with the distances travelled by some animals, made radio tracking challenging. There were some issues with the GPS loggers that we trialled on ten animals in the first year (2015). The batteries drained more quickly than anticipated, probably as a result of the extra time needed to find satellites under thick forest cover. This meant there was insufficient voltage for remote download when this was attempted a few weeks after release. Different GPS collars were used in 2016-2017 which were relatively effective and reliable, given the difficult terrain. The battery life, however, was less than that of the VHF transmitters. Also, the success rate of the GPS units (percentage of scheduled attempts that found enough satellites to obtain a fix) was still relatively low (mean = 19%). However, these data added to the VHF fixes from radio tracking provided more detailed information on the movements of these animals since release.
- Pine martens have a low reproductive rate, with females not breeding until their third year and then only having one litter a year, usually of 1-4 kits. Population growth is slow and therefore a long-term commitment to monitoring and

management will be required to ensure long term success. Detecting and monitoring breeding is challenging and resource intensive.

## Major lessons learned

- Establishing support for the project from a wide spread of sectors across the community at the earliest stages was key.
- Thorough research and meticulous planning are essential, but adaptive management is also vital, as is ensuring sufficient funding, time and resources and a long-term commitment to monitoring.
- GPS tracking technology for small, forest dwelling carnivores is currently problematic but is developing very quickly.

## Success of project

The project has been successful in the early stages, as measured against short to medium term criteria, however long-term success will not be known for many years.

**Reasons for success/failure:**

- A considerable amount of effort and resource was put into the feasibility and planning stages. This included careful selection of both release and donor sites, with a significant post-release monitoring programme incorporated as an essential element of the translocation.
- Equal emphasis was placed on social feasibility as on biological suitability and meaningful community and stakeholder involvement throughout the process has been key.
- Partnership working with a multidisciplinary team of scientists, wildlife veterinarians and land managers was essential, to encompass the range of skills and experience needed for the project. It was important to have a long-term research and monitoring programme and a staged exit strategy with the goal of local ownership.
- Communication and open, constructive dialogue with other land users in the area is crucial, in order to address and resolve any areas of actual or perceived conflict before they arise or at the very earliest stage. As well as game shoots, we have maintained dialogue with farmers in the release area throughout the project. To date, there have been no direct conflicts reported between pine martens and farming or game interests.

# Plants

## P1 – North-West Rare Plant Initiative (NWRPI): lesser bladderwort

### Intervention type: reinforcement

Author: Joshua Styles BSc AMRSB MCIEEM, North Wales Rare Plant Initiative

### Conservation status

IUCN Red List: Global – Least Concern
IUCN Red List: Great Britain – Least Concern
IUCN Red List: England – Unassessed
IUCN Red List: Scotland – Unassessed
IUCN Red List: Wales – Unassessed
IUCN Green List – Unassessed

### Introduction

Lesser bladderwort *Utricularia minor* is a sub-affixed aquatic, insectivorous perennial of bog pools and fen ditches (Stace, 2019). Historical and ongoing habitat loss has resulted in an Area Of Occupancy decline of 40% and Extent Of Occurrence decline of 42% across England since 1930 (Stroh *et al*, 2014). In north-west England, lesser bladderwort became confined to a single bog pool in Cheshire and sites in Cumbria. This contrasts to its distribution pre-1930, which extended widely across the region, especially including Greater Manchester and north Cheshire. By the time of this project in 2018, the species had been lost from 14 hectads (BSBI Maps).

**Figure 20 Lesser bladderwort in a bog pool by Joshua Styles. ©Joshua Styles, reproduced with permission.**

## Goals

- Goal 1: To reintroduce plants to targeted peatland restoration sites within the Greater Manchester region.
- Goal 2: To re-establish a robust metapopulation across peatland restoration sites within the Greater Manchester region.

## Success indicators

- Indicator 1: Continually increasing population extent through natural spread.
- Indicator 2: Continually increasing population size (measured as a count of turions late summer/autumn)

## Project summary

### Feasibility

Lesser bladderwort has a close affinity to M1 bog pools[8] and areas of open water within peatlands. The primary habitats and target communities that exist across Greater Manchester's raised mires include M2 *Sphagnum cuspidatum* bog pool and M18 *Erica tetralix – Sphagnum papillosum* raised mire.

A review of literature and similar sites inclusive of Fenns and Whixall Moss revealed the plant prefers open water communities and peat cuttings across raised mires locally. The outcome of suitability study, including a literature review, was presented to Lancashire Wildlife Trust, Warrington Borough Council Ranger Service and Natural England during 2018. This led to a consent to reintroduce the species at logged locations during August 2018.

### Implementation

Across the Lancashire-Cheshire plain, a single extant population of lesser bladderwort was known at Lilly Pool on the Abbots Moss SSSI complex, where this plant grows across the margins of Lilly Pool. Liaison between NWRPI, Cheshire Wildlife Trust and Natural England began during 2017, which led to consent to sample a small number of plants during April 2018, aligned with the BSBI Code of Conduct (Whild *et al,* 2017). Plants were subsequently taken into cultivation and closely monitored.

A total of 60 cultivated plants were reintroduced across the Manchester Mosses SAC during August 2018 and closely monitored thereafter.

### Post-release monitoring

Population assessment of the reintroduced population across Greater Manchester during September 2019 found a significant increase in area occupancy over receptor pools and peat cuttings, with an estimated population in excess of 29,000 plants – a representing a 500-fold increase.

Population assessment was repeated with volunteers from Lancashire Wildlife Trust (in alignment with standing COVID-19 guidance) during August 2020. This found a significant increase in area occupancy and an estimated population size exceeding 200,000. During 2020 monitoring, natural dispersal was noted for the first time from original receptor sites

[8] This is description follows the JNCC National Vegetation Classification, which provides a common standard. For more details see: https://jncc.gov.uk/our-work/nvc/

to adjacent pools. Transmission was most likely via waterfowl or water voles, which frequently inhabit pools

Population estimates were made through counting the number of late season developing turions[9] in an area of 0.1m x 1m, repeated at least 50 times across occupied areas. The total area occupancy was then calculated and the estimate over the given area multiplied out by the mean population per 0.1 x 1 metre sample.

**Figure 21 Flowering lesser bladderwort by Joshua Styles. ©Joshua Styles, reproduced with permission.**

## Major difficulties faced

- None.

## Major lessons learned

- Native bladderworts generally have a poor dispersal ability and heavily rely upon asexual reproduction through the spread of vegetative fragments (Sell & Murrell, 1996).

[9] A turion is a wintering bud that becomes detached and remains dormant at the bottom of the water.

It is likely that dispersion is a key limiting factor to the recolonisation of this species on many degraded peat sites.

- Lesser bladderwort appears to avoid heavily vegetated pools with *Sphagnum cuspidatum* and *Eriophorum angustifolium*
- Where there is little competition and adequate marginal vegetation across suitable water bodies (including *Molinia caerulea* and Sphagna), populations of this species may increase exponentially over short periods of time
- Given the species' ability to rapidly colonise new habitats, it has proved straightforward to inoculate new sites with this species, including Cadishead Moss during 2020. The population at this site was noted to have increased in the space of one growing season from one plant in June 2020 to over 150 during September 2020.

## Success of project

Highly successful.

**Reasons for success/failure**

- The species has the ability to rapidly colonise suitable sites, so is easily reintroduced.

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The River Otter Beaver Trial has been supported by The Peter De Haan Charitable Trust, The Royal Society of Wildlife Trusts, Garfield Weston Foundation, Wellcome Trust, Natural Environment Research Council, the Tale Valley Trust. Plymouth City Council have also contributed to the socio-economic work, and the Environment Agency and Wessex Water have funded the installation of monitoring equipment.

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