PINE MARTENS BOUNCE BACK

The Two Moors Pine Marten Project

Made possible with Heritage Fund

The Feasibility of Reintroducing Pine Martens (*Martes martes*) to the Southwest of England, UK

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Redacted version:

This version of the Feasibility Study has had sensitive personal or ecological information redacted to enable it to go into the public domain. Otherwise, this is the same report that was submitted and subsequently accepted by Natural England (2024) as part of the consenting process in accordance with the *Guidelines for Reintroductions and Other Conservation Translocations* (IUCN, 2013) and *Reintroductions and other conservation translocations: code and guidance for England* (DEFRA, 2021).

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Associated documents

This report should be read in conjunction with the following associated documents:

1. **Initial Feasibility Assessment for the Two Moors Pine Marten Reintroduction Project** (MacPherson *et al*., 2021). Hereafter referred to as **Initial Feasibility Assessment.**
2. **Disease Risk Analysis for the Reintroduction of the Pine Marten to Dartmoor and Exmoor National Parks, Southwest England** (Carraro and Sainsbury, 2023). Hereafter referred to as the **DRA.**
3. **Perceptions of Pine Marten Reintroduction in South-West England: Results of a Q-Method Stakeholder Study and Regional Public Survey** (Auster *et al*., 2023).
4. **Natural England - Conservation translocation project scoping form.**
5. **Habitats Regulations Assessment, appropriate assessment report**. Hereafter referred to as the **HRA.**

Executive summary

1. Biological Feasibility has identified two areas within the southwest peninsula of England to be biologically suitable as Potential Release Regions (PRRs) for a pine marten reintroduction – the wooded areas of northern Exmoor and eastern Dartmoor. Priority release areas within these PRRs have been determined and release sites identified with surveys currently ongoing. Wider suitability for pine martens and connectivity across the southwest peninsula indicates a good likelihood for establishment of a sustainable southwest population which could link to existing populations in Wales and the Forest of Dean.
2. Ecological Feasibility has determined both benefits and impacts from the return of pine martens.
    a. The main area for potential negative impact is where extant species are using man-made structures, such as nest boxes and buildings as nesting and roosting spaces. Learning by predators potentially leaves these vulnerable to repeated predation. Mitigation for these situations is successfully used elsewhere in areas where pine marten occurs and will consist of a mix of tested proactive modification to prevent pine marten access as well as reactive modifications based on monitoring with clear action trigger points. Research to investigate effectiveness of any trial methods will be included as part of an on-going adaptive management plan.
    b. The key benefit from the project is through restoring an important component of the broad guild of native, co-evolved predators - key to restoring woodland ecosystems and supporting conservation of woodland species. Predators balance ecosystems, reducing dominance and fluctuations of species that have coevolved with them. Pine martens also play an important role in reducing the invasive non-native grey squirrel and dispersing seed. These benefits can be maximised through woodland advice to support extant species and enhance suitability for pine marten, creating diverse connected woodlands.
3. Social Feasibility has demonstrated broad support for a pine marten reintroduction to southwest England. Concerns focus around potential for impacts to ecology, poultry-rearing operations (including game birds) and management of grey squirrels. A mitigation plan will be developed to respond to stakeholder impacts. A Pine Marten Stakeholder Group will be established to enable ongoing dialogue and input. Training and advice will be provided on living with pine martens.

Two Moors has a detailed funded project plan to deliver this.

1. Introduction

1.1 Pine marten biology

The pine marten *Martes martes* is a medium-sized mustelid native to much of the Western Palearctic. Pine martens are semi-arboreal generalist omnivores. Adults typically weigh between 1-1.7kg and are roughly 60-70cm in length (Lawton, 2016). The species shows an average of 40% sexual dimorphism towards the male and display a corresponding polygynous mating strategy of 1 male to 1-5 females. The brood size of pine martens is usually a litter of between 1-5 kits (Tosh *et al*., 2007).

Pine martens require a habitat which provides them with three factors: food, shelter, and a low risk of mortality (Virgos *et al*., 2012). Territories are large and will often be 10-25km^2 for males and 5-15km^2 for females (Stringer *et al*., 2018). Absolute territory size is dependent on habitat quality with all three habitat requirements having to be catered for. Territories will often overlap with pine martens of the opposite sex but show minimal overlap between territories of same sex individuals (Stringer *et al*., 2018).

1.2 Pine marten diet

Pine martens are generalist omnivores feeding on high-energy food items both arboreally and terrestrially. This most frequently takes the form of carnivorous and frugivorous behaviours, although some insectivorous behaviour is observed. The exact components of pine marten diet vary greatly across their range. Their diet in Scotland varies seasonally reflecting the availability of different food sources such as fruit, insects and carrion (Caryl *et al*., 2012). However, regardless of location, pine marten diet mostly comprises small mammals and berries. Within the Two Moors project area, it is recognised that these groups are well-represented and abundant, and that small mammals and fruits are therefore likely to form a large component of the diet. Average prey consumption across Europe indicates that small mammals made up 44% of the pine marten diet and berries made up 19% (Stringer *et al*., 2018). Before the reintroduction to the Forest of Dean, modelling based on latitude predicted that small mammals would form 56% of the diet and berries 16% (Stringer *et al*., 2018). The project area is on a similar latitude and so likely to have similar estimates. Pine martens will also predate on medium-sized mammals, reptiles and amphibians, invertebrates, birds and bird eggs. They have also been recorded feeding on carrion and fungi. Most of these alternative food sources appear to be opportunistic and represent relative abundances within the individual foraging territory. Analysis of Scottish populations identified that percentage of birds within the diet range between 11% and 22%, invertebrates between 11% and 41% and reptile and amphibians between 0% and 10% (Stringer *et al*., 2018). Pine martens adapt to feed on the most commonly occurring food items. Within one study in Scotland, roughly half (48.5%) of the pine marten diet comprised

just three common species; field vole (*Microtus agrestis)*, bilberry (*Vaccinium myrtillus)* and rowan (*Sorbus aucuparia)* (Caryl *et al*., 2012).

1.3 Habitat

Across Europe, the pine marten is associated with woodland habitat although, contrary to what their name implies, pine martens are not restricted to coniferous forest but will thrive in deciduous or mixed woodland. However, high population levels within intermediate levels of fragmented forest cover in Scotland and the Irish midlands, indicates less dependence on large forest areas than previously believed (Sheehy, 2013; Caryl, 2008). The access to foraging resources and denning opportunities provided by such habitat mosaics and woodland corridors highlights their importance for both sustaining pine marten populations and facilitating dispersal in the landscape.

Structural diversity is a key characteristic of good pine marten habitat, along with an abundance of the preferred food items. The presence of a diverse range of berry bearing species as listed above as well as vole-rich rough grassland including woodland rides, glades and grassland along waterways are important foraging areas. Proximity of foraging areas to woodland provides vertical escape routes from predators such as foxes (*Vulpes vulpes*). Tree cavities provide important denning opportunities, especially for breeding females as they give good thermal insulation to the vulnerable kits (MacPherson, 2021). Up-turned root plates, large stumps, large brash piles, and trees with veteran features all provide potential resting places and cover.

Pine martens generally avoid urban areas and roads are a major cause of mortality. They also avoid moving into areas such as open moorland where they are more vulnerable to predation from both foxes and aerial predators such as golden eagle and Northern goshawk. Pine marten forms varying percentage frequency in fox diet (present in 0.4% of 4,175 fox scats) (Waggershauser et al., 2021 and references therein) with yearly mortality rate of 0.3 reported due to fox predation in Scandinavia (Lindström et al., 1995).

1.4 Two Moors Project area

The Two Moors Project area occupies the central region of the southwest peninsula, the most southerly part of the British Isles. The climate is strongly influenced by the surrounding sea, resulting in a mild oceanic climate characterised by low annual temperature ranges and high rainfall, especially on the uplands, compared with much of the UK (Met Office, 2016).

Diverse geology of the region underlies a wide range of landscapes from the low-lying Somerset levels to the steep slopes of the Mendips, and high moors of Exmoor and Dartmoor. The highest areas correspond to the granite outcrops forming Dartmoor in Devon (max. altitude of 621m) and Bodmin Moor (Cornwall). Exmoor is largely formed by gritstones and slates (max. altitude of 521m) and lies in Devon and Somerset (Devon Local Nature

Partnership, 2018). The southwest supports a wide range of species and habitats of international importance, with many protected under EU legislation (see Section 5.3, figure 5.1)

Within the Two Moors Project area, the acid grasslands, bogs, mires and heather moor of the uplands, give way to steep, wooded river valleys around the fringes of Exmoor and Dartmoor. Many of these are sessile oak woodland areas, forming connected continuous cover throughout the steep moorland edge valley systems and along the coastline (on Exmoor). On parts of Dartmoor, the oceanic climate supports remnants of temperate rainforest habitat of global significance, characterised by a huge diversity of plants and lichens.

Conifer forest planted largely after the First World War to address the national timber shortage also makes up a significant proportion of the woodland cover, for example the Dartmoor Forest Plan area totals 1366ha (Forestry Commission, 2020). Their management includes aims to increase ecological resilience.

The southwest is also known for its extensive network of large, dense hedgerows, surrounding relatively small fields which have survived the extensive hedge removal seen elsewhere in Britain. Where well managed under less than annual cutting regimes, these hedges and trees form corridors, aiding the movement and dispersal of wildlife as well as acting as important habitats.

To assess the suitability of this landscape for pine marten and evaluate the connectivity of beneficial habitats a modelling approach was employed initially (see Initial Feasibility assessment), followed with verification by field survey to investigate suitable release sites.

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2. Project goals and justification

2.1 Goals and Objectives

Focal species: As recommended in the national recovery plan for pine marten (MacPherson and Wright, 2021), the Two Moors Pine Marten Project (henceforth referred to as the Two Moors Project) aims to increase the distribution of the species in the UK to cover the southwest peninsula of England. This would lead to population increases for a threatened species in England, improving its resilience and potentially, the overall genetic health. A key objective is to provide an opportunity for the development of a meta-population, connected to the Forest of Dean and Welsh populations to facilitate geneflow.

Habitat or ecosystem: The Two Moors Partnership believes that the reintroduction of the pine marten and raising awareness of its habitat requirements would act as a catalyst with the pine marten as a flagship species, driving improvement of existing habitats and the creation of new habitats within the national parks and wider southwest landscape. This would result in the creation of more dynamic mosaics of open and woodland habitats that would benefit a range of other species. The pine marten's ecological function as predator and seed disperser are important natural processes in a healthy woodland ecosystem. Pine martens are a vital component that has been missing in the southwest for approximately 150 years.

The pine marten, as a charismatic flagship species of diverse and extensive woodland, will help raise awareness of the importance of woodland and habitat connectivity in the context of reversing biodiversity loss and building resilience to climate change. As such, the interest in pine marten reintroduction to southwest England has been increasing in recent years. Because of the natural low densities and large home ranges of pine martens, such a project would need to be delivered at the landscape scale across Devon and Somerset. The successful reintroduction of the pine marten would reinstate a fundamental ecological component missing from the natural heritage in the southwest of England. It could bring multiple benefits to the organisations involved as a nature conservation partnership working at a landscape scale and provide a strong focus for the development of Nature Recovery Networks, particularly within the two National Parks.

The goal of the Two Moors Pine Marten Project is to re-establish a viable population of pine martens within the southwest peninsula within 25 years, improving the likelihood of creating a robust West England/Wales metapopulation - moving the pine marten from its current Critically Endangered status in England and Wales to match its Least Concern status in Scotland and Europe. This will contribute to the government's targets to reverse the decline in species abundance and increasing populations by at least 10% (Environment Act, 2021).

Objectives:

1. To help restore balanced woodland ecosystems where natural processes can function and drive activities which support more resilient woodlands.
2. To increase awareness, appreciation and knowledge of pine martens and their ecology within communities and stakeholders, improving their understanding of why pine martens are important to healthy woodland ecology.

Key actions to achieve this:

- Identification of the most appropriate site for release based on:
    - Broad habitat suitability modelling and subsequent detailed site assessment using desirable pine marten habitat and food availability characteristics.
    - Identifying areas of minimal conflict and high support for the project within high habitat suitability regions.
- Identifying the most appropriate source population in Scotland and harvesting animals in a sustainable way.
- Conducting a conservation translocation of 30-40 individual pine martens from Scotland to release sites within Exmoor and Dartmoor.
- Key local stakeholders identified, feedback recorded and responded to, and involvement enabled where appropriate.
- Stakeholders including landowners are supported in taking an adaptive management approach to renewed coexistence with pine martens.

This will be completed in compliance with all relevant legislation and reintroduction guidelines.

2.2 History and status in Britain

The pine marten (*Martes martes*) is a medium-sized member of the mustelid family, native to Britain and Ireland. Pine martens are distributed across Europe, where they are predominantly associated with forested habitat (Mitchell-Jones *et al.*, 1999).

The species was once common and widespread throughout Britain (Maroo and Yalden, 2000), but during the 19th and early 20th centuries the population suffered severe declines in numbers and distribution. This was largely a result of increases in predator control (Langley and Yalden, 1977; Tapper, 1992), compounding the historical effects of large-scale loss and fragmentation of woodland habitat. By the beginning of the 20th century pine martens were extinct in almost all southern Britain, with the majority of the remnant population restricted to the north-west highlands in Scotland, and much smaller areas in the uplands of northern England and Wales (Langley and Yalden, 1977).

As such, they are now protected under the Wildlife and Countryside Act (1981) and listed as Critically Endangered in England and Wales (Mathews and Harrower, 2020) with British population estimates of 3,700 (95%CI = 1,600–8,900) occurring predominantly in Scotland (Mathews *et al.*, 2018).

With increases in afforestation and legal protection, the pine marten population in Scotland has been recovering well and expanding its range since the 1980s, but this was not the case elsewhere in Britain. By 2010, after 30 years of research and surveys by the Vincent Wildlife Trust (VWT), there was no evidence of pine marten recovery in England and Wales.

2.3 Previous conservation translocations in the UK

After several years of preparation and research (MacPherson *et al.,* 2014; Bavin *et al.,* 2020), VWT began, in 2015, to translocate pine martens from Scotland to mid-Wales, with a total of 51 animals released across three years as part of a strategic reinforcement programme (MacPherson, 2014). The released martens have established territories, are breeding successfully and the population is now expanding further afield (McNicol *et al.,* 2020). In 2016, VWT began to collaborate on a project led by Gloucestershire Wildlife Trust and Forestry England to explore the potential for reintroduction of the pine marten to the Forest of Dean in Gloucestershire (Stringer *et al.,* 2018). As a result of research and feasibility studies, the translocation of pine martens to the Forest began in 2019, with the initial release of 18 animals and a further 17 martens released in autumn 2021.

The results of spatially explicit population viability analyses, incorporating translocations that have taken place to date, show that the re-established population in Wales in combination with the reintroduction in the Forest of Dean is likely to result in a robust western metapopulation of martens within approximately ten years of the first releases into mid Wales.

2.4 Pine martens in southwest England

Updated from Initial Feasibility report (MacPherson, 2021).

The pine marten is thought to have become extinct in Devon, Somerset and Cornwall between 1870-1880 (Langley and Yalden 1977). Nonetheless, occasional records of pine martens in these counties were documented in the early 20th century, including sightings near Paignton in 1918, Dartmoor in 1932, at Noss Mayo in 1952, and South Brent and Maristow in 1953 (Hurrell, 1954). It was suspected that these animals originated from escapes from fur farms and three animals were known to have escaped from a collection at Wrangaton in the 1940s (Hurrell, 1954; Hurrell, 1953, cited by Strachan *et al.*, 1996). Furthermore, the closely related but non-native beech or stone marten (*Martes foina)* was imported from continental Europe and kept in fur farms in parts of Britain, including one in Moretonhampstead during the 1940s and 1950s, and escapes from these farms and other

private collections may have accounted for some records during the mid-20th century (Strachan *et al.*, 1996). Nevertheless, despite these records, there has been no evidence of a viable pine marten population in southwest England since the late 19th century.

In recent years, there have been occasional confirmed records of pine martens in Devon and Cornwall. These include a pine marten road casualty near Christow (Devon) in 2019, camera trap records from Hartland and Slapton (Devon) in 2023, another road casualty near Sithney (Cornwall) in 2019, and a camera trap record from near Bude (Cornwall) in 2015. The origin of these animals is unknown, however, it is probable that they originate from covert releases, either from animals translocated from elsewhere, such as Scotland, or from captive collections. This is especially likely given the large distance from the nearest known marten populations (in Hampshire, Wales or Shropshire) and anecdotal reports from elsewhere that pine martens are occasionally captured in Scotland and relocated to other parts of the country. It is almost certain that these records represent single or few animals and there is no evidence that they comprise a viable population or that there has been any population recovery in southwest England. It is also crucial to highlight the risks associated with these activities. The pine martens are of unknown origin, and without diligent oversight, they risk unnecessary unmitigated conflict, potential for spread of disease, and potential long term genetic issues. This is also likely to generate resentment and misunderstanding around pine martens and their impacts, preventing or limiting future recovery opportunities.

2.5 Justification for a conservation translocation of pine marten to the southwest of England

To restore and secure pine marten recovery and favourable conservation status in Britain, Vincent Wildlife Trust working in partnership with NatureScot, Natural England and Forestry England, published a long-term strategic recovery plan for pine martens in Britain in 2021. This identifies the most suitable areas for pine marten across Britain and informs reintroductions to these optimal areas alongside ecosystem restoration to allow natural recovery where possible. Habitat and connectivity modelling indicate the north and west of Great Britain as the most suitable areas (MacPherson and Wright, 2021). Following the successful translocations of pine marten to Wales and subsequent reintroduction into the Forest of Dean, *the southwest was identified as potentially the next appropriate area to establish a pine marten population*. This would create a robust metapopulation in the west of England and Wales, maximising potential for gene flow and expansion into new areas.

Modelling of natural colonisation over a 10-year period, following the Welsh and Forest of Dean (Gloucestershire) interventions, demonstrates no natural colonisation of the southwest peninsula or in the east of the country (fig. 2.1). Recolonisation of the southwest has been assessed as highly unlikely, within this timeframe, due to natural barriers (major waterbodies) and human factors such as built development and road networks.

Figure 2.1. HexSim predictions of pine marten occupancy in southern Britain after 10 years including translocations to Wales only (left) or Wales and Gloucestershire (right). Reproduced from MacPherson and Wright, 2021. Maps produced using OS Open Data. Contains public sector information licensed under the Open Government Licence v2.0.

The authors concluded that range expansion of pine martens into the southwest within this timeframe would require reintroduction. This should follow published best practice approaches (IUCN,2013; Scottish Code for Conservation Translocations, 2014; DEFRA, 2021). This is identified as a priority region for reintroduction. With the Scottish population able to provide source animals for just two full reintroduction projects during the next 10 years, it is therefore important that this project progresses as soon as possible.

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3. Project plan

3.1 Partnership

The Two Moors partnership was established in 2018 and formalised with an MOA signed in September 2022. It is a partnership between Devon Wildlife Trust (lead partner), Woodland Trust, National Trust, Dartmoor National Park Authority and Exmoor National Park Authority. The partnership is being supported by the Vincent Wildlife Trust, Forestry England and Somerset Wildlife Trust (under an MOU).

The partnership will all take an active role in the delivery of the project including stakeholder and community engagement. Core partners are all landowners and provide landowner advice.

Table 3.1. Partnership roles and responsibilities

Partner	Roles and Responsibilities
Core Partners	
Dartmoor National Park Authority	• Dartmoor local lead • HRA competent authority
Devon Wildlife Trust	• Lead organisation & accountable body
Exmoor National Park Authority	• Exmoor local lead • Release sites owner
National Trust	• Chair of Steering Group • Release sites owner
Woodland Trust	• Lead on land management – woodland management and creation/regeneration, monitoring and evidence • Release sites owner.
Supporting Partners	
The Vincent Wildlife Trust	• Specialist pine marten species and reintroduction support • Deliver bat roost impact assessment and mitigation. • Deliver Scottish elements of Project including consents, landowner permissions, monitoring, capture, health checks and radio collar fitting. • Links to other pine marten projects and delivery.
Forestry England	• Woodland restoration and management specialist support • Pine marten species and reintroduction support • Links to other pine marten projects and delivery.
Somerset Wildlife Trust	• Support community and stakeholder engagement in Somerset/Exmoor. • SWT Coexistence Officer to work closely with project supporting project engagement and activities where appropriate in Somerset/Exmoor. • Enable habitat enhancement and connectivity to provide potential to link with Gloucestershire pine marten population.

3.2 Management

Day-to-day management of the project will be delivered through a project team with partner support. The project team will be hosted by Devon Wildlife Trust within the same directorate as the Devon Beaver Project and benefitting from extensive experience of species and habitat recovery projects.

Core project staff include:

- Project Manager – managing team and partnership and responsible to funders and consenting agencies.
- Project Lead – leading all delivery activities, managing Field Officers and leading relationships with key stakeholders.
- 2 Field Officers – delivering activities and working with volunteers, stakeholders, and communities.

Partner managers and officers will be critical to specific activities and localities, leading and supporting the project team as appropriate.

3.3 Project progress to date

- 2018-19:
    - Initial discussions
    - Project scoping
    - Partnership formation including ongoing close relationship with Mid-Wales project through VWT.
    - Forest of Dean site visit led by Gloucestershire Wildlife Trust (GWT) pine marten team – ongoing close relationship with FoD project through Forestry England, Woodland Trust, VWT and GWT
- 2020:
    - Initial feasibility study commissioned from VWT (partner-funded) – focussed on biological and ecological feasibility with social feasibility paused due to Covid.
- 2021:
    - Initial feasibility report produced (March)
    - Investigations into source population, evaluating options for European, Irish, Scottish and captive-bred sources. Discussions held with Nature Scot to confirm in-principle access to Scottish populations subject to consenting processes – aligning with partner preferences.
    - Funding and communications plan development
    - Detailed project planning
- 2022:
    - Awareness raising through initial stakeholder engagement, publicity and media launch.

    - Attend national pine marten working group and developed ongoing relationships with Cumbria, Kent, and Stourhead projects
    - Stakeholder and public education and knowledge exchange through presentations, Q&As and focussed meetings
    - Devon Wildlife Trust (DWT) public appeal
- 2023:
    - Recruitment of project lead
    - Stakeholder consultation through sector workshops and public drop-ins
    - Consenting processes carried out and submitted:
        - HRA screening
        - HRA appropriate assessment (Bat report carried out by University of Sussex and VWT as part of this)
        - DRA carried out by ZSL as update of Forest of Dean DRA
        - Feasibility assessment to answer Defra Code on Conservation Translocations (Social perceptions study carried out independently by University of Exeter to feed into this)
    - Grant funding applications to NE Species Recovery Fund (unsuccessful) and NLHF development phase (successful)
    - Release site identification, short-listing, and surveys led by trained volunteers using bespoke app developed by project.

3.4 Timeframe

The Two Moors Pine Marten Project delivery phase will start January 2024 and run to March 2027. A comprehensive workplan has been prepared for the project which aligns with funding bids. This is available on request, but a summary follows.

January - July 2024: Mitigation, preparation and Scottish consent

- Contractor (VWT) to carry out the Scottish end of works for the first translocation including monitoring, surveys, landowner permissions and Nature Scot consent application.
- Proactive mitigation of bat roosts by contractor (VWT) with support from key bat roost monitors and landowners and other mitigation identified as required in advance of release.
- Preparatory works

August – December 2024: Translocation 1 Dartmoor (T1)

- Capture, translocate and release including veterinary processes, collars and tags, transport, soft release from pens.
- Intensive survey including radio-tracking and camera trapping.
- Adaptive management begins, including reactive mitigation and landowner support and advice.

January – July 2025: Monitoring, adaptive management and Scottish consent

- Intensive survey and adaptive management for T1 continues.
- Contractor (VWT) to carry out the Scottish end of works for the second translocation including monitoring, surveys, landowner permissions and Nature Scot consent application.
- Preparatory works

August – December 2025: Translocation 2 Exmoor (T2)

- Capture, translocate and release including veterinary processes, collars and tags, transport, soft release from pens.
- Intensive survey for T2 including radio-tracking and camera trapping.
- Adaptive management including reactive mitigation and landowner support and advice.
- Ongoing survey (including camera trap and scat survey) and adaptive management for T1.

January – March 2026: Monitoring, adaptive management

- Intensive survey and adaptive management for T2 continues.
- Ongoing survey (including camera trap and scat survey) and adaptive management for T1.
- Long term monitoring programme developed with learning from project to date.

April 2026 – March 2027: Monitoring, adaptive management

- Long term monitoring programme initiated including camera trap and scat surveys in both T1 & T2 plus wider landscape.
- Long term volunteers (monitoring and mitigation) recruited, trained and supported.
- Adaptive management including reactive mitigation and landowner support and advice.
- Training of other land advisors in region around adaptive management for pine martens

April 2027 onwards: Monitoring, adaptive management

- Long term monitoring programme ongoing with volunteer support.
- Adaptive management delivered by partner and other land advisors.

3.5 Funding

The project is broken into three phases with the funding approach varying across these.

1. **Feasibility (2018 – March 2022)**
   Partner-funded phase to explore options and carry out initial feasibility studies.
2. **Development (April 2022 – Dec 2023)**
   This phase, which focusses on stakeholder engagement, consenting processes and fundraising, is still largely partner-funded with additional income from a public appeal and a commercial donor of DWT. From July 2023, NLHF Development Phase

income was secured, funding additional community engagement elements of wider NLHF project and staff costs. Delivery Phase application to NLHF is due in November 2023.

3. **Delivery (January 2024 – March 2027)**
   The partners are committed to delivering this project and, to ensure this, are pursuing the following options for funding:
   a. The preferred option is through National Lottery Heritage Fund (NLHF) support with match funding through partners, public appeals and charitable trusts. This is a large application (total project value c.£2.2m) and expands the project to include both the core reintroduction strand and a large-scale public engagement strand. If successful this funding would run April 2024 - March 2027, with partners funding the initial delivery phase Jan-Mar 2024.
   b. Forestry England are already Supporting Partners for this project, which aligns with their organisational plans to restore species that play a key role in fully functioning ecosystems; and, in recognition of the project's delivery of a key aspect of the Long-term strategic recovery plan for pine martens in Britain. Forestry England are open to increasing their role to a core project partner, potentially including provision of funding (significant, or match-funding) for the upcoming financial year (2024-25). Details – and any scope for longer-term investment – are being discussed. Other partners will also play a key role in funding, both directly and through a partner fundraising group established to explore fundraising opportunities including public appeals. Additional grant and charitable trust funding would also be sought to support this. This option would focus on the reintroduction strand only.

The partnership has costed up the project based on learning from the Mid-Wales and Forest of Dean pine marten reintroduction projects and from the Devon Wildlife Trust-led River Otter Beaver Trial and subsequent Devon Beaver Project. Budget has been allocated to include the following:

- Staff including overheads, running costs, and vehicles.
- Contractors including Vincent Wildlife Trust (VWT) to lead Scottish end of works and bat roost mitigation works.
- Mitigation (ecological and socio-economic) as identified by this report and the Habitats Regulations Assessment and as required by Natural England and Nature Scot.
- Translocation including Scottish end, transport, veterinary, and soft release.
- Monitoring and survey including radio tracking, camera trapping, scat survey, reactive surveys of sensitive sites (e.g. bat roosts) and site assessment.
- Volunteer support including training.
- Adaptive management including support for habitat creation and enhancement.
- Contingency to enable exit strategies to be carried out where necessary.

In both funding scenarios and across all three phases, in addition to cash funding, partners are committing large amounts of in-kind time, with support from multiple staff in project delivery – including managers, fundraisers, communications teams, ranger and reserves teams, land advisors, engagement staff and specialists. This is a demonstration of the widespread support for this project from partner organisations.

3.6 Translocation plan

The Two Moors Project will follow a similar translocation plan to that used in the Forest of Dean (FoD) and Mid-Wales projects, compliant with all relevant animal welfare legislation and best practice. Vincent Wildlife Trust will be key advisors on the translocation process.

The Zoological Society of London (ZSL) carried out the Disease Risk Analysis for the FoD project and have prepared an updated version of this for this study (see section 6 of this report) as the translocation pathways for both are similar.

Vincent Wildlife Trust (VWT) carried out the Scottish monitoring, survey, landowner liaison, consenting, trapping and health & welfare processes for both the FoD project and the Mid-Wales project – they will also be contracted to do so for this project, following the same protocols. VWT have also been carrying out monitoring of the Scottish pine marten population for Nature Scot and so have a detailed understanding of pine marten populations in Scotland.

Differences between the Two Moors Project and Forest of Dean project translocation plans include:

- Distance between source population site and release site is greater meaning a longer transport distance and time with implications for welfare to be considered. This provides additional restrictions on the distance north pine martens can be sourced.
- Nature Scot requires a minimum donor site rest period of 5 years prior to a subsequent trapping to allow population recovery. The Two Moors Project will therefore examine which sites are suitable following previous project trapping.
- While the Forest of Dean project had a single Potential Release Region (PRR), the Two Moors Project has two PRRs whose centre points are approximately 65km apart. A single translocation (of 15-20 individuals) will be carried out to each PRR in consecutive years, to establish a single southwest population. This reflects the differences in woodland cover and distribution in Devon and Somerset from that in the Forest of Dean, where two translocations were carried out to a single PRR.

3.6.1 Donor stock and source populations

The long-term strategic recovery plan (MacPherson & Wright, 2021 (pg 32)) states that '*between 30 to 40 pine martens need to be released in an area to maximise the viability of the founder population'.* It recommends that wild, Scottish populations are used to supply founder stock for as they show the best matched genetic provenance, behaviour and morphology to potential reintroduction sites in England, Scotland and Wales. Wild caught

animals generally show greater adaptation and increased survival in new environments than captive bred animals (Jule, Leaver & Lea 2008).

It is important to protect the recovering population of pine marten in Scotland so a careful harvesting strategy should be adhered to in accordance with the published guidelines detailed below.

3.6.2 Sustainable harvesting of source population and other pine marten conservation projects

With an increasing interest in UK pine marten recovery through reintroduction, a strategic approach to sustainable harvesting of donor populations is necessary to ensure no likely significant effect on the Scottish populations. Both the *'**Preliminary work towards a sustainable harvesting model of pine martens in Scotland for translocations** (to supplement a long-term strategy and recovery plan for pine martens in Britain)*' (MacPherson *et al.,* 2020) and '***Long-term strategic recovery plan for pine martens in Britain**'* (MacPherson & Wright, 2021) were produced with this aim in mind. The research documented within these publications show that the evidence based harvesting approach for the Welsh and forest of Dean projects has been appropriate in minimising impact on the source populations (MacPherson *et al.,* 2020). To protect recovering Scottish populations, recommendations from this research is for a maximum of two pine marten reintroduction projects using Scottish animals during the ten-year timescale of the recovery plan (2021-2031). The agreed first priority is south-west England.

To ensure that best practice is adhered to in accordance with this guidance and the recommendations made based on the findings of the Two Moors biological feasibility study, (see Initial Feasibility report and this report, section 4) the Two Moors Project will engage experienced personnel from VWT to follow the same protocols used for the translocations to Wales and Gloucestershire. Potential donor sites will be identified by VWT using the same methods as previously, following surveys and discussions with the relevant authorities, stakeholders and local communities.

3.6.3 Discussions with other pine marten projects

The Two Moors partnership has held formal discussions with other pine marten reintroduction projects around the UK since 2019. To ensure ongoing strategic planning, transparency and information exchange among projects, the Two Moors Project has set up a series of meetings over the coming months. Relevant Natural England staff have also been invited to these.

3.6.3.1 Previous reintroduction projects: Mid-Wales and the Forest of Dean

Initial discussions with VWT staff involved in the Mid-Wales project and Gloucestershire Wildlife Trust staff running the Forest of Dean project enabled the early development of the Two Moors project. A site visit to the Forest of Dean by Two Moors partners in 2019 (prior to release of pine martens) provided invaluable insights and learning. The GWT team have also shared documents with the Two Moors Project and there is a crossover between partner

organisations and staff (Vincent Wildlife Trust, Forestry England, Woodland Trust) involved in both projects.

These close working relationships have been maintained throughout the feasibility and development phases of the Two Moors project.

We have assurances from VWT that neither the Welsh nor the Forest of Dean project are planning further translocations at this time, with both populations surviving and expanding well.

3.6.3.2 Current and developing projects

In addition to former projects, Two Moors partners have held meetings with projects currently in development, some of which aspire to release pine marten, whether from captive stocks or using wild Scottish animals. The intentions of the meetings are to exchange information, liaise, share approaches and learning and wherever possible coordinate plans. It should be made clear that staff and partners from all projects are keen to ensure coordination and have endeavoured to maintain close communications. Project staff are also attending National Pine Marten Working Group meetings and attending key knowledge sharing opportunities such as the International Martes Symposium and national pine marten monitoring workshops.

3.6.3.3 Forest of Selwood partnership project

This project, involving a group of landowners on the Somerset Wiltshire border, has been investigating pine marten reintroduction over a similar period to the Two Moors Project. With the involvement of Longleat Safari Park, it is exploring captive-breeding as well as sourcing animals from Scotland.

Discussions between Two Moors and Selwood have been ongoing since 2019. It was agreed early in the process for the two projects to remain separate due to the different stakeholders involved and different approaches being taken. A crossover between partners and staff (National Trust, Somerset Wildlife Trust) has also enabled coordination and communication.

The Selwood project is aware of the Two Moors timeline and is not currently seeking to source Scottish pine martens at a time likely impact the Two Moors project.

3.6.3.4 BOOM Cumbrian project

The only other project which is imminently seeking wild caught Scottish animals for reintroduction is the BOOM (Back On Our Map) project in Cumbria. Two Moors staff have had meetings and emails with the BOOM team since summer 2022 to exchange information (latest on 25th July 2023) and update on project progress.

BOOM carried out detailed survey work during early 2023 in an area around Lairg (fig. 3.1) to determine suitability for harvesting. This area lies to the north of sites previously harvested for Wales and the Forest of Dean and was actively targeted by BOOM as an area unlikely to be targeted by Two Moors due to the distance from translocation release sites.

BOOM have recently submitted a feasibility study to Natural England/Nature Scot, seeking permission to carry out a first translocation in September 2023 – prior to a Two Moors translocation – with a possible second translocation to be carried out in autumn 2024. Their team have been keen to enable both projects to go ahead while avoiding significant burdens on Scottish populations.

Redacted

Figure 3.1 Scottish pine marten donor sites with the intended donor sites for the Cumbrian project in green. Map by courtesy of the Cumbrian BOOM project.

3.6.3.5 South East Pine Marten Restoration Project

This project is run through a partnership between Kent Wildlife Trust, Wildwood Trust and Sussex Wildlife Trust. It is currently in its feasibility phase, carrying out research and engagement which is due to finish at the end of 2024. The most recent communication to exchange project updates (9th August 2023) informed us that they are currently investigating all options for sourcing wild animals for release, including Europe, Ireland, and Scotland. However, they are also considering including captive bred animals, co-ordinated by Wildwood Trust who are assisting with the stud book for captive pine marten in Britain and Ireland held by New Forest Wildlife Park. If the feasibility study shows that reintroduction is a viable option to restore pine marten to the southeast, they would look at releasing animals, most likely, during 2026. They are aware of our planned timeline and ongoing discussions will facilitate a co-ordinated approach for sourcing any animals from Scotland, if that is considered an appropriate option at that time.

3.7 Legal status and requirements

3.7.1 Species

In the UK, pine marten and their dens are protected by the Wildlife and Countryside Act 1981 (as amended), under which the species is listed on schedules 5 & 6. Under this legislation it is an offence to intentionally kill, disturb, injure, or take a wild pine marten; or to possess or control, sell, offer for sale or possess, or transport for the purpose of sale, any live or dead wild pine marten except under licence from the government's Statutory Nature Conservation Organisations (SNCOs) - Nature Scot, Natural Resources Wales or Natural England. Pine marten are also included in Annex V of the EU Habitats Directive 1992, Appendix III of the Bern Convention 1979. (European Environment Agency, 2019). Pine martens are also a priority species under the UK Post-2010 Biodiversity Framework (JNCC and DEFRA, 2012).

To capture animals from the wild in Scotland, for subsequent translocation to England, the project will require a licence from Nature Scot (the Scottish SNCO). Since pine marten are a native British species, no licence is required for their release. However, any ensuing trapping, disturbing or handling of pine marten in England will require an individual

protected species licence for science, education or conservation (A29) from Natural England (Natural England, 2014). This includes holding in temporary captivity during transport and in soft release pens. To support the licence application to Nature Scot, this feasibility report and accompanying documents will be presented to Natural England and Nature Scot for an assessment to consent to the reintroduction.

3.7.2 Disease

As a part of the feasibility study, there is a requirement to ensure conservation translocations avoid the spread of diseases, non-native and other potentially harmful species. A full disease risk analysis (DRA) is therefore required to be submitted to Natural England (see accompanying document).

Zoological Society of London (ZSL) have updated the Forest of Dean DRA for the Two Moors project and will provide the Two Moors Partnership with a disease risk management and post-release health screening protocol to guide project activities to minimise disease risk.

3.7.3 Welfare

Previous projects following the same protocol have used an appropriately qualified and experienced wildlife vet for health screening and fitting of tracking collars as a non-experimental clinical veterinary practice under the Veterinary Surgeons Act (VSA). There has been no requirement for a home office licence as interventions have been for animal husbandry and monitoring. PIT tagging of release animals is intended for monitoring and welfare (collecting data on dead retrieved animals) but also ensuring welfare of potential prey animals e.g. bats.

3.7.4 Ecological impact

The reintroduction of pine marten onto protected European sites may require Habitats Regulations Assessments (HRA).

A European site is protected by the Conservation of Habitats and Species Regulations 2017 as amended (known as the Habitats Regulations). A competent authority must carry out an assessment under the Habitats Regulations, known as a Habitats Regulations Assessment (HRA), to test if a plan or project proposal could significantly harm the designated features of a European site. Within the proposed release regions (PRRs), there are several SAC's which need to be considered (see section 5.3, fig. 5.1 SACs and SPAs). A phase 1 HRA screening report has been submitted to Natural England for the PRRs including an extensive 20km buffer zone of the PRR to cover likely dispersal within the project life. The NE response has been followed up with appropriate assessments where required. A full account of this process can be found in section 5, and associated documents. The Two Moors Project has also assessed impact on SSSIs within the PRRs and a 10km buffer zone and will be applying for consent for proposed releases (associated activities such as building release pens) from Natural England where releases are planned on SSSIs. The buffer zones were informed by dispersal distances seen in previous projects and agreed with Natural England (McNicol *et al.,* 2020).

3.8 Project risk and resource needs

A thorough project risk register has been prepared (Appendix 1.) This is informing project design and funding.

3.9 Monitoring and mitigation

The Two Moors project will be developing full monitoring, mitigation, adaptive management and conflict resolution plans during autumn 2023 based on best practice from other projects and additional requirements of consenting processes.

3.9.1 Pine marten health and wellbeing

Zoological Society of London (ZSL) has prepared a Disease Risk Analysis for the Two Moors Project based on that prepared for the Forest of Dean project (see summary in section 6, this report and accompanying full report). This will inform a Disease Risk Management and Post-Release Health Screening Protocol, which will guide project activity to minimise risk of disease transmission and risks to animals.

A wildlife vet will inspect trapped animals in Scotland to ensure only healthy animals of the correct age are translocated. They will also fit tracking equipment (VHF radio transmitter on a collar) at this stage to enable monitoring of released animals. PIT tags and GPS tags may also be fitted dependent on advice from VWT and consenting authorities. Welfare legislation and best practice will be followed during transport including a list of vets along the transport route in case of emergency support. Soft release pens will be built following best practice with close monitoring of marten health while in captivity, including visual inspections during feeding. Release will only occur once animals are considered healthy and stress levels are safe.

3.9.2 Monitoring

Post-release monitoring will be primarily using VHF radio collars and radio tracking, which will be intensive during early mobile phase until settlement into territories. Continued radio-tracking will enable monitoring of use of territories and any displacement. Radio collars are designed to fall off after 3-6 months.

Camera trapping will be a key aspect of monitoring. Initially this will complement radio-tracking to provide insight into health and wellbeing of martens and to monitor any key risk sites reactively (e.g., bat roosts). As radio collars fall off, strategic camera trapping to understand distribution will become the central monitoring approach.

Scat surveys will be used to complement camera trapping and provide insights into diet, including using DNA analysis to determine predation of key species of conservation concern (e.g., tree-roosting bats).

Where monitoring (or reporting) identifies ecological or socio-economic risk (e.g., proximity to known bat roost) then reactive measures will be carried out according to mitigation plan.

Volunteers will play a key role in delivering monitoring. National monitoring schemes for individual species already rely on volunteer networks (e.g., National Bat Monitoring Scheme, PiedFly.net), with trained volunteers delivering long-term conservation data. The project will work with established schemes for species that may be impacted by pine marten (as identified through HRA) to understand impacts and enable suitable mitigation where required. Where appropriate Two Moors partnership volunteers can also contribute to monitoring and an active volunteer base has already been established to carry out site assessment surveys (see section 4.3.3).

3.9.3 Mitigation

The HRA will identify mitigation required to ensure the protection of other species and habitats of conservation concern from pine martens. Some of this will be proactive and require implementation prior to a translocation progressing. However, there will also be potential risks that demand a reactive approach to mitigation. These will rely on monitoring of pine martens and other species affected and good communications with stakeholders who can inform the project staff of a risk. This latter approach is also important for socio-economic risks where regular monitoring may not be present.

Learning from other reintroductions (e.g., Mid-Wales, Forest of Dean, River Otter Beaver Trial) demonstrates the need for a hierarchical approach to mitigation and management to ensure adaptation and coexistence measures are explored fully, prior to translocation being considered. The Two Moors Project will use a management and mitigation hierarchy which will be developed fully in autumn 2023 - fundraising activities will ensure this is fully funded. A summary of key features from other projects that are likely to be applied to this project include:

- Raised awareness and understanding: Detailed information about pine martens and their behaviour are widely available through webpages, factsheets and partner organisations.
- General adaptation: Targeted stakeholder engagement includes advice on pre-emptive adaptation and coexistence measures.
- Targeted proactive mitigation: Where HRA identifies key mitigation required prior to release, this will be carried out to protect higher risk ecological features.
- Community and stakeholder relationships and trust: Project staff have good presence in PRRs and provide regular and transparent feedback to stakeholders and have regular communications with relevant community members.
- Availability: Contact details for project staff and hotline disseminated.
- Rapid response: Project staff respond to stakeholder concern or risk identified through monitoring and consider location and nature of concern, consulting relevant information, and provide advice.
- Lower impact behaviour/ lower risk location: Site visited by project staff or local volunteer. Advice provided on likely impacts from pine marten activity and mitigation techniques available.

- Problematic behaviour / higher risk location: Site visit prioritised by project staff, and suitability for mitigation and/or deterrents rapidly assessed.
- Mitigation or deterrent measures: Employed by stakeholder or project staff (as appropriate). This may include monitoring to confirm pine marten ID or assess activity.
- Grant application advice: Provided by project staff for suitable habitat creation, mitigation and deterrent measures.
- Alternatives: Where deterrents or mitigation are not feasible or achieving desired outcome alternatives are explored.
- Translocation assessment: Following consultation with Natural England, project partners and VWT, a decision is made that the pine marten(s) need removing from a specific location, using criteria laid out by Pine Marten Management Group. Translocation options assessed.
- Translocation: Animal(s) trapped by licenced officer (project or partner) and translocated to other suitable site within PRR or agreed location with Natural England.

For this approach to be successful, it is necessary to have the following:

- Ongoing monitoring of the pine marten population overseen by project staff, together with good relationships and data management protocols with key species monitoring programmes.
- A Pine Marten Management Group which meets at least annually and includes representatives of key stakeholders and communities. This group oversees population health and expansion and understanding of risk and management needs.
- Translocation sites options identified.

3.9.4 Research

There is likely to be insufficient knowledge, data and understanding around some risks and opportunities. The project will therefore seek opportunities to collaborate with research and academic institutions to explore these through research. This may not provide immediate mitigation but may provide more robust evidence of how to mitigate in future.

3.10 Integration with other conservation actions

3.10.1 Woodland management

As reintroduction projects are focussed on rebuilding ecosystems, the Two Moors Project brings an opportunity to provide landscape-scale woodland management advice that supports a broad range of species and habitats. Pine martens thrive in complex landscapes of varied woodland and complementary open habitats that support prey and food items alongside complex woodland structures where denning is possible – in providing for pine martens, the right environments are created or enhanced for many woodland species. The project will work with species monitoring groups (bats, dormice, birds, woodland habitats), specialist conservation organisations, commercial forestry operators, landowners, other

conservation projects and advisors (e.g. Saving Devon's Treescapes, Upstream Thinking). Landowners will be encouraged and supported to apply for agri-environment schemes to support long-term beneficial management and the project will upskill audiences in how to live with pine martens, increasing the sustainability of the project outcomes.

3.10.2 Squirrels

Grey squirrels have had a devasting impact on woodlands since their introduction in the 19th century:

- Bark-stripping decimating tree growth, particularly of young woodlands reaching canopy closure.
- Out-competing red squirrels and infecting them with Squirrel Pox Virus leading to the loss of red squirrels across most of England.
- Out-competing nut and berry-eating species.
- Predation of birds and small mammals.

Emerging evidence (see HRA) of pine martens' impact on grey squirrels means stakeholders involved in red squirrel conservation (e.g. Red Squirrel South West), woodland management (e.g. private landowners and commercial foresters), and specialist conservation (e.g.PiedFly.net) are collaborating with the project.

3.10.3 Citizen science and engagement

The project aims to engage volunteers and citizen scientists from traditional and hard-to-reach audiences (elderly and young people) in a range of programmes. This will leave a legacy of greater data and knowledge of woodland environments and upskilled, enthusiastic volunteers who can continue to support woodland conservation in their local communities.

3.10.4 Nature recovery and LNRS

With pine martens requiring connected ecosystems across a regional scale, the project will act as a flagship for landscape-scale nature recovery and be a key project under the Local Nature Recovery Strategies for Devon and Somerset. LNRS can provide a route for funding of strategic woodland restoration to ensure connectivity at a large scale and partners are all involved closely in this process. The Pine Marten can help build a narrative of woodland and habitat connectivity which is becoming increasingly important to develop if we are to reverse long-term declines in UK biodiversity and build resilience to climate change. This is particularly relevant to the developing Landscape scale nature partnerships along the Exmoor Coast and on Dartmoor (Dartmoor's Wooded Valleys) both of which are likely to form the core of emerging Nature Recovery Networks within the National Parks.

3.11 References

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The Wildlife and Countryside Act 1981 (England and Wales) (Amendment) Regulations 2016

4. Biological Feasibility of a pine marten reintroduction

Vincent Wildlife Trust were engaged to carry out an **Initial Feasibility Assessment for the Two Moors Pine Marten Reintroduction Project** (MacPherson *et al*., 2021). Please see accompanying report for further detail.

This section contains:

- A summary of section **2. Biological suitability for pine marten reintroductions,** from the Initial Feasibility Assessment.
- An account of preliminary habitat surveys of selected priority areas within the potential release regions (PRRs) identified within the above report.

Summary

The initial habitat suitability and connectivity modelling of the southwest UK found sufficient high-quality habitat to warrant further consideration for a pine marten reintroduction to the southwest. The initial feasibility assessment identified two Potential Release Regions within the Two Moors Project area where woodland/forest cover was around 20% and suitably connected to the wider landscape to allow for pine marten dispersal across the region.

Population viability analyses show that a minimum of 30 animals released at a landscape scale across both PRRs would result in a (meta) population with the most resilience. These regions in Somerset and Devon are in sufficient proximity to the restored populations in Wales and Gloucestershire for there to be a reasonable expectation of gene flow between them in the future.

Following the recommendations from these analyses, subsequent site and habitat surveys identified priority areas for releases within each PRR. These allow for the release of animals into well-connected, high-quality habitat at the recommended spacings (of release pens). Priority areas are situated toward the core of each PRR, allowing optimal dispersal opportunities for released animals. All the woodland sites surveyed to date appear suitable to sustain a viable population of pine marten and compare favourably with the previous reintroduction areas in Wales and Forest of Dean

Members of the Two Moors partnership own and manage much of the land in the priority areas, facilitating releases on their sites (subject to approval from NE where sites fall within SSSIs).

Actions

Actions:

Actions to progress the potential reintroduction of pine marten into the identified areas are detailed in section 3. Project plan.

Key next steps are:

- Further (& ongoing) engagement with landowners and key communities in the vicinity of potential release sites
- Site habitat assessment for 2023 will be concluded with prey abundance surveys around first release sites on Dartmoor.

4.1 Initial biological suitability for pine marten reintroductions: Summarised from Initial Feasibility Assessment

A combination of habitat suitability and connectivity modelling were performed to investigate the potential of southwest England as a reintroduction region. This also determined likely corridors and other important elements of the landscape connecting suitable habitat in southwest England for pine martens. A population viability analysis linked the habitat suitability model with population demography under different scenarios to determine an optimal approach to restore a viable population of pine marten to the southwest, ultimately linking with expanding populations from Wales and Gloucester. Variables to inform the habitat suitability model included urban areas and road density (a significant cause of mortality for marten species particularly when provisioning young (Grilo et al., 2009)) as well as habitat type. Habitat suitability mapping results (figure 10 Initial Feasibility Assessment) concurred with that produced by Mathews & Hargreaves (2023), who mapped suitable habitat and connectivity across the southwest and show opportunities for future dispersal to the west, linking Exmoor and Dartmoor derived populations.

The results show that in the southwest, areas of high suitability were associated with areas of high forest cover with the exception of south Devon where the high levels of road traffic reduced the suitability of the habitat in places. A landscape scale reintroduction project across both counties would result in a (meta)population with the most resilience. Thus, the counties of Devon and Somerset could be suitable for a future reintroduction project. Suitable habitats in Somerset and Devon are in sufficiently close proximity to the restored populations in Wales and Gloucestershire for there to be a reasonable expectation of gene flow between them in the future, should a successful reintroduction go ahead in the southwest (fig. 4.1). It is worth noting that reintroductions should take place in the optimal habitat areas, whereas pine marten will disperse throughout connected areas where there may not be the large woodland blocks required for release (MacPherson pers. comm.).

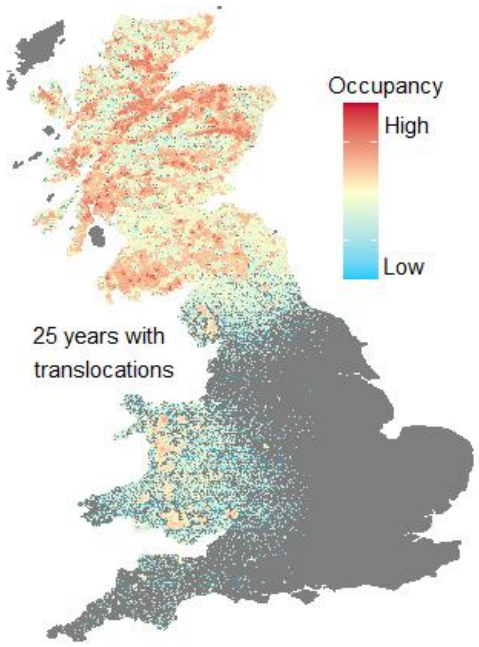

Figure 4.1 HexSim predictions of pine marten occupancy within 25 years of first translocations to Wales (in 2015), incorporating subsequent reintroductions to Gloucestershire and southwest England. Reproduced from the initial feasibility study (MacPherson et al., 2021). Maps produced using OS Open Data. Contains public sector information licensed under the Open Government Licence v2.0.

The analyses enabled identification of two Potential Release Regions (PRRs) within the Two Moors Project area (fig. 4.2). Each PRR consists of nine contiguous 10km squares with approximately 20% woodland and predicted high habitat suitability for martens. The PRRs contain some of the largest single blocks of woodland within the project area.

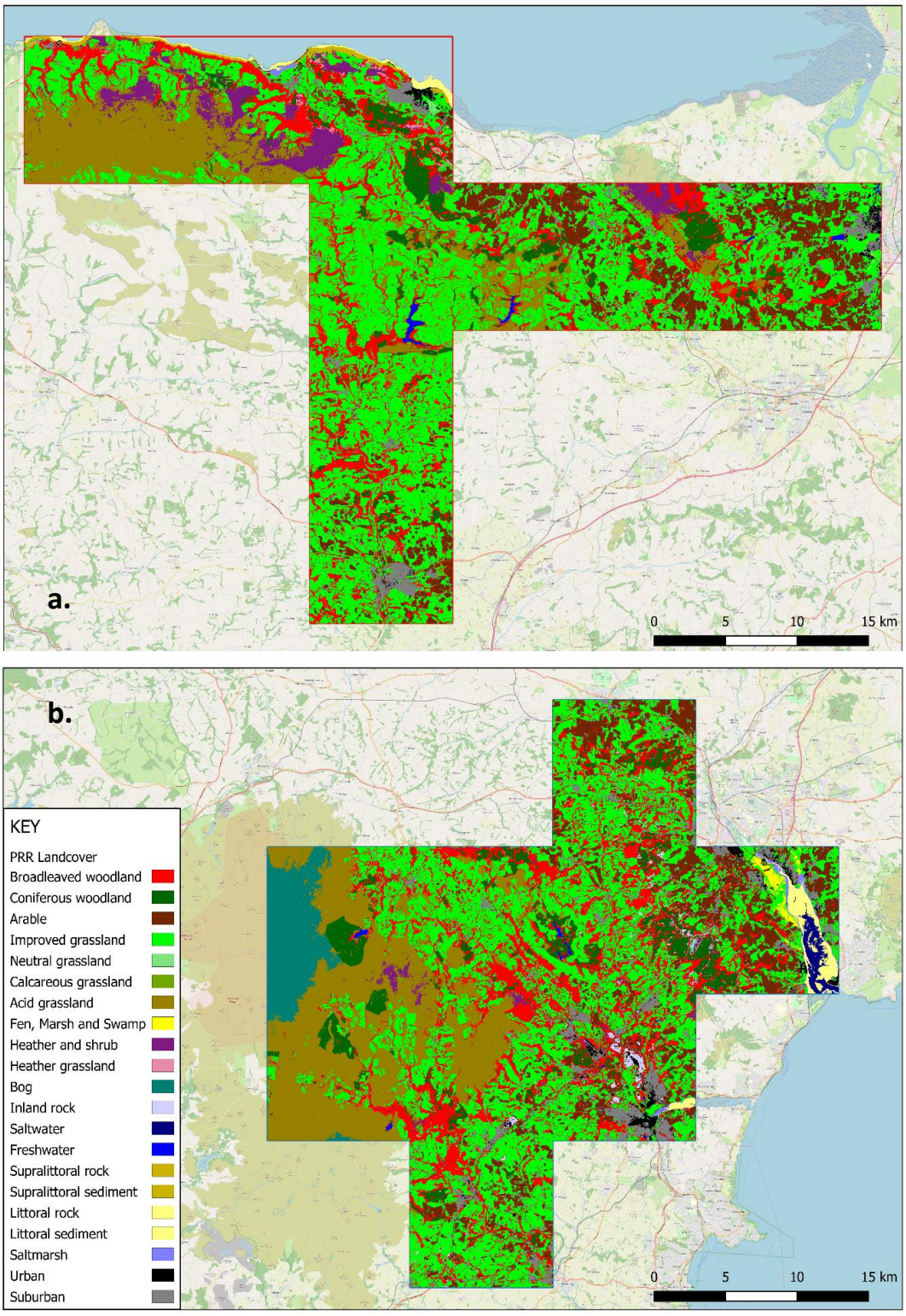

Figure 4.2. Landcover for both PRRs. a. Exmoor, b. Dartmoor. Land Cover Map 2021 (10m classified pixels, GB): Marston, C. et al., (2022). NERC EDS Environmental Information Data Centre. Contains OS data © Crown copyright and database right 2023.

4.2 Detailed habitat survey of PRRs

The extent and quality of habitat is a key determinant of whether a reintroduced population will survive and predictor of reintroduction success (Armstrong and Seddon, 2008). This section presents the preliminary findings of habitat structure assessment within the Potential Release Regions (PRRs).

The initial biological feasibility assessment summarised above concludes that a landscape scale pine marten reintroduction project across Devon and Somerset warrants further investigation. The most conservative habitat suitability model, based on GIS data, show that the large area of woodlands parallel to the northern coast of Somerset is the most contiguous region of highly suitable habitat for pine martens within the Two Moors Project area. In the north of the project area, in and around Exmoor, the large woodlands to the northwest and southwest of Dunster are probably the most suitable for releases. The size and connectivity of these woodlands would minimise risks to the released animals while finding and establishing territories (Exmoor PRR).

For the southern project area, in and around Dartmoor, the steep valley woodlands to the north and south of Moretonhampstead might be suitable release sites (Dartmoor PRR). This would reduce risks associated with major roads such as A38 where otherwise suitable habitat exists.

There is also a large swathe of suitable habitat running south from Bideford to Holsworthy and then Okehampton. This is made up of a series of ‘stepping stone’ woodlands that link the northern project area to that around Dartmoor in the south. Whilst these woodlands contribute to the overall habitat suitability of this area and are highly likely to be utilised by pine martens once established, none are likely to be suitable release sites, due to their relatively small individual size and conformation. However, this is subject to verification by field survey.

The aims are to select potential release (priority) areas within the PRRs and assess their suitability for pine marten to ensure they meet all requirements of the pine marten’s life history; foraging, movement/cover and secure denning sites for survival and maintenance of healthy populations into the foreseeable future. In addition to habitat criteria, consideration was given to potential areas of conflict and risk of mortality. As mentioned, roads are a significant cause of mortality for pine marten. They also avoid urban areas where possible. Possible areas of conflict are shooting estates that exist within the project area (see section 7 for detail).

The habitat surveys were undertaken during the summer of 2023 and are on-going.

4.3 Method

4.3.1 Desk study

Release sites should be within regions of high woodland cover (≥20%) and low road density. Land cover maps (fig. 4.2) at 10m resolution were used to quantify habitat within the PRRs and guide selection. Several other criteria (see table 4.1) were included in the selection process for potential release sites. An initial site selection was carried out as a desk-top study, using detailed site knowledge held among the partnership and resulted in identification of three priority areas within each PRR (fig. 4.3).

Table 4.1. Broad site selection criteria.

Criteria	Consideration
High woodland cover	Habitat quality
High connectivity of habitat	Habitat quality
Close to core of PRR for maximum dispersal opportunities	Habitat quality
Low proximity to major roads	Mortality risk
Low proximity to urban areas	Conflict risk
Low proximity to large commercial shoots	Conflict risk
Low levels of public access in at least part of the site	Minimise stress to animals
4 x 4 access & some flat areas for release pens	Practical consideration Minimise stress to animals

4.3.2 Walkover assessment

The desk study was followed up with walkover site visits to broadly assess habitat and identify suitable areas for release pen construction. Expert VWT advisor Jenny MacPherson accompanied the Two Moors Project team on site visits. Consideration was given to ensuring four pairs of release pens (at a minimum spacing of 2km between pairs) could be satisfactorily located within the priority areas. At this stage, the priority areas 1 & 2 within the Dartmoor PRR were combined to give sufficient pen sites at this spacing.

4.3.3 Detailed site surveys

A detailed habitat structure site assessment was undertaken, focussing on the priority areas and a surrounding 8.7km dispersal zone to ensure suitable habitat exists in the surrounding areas.

4.3.3.1 Identifying survey plots

To allocate survey plots for further investigation into habitat structure and presence of fruiting trees and shrubs, these priority areas had an 8.7km buffer applied since this represents the average dispersal distance of pine marten within the first year of release (McNicol, 2020). Random sampling was used to generate sample plots across all the woodland habitat within buffer zones for priority areas 1 (1 and 2 for Dartmoor). We used double the density (0.1 survey plots/ha) defined in the sample squares from the Welsh study, due to the more fragmented and often linear nature of the valley woodlands within the priority areas. A lower density of plots (at 0.05 plots/ha) often resulted in 1 or 0 plots in some woodland areas, failing to sample habitat representatively. This process generated a random spread of 10m diameter plots with a minimum distance between plots of 250m (fig. 4.3). This was carried out using QGIS (2023) with National Forestry Inventory NFI (2020), which covers all forest and woodland area over 0.5 hectare with a minimum of 20% canopy cover, to supply information about the woodland cover.

NFI woodland categories used:

Conifer, Broadleaved, Mixed Predominantly conifer, Mixed Predominantly broadleaved, Coppice, Coppice-with-Standards, Shrub, Young Trees, Felled, Low density, Assumed woodland, Windblow.

4.3.3.2 Survey approach

The data collected for each plot largely followed that of the Welsh study (Bavin and MacPherson, 2015) and the Forest of Dean (Stringer *et al*., 2018) with additional questions relating to access, public activity, and species of interest. For brevity we have referenced these documents for a detailed account where appropriate.

4.3.3.3 Mobile phone application

To facilitate standardised data collection across a group of volunteers, the survey was incorporated into a mobile phone app and training days were held for the field surveyors. Using an app ensured all input fields were completed and results in a relatively clean data set exported as an excel file. This meant many plots could be surveyed by teams of volunteers.

The Pine Marten Release Site Survey form within the app was developed by the Woodland Trust following successful use for other standard woodland assessments. Mobile Data Collection MDC is an iPhone/Android based geospatial data collection app, available in GIS

Cloud (https://www.giscloud.com/), allowing surveyors to capture data in the field using a predefined form. Collected data is stored in the cloud and can be downloaded in shapefile or csv format for analysis and archival.

4.3.3.4 Survey attributes assessed.

Each plot had a unique identifier and was plotted on a map within the app. Plots had a 5m radius, measured with a tape. Photos for each plot were taken to the N, S, E and W for later verification. Within each plot a variety of attributes were measured. Within some of the options, were further attributes, selectable through a drop-down menu (Table 4.2).

Table 4.2. Attributes recorded as part of the survey.

Attribute question	Options	Options
Primary habitat type	Woodland & scrub	Broadleaved (semi-natural)
		Broadleaved (plantation)
		Coniferous (plantation)
		Mixed (semi-natural)
		Scrub (dense/continuous)
		Recently felled woodland
	Grassland	
	Dense bracken	
	Heathland	
	Mire/bog/fen	
Canopy layers	Single layer	
	Canopy and understory	
	No canopy	
Ground flora	Grass (sward height <40cm)	
	Tussock >40cm)	
	Bilberry	

	Bracken
	Clear-fell
	Shrubs
	Heather
	Moss
	Bramble/Ivy
	Needle litter
	Leaf litter
	Other -describe in notes
Woody debris	No debris
	Fine twigs/branches
	Coarse woody debris (>7cm diameter)
	Both fine and coarse woody debris present
Root plate count	
Tree cavity count (cavities >50cm diameter observed within the plot)	
Fruit bearing tree count (if a count is entered the following menu appears) Fruit bearing species (present)	Blackthorn
	Hawthorn
	Rowan
	Crab apple
	Wild cherry
	Elder
	Holly
Fruiting shrub cover (% cover of total plot)	
*DBH (diameter at breast height) greater than 7cm – count of trees within plot.	

The remaining questions apply beyond the 5m radius limit of the plot.

*Basal area count (A tree stem count of all trees meeting the requirements observed from the plot centre, using a wedge prism relascope).	
Vehicle access type	No nearby vehicle access
	4 x 4
	Car only (width/height restrictions)
	All road vehicles
Vehicle access distance (approx. walking distance in m)	
Path or track nearby Y/N	
Public activity level	Low (almost none)
	Medium (occasional)
	High (regular)
Dormouse nest boxes Y/N	
Small bird nest boxes Y/N	
Bat boxes Y/N	
Squirrel damage Y/N	
NOTES: for any other information thought relevant.	

*To assess tree size and density two measures were used. The number of trees of over 7cm diameter at breast height found within the 10m plot, and a basal count using a wedge prism from the centre of each plot. A 360^{o} sweep is performed, with all trees counted if lateral displacement of the trunk is incomplete when viewed through the prism. The basal count x 2, (the Basal Area Factor BAF number marked on the prism, in this case 2), gives the basal area of timber in square metres per hectare. An index of tree size and spacing was calculated by dividing the basal area by the number of trees >7cm diameter (Tree Space Index). A full account of this may be found on pages 89-92 by Caryl *et al*., (2012).

Low numbers for the tree index ratio suggest many, small trees packed together. Larger values suggest large, well-spaced trees. Basal area is a significant predictor in determining whether a site is likely to be in a core or non-core area for pine marten (Caryl, 2008) with more dense woodland scores of over 33m^2/ha being associated with non-core areas and

therefore less favourable. Pine marten have been shown to prefer the more open conditions reported on these sites, where increased light benefits fruiting shrubs and ground flora (Caryl, 2008).

4.4 Results – priority area summaries

The three priority areas selected for each PRR (fig. 4.3) contained some of the largest woodland blocks in the PRRs and were well connected to other woodland habitat. They all had quieter areas and some limited level areas for erection of pens. All allowed access by 4 x 4 vehicles.

4.4.1 Exmoor priority area summaries

Exmoor priority areas are around the Porlock vale area, close to the core of the PRR and away from some of the larger commercial shoots further to the south towards Tiverton. Priority area 1 was further from urban areas than area 2, and not bisected by the A39 road which runs along the coast, as is the case for area 3.

4.4.1.1 Site descriptions

These sites are a mix of undesignated conifer dominated woodland and deciduous woodland which are part of the Exmoor & Quantock Oakwoods SAC and the North Exmoor SSSI. Ownership includes the National Trust, Exmoor National Park Authority and Forestry England.

These steep sided valley and coastal sites are mostly mature deciduous woodland on ancient woodland sites, particularly sessile oak, with some ash (with ash die-back present), rowan and silver birch and rare whitebeam species.

Pedunculate oak dominates the combe bottoms, with ash, alder and sallow. The oak has historically been coppiced over much of these woodlands, but large old trees and pollards are also present. The ground flora is mainly bilberry, bracken and grasses with some of the sites more dominated by ferns and bryophytes.

There are also some conifer blocks which are structurally diverse with many fallen trees and dense understorey in places. Denning opportunities within brash piles and fallen trees are present. It is likely that cavities exist within the large old ivy clad trees, but none were seen on the day. The more open areas support similar ground flora to the oak dominated areas. Much of the woodland is surrounded by heather scrub and rough moorland grassland as the landscape rises toward the high moorland of Dunkery Beacon.

Inland, the woodland borders farmland (pasture) with some commercial shoots and open moorland. Some of the sites are well used by the public, including dog walkers, horse riders and cyclists.

4.4.2 Dartmoor priority area summaries

Dartmoor priority areas 1 and 2 were central within the PRR. Area 1 having larger single woodland blocks than area 2 and less proximity to roads. Area 3 is more peripheral within the PRR, although has a large contiguous woodland block. It is also relatively close to the busy A30 dual carriageway. The River Dart Valley, further west within the PRR, was also considered, as it has potentially the largest woodland blocks. However, it is close to the busy A38 dual carriageway and the greater horseshoe bat roost within the South Hams SAC (fig. 5.1 Section 5).

All these sites fall within the Dartmoor National Park boundary.

4.4.2.1 Site descriptions

These sites all occupy the various wooded river valleys along the SE Dartmoor fringes. They are of mixed woodland habitat and management. Site ownership includes the Woodland Trust, Dartmoor National Park Authority, Natural England and Devon Wildlife Trust.

Some sites are adjoining via contiguous woodland habitat forming the majority of the South Dartmoor Woods SAC. Within the SAC. the mature deciduous woodland is dominated by sessile oak and derived from abandoned oak coppice. Common silver birch along with holly and rowan forms the understorey. Honeysuckle and ivy occur abundantly, while the ground flora has a dominance of bilberry and abundant common cow-wheat, ferns and bryophytes. In areas, hazel becomes more common in the understorey, while bramble and grasses replace bilberry in the ground flora. In the valley bottoms the woodland is dominated by downy birch and alder. There is good structural diversity with many fallen trees with exposed rootplates and dense understorey in places, which can offer potential denning and cover opportunities.

Other sites comprise a diverse mix of mature conifer plantation, well thinned and under conservation restoration and surrounding ancient oak woodland. Ring barked conifers are creating deadwood and allowing restoration of the broadleaved habitat. Conifer clear fell areas are now areas of broadleaved regeneration and young woodland, comprising birch, ash, sycamore and holly with occasional mature oaks. Both oak species and silver birch have colonised much of the area, with alder and sallow in the wetter areas. The ground flora varies from a dense cover of bracken and bramble to a rich herb flora. There are areas of large mature trees and boulders, close to the rivers.

Included in this survey is an area of pasture woodland, derived from a medieval deer park and known for its exceptional ancient and veteran trees with associated lichens. The SSSI citation states '*the site has many exceptionally large and old [sessile] oak, ash and beech trees. Interspersed among these, unusually so for ancient pasture woodland, are many*

younger trees, mainly oak, but including birch., holly, willow. and hawthorn.' The ground flora is largely dominated by grasses with bracken.

The majority of these sites are connected to the wider landscape with continuous woodland cover.

The detailed site surveys focussed on priority areas 1 and 2 and their dispersal zones in both PRRs (fig. 4.3).

Redacted image detail

Figure 4.3 Survey plots within the potential dispersal buffer

4.5 Results

This survey is currently ongoing (August 2023), but some preliminary data can be presented to explore the suitability of some of the sites. It should be noted that missing data from areas such as the Wray Valley on Dartmoor, are currently being surveyed. At this stage data has been combined for all sites within each PRR as currently the dataset is too small to give good comparison between sites.

Data was obtained from 36 plots on Exmoor across three sites and 39 plots on Dartmoor across three sites during July and August 2023.

4.5.1 Exmoor

19% of the Exmoor PRR has woodland cover.

Redacted site detail

Figure 4.4 Landscape view, Exmoor.

Woodland type & structure:

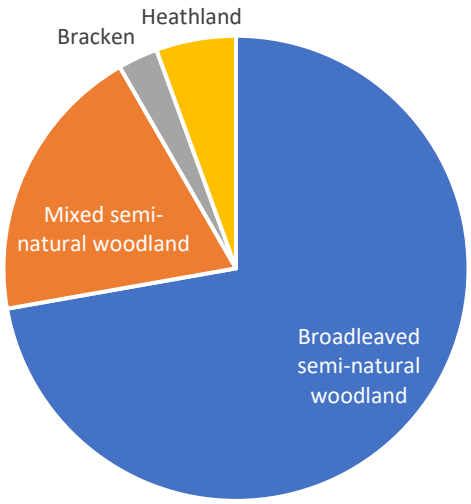

Figure 4.5. Proportion of primary habitat type for Exmoor plots, n=36

- 66% of the plots had coarse woody debris present and 51% of plots had tree cavities >50cm diameter.
- 86% of plots had canopy and understory with only 5% with no canopy.
- The basal area (m^2 /ha) ranged from 0 to 45, with 92% below 33m^2 /ha.
- The average Tree Space Index across all plots was 3.85 with 36% plots scoring 4 or over.
- 61% of plots had fruiting tree species present.

Ground flora:

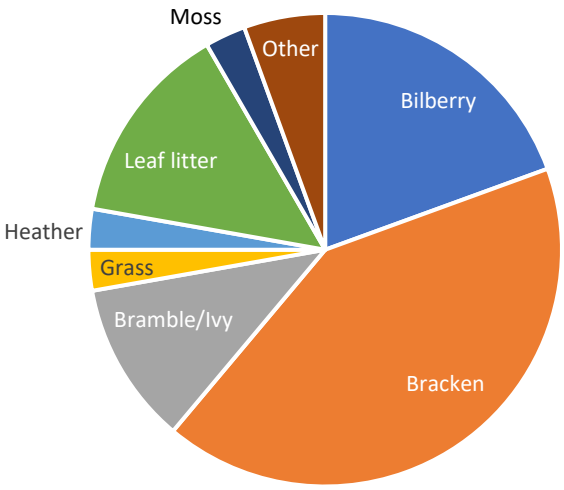

Figure 4.6 Proportion of ground cover recorded across Exmoor plots, n=36.

- The 'other' category for ground flora contained leaf litter, bilberry, grass, ferns, moss and bracken in unspecified amounts.

4.5.2 Dartmoor

23% of the Dartmoor PRR has woodland cover.

Redacted site detail

Figure 4.7 Landscape view, Dartmoor.

Woodland type & structure:

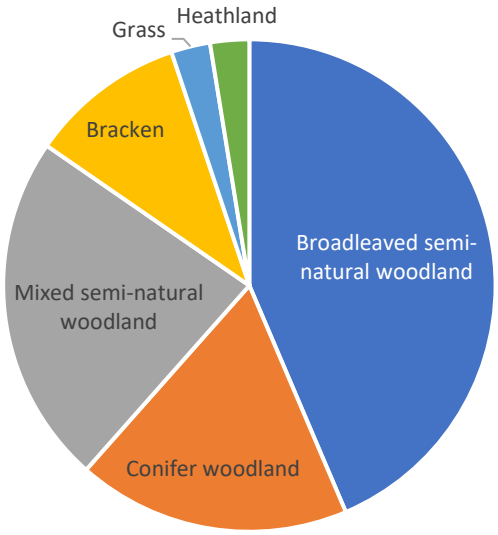

Figure 4.8. Proportion of primary habitat type for Dartmoor plots, n=39

- 70% had both a canopy and understorey.
- 64% of the plots had coarse woody debris present and 15% of plots had tree cavities >50cm diameter.
- 69% of plots had canopy and understory with only 5% with no canopy
- The basal area (m^2 /ha) ranged from 0 to 44, with 82% below 33m^2 /ha
- The average Tree Space Index across all plots was 4.3 with 41% plots scoring 4 or over.
- 43% of plots had fruiting tree species present.

Ground flora:

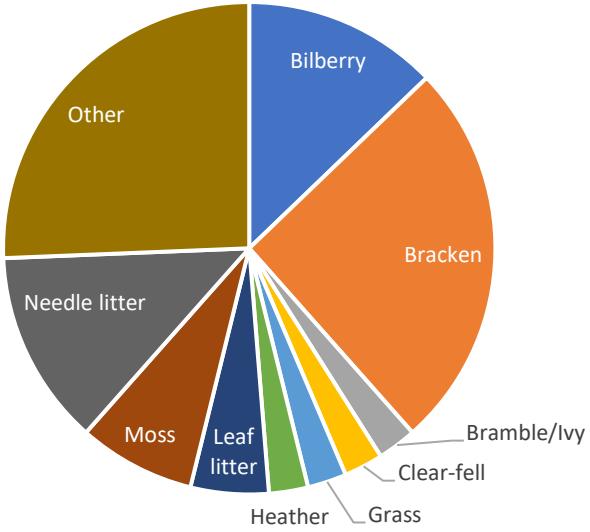

Figure 4.9. Proportion of ground cover recorded across Dartmoor plots, n=39.

- The 'other' category for ground flora contained wood rush, bilberry, bramble, wood sage, honeysuckle, ivy, leaf litter and clear fell. These had not been specified within the drop-down menu.

4.6 Discussion

4.6.1 Woodland structure and denning opportunities.

Data presented here show that all the woodland sites surveyed appear suitable to sustain a viable population of pine marten and compare favourably with the previous reintroduction areas in Wales and Forest of Dean.

Except for parts of the Teign Valley (Dartmoor) which has some large conifer blocks, there is a dominance of broadleaved woodland with the presence of large specimen trees, many with veteran tree characteristics such as decaying wood with potential for cavities. Although tree cavities were recorded across all sites, the addition of den boxes would be recommended, especially in any areas found to be deficient in natural denning sites once data collection is complete.

The wide range of Tree Space Index figures recorded, suggest woodlands of mixed structures, varying from areas with many smaller trees to areas with few large trees. As such, the range encompasses figures from the Welsh and Forest of Dean sites. It reflects the heterogeneity of the Two Moors Project sites, with their varying historic management for coppice, some conifer plantation and regenerating woodland areas.

4.6.2 Dietary components and complementary habitats

Fruiting trees and ground flora are present on all sites. Rowan and holly were the more frequent fruiting trees with bilberry and bramble as common shrubs. The woodland areas surveyed have scrubby edges, some grassy glades and are part of a complex landscape containing scrubby and open moorland, hedgerows, pastures and small copses. This provides plentiful habitat for small prey mammals (figs. 4.4 & 4.7 satellite images). Surveys for these will be undertaken during autumn 2023.

The connected habitat via wooded valleys and hedgerows allows for protected movement in the landscape, between most of the wooded areas. The moorland edges are dense with heather and other scrub including bilberry, providing cover for foraging and prey. The high levels of connectivity also allow for anti-predator arboreal behaviours and avoidance of open habitats where pine marten will be more vulnerable to potential fox predation. Fox populations are most dense in urban and lowland areas where food is more abundant (Mathews *et al*., 2018). Whilst fox numbers have not been assessed here, the site selection process, avoiding close proximity to urban areas, will decrease that risk. However, there may be some restrictions to dispersal over open landscapes where foxes are present as pine marten will show more fidelity to woodland habitats. Since pine marten are less likely to use open moorland and farmland, it is not anticipated that fox presence will impact long-term dispersal and success.

4.7 References

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5. Ecological Impact of a pine marten reintroduction

This section includes a summary of the **HRA appropriate assessment** and an expansion of **section 3. Potential impacts of restored pine marten populations on other species,** from the Initial feasibility assessment.

Refer to these accompanying documents for a full account and further introduction to the subject area.

Summary

A habitats regulations assessment (HRA) Stage 1: Screening Assessment was carried out on the protected features within the potential release regions (PRRs) and surrounding 10 and 20km buffers. This was submitted to Natural England in February 2023 and a subsequent HRA appropriate assessment was then undertaken, in response to points raised by Natural England, where there was potential for impact by pine marten.

In addition to this, Two Moors carried out assessments of potential impact by pine marten for:

- Species of conservation concern that are *not* listed as designated features within the SACs and SSSIs but *do* occur within the PRRs.
- Species which were raised as species of concern by stakeholders during the stakeholder workshops (see section 7).

Impacts of pine marten may be positive and negative and it is important to highlight the ecological benefits of pine marten returning to the southwest. How these might be maximised is summarised.

The risk of negative impact from predation and food competition by pine marten, for the species assessed, is low for those in natural habitats. The main area for potential negative impact is where animals are using man-made structures, such as nest boxes and buildings as nesting and roosting spaces. Learning by predators potentially leaves these vulnerable to repeated predation. Mitigation for these situations is successfully used elsewhere in areas where pine marten occurs and will consist of a mix of tested proactive modification to prevent pine marten access as well as reactive modifications based on monitoring with clear action trigger points. Research to investigate effectiveness of any trial methods will be included as part of an on-going adaptive management plan.

The role of pine marten in a healthy functioning woodland ecosystem should also be emphasised. Restoring the broad guild of native, co-evolved predators is key to restoring woodland ecosystems and supporting conservation of woodland species, as predators fulfil a wide range of natural functions and can tackle non-native species. Of SSSIs screened into

this assessment, half of relevant assessed habitats are in unfavourable condition, with many of those species identified within citations and conservation objectives in decline, some critically so. Restoring natural processes is key and therefore returning missing components of these processes is essential to enable recovery. Ensuring that landscapes can support pine marten and the wide range of other woodland species is critical to this and can be managed through management advice and in some instances project support.

Actions

Actions:

- Provide woodland management advice to landowners to increase and enhance woodland habitat within the project area.
- Explore funding incentives and opportunities for landowners through e.g. woodland grants and incentives, Environmental Land Management schemes.
- Develop a programme of appropriate bird and dormouse box modification, via the relevant schemes currently managing the monitoring of these. (i.e. PTES & PiedFly.net)
- Explore research opportunities to trial modifications.
- Measures to protect selected at-risk bat roosts in buildings within the project area, planned and executed during January-July 2024.

5.1 Introduction

Across its range, including in Scotland and elsewhere in Europe, the pine marten coexists with many potentially vulnerable rare species. Pine martens are territorial, have large home ranges and live at low population densities, so their impacts on other species are likely to be lower than more common predators such as stoats *Mustela erminea* and foxes *Vulpes vulpes*. While it is unlikely that recovering pine marten populations would negatively impact other native species, it is important to evaluate specific potential risks in these areas in more detail, should a reintroduction go ahead.

A range of different impacts could result from the reintroduction of pine martens. Of fundamental importance is that every native species has lived and evolved alongside European pine marten for over a million years (Koepfli *et al*., 2008). Indeed, it is thought that pine martens were once the UK's second most numerous carnivore (Maroo and Yalden, 2000). This evolutionary history means that pine martens are a fundamental missing piece of our natural heritage, and their potential importance within ecological communities should not be understated.

5.2 Ecosystem impacts

There is a perception that the recovery or restoration of a native predator may have a negative effect on native prey species, and this is a major concern for some stakeholders. Possible negative impacts may come about through direct predation, competition for prey or nesting/roosting areas and disturbance. Introduced, *non-native* predators can have a devastating effect on naïve prey populations, indeed, the suppression and control of predators has been shown to promote the success of invasive species. However, when predators and prey have co-evolved over a long period of time, prey species adapt (behaviourally or morphologically) to reduce the rate of encounters with predators or increase their prospects of escape if detected (Lima and Dill, 1990).

Pine marten as generalist omnivores with a very broad and seasonal diet (see section 1.2) play multiple roles in a woodland ecosystem; predation, seed dispersal and potential control of non-native species the north American grey squirrel.

Predation is a key component of a healthy ecosystem, and the reintroduction of a native predator can have profound positive impacts for ecosystem restoration (Ritchie at al., 2012). Indeed, with increasing density and diversity of generalist predators, comes increasing prey population stability (Klemola *et al*., 2022; Andersson and Erlinge, 1977). Generalist predators, such as pine martens, can have a stabilising effect on prey populations that reduces large fluctuations (Anderson and Erlinge, 1977). A lack of predation of terrestrial herbivores can also lead to reduced plant survival (Ripple and Beschta, 2012; Terborgh *et al*., 2001). This balancing of the ecosystem by predators is an important ecological function.

Any species investing resources in anti-predator strategies, or decreasing resource intake to lower predation risk, is at a competitive disadvantage if predation risk is not present. Thus, **predator mediated competition** and **predator protection**, often described as 'the predator of my predator is my friend', are important mechanisms by which predators confer balance to an ecosystem. An example of the latter is the relationship between goshawk (*Accipiter gentilis*) and firecrest (*Regulus ignicapilla*) where firecrests have been found to be more likely to nest near a goshawk nest, to gain protection from other predators, such as jays (*Garrulus glandarius*) (Mawson, 2010). This has been observed for a variety of species (Quinn *et al*., 2003; Bogliani *et al*., 1999; Bianco *et al*., 1997).

For a summary of different predation mechanisms and a full account of benefits and potential costs of pine marten see the full HRA report and the Forest of Dean feasibility report (Stringer, 2018).

Carnivorous mammals are the main mammalian frugivores and seed dispersers in temperate climate regions (González-Varo *et al*., 2017). They are considered long-distance seed dispersers due to their large territory sizes, meaning they fulfil a different ecological role

from resident (non-migrating) passerine birds which have relatively smaller dispersal distances (González-Varo *et al*., 2017). A study in NW Spain identified that pine martens had a maximum seed dispersal distance of 1233m from the maternal tree where home range was 0.5-1.5km^2 (González-Varo *et al*., 2017). UK home range is more typically 5-25km^2 so pine martens may present substantially greater seed dispersal distances in the UK (Mammal Society, 2023). As ground flora and understorey species frequently rely on endozoochory for seed dispersal, pine martens are key dispersal vectors for these components of woodlands (Schaumann and Heinken, 2002). Carnivore seed dispersers (incl. pine marten) may also play a role in providing resilience against climate change (González-Varo *et al*., 2017).

The non-native grey squirrel (*Sciurus carolinensis*) negatively impact woodland ecosystems when they are present in high densities, through damage to trees (bark stripping) and their effects on seed dispersal and seed predation (Hewson and Fuller, 2003). They are known nest predators of some bird species, with potential resulting impacts on populations. Spotted flycatchers (*Muscicapa striata*), Hawfinch (*Coccothraustes coccothraustes*) and lesser spotted woodpecker (*Dryobates minor*) are negatively associated with grey squirrel density (Stoate and Szczur, 2006; Amar *et al*., 2006), which may be due to predation, food competition and/or reduced habitat quality.

Pine martens are thought to have a controlling influence on grey squirrel populations with pine marten recovery in Ireland associated with population decline in grey squirrel, alongside red squirrel recovery. Research results from studies in Scotland reveal that pine martens are having the same effect on squirrels there, suppressing grey squirrel populations and allowing reds to recover. The mechanisms are thought to be a combination of direct predation at critical stages of the grey squirrel life cycle and a disturbance effect lowering survival rates and fecundity (See Stringer, 2018 and references therein).

The key taxa considered to be impacted by pine marten are bats and birds via direct predation, disturbance or competition. There may also be benefits to some of these species through the mechanisms described above. Both are covered extensively in the accompanying HRA document but here we expound some of the nuanced effects of the different types of bird nesting behaviours in the context of predation.

Pine martens predate upon birds and engage in nest-raiding behaviour across their range (Kaliński et al, 2014). Pine martens will also compete with cavity-nesting species for access to sheltering spots/nestbuilding sites (Kleef and Tydeman, 2009). As well as competition for nesting sites, pine martens are direct competitors for prey items with raptors, corvids and woodpeckers (Kleef and Tydeman, 2009; Putman, 2000; Zalewski, 1996). As with dormice and bats, pine martens are likely to have a greater impact on species living within more modified habitats or extensively utilising bird nest boxes (Sorace, 2004). There is potential for pine martens to impact rare bird assemblages in these situations.

Bird nest types are split into three categories: ground-nesting, open-nesting and cavity-nesting; each one subject to a variety of different nest predators and pressures (Mainwaring *et al*., 2015).

Ground-nesting birds

Nests built on or near the ground, it could be argued, are the most vulnerable and least protected type of nest. Predation of eggs and chicks from ground nests can have a great effect on the breeding success of a number of species, and predation of incubating adult females can also be significant (Amat and Masero, 2004). Ground-nesting birds face predation by corvids (raven, carrion crows, jackdaws, magpies and jays), gulls and a range of mammalian predators, including foxes, badgers, hedgehogs, stoats, weasels and small rodents (Angelstam, 1986; Fletcher *et al*., 2010; Gibbons *et al*., 2007). Multi-brooded birds are less likely to be limited by predation (Roos *et al*., 2018)

Open-nesting birds

Building a nest higher off the ground may provide a little more protection for eggs and chicks as these nests can be harder to find (Martin and Li, 1992). Open nests, however, don't provide complete cover and so are still vulnerable. Potential predators of open nests are grey squirrels, small rodents, corvids, weasels and stoat (Gibbons *et al*., 2007; Purcell and Verner, 1999).

Cavity-nesting birds

Nests built in cavities usually receive lower levels of predation because of the reduced predator access (Yoon *et al.,* 2016). The entrance hole size plays a part in inhibiting access to larger predators (Wesolowski, 2002) and this level of protection means cavity-nesters have greater nesting success (Martin and Li, 1992). However, cavity-nesters are still at risk of predation from great spotted woodpeckers, magpies, jays, grey squirrels, stoats and weasels (Gibbons *et al*., 2007; Yin *et al*., 2023).

5.3 Habitats Regulations Assessments.

This summary forms the appropriate assessment part of the Habitats Regulations Assessment. This is in response to Natural England regarding the Two Moors Project, HRA, Stage 1: Screening Assessment of February 2023. Both documents were submitted to Natural England by Dartmoor National Park Authority as the competent authority.

The Stage 1: Screening Assessment considered all European nature conservation sites located within a 20km radius of the Proposed Release Regions (PRR) of the Two Moors Pine Marten Project, or which may otherwise be affected. These European sites comprise Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Ramsar sites. Whilst not a requirement, the Two Moors Project also assessed all SSSIs within the PRRs and a 10km buffer zone. The buffers are to allow for pine marten dispersal and therefore possible future impacts beyond the initial release.

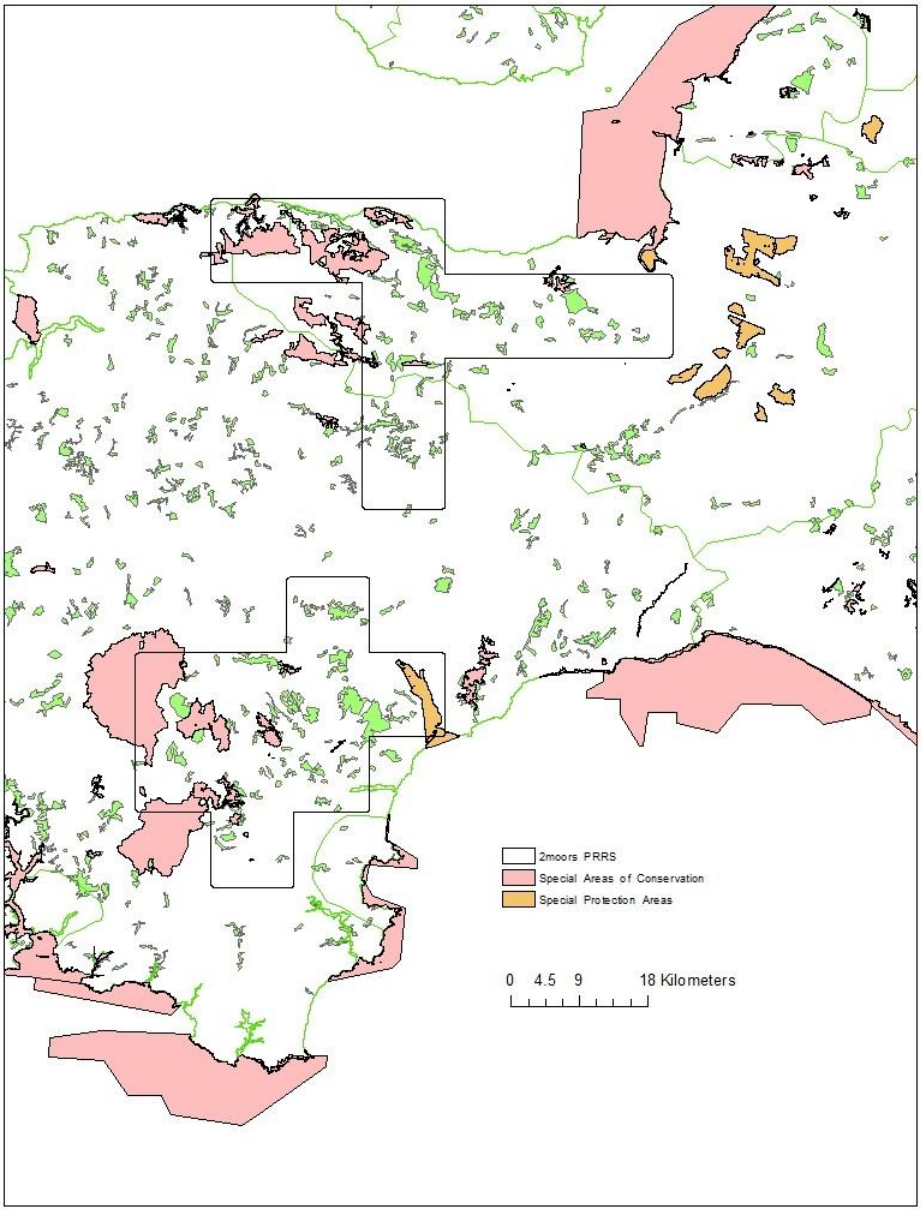

Figure 5.1 Special Areas of Conservation and Special Protection Areas in relation to Potential Release Regions (PRRs) for pine martens in the Two Moors Project area in Somerset and Devon

Whilst an HRA is primarily to assess whether a plan or project proposal could significantly harm the designated features of a European site, we have included potential beneficial impacts and how they may be maximised to better reflect a wider range of possible outcomes.

The response from Natural England to the Phase 1 screening, specified appropriate assessment of the following:

SACs identified as having the potential to be impacted by the project:

- **Exmoor and Quantock Oakwoods SAC**
- **Hestercombe House SAC**
- **South Dartmoor Woods SAC**
- **South Hams SAC**
- **Dartmoor SAC (features only listed within Dendles wood SSSI)**

21 SSSIs were identified as having the potential to be impacted by the project. These 21 sites support notable populations of dormice, important bat roosts or rare woodland bird assemblages. The majority of these are within SACs and summarised below under those headings. Note: species listed in SSSI citations may not be designated features within the overlapping SAC but the assessment and the residual adverse effect applies to those species.

Natural England was particularly concerned about the potential predation by Pine Martens on:

- Barbastelle and Bechstein's bats and breeding woodland birds (such as pied flycatcher) within the **Exmoor and Quantock Oakwoods SAC**.
- Breeding woodland birds (such as pied flycatcher) within the **South Dartmoor Woods SAC**
- Lesser Horseshoe bats within the **Hestercombe House SAC**
- Greater Horseshoe bats (and other bat species within the **South Hams SAC.**
- Breeding woodland birds and Barbastelle bats within the **Dartmoor SAC (features only listed within Dendles wood SSSI** *which is the only woodland element of the Dartmoor SAC*)

SSSIs not already included in above SACs

Concern that the application might have the following adverse effects on the SSSIs:

Predation by Pine Martens on, (or competition for prey, in the case of raptors) with:

- Breeding Goshawk, breeding Honey Buzzard and the raptor assemblage of the Haldon Forest SSSI.
- Nightjar of the Haldon Forest SSSI
- Breeding woodland birds at Stoke Woods SSSI

While the HRA Screening and the NE response did not include Beer Quarry and Caves SAC as its designated sites are outside the PRR+20km zone, this has been included within this appropriate assessment due to the main associated maternity roost lying within the PRR+20 zone and the connectivity to other roosts being good.

5.3.1 Appropriate Assessment Results Summary

For a full account, please see accompanying HRA document.

- Six SACs (including Beer Quarry & Caves) were considered for further consideration. The only relevant component of the Dartmoor SAC is Dendles Wood SSSI. 21 SSSIs including several that lay outside SACs were also included.
- Habitat features were not considered to be at risk. However, improved natural regeneration of woodland habitat may come about through increased seed dispersal of fruiting species, and reduced tree damage and predation of tree seed through a reduction in grey squirrel numbers.
- The primary species focus was on bats (specifically greater and lesser horseshoe bats, and woodland species, Barbastelle and Bechstein's bats), woodland birds and raptors. Dormice were also included within some of the SSSI citations.
- Pine marten were not considered to cause any residual adverse effect on woodland birds and (non-bat) mammals at a population level, in a natural situation. The generalist feeding habits of the pine marten mean greater predation of the common species, since they will prey on the most abundant food source. Rare, opportunist predation of these species will not cause adverse population level effects.
- Prey competition between pine marten and raptors was not considered likely to cause any residual adverse effect the specified raptors. This is due to the compensatory nature of the prey population and habitat partitioning in many cases.
- Benefits to some species of concern may come about through predator mediated competition and potentially predator protection. Changing predation pressure on woodland birds (via pine marten predation of grey squirrel, corvids and great spotted woodpecker) may benefit other species.
- The main risk of negative impact to species of concern is in human mediated environments where species are using anthropogenic structures in replacement of natural features - such as bat roosts in buildings and nest boxes for birds. Pine marten (and other predators) may learn associations of prey with nest boxes. Large bat roosts, while unlikely to be found by pine marten, carry a moderate risk of predation and disturbance due to the proportion of a local population that may be using an individual roost, mediated by the accessibility of the feature to pine martens. Mitigation measures for these circumstances may be proactive or reactive, depending on circumstances or outcomes of monitoring.

A summary of features associated with the protected areas and their assessment can be found in table 5.1.

***Table 5.1**. Summary table of vulnerable conservation features considered for appropriate assessment as per the Natural England response to Two Moors Pine Marten Reintroduction Project Stage 1 HRA screening report of February 2023. * Included as required by NE. Species rated green or least concern are not included unless they are a listed feature of an SAC. See full HRA appropriate assessments for evidence to support mitigation and risk. Some species may benefit from the presence of pine marten and actions to maximise these benefits are suggested. + Beer Quarry and Caves SAC falls outside the PRR buffer zone but the maternity roost integral to the functioning of the SAC lies within it. Conservation status for birds: BOCC 5 assessment at European and global level. Mammals: English Red list (Mathews and Harrower, 2023). PRR = Potential Release Region.*

Conservation feature	**Component if noted**	**Status**	**SAC (& SSSI's therein) & individual SSSI where not part of a wider SAC**	**Mitigation and actions to maximise benefit**	**Residual adverse effect** If mitigation undertaken, are you sure that no adverse effect on the integrity of the site will occur.
Breeding (woodland) bird assemblage:	Pied flycatcher *Ficedula hypoleuca*	Amber	South Dartmoor Woods **SAC** Exmoor and Quantock Oakwoods **SAC** Dartmoor **SAC** (Dendles wood SSSI)	**Mitigation:** Trial nest box mitigation to understand occupancy effects. If effects are low, then deploy proactively across PRRs and reactively beyond PRRs. If effects are moderate to high, then deploy reactively where signs of predation are occurring.	Yes

				How to maximise benefit: Provide woodland management advice to landowners encouraging varied woodland habitat structure, including open woodland habitats, retention of ivy and creation of veteran tree features including cavities, fungal decay, and nest holes. Seek opportunities to connect and de-fragment woodlands through woodland creation to increase woodland area and reduce fragmentation effects.	Yes
	Wood warbler *Phylloscopus sibilatrix*	Red	South Dartmoor Woods **SAC** Exmoor and Quantock Oakwoods **SAC** Dartmoor **SAC** (Dendles wood SSSI) Stoke Woods **SSSI**	**How to maximise benefit:** Provide woodland management advice to landowners encouraging varied woodland habitat structure, including development of more open woodland understoreys (suitable to the woodland type) in a proportion of woodland. Seek opportunities to create, connect and de-fragment woodlands through woodland creation to reduce edge effect which otherwise benefits pine marten predation of wood warbler.	Yes

	Redstart *Phoenicurus phoenicurus*	Amber	South Dartmoor Woods **SAC** Exmoor and Quantock Oakwoods **SAC** Dartmoor **SAC** (Dendles wood SSSI)	**How to maximise benefit:** Provide woodland management advice to landowners encouraging varied woodland habitat structure, including increasing deadwood and levels of low-level woodland cover.	Yes
	Lesser spotted woodpecker *Dendrocopus minor*	Red	South Dartmoor Woods **SAC** Exmoor and Quantock Oakwoods **SAC** Stoke Woods **SSSI**	**How to maximise benefit:** Provide woodland management advice to landowners encouraging varied woodland habitat structure, including open woodland habitats, retention of deadwood, particularly smaller standing deadwood trees and branches, and increased number of mature trees. Seek opportunities to connect and de-fragment woodlands through woodland creation to increase woodland area and reduce fragmentation effects.	Yes
	Merlin *Falco columbaris*	Red	Exmoor and Quantock Woodlands **SAC**	**How to maximise benefit:** Provide woodland and heathland management advice to landowners encouraging varied habitat structure, including increasing areas of open ground with adjacent woodland suitable for nesting merlin.	Yes
	Tawny owl *Strix aluco*	Amber	Stoke Woods **SSSI** Exmoor and Quantock Woodlands **SAC**	**Mitigation (reactive):** Explore mitigation measures to tawny owl nest boxes reactively due to low level of risk and low numbers of nest boxes in landscape.	Yes

Nightjar *Caprimulgus europaeus*	n/a	Amber	South Dartmoor Woods **SAC** Exmoor and Quantock Oakwoods **SAC** Haldon Forest **SSSI** Stoke Woods **SSSI**	**How to maximise benefit:** Provide woodland and heathland management advice to landowners encouraging varied habitat structure, including increasing areas of open ground suitable for nesting nightjar.	Yes
Assemblage of breeding birds of prey:	Honey buzzard *Pernis apivorus*	Amber	Haldon Forest **SSSI** (not confirmed breeding since 1995)		Yes
	Goshawk *Accipiter gentilis*	*Not listed	Haldon Forest **SSSI**		Yes
	Sparrowhawk *Accipiter nisus*	Amber	Haldon Forest **SSSI**		Yes
	Kestrel *Falco tinnunculus*	Amber	Haldon Forest **SSSI**	**Mitigation (reactive):** Explore mitigation measures to barn owl nest boxes (which are occasionally used by kestrel) reactively due to low level of risk.	Yes

Dormouse *Muscardinus avellanarius*	n/a	Vulnerable (Eng)	Exmoor and Quantock Oakwoods **SAC** South Dartmoor Woods **SAC** Haldon Forest **SSSI** Ladies Wood **SSSI**	**Mitigation (proactive):** Providing advice to dormouse monitoring volunteers (via PTES) of the importance of positioning nest boxes within dense understorey for predator protection and the need to firmly secure next box lids and ensure nest boxes are of robust construction.	Yes
See 'Assessment to inform HRA Pine Martens and Bats' including flow chart of monitoring and mitigation strategy					
All bat species				**Mitigation (proactive):** Pine marten den boxes will be installed in areas away from known bat colonies to provide alternative denning sites to limit competition with bats.	Yes
Barbastelle bat *Barbastella barbastellus*	Tree roosts	Vulnerable (Eng)	Exmoor and Quantock Oakwoods **SAC (low)** Dartmoor **SAC** (Dendles wood SSSI) **(low)**	**Mitigation (reactive):** Where monitoring identifies pine marten near high value roost, examine if practical to use deterrents (climbing baffles/anti-climb sheeting, mesh tubes, entrance hole reducers) – deploy reactively where suitable. Consider translocation as last resort – see flow chart of monitoring and mitigation.	Yes

				How to maximise benefit (bat habitat): Provide woodland management advice to landowners encouraging retention of tree features favourable to bats.	Yes
Bechstein's bat *Myotis bechsteinii*	Tree roosts	Least concern (Eng)	Exmoor and Quantock Oakwoods **SAC (low)**	**Mitigation (reactive):** Where monitoring identifies pine marten near high value roost, examine if practical to use deterrents (climbing baffles/anti-climb sheeting, mesh tubes, entrance hole reducers) – deploy reactively where suitable. Consider translocation as last resort– see flow chart of monitoring and mitigation.	Yes
				How to maximise benefit (bat habitat): Provide woodland management advice to landowners encouraging retention of tree features favourable to bats.	Yes
			[+]Beer Quarry and Caves **SAC (low)**	**Mitigation (proactive):** Monitoring using trail cameras will target the pinch-point area where pine martens may move to the east of the Exe Estuary. If activity is detected in this area, then the following mitigation approaches should be followed as there is good connectivity from there to the Beer Quarry and Caves SAC and associated roosts.	Yes

	Underground roosts			**Mitigation (reactive):** Where monitoring identifies pine marten near high value roost examine if practical to use bespoke mitigation – deploy reactively where suitable. Consider translocation as last resort– see flow chart of monitoring and mitigation.	Yes
	Tree roosts			**Mitigation (reactive):** Where monitoring identifies pine marten near high value roost, examine if necessary/practical to use deterrents (climbing baffles/anti-climb sheeting, mesh tubes, entrance hole reducers) – deploy reactively where suitable. Consider translocation as last resort– see flow chart of monitoring and mitigation.	Yes
				How to maximise benefit (bat habitat): Provide woodland management advice to landowners encouraging retention of tree features favourable to bats.	Yes
Greater horseshoe bat *Rhinolophus ferrumequinum*	Building roosts	Least concern	South Hams **SAC (moderate)**	**Mitigation (proactive):** Bespoke mitigation of high value roosts within PRRs and 20km buffer to prevent access by pine marten. Consider translocation as last resort – see flow chart of monitoring and mitigation.	Yes

				Mitigation (reactive): Where monitoring identifies pine marten near moderate value roost examine if appropriate to use bespoke mitigation – deploy reactively where suitable. Consider translocation as last resort – see flow chart of monitoring and mitigation.	Yes
	Underground roosts		South Dartmoor Woods **SAC** (Hembury wood SSSI) **(moderate)** Napp's Cave **SSSI (moderate)** Torbryan Caves **SSSI (moderate)**	**Mitigation (reactive):** Where monitoring identifies pine marten near high value roost examine if practical to use bespoke mitigation – deploy reactively where suitable. Consider translocation as last resort – see flow chart of monitoring and mitigation.	Yes
			[+]Beer Quarry and Caves **SAC (low)**	**Mitigation (proactive):** Monitoring using trail cameras will target the pinch-point area where pine martens may move to the east of the Exe Estuary. If activity is detected in this area, then the following mitigation approaches should be followed as there is good connectivity from there to the Beer Quarry and Caves SAC and associated roosts.	Yes

				Mitigation (proactive – following movement into East Devon): Bespoke mitigation of high value roosts within PRRs and 20km buffer and other key SAC roosts to prevent access by pine marten. Consider translocation as last resort – see flow chart of monitoring and mitigation.	Yes
				Mitigation (reactive): Where monitoring identifies pine marten near moderate value roost examine if appropriate to use bespoke mitigation – deploy reactively where suitable. Consider translocation as last resort – see flow chart of monitoring and mitigation.	Yes
				Mitigation (reactive): Where monitoring identifies pine marten near high value roost examine if practical to use bespoke mitigation – deploy reactively where suitable. Consider translocation as last resort – see flow chart of monitoring and mitigation.	Yes
Lesser horseshoe bat *Rhinolophus hipposideros*	Building roosts	Least concern	Hestercombe House **SAC (moderate)** South Hams **SAC (moderate)** *not listed as a feature.*	**Mitigation (proactive):** Bespoke mitigation of high value roosts within PRRs and 20km buffer to prevent access by pine marten. Consider translocation as last resort – see flow chart of monitoring and mitigation.	Yes

			Napp's Cave **SSSI (moderate)** Torbryan Caves **SSSI (moderate)**	**Mitigation (reactive):** Where monitoring identifies pine marten near moderate value roost examine if appropriate to use bespoke mitigation – deploy reactively where suitable. Consider translocation as last resort – see flow chart of monitoring and mitigation.	Yes
	Underground roosts			**Mitigation (reactive):** Where monitoring identifies pine marten near high value roost examine if practical to use bespoke mitigation – deploy reactively where suitable. Consider translocation as last resort – see flow chart of monitoring and mitigation.	Yes
			[+]Beer Quarry and Caves **SAC (low)**	**Mitigation:** Monitoring using trail cameras will target the pinch-point area where pine martens may move to the east of the Exe Estuary. If activity is detected in this area, then building roosts should be defended as there is good connectivity from there to the Beer Quarry and Caves SAC and associated roosts.	Yes
	Building roosts			**Mitigation (proactive – following movement into East Devon):** Bespoke mitigation of high value roosts within PRRs and 20km buffer and other key SAC roosts to prevent access by pine marten. Consider translocation as last resort – see flow chart of monitoring and mitigation.	Yes

				Mitigation (reactive): Where monitoring identifies pine marten near moderate value roost examine if appropriate to use bespoke mitigation – deploy reactively where suitable. Consider translocation as last resort – see flow chart of monitoring and mitigation.	Yes
	Underground roosts			**Mitigation (reactive):** Where monitoring identifies pine marten near high value roost examine if practical to use bespoke mitigation – deploy reactively where suitable. Consider translocation as last resort – see flow chart of monitoring and mitigation.	Yes

5.4 Additional ecological impact assessment of species of concern within the PRRs

Beyond the scope of the HRA process, there are also potentially vulnerable species which occur within the PRRs but are not listed as features of protected sites. To include them within the impact assessment process, the woodland bird assessment carried out by VWT (see section 3 of their **initial feasibility assessment)** was expanded to include evidence of interaction/predation, modern environmental differences and levels of predation on the target species by other predators. Other taxon groups are also considered.

Several species were raised by stakeholders as of concern when discussing the potential reintroduction of the pine marten (see section 7.2.5, tables 7.1 & 7.2). These species are listed separately as there is overlap with the species list within the HRA. For those species raised by stakeholders, we considered the level of stakeholder concern and what the concerns for that species were.

5.4.1 Potential impact on other species

5.4.1.1 Predation upon and competition with mammals

Bat species and dormice are considered within the HRA and not covered here.

Competition with Eurasian Otter (*Lutra lutra*)
Pine martens and otters will both forage in terrestrial habitats for small mammals and invertebrates. However, the prey overlap between otter and pine marten is small with none of the shared prey species being identified as considerable components of both species' usual diet.

Competition between the two carnivores may decrease the percentage of time otters spend foraging terrestrially. This would increase predation pressure on fish and waterfowl. However, these are already a large percentage of the otter's diet, and the increased predation pressure is unlikely to significantly impact them. An HRA appropriate assessment of otter was not required.

5.4.1.2 Predation on Invertebrates

Pine martens feed on invertebrate species. Across Europe, the average consumption of these species is 10% of the pine marten diet (Zalewski, 2005). Latitude-based modelling for the Forest of Dean predicted that within that population the composition of invertebrates would be 6%. An assessment for Devon and Somerset within the Two Moors Project HRA suggests invertebrates would represent 5-10% of diet. Pine martens prefer feeding on large-bodied insects such as beetles but will also raid the nests of social insects for larvae and pollen (Clevenger, 1993). Pine martens are most likely to predate invertebrates living in woodlands and woodland edges. The low density of pine martens and the wide array of

current insectivores means that pine marten predation is not likely to significantly impact invertebrate species.

A species raised as of concern, which may be vulnerable to pine marten predation following the reintroduction is the blue ground beetle (*Carabus intricatus)*. The blue ground beetle is restricted to 15 sites in the UK with the majority of these being found on the edges of Dartmoor. However, the risk to blue ground beetle was considered to be low because of their much lower density compared to other beetle species in the area, as well as having more developed defence mechanism compared to other Carabrid species (Boyce and Walters, 2015). An HRA appropriate assessment of blue ground beetle was not required.

5.4.1.3 Predation on amphibians and reptiles

Pine martens feed on reptiles and amphibians. They are likely to encounter them when foraging around woodland edges. In Scotland, reptile composition in the pine marten diet ranged from 0% to 10% (Caryl, 2008). Reptile populations in the area are likely already subject to terrestrial predation pressures and the low levels of additional pine marten predation pressure are unlikely to result in a significant impact.

Great crested newt (*Triturus cristatus*)

Great crested newts were assessed as a species of concern due to its threatened status and their isolated populations in the southwest. There is a low level of concern over the potential impact of pine martens on great crested newts. Whilst there is no evidence of interaction between the two species, they may overlap in specific areas of the PRRs.

5.4.1.4 Predation upon and competition with birds

Information on Red and Amber List birds and their distribution in Britain was derived from the 2007-2011 *Atlas of Breeding Birds* (Balmer et al., 2014). It should be noted that greenfinch, common whitethroat, rook, sparrowhawk, wren and woodpigeon have only recently been added to the Red and Amber Lists as part of the fifth Birds of Conservation Concern in the United Kingdom (Stanbury *et al*., 2021), and therefore breeding distribution data is not yet available for these species.

Impacts on birds are covered comprehensively through examination in a table in Appendix 2 and in the Initial Feasibility study pg 23-24. 'Of the 163 species on the Red and Amber Lists, 62 species (35 red and 27 amber) nest in woodland, woodland edge or habitats likely to be adjacent to woodland. Of these, 41 species (23 red, 18 amber) are recorded as confirmed, probable or possible breeding in one or more 10km squares in the Two Moors PRRs.' However, only a few have more than 1% of their breeding range in either of the two PRRs and these have been assessed as part of the HRA with the exception of cirl bunting (*Emberiza cirlus*) and Dartford warbler (*Sylvia undata*). Neither of these species overlap with pine marten in their habitat use and so are unlikely to encounter pine marten.

Nest boxes

Impact to vulnerable bird species is likely where nesting occurs in nest boxes. Pied flycatcher (*Ficedula hypoleuca)* is one of the Amber List species present in both the Dartmoor and Exmoor PRRs. Natural cavities where this species would normally nest are usually too small for a pine marten to access. However, within the PRRs there are 48 sites where pied flycatcher nest boxes are monitored as part of the PiedFly.net scheme. This species was assessed within the HRA and mitigation measures to modify nest boxes to prevent pine marten access were discussed with PiedFly.net as part of the stakeholder workshop (see section 7.2.5 for comment).

Mitigation:

Protection of bird nests and boxes from predators is more commonplace in North America and mainland Europe. The image below has examples of relevant modifications used. The mesh adaptation has been used successfully in Scotland to prevent predation of crested tit clutches.

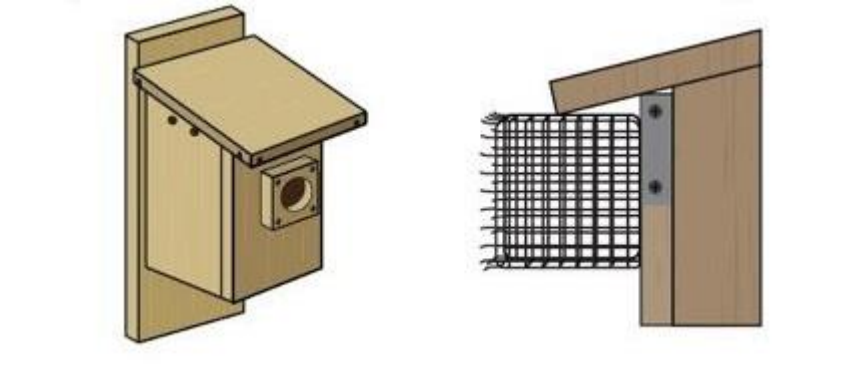

Figure 5.2. Examples of nest box modifications used to prevent pine marten access. Image © NestWatch

PiedFly.net volunteers have carried out initial tests around installation of baffles to nest boxes and will extend these to larger trials to understand impact on occupancy of the boxes. Where trial results are positive, proactive protection of nest boxes in the immediate vicinity of release sites will be carried out as mitigation. If occupancy rates are affected by mitigation, this will only implemented reactively where monitoring suggests a direct risk. All nest box sites are intensively monitored, and the released pine martens will be radio-tracked initially. Mitigation reacting to actual predation or a pine marten establishing a territory close by, is more appropriate on remaining sites. A stepwise plan will be developed according to the timeframe outlined in section 3.4 of this report.

A research proposal to investigate the effect of box modification on occupancy rates has been put forward by PiedFly.net. Reduced occupancy has been noted where boxes have been modified elsewhere, but this has not been rigorously tested over time.

5.4.1.5 General benefit of grey squirrel and corvid impacts

Benefits to some species of concern may come about through predator mediated competition and potentially predator protection. Changing predation pressure on woodland birds (via pine marten predation of grey squirrel, corvids and great spotted woodpecker) may benefit other species such as dormice.

5.4.2 Species of concern raised by stakeholders

Assessments for species of concern raised by stakeholders was based on evidence of interaction between pine martens and the species in question. Any mitigation actions that may be considered are discussed.

5.4.2.1 Predation upon and competition with mammals

Hazel dormouse (*Muscardinus avellanarius*) (also see HRA)

Hazel dormice form a part of the pine marten diet where their ranges overlap (Balestrieri et al., 2011). The hazel dormouse and pine marten have a widespread overlap in ranges as well as habitat preference.

Stakeholders were concerned that there is a lack of alternative prey for pine martens, and that there would be a negative impact on hazel dormice, especially since suitable habitat seems to be declining. Dormice are agile tree climbers and are likely to avoid capture when active, but the concern was they could potentially be under greater threat when hibernating and nesting. However, dormice are seldom recorded in the winter diets of predators and proportions of dormice in the diets of mammalian predators is not high (Juškaitis, 2022). Expert opinion within the stakeholder group corroborated this with observations from survey footage of hibernating dormice, eliciting no response from passing badger, fox and even sniffer dog (Leo Gubert pers. comms.).

Impact to dormice is likely where nesting occurs in nest boxes. The national dormouse monitoring scheme run by the Peoples Trust for Endangered Species PTES has a network of volunteers, monitoring dormice across southern Britain. Devon is a stronghold for dormice and there are many nest box sites within the PRRs (fig.5.3). PTES was supportive of the project, stating the main risk to dormice populations is from habitat degradation by deer browsing and from grey squirrel via food competition (Ian White, pers. comms.). Hazel dormice may therefore benefit from reduced grey squirrel numbers, via pine marten predation.

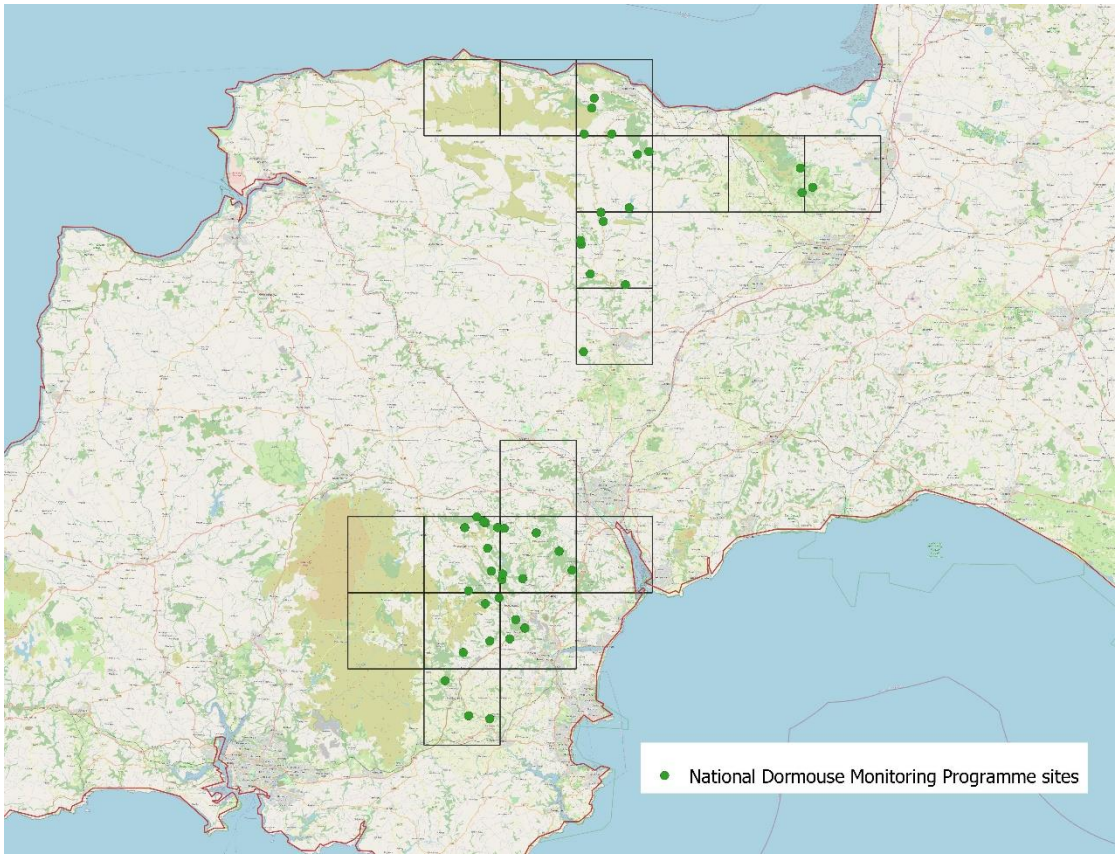

Figure 5.3 National Dormouse Monitoring Programme sites within the Two Moors PRRs (People's Trust for Endangered Species (PTES), 2020)

Mitigation:

Mitigation action here is to encourage volunteers to ensure nest boxes are in good condition, removing old decaying boxes and secure the lids with wire to prevent predation (entry holes at the rear of the boxes are not accessible to pine marten). This is currently best practice and encouraged by PTES. Sites near to pine marten releases can be pro-actively protected if not already. Advice will also be provided on siting boxes within dense foliage which provides a warning to dormice of presence of predators.

Harvest Mouse (*Micromys minutus*)

There was some concern from Devon Mammal Group regarding the potential impact of pine martens on harvest mice. They particularly wanted to know if other projects had seen an impact of pine martens on harvest mice and if any surveys have been completed to better understand the population of harvest mice, and other small mammals, in the potential release areas. It was felt that harvest mice are under-surveyed, so the true population is unknown and that they are already struggling due to the effects of climate change and additional predation pressures should be given more consideration. Whilst the habitats of

harvest mice and pine martens will overlap, it was thought there was a low level of risk, due to harvest mice occurring in lower densities than pine martens preferred food source- the field vole.

5.4.2.2 Predation upon and competition with birds

(i) Ground nesting birds- waders

Curlew (*Numenius arquata*)

Outside of the species discussed in the HRA, curlew was the bird species mentioned most frequently by stakeholders and for which most concern was expressed. Stakeholders were worried about extant curlew surviving on Dartmoor and those reintroduced through The Curlew Headstart Project, while acknowledging these represented very small numbers. The project is located close to the Dartmoor PRR and stakeholders felt that the small population was already under huge pressure and the population risked being eradicated. There was also a concern about woodland expansion bringing the tree line closer to breeding curlew, making them more vulnerable to predators.

However, an appropriate assessment was not required as curlew don't breed in woodland or woodland edge habitat where pine martens are expected to spend a large proportion of their time and the rarity of both species means it is unlikely they will interact. In Northumberland, curlews currently coexist with pine martens and are probably far more widespread in the mid-Wales pine marten reintroduction area, than they would be in Devon. The Two Moors Project is not aware of any concerns raised in mid-Wales around curlew. It is also worth noting that whilst the comment regarding expanding woodland habitat closer to breeding curlew could put them at greater risk, this is not the intention of this project in these areas. Any woodland creation supported by the project would assess risks to existing species and habitats and avoid conflict.

Other breeding waders

Dartmoor's other breeding waders; dunlin (*Calidris aplina*), lapwing (*Vanellus vanellus*) and snipe (*Gallinago gallinago*), were mentioned as an area of concern. One stakeholder shared their concern over the already very low population of breeding waders on Dartmoor and was worried pine martens may eradicate the remaining breeding pairs. There will likely be little spatial overlap between pine martens and other breeding waders on Dartmoor due to differing habitat preferences. It is therefore anticipated that interactions between breeding waders and pine martens will be minimal, and the impact low. Other breeding waders were screened out of the original HRA because none of them breed in woodland or woodland edge habitat. All three species are in national decline and breed in low numbers, if at all, in the PRRs (BTO).

(ii) Ground nesting birds- passerines

Willow Warbler (*Phylloscopus trochilus*)

There were high levels of concern for willow warbler predation from some stakeholders. Willow warblers were considered to be under threat with low populations unable to sustain additional pressures during the breeding season. However, predation by reintroduced pine martens, which will take eggs as well as chicks, may be compensatory of chick predators such as jays (considered a key predator of wood warbler), and so may not lead to increased overall nest failures (Maag et al., 2022). The effect of pine marten on ground nesting birds, including wood warbler, was considered to be low compared with existing predator pressures (including badger and fox). Therefore, the impact on willow warbler is expected to be low.

Ring Ouzel (*Turdus torquatus*)

Stakeholders had a low level of concern over the potential impact of pine martens on ring ouzel. Along with other birds, there was concern that the wildlife industry is more interested in reintroducing predators than reversing a decline of Exmoor's birds.

Ring ouzel were originally screened out of the HRA because the breeding population in Devon is almost extinct, with only a couple of breeding pairs left on Dartmoor, and no current breeding on Exmoor (Exmoor National Park, 2014). They don't breed in woodland or woodland edge where pine martens are expected to spend a large proportion of their time and it was felt the effect of pine marten on ground nesting birds would be low compared with existing predator pressures. Therefore, the impact on ring ouzel is expected to be low.

(iii) Open nesting birds

Blackcap (*Sylvia atricapilla*)

There was a small amount of concern for blackcaps, with only one stakeholder concerned with the impact pine martens could have on them. They were screened out of the original HRA report because, whilst they are an open-nesting species, the blackcap population and distribution has increased dramatically since 1967 (BTO) and it was felt the impact of an additional predator on this species at a population level would be low.

Corvids

Corvids were the only birds whose predation was thought to be a good outcome of the potential reintroduction of pine martens, and which could have a positive effect on other bird species and woodland ecosystems. One study has shown that corvids make up 80% of all farmland bird nest predation events (Bravo et al., 2020). It was felt that since pine martens predate corvids, the reduction in corvid populations could benefit a wide range of other bird species.

(iv) Cavity nesting birds

Goosander (*Mergus merganser*)

Goosander was mentioned twice in feedback from stakeholders, with the feeling that goosander could be at risk from the pine marten reintroduction due to them often using cavities near mature forests for their nests. However, there is no evidence that we know of, of pine martens predating goosander specifically. They will predate cavity-nesting ducks such as goldeneye (Dow and Fredga, 1983), however, as both pine marten and goosander occur at low densities the probability of encounter is low and negative impact at a population level therefore unlikely. Additionally, it was felt that the greater pressure from pine martens on goosanders would be from competition for den sites (Birks et al., 2005). Whilst there is a risk, it was considered to be low. The project will be seeking to install den boxes in key areas to provide sufficient denning opportunities for pine marten while limiting competition with species using cavities and buildings.

Mitigation:

Pine marten den boxes will be installed in areas away from known goosander populations to provide alternative denning sites to limit competition for cavities.

5.5 Discussion

A discussion section can be found on pg.26 of the Initial Feasibility Report and references therein. The key points focus on the generalist diet of the pine marten combined with its low density in the landscape which make opportunistic predation on rare species uncommon. Despite having a large variation in diet, pine martens tend to specialise on certain common species. Caryl (2008) found that in Scotland, 48.5% of yearly diet was made up of just three species; rowan berries (*Sorbus aucuparia*), bilberry (*Vaccinium myrtillus*), and *Microtus* voles. Pine marten preferentially select prey of common species such as field vole, and in years when these are more scarce, pine marten will usually switch to other common or abundant prey rather than to rare prey.

There was a general apprehension that adding predators to the environment would cause an additive predation pressure on already struggling prey populations. MacPherson (2021) states that ‘when a range of predators is present, as well as interference competition among predators, there may also be intra-guild predation of the predators themselves (Polis, Myers & Holt 1989). The general perception is often that there will be additional mortality for prey species if pine marten numbers increase. However, pine martens might have a negative impact on other nest predators, such as corvids and grey squirrels *Sciurus carolinensis* (Sheehy & Lawton 2014; Sheehy et al., 2018) and may consume prey that would otherwise

have been eaten by other predators. Food webs are highly complex and predator impacts are rarely as simple as generally perceived.'

There was concern among stakeholders of increased predation pressure on vulnerable species in the early phases of release, where pine marten may be at higher density in the landscape before eventual dispersal to establish territories. Released animals in Wales, dispersed on average 8.7km within 14 days to set up territories with less than half this time taken for subsequent releases (McNicol, 2020). The optimal time of year to release pine marten is late summer to early autumn, beyond the breeding time for the majority of species and when breeding migratory species will have left. By the following spring, the released pine martens will be at their lowest density in the landscape, so avoiding critical, albeit temporary pinch points of high density, newly released animals among breeding birds and bats.

Bats are predated opportunistically by pine martens as they forage in trees, caves and buildings. However, reviews of pine marten diet, found bats form a minimal component of pine marten diet (De Marinis and Masseti, 1995). Native bat species and pine martens coevolved to live in European habitats and currently coexist across large areas of mainland Europe. The Global Biodiversity Information Facility (as accessed during the HRA phase 1 screening process) shows considerable overlap of pine marten in Europe with barbastelle *Barbastella barbastellus*, Bechstein's *Myotis bechsteinii*, lesser horseshoe *Rhinolophus hipposideros* and greater horseshoe *Rhinolophus ferrumequinum* bats. There are no recorded cases of reintroduced predators causing the extinction of prey items within native habitats. It is assumed that within natural environments, prey items can exhibit behaviour which allows avoidance, such as vigilance within colonial nesters, roost switching behaviour, and the fission-fusion dynamics of bat groups in woodland environments.

An expert report carried out as part of the HRA (Mathews and Hargreaves, 2023) evaluated potential for predation and disturbance of the above bat species within the protected areas of the buffered PRRs by pine marten and what level of impact would be likely.

Table 5.3. Risk to different types of bat roosts from pine martens (from Mathews and Hargreaves, 2023)

Type	Species	Likelihood of use	Potential Impact[a]	Moderating factors	Opportunity for defence against pine martens
Large building roost	Greater horseshoe	Low	Moderate	Distance to suitable habitat	High

	Lesser horseshoe			for pine martens Availability of alternative denning sites	
Medium building roost	Greater horseshoe Lesser horseshoe	Low	Moderate	Distance to suitable habitat for pine martens Availability of alternative denning sites	High
Small building roost	Greater horseshoe Lesser horseshoe	Medium	Very low	Distance to suitable habitat for pine martens Availability of alternative denning sites	High (but potentially expensive owing to large number of sites)
Cave/mine/adit	Greater horseshoe Lesser horseshoe (Small numbers of Bechstein's and barbastelle)	Moderate	Moderate	Pine martens unlikely to range far from entrance, but horseshoe bats in Devon frequently found roosting at low heights and near entrances	Low
Tree roosts	Bechstein's Barbastelle	Low	Low	Availability of alternative denning sites	Very low

				Availability of tree features suitable for bat roosts and inaccessible to pine martens	
Bat boxes[b]	Bechstein's Barbastelle	Low	Low[c]	Availability of tree features suitable for bat roosts, and hence ability to use multiple roost locations	Medium

a. In each case, the possibility that an individual pine marten could create high impacts at a local level cannot be excluded.
b. Barbastelle bats are very rarely found in bat boxes in Devon and Somerset. There are also few bat box schemes with Bechstein's bats, and none within the PRRs that the authors are aware of.
c. Unless there is learnt behaviour to target boxes, though this has not been reported for pine martens elsewhere.

The probability of encounter between pine marten and individual bats is extremely low, and impact of single predation events also very low. Also, where bats are widely distributed across many roost sites in the landscape, it is highly unlikely that predation by pine marten will occur either because they are inaccessible, not a preferred diet item, or simply not encountered.

The availability of alternative pine marten den sites and prey items within the designated woodland sites due to the high habitat quality, minimises impact on woodland bat species, Barbastelle and Bechstein's.

However, extensive human modification of the environment may produce conditions in which pine martens have greater potential for impact on bats particularly bats living within anthropogenic structures. Bats that hang free such as the horseshoe bats, rather than those that hide in inaccessible areas, are potentially more vulnerable to predation. Where pine martens establish a den within a roost, there is potential for disturbance of sufficient level to cause abandonment of a maternity roost by bats. A case study identified as part of the HRA (Mathews and Hargreaves, 2023) found that although pine marten regularly visited a building used by bats, scat analysis showed no predation of bats by pine marten. Simple measures were taken to effectively exclude them from the building. High levels of

anthropogenic disturbance at Hestercombe House SAC mean a low likelihood of pine marten use, but risk of disturbance results in moderate impact. Buildings are easier to protect against pine marten than natural roosting sites and there are established methods to prevent pine marten access such as those installed as part of the bat mitigation for the Forest of Dean project.

Modifying bat roosts even for conservation benefits requires a licence from the relevant SNCO (Statutory Nature Conservation Organisation) and getting advice from licensed bat workers is highly recommended. Restricting or reducing entrance size should not be detrimental to the bat colony and should consider all species present, i.e., swallows and less manoeuvrable bat species such as serotine. Planning permission and Listed Building Consent may also be required, and advice should be sought from the Local Planning Authority.

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6. Disease Risk Analysis

This is the executive summary of a report commissioned by the Two Moors Partnership. For the full report see accompanying documents. **Disease Risk Analysis for the Reintroduction of the Pine Marten to Dartmoor and Exmoor National Parks, Southwest England**

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July 2023

6.1 Summary

A disease risk analysis (DRA) was adapted and updated from the DRA carried out for the Forest of Dean pine marten reintroduction (Carraro & Sainsbury, 2019). The study included:

- Review of background information with new evidence added, as appropriate, on the pine marten's ecology, conservation and legal status.
- Description of the proposed translocation pathway, evaluating the geographical and ecological barriers to parasite spread along this translocation pathway
- Identification, review and evaluation of 72 potential hazards (66 infectious and six non-infectious).
- Detailed disease risk analysis on 16 prioritized hazards, followed by a brief discussion on how the risk from these hazards could be mitigated. This included 14 hazards that were fully analysed in Carraro and Sainsbury (2019) that have been re-assessed, along with two newly prioritized hazards (*Mycobacterium bovis*, and High and Low Pathogenic Avian Influenza Virus).

No geographical and/or ecological barriers are likely to be crossed in this translocation pathway thus markedly reducing the probability that translocated or recipient populations will be exposed to novel infectious agents, and markedly reducing the probability of a serious disease outbreak following translocation. Therefore, the analysis focused primarily on population, carrier, and transport hazards. However, considering its peculiar epidemiology within the UK, *M. bovis* was classified and fully analyzed as a destination hazard.

Of the sixteen hazards prioritized for full disease risk analysis, one, the transport hazard SARS-CoV-2, was assessed as currently being of high risk for specific groups of translocated pine martens but of medium risk for other mammals at the destination; and a further two were assessed as medium risk, Anticoagulant Rodenticides (ARs) and Illegal Persecution, both non-infectious population hazards that represent a threat to a small, newly released pine marten population. Of the remaining fully analyzed hazards, eight were assessed as low risk: the population hazards Canine distemper virus (CDV), *Mucoraceae* spp., *Toxoplasma*

gondii, Trauma, and the carrier hazards *Leptospira* spp., *Yersinia* spp., *Hepatozoon* spp., *Toxoplasma gondii*; and five as very low risk: the destination hazard *Mycobacterium bovis*, the population hazards Canine parvovirus type 2 (CPV-2), Canine amdoparvovirus 1 (previous Aleutian mink disease virus AMDV), High and Low Pathogenic Avian Influenza Virus (HPAIV and LPAIV), and the carrier hazard *Neospora caninum*.

The analysis estimated that there is a very low likelihood that transmissions amongst reintroduced pine martens will be sufficient for *M. bovis* to become endemic in the reintroduced pine marten population. The proposed pine marten reintroduction is likely to have negligible biological and economic consequences for the epidemiology of bovine tuberculosis disease in livestock in England.

In the qualitative ZSL DRA method used in this report, risk estimation is made prior to consideration of disease risk management, which is evaluated thereafter. Mitigation measures are employed to reduce the risk level and therefore the risk estimations noted by the report might be reduced when risk management is implemented. In the report, the authors briefly outline some mitigation options for each of the fully assessed hazards and recommend to further develop such measures in a Disease Risk Management and Post-Release Health Surveillance (DRM PRHS) protocol.

Because of the paucity of information on the current parasite and disease status of free-living pine martens in Britain, the presence of unknown, novel parasites affecting this translocation cannot be discounted. Since unknown parasites have caused severe epidemics as a result of translocations, the DRA should be regularly updated as new evidence becomes available. Post-release health surveillance will be extremely important to detect emerging diseases at the reintroduction site and will be integrated with post-release population monitoring. Prompt efforts will be made to incorporate surveillance data back into the DRA and hazards re-evaluated accordingly.

Action:

ZSL has prepared a Disease Risk Management and Post Release Health Screening Protocol for the Two Moors Project, which will be implemented by the project team and partnership.

6.2 References

Carraro, C. & Sainsbury, A.W. 2019. Disease Risk Analysis for the Reintroduction of the Pine Marten (*Martes martes*) to the Forest of Dean and lower Wye Valley. Report available upon request at drahs@ioz.ac.uk

Carraro, C., Common, S., & Sainsbury, A.W. 2021. Risk from SARS-CoV-2 to the reintroduced pine marten (*Martes martes*) population in England and mitigation recommendations for conservation fieldworkers. Report available upon request at drahs@ioz.ac.uk

7. Social feasibility of a pine marten reintroduction

This section describes and reports on a range of stakeholder engagement activities carried out by the Two Moors Project. Summaries of independent contracts carried out by VWT and the University of Exeter for the project are also included.

See the accompanying reports for full details of these: Initial Feasibility Assessment, VWT (Section 4. Community and stakeholder engagement) & Perceptions of Pine Marten Reintroduction in South-West England, University of Exeter.

Summary

The Two Moors Project has taken a phased approach to engagement over more than two years.

- 2020-2021: Initial awareness raising, engagement, education, and knowledge exchange within partnership organisations.
- Apr-Jul 2022: Initial introductory stakeholder engagement.
- Jul 2022: Public media launch to raise awareness.
- Jul 2022-current: Education and knowledge exchange through presentations, Q&A and meetings.
- Sept 2022-current: Follow-up meetings and responses.
- Mar-Jun 2023: Targeted stakeholder workshops and public drop-in sessions.
- Mar-Jun 2023: Independent perceptions study.

This process will continue throughout the project with the establishment of a Pine Marten Stakeholder Group alongside project engagement activities.

Engagement activities have reached good numbers from a broad range of audiences:

- over 20 public talks with Q&A.
- 105 participants in face-to-face workshops.
- over 60 members of the local community through 2 drop-in sessions.

The stakeholder and public drop-in workshops revealed a variety of responses. Reasons for support were ethical (a moral duty to return a lost species) or focussed on wider ecological benefits (via 'balancing' of predators, species and woodland benefits as a consequence of grey squirrel reduction, and habitat restoration as part of the wider project). Tourism was not often raised as a benefit. Pine marten were also seen as a potential flagship species to catalyse habitat improvements. There was a real interest in being able to see a pine marten in the wild.

Stakeholders also raised concerns about the predation of wildlife, poultry and gamebirds. There were concerns over the pine marten's status as a protected species impacting forestry operations such as felling and grey squirrel control. Concerns for wildlife from stakeholders with conservation interest were often framed as questions requiring more knowledge. Some sectors of landowners were less supportive, specifically the shooting and farming community. Habitat improvements and incentives could provide support and build confidence in nature recovery. It is recognised that ongoing dialogue will be critical and a robust monitoring and mitigation plan necessary for success (see section 3.9.3).

Summary facts from the independent report from the University of Exeter

29 self-selected stakeholders took part in the University of Exeter Q-sort survey to further explore perceptions of a potential reintroduction.

880 people responded to the regional public survey.

There was broad support from the public survey across the southwest (n= 814), with 84.6% of respondents to the University of Exeter public survey in support. 10.9% were opposed and 3.4% took a neutral position. This level of response compared favourably with surveys from other pine marten reintroduction projects.

Actions:

- Pine marten survey training opportunities for landowners who have or are likely to have pine martens on their land.
- Access to peer discussions from people living with pine martens.
- Mitigation plan developed with clear paths of actions to respond to stakeholder concerns e.g. poultry farmers/owners and game shoots.
- Establish a Pine Marten Stakeholder Group as a long-term approach to enabling engagement and joint working with those living with pine martens.
- Establish a Two Moors Land Management and Forestry Group to work with forestry operative in the area and provide woodland management advice to landowners (including around ash die-back) to increase and enhance woodland habitat within the project area. E.g. managing-ash-dieback-on-woodland-trust-sites.pdf (woodlandtrust.org.uk)
- Explore funding incentives and opportunities for landowners through e.g. woodland grants and incentives; Environmental Land Management schemes.
- Provide clear advice, support and guidance for foresters/ woodland managers around felling operations and grey squirrel control where pine marten are present. See Pine-Martens-and-Forest-Management-Leaflet.pdf (vwt.org.uk)

Actions

7.1 Introduction

Reintroduction of a species that has been absent for over 100 years, as in this case, may be challenging and successful reintroductions must consider the biological and social factors in the context of the species, habitats and landscapes where they are to take place. Local support and stakeholder participation in the decision process is vital for the long-term establishment, particularly of a carnivore reintroduction.

The IUCN Guidelines (IUCN, 2013), The Scottish Code for Conservation Translocations (2014) and Reintroductions and other conservation translocations: code and guidance for England (DEFRA, 2021) emphasise the importance of social and cultural considerations in species restoration. Identification of groups and individuals that may be affected by potential reintroductions is a vital element in ensuring reintroduction success. Impacts may be potentially beneficial or bear potential costs to those communities. Therefore, these groups should be considered for inclusion in the planning process, including addressing any pre-reintroduction concerns and continuing dialogue about subsequent post-reintroduction issues or conflicts that may arise (IUCN, 2013).

A broad range of stakeholders was considered, from those occupying the wider southwest region of the UK, to those who's input has been at a very localised level, living close to potential release sites. Individuals and groups who have a specific interest in pine marten reintroductions include those who have a general or specialist interest in wildlife conservation, particularly in their locality and those who live in close proximity to release sites who may be likely to experience reintroduced pine marten first hand, either on their own land or nearby. There is a strong interest when a reintroduction is near to home. Some national or regional organisations also express views, representing members who will fall into the above categories.

The broad reach of the combined partnership organisations enabled identification of, and communication with stakeholder groups and individuals across the project area, demonstrating the strength of the partnership approach. For example, the Woodland Trust operate within the network of foresters and woodland owners across the region.

7.1.1 Characterisation of the Two Moors Project area

The southwest peninsula is one of the most outlying parts of England with limited road and rail access. Most of the land is rural with approximately 40% of the population living in urban areas (Heart of the South West, 2016). Economic interests relating directly to these rural areas are predominantly tourism and land-based industries. Across both national parks, agriculture, forestry and fishing form a declining but still significant proportion of the

economy (4% of total jobs on Dartmoor and 11% on Exmoor) highlighting the economic importance of this sector on Exmoor (Dartmoor National Park, 2016; Exmoor National Park, 2021). Tourism is especially important for both areas and is a growing sector with food and accommodation services occupying the top employment sector. (Exmoor National Park 2021; Exmoor National Park, 2016). The national parks are also enjoyed by many residents of the region who visit to enjoy their natural beauty and wildlife.

The larger urban areas of the southwest are situated away from the Potential Release Regions, with relatively low population densities across the national parks. Dartmoor National Park itself is approximately 26,169ha with a population of approximately 33,400 and Exmoor National Park has an estimated declining population of 10,275 across its 4739ha (Exmoor National Park, 2021).

Previous reintroduction areas in Wales and the Forest of Dean differed in their population densities, with the Welsh reintroduction area being one of low population density in contrast to the Forest of Dean which has a much higher urban population in direct contact with woodland (Stringer *et al*., 2018). The Two Moors Project areas and PRRs have a larger overall scope with two release regions suggested for maximum likelihood of dispersal across the southwest region (see Section 4).

Urban and suburban landscape cover for both PRRs is low, 5.9% of both PRRs combined (fig. 4.2). The Forest of Dean feasibility report reflects on the co-existence of people and major populations of pine marten in densely populated parts of the Netherlands and acknowledges the understanding of human-wildlife conflict with this species across Scotland, Ireland and much of continental Europe (Stringer *et al*., 2018).

7.1.2 Potential socio-economic benefits and risks

The Forest of Dean report details the main socio-economic benefits and risks which are of relevance here. For brevity we direct the reader to pages 80-86 at https://www.gloucestershirewildlifetrust.co.uk/sites/default/files/2020-02/Full%20Feasibility%20Study%20Report%20-%20GWT.pdf for further information. It is worth noting that game shoots, specifically pheasant shooting is prevalent on parts of Exmoor, with large numbers released annually. However, also see section 4. Pg 39 for site selection criteria.

Conflicts involving wildlife are often termed human-wildlife conflicts and appear to be about negative impacts on species on one side and direct costs of e.g., livelihood on the other (Pooley *et al*., 2017). However, when exploring categories of conservation conflict, the majority are between humans, many relating to power relations and cultural values rooted in history (Redpath *et al*., 2013).

Benefits and risks may not always be economic. Previous projects have demonstrated that species reintroductions spark public interest and many people who have interests in wildlife have strong opinions that don't necessarily have an economic basis.

7.1.2.1 Benefits

(i) Ecotourism

This is seen in Scotland and sightings of pine marten are encouraged through feeding stations.

(ii) Increasing engagement with nature

An increasing concern is the 'disconnect' from nature by much of society. Opportunities to explore places where sightings of pine marten may occur can be beneficial to health and well-being.

(iii) Grey squirrel control

We have elaborated here as this is a primary motivation for the interest in pine marten reintroductions. The expectation expressed by many individuals and organisations is that pine marten will provide a biological control for grey squirrels. Grey squirrels are considered one of the greatest threats to broadleaved woodland with land managers and conservationists currently using approved trapping and shooting methods to try to manage squirrel numbers. However, no single control method is considered very effective or sustainable in the long term, particularly if neighbouring properties are not also controlling squirrels (RFS, 2021). There is evidence from Ireland and Scotland to suggest that, at relatively high densities, pine martens may have a negative effect on the occupancy of grey squirrels (Sheehy & Lawton 2014; Sheehy *et al.* 2018; Flaherty & Lawton 2019; Twining, Montgomery and Tosh, 2020), however, it is not certain that grey squirrel numbers will be reduced to extinction where pine martens occur. There are also challenges for those wishing to control grey squirrel in areas with pine martens as lethal trapping methods cannot be used due to the risk of killing pine marten. Lethal squirrel trapping is in place on some sites within the project area and these subjects form part of the Two Moors project adaptive management plan being developed. Alternatives may be expensive and time consuming and may also have 'closed seasons' during marten maternity season. The Two Moors project will offer support with alternative approaches.

Therefore, it is important that expectations are managed when discussing impacts of pine marten in the context of any potential reintroduction. However, research is ongoing, and communications should be updated to reflect the most recent scientific evidence.

7.1.2.2 Risks

(i) Denning within roofs

This is something seen rarely in Scotland and Ireland with predominantly uninhabited building spaces being occupied by denning females and subsequently their young, often reflecting a scarcity of natural denning sites (Birks *et al*., 2005).

(ii) Captive poultry and game bird pens

Pine marten are known predators of captive poultry and game birds. This presents a higher risk where birds are confined in a pen or house, and several may be killed at one time through predator caching behaviour.

Game shooting is an important part of the local economy and supports approx. 10,000 jobs though the whole support chain, in southwest England (PACEC 2014). There are a number of commercial shoots within the Two Moors Project area (fig. 7.1), and these are therefore important stakeholders. See

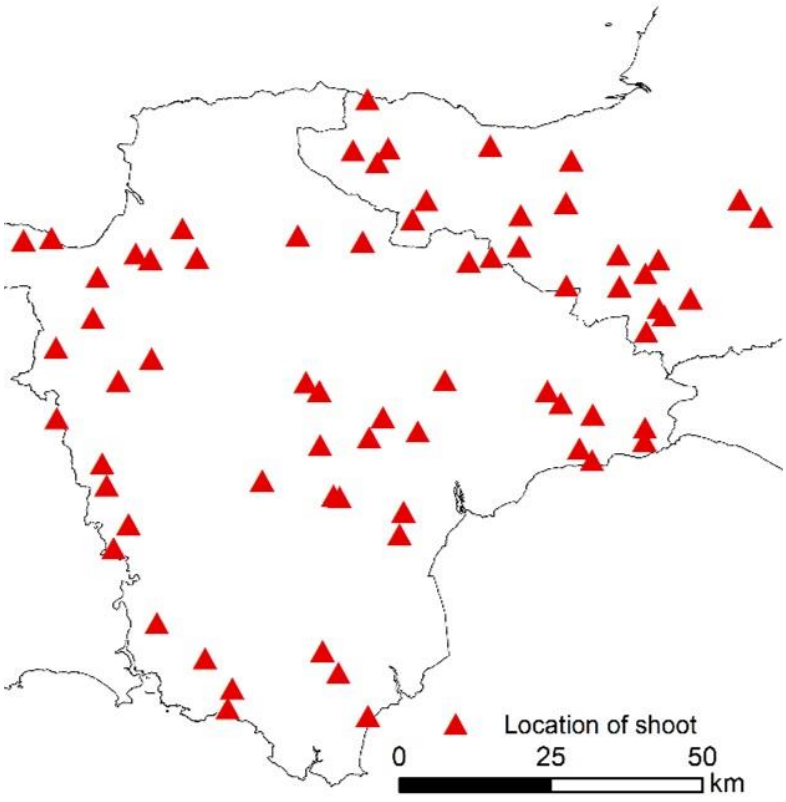

Figure 7.1. Locations of commercial shoots Devon and Somerset. Re-drawn from data taken from https://www.gunsonpegs.com

7.2 Stakeholder engagement

From Section **4. Community and stakeholder engagement,** Initial Feasibility Assessment.

'*The original proposal was for VWT to lead on a social feasibility assessment, working closely with local staff from the partnership. However, plans to undertake initial engagement face-to face with local communities and stakeholders in 2020 were not possible due to COVID-19 and associated restrictions. An altered approach was taken, whereby VWT ran online training workshops for relevant staff of the partner organisations on key aspects of community and stakeholder engagement and consultation, based on VWT's experience gained during the Pine Marten Recovery Project and the successful translocations of pine martens to Wales. In this way, key personnel from the partnership were in a position to commence engagement on the ground as soon as it was possible to do so*.'

This process was continued by the Two Moors Project from January 2021, with focussed engagement and consultation with relevant stakeholders and local communities in the potential release areas, as per the recommendations in the project's Communications and Stakeholder Engagement Strategy and Action Plan with the aim to assess potential impacts on local communities and address any concerns.

7.2.1 Initial training for partner organisation staff

'During winter 2020/21, five online workshops were run by the VWT, cumulatively attended by 92 people from organisations within the partnership and some relevant external organisations and individuals.

These workshops comprised an overview of the Two Moors pine marten partnership; the scope and content of the feasibility study conducted to date; an introduction to the status, habitat requirements and diet of pine martens; and a comprehensive outline of community and stakeholder engagement with relation to carnivore reintroductions. This covered the background and rationale for social feasibility and community and stakeholder engagement within reintroductions, the social challenges associated with reintroductions, perceptions of pine marten translocations to Wales as learnt from VWT's Pine Marten Recovery Project, and methods for identifying and consulting with local communities and stakeholders.'

The presentations were followed by a Q&A and discussion session.

7.2.2 Initial introductory stakeholder engagement

Stakeholder engagement by the Two Moors Project partnership commenced in January 2021 – although the main phase was delivered April-July 2022. Stakeholders were identified through a stakeholder mapping process informed by the initial online workshops, previous project experiences, partner networks and following suggestions from established local

contacts and other interviewees. They were individuals, groups and sectors with specific interests in pine marten reintroduction and /or living in close proximity to potential release sites.

75 individuals, groups and organisations were contacted by the Two Moors Project partners through existing relationships and/or by introductory communication. The purpose of these discussions, calls and meetings was to introduce the project (prior to it becoming public knowledge) and establish direct relationships between project staff and stakeholders to enable further discussions. This also provided stakeholders with an early opportunity to raise initial concerns or thoughts. Responses were recorded to gain an understanding of general viewpoints and identify areas for follow-up actions, including other potential stakeholders to contact. All stakeholders were then offered follow-up meetings or presentations to enable wider participation from stakeholder groups.

Once key stakeholders had been reached, media releases about the project (see section 7.4) raised awareness with wider stakeholders and the public, encouraging participation in the project's engagement activities.

7.2.3 Education and knowledge exchange

In recognition of a general request to understand more about pine marten ecology, the project and the reasons behind the proposed reintroduction, the Two Moors Project partnership delivered 21 online and in-person talks with Q&A sessions to key interest groups. This continues and will be an ongoing aspect of engagement. Some presentations formed part of larger workshops, such as the forestry focussed events run by the Woodland Trust (five events reaching approximately 180 people in the forestry industry).

This approach led to the development of a 'frequently asked questions' document, to help inform and dispel common myths about pine marten and the project (https://www.devonwildlifetrust.org/sites/default/files/2022-07/FINAL%20VERSION%20FAQ%27s%2020th%20July%202022_1.pdf). Alongside the media launch, these presentations and tools served to spread a greater awareness of both the project and pine marten among the general public, but also to reach additional stakeholders. This baseline of available information allowed greater focus for future discussions around specific topics. There was an understanding by the project, that not everyone was aware of the resources available to answer questions and that some groups and individuals wished to engage in a more detailed discussion, particularly where they had concerns. Where possible and appropriate, meetings were held with individuals to examine concerns and provide more information prior to sector-based workshops.

7.2.4 Targeted stakeholder workshops

The next phase was to invite a more detailed response and enable sector-based discussions as a follow up to the initial engagement with the selected stakeholders. This explored areas of support and concern and discussed potential mitigation actions that could be developed.

This phase comprised 105 people attending eight participatory stakeholder workshops broadly following the format of those held by VWT. Organisations and groups were invited to select representatives to join the workshops – enabling stakeholders to choose those best able or most interested to discuss the subject in detail. Representation from national and regional groups was invited. These workshops were facilitated by Two Moors Project partnership staff relevant to the group. Two were held online to facilitate wider participation (one bird conservation workshop and dormouse conservation workshop). One of the bird workshops was held as part of a larger meeting of a pied flycatcher monitoring group (piedfly.net) and therefore had a larger number of participants.

During the workshop, a presentation about pine marten and the project was followed by a discussion to identify positive and negative impacts perceived by the participants. Where possible, mitigation solutions to address any negative impacts and concerns were discussed. All comments were noted.

Prior to the workshops a feedback form was sent out to all attendees and a wider invite list to express their response to the project and any general thoughts they had. This response could be anonymous, or they could leave their details on the contact consenting page. The purpose was to frame the debate and collect preliminary responses from the group.

7.2.4.1 Stakeholders

Those stakeholders identified with a high interest and high influence on the project, broadly fell into two groups.

- Socio-economic groups, where livelihoods may be affected by the reintroduction of pine marten.
- Specialist conservation groups with a particular interest in species which may be affected by the presence of pine marten.

The stakeholder groups identified for the workshops were:

Socio-economic interests:

- Foresters and woodland managers
- Game keepers and shoot managers
- Farmers and landowners

Conservation Interests:

- Bird interest
- Dormice and small mammal interest
- Bat interest

Organisations that collated responses from their membership and had representatives attending the workshops comprised: Confederation of Forest Industries (CONFOR); British Association for Shooting & Conservation (BASC); Exmoor Society; Devon Mammal Group (DMG). Feedback was also received from the Peoples Trust for Endangered Species (PTES) who run the National Dormouse Monitoring Scheme, a nest box monitoring programme.

All attendees of these workshops were invited to contact the University of Exeter and participate in the Q-method survey - Perspectives of stakeholder representatives and interest groups (see section 7.7 below and accompanying report).

There were several objectives:

a) Raise awareness of both the project and pine marten ecology and in doing so foster a better understanding of the wider context of the project to enable informed viewpoints.
b) Identify concerns and gauge the level of concern within particular stakeholder groups.
c) Identify those in support of a pine marten reintroduction and ascertain the main reasons for positive support.
d) Identify where the local community wished to participate in the project so this could be facilitated.
e) Where possible, co-develop solutions and mitigation.

7.2.5 Stakeholder engagement results

The initial online workshops run by VWT set a framework of common themes and discussion points:

- locality of the potential release areas.
- potential impact of pine martens on potentially vulnerable prey species (Red and Amber List birds, bats, dormice) and options for mitigation.
- potential impact of pine martens on the game bird rearing and shooting industry and options for mitigation.
- the likely movement and behaviour of pine martens post-release (e.g., dispersal distances).
- pine martens and forestry/woodland management.
- the process of effectively selecting and targeting stakeholders for consultation.

- how a reintroduction may link in with other initiatives or schemes (e.g., the new Environmental Land Management scheme, local initiatives within the national parks).

The subsequent stakeholder workshops held in 2023 found some common viewpoints across multiple groups with many individuals associated with multiple stakeholder groups so responses have been combined from all stakeholders here. The comments fell into several themes or viewpoints and tables 7.1 & 7.2 summarise these, presenting a few examples of views expressed. We have included responses via the feedback form and those collated by special interest groups within these themes.

The viewpoints have been split into areas of concern and areas of support. These stakeholders were identified as those where concerns may be raised, therefore negative viewpoints occupied a greater proportion of the discussion. Mitigation measures presented were those suggested and developed during the workshops and via feedback.

The level of concern for each theme was gauged in part by how frequently that viewpoint was raised, and the level of concern perceived by those facilitating the workshops. Whilst this is not a quantitative approach, we recognised those areas where people had strong concerns.

Table 7.1. A summary of reasons given for the support for pine marten reintroduction to the southwest of England.

Positive impact / theme	Further detail: examples of viewpoints	Raised by	Strength of feeling/frequency*
ETHICAL/MORAL			
Justification for reintroduction to support species recovery	• Positive step for the distribution of pine martens. • Reintroducing a lost species • Pine marten distribution is likely to spread to southwest anyway. • A considered release done under a project such as this one where all consents and permissions are in place is better than a 'bandit' release. • Pine martens have been absent from our landscape for too long and their return has more positives to offer than negatives. • It is an agreed priority action of the North Devon Biosphere Nature Recovery Plan • Pine martens are easy to catch.	Forestry workshop Shoot workshop Piedfly.NET	High
ECOSYSTEM SERVICES			
Pine martens help with woodland management and creation	• Reintroduction could manage and promote woodland expansion and increase connectivity.	Piedfly.NET Bird workshop	High

	• Could be flagship for improved conservation management. • Improvements in habitat and woodland creation would help get Forestry Commission grant support.	Forestry workshop	
Pine martens act as important seed dispersers	• Seed dispersal will be good for habitat. • Pine martens will plant shrub/ fruiting species in the landscape.	Piedfly.NET Forestry workshop	Low
Pine marten reintroduction could increase biodiversity	• Return of native meso-predator could increase biodiversity. • Will improve the ecology of woodlands.	Piedfly.NET Forestry workshop	Medium
General ecosystem services provided by pine martens	• Co-ordination between pine martens and habitats will be helpful to provide context to people. • A meso-predator will help restore the natural balance. • Would be great if pine martens were to start rebalancing nature, which could lead to red squirrels being common on Exmoor. • Trial period in isolated woodland to understand pine marten impacts on the ecosystem would be good.	Forestry workshop Piedfly.NET	Medium

Habitat improvements to support the reintroduction of pine martens	• Forestry Commission will help cover the costs of the woodland management plan. • Interest in knowing how to improve existing habitat to aid the success of pine martens.	Dormouse workshop	Low
IMPACT ON SPECIFIC WILDLIFE			
Pine martens could reduce the grey squirrel population	• Pine martens may predate grey squirrels and offer a natural method of control. • Pine martens may disrupt grey squirrel reproduction and selectively prey on female squirrels in the breeding season. • Reduced grey squirrel population may reduce competition with other species for food and predation of other species. • Reduced grey squirrel population may positively impact young woodland.	Piedfly.NET Forestry workshop Dormouse workshop	High
Effect of pine martens on red squirrel population	• Could help with red squirrel reintroduction. • People may be more supportive of the project if it benefits red squirrels. • Red squirrel behaviour is modified to cope with pine martens.	Forestry workshop Piedfly.NET	Medium

Effect of pine martens on dormouse population	• Pine martens are a native species that evolved alongside hazel dormice and shouldn't be a serious threat. Study shows hazel dormice are good at avoiding predation in winter. • Pine marten predation of grey squirrels, a significant competitor of dormice, may help the dormice population.	Dormouse workshop	Medium
Effect of pine martens on bird populations	• Have we got too many pied flycatchers? Could the reintroduction help balance the population? • Pine martens occur at low densities which could reduce impact on a single bird species.	Piedfly.NET Bird workshop	Low
Impact of pine martens on other predators	• Pine marten will hopefully contribute to the landscape-scale control effect on crows and magpies, just like goshawk. • Pine martens predate corvids, which could benefit specialist birds.	Forestry workshop Piedfly.NET	Medium
Impact of pine martens on nest box schemes	• Historic and ongoing monitoring gives a real opportunity assess the impact of pine martens on	Piedfly.NET Bird workshop	Low

	hole-nesting breeding birds. • Protection options are available to mitigate the risk for nest box nesting species.		
General positive impact of pine martens on other wildlife [prey species]	• Pine marten could help reduce invasive, non-native species. • Pine martens could help restore native species populations. • Pine martens are lazy predators. • Pine martens occur at low densities. • Pine martens in commercial forestry sites would have no more impact than a badger sett or a goshawk nest.	Forestry workshop Piedfly.NET	Medium
Ecotourism	• Reintroduction could help ecotourism. • Red squirrels would be popular to see.	Piedfly.NET Shoot workshop	Low
Shooting community	• Shoots have a bad reputation, and this reintroduction could help change this. • A great opportunity to work alongside the shoot community and could be a great thing for shooting on Exmoor.	Piedfly.NET Shoot workshop	Medium

	• Something is needed to keep game bird numbers down.		
Education	• Reintroduction could provide research opportunities. • Reintroduction could help educate people about pine martens.	Piedfly.NET	Low
General community benefits from the pine marten reintroduction.	• Good opportunity to work alongside the public. • Reintroduction could provide monitoring and volunteering opportunities.	Shoot workshop Piedfly.NET	Medium
Communication with communities	• More readily available information would help farmers/landowners improve their habitats for pine martens, so they are in connected habitats. • Better habitat management guidance would show people it's possible to work around seasonal constraints. • If solutions to potential issues can be found upfront and the project is well run, then reintroduction is more acceptable.	Farmer/landowner workshop Forestry workshop Shoot workshop.	Low

General support for the pine marten reintroduction	• Very supportive of the project, having seen the success of the projects in Wales and elsewhere in England. • Support is wholehearted and not confidential. • Pine marten reintroduction would be of great benefit.	Forestry workshop Exmoor Natural History Society Devon Reptile and Amphibian Group	Medium

Table 7.2. A summary of concerns given regarding a pine marten reintroduction to the southwest of England.

Negative Impact / theme	Further detail: examples of viewpoints	Group raised by	Actions discussed by group	Strength of feeling/frequency
VIABILITY OF PROJECT/REINTRODUCTION				
Project validity and management	• High costs of reintroduction Funds could be better used. • Fashion for reintroduction-vanity project. • The project is producing only positive literature rather than a balanced view that includes experiences from Scotland, Wales and elsewhere. • Lack of proper impact assessment. • Needs commercial interests as part of project. • I could understand this initiative if pine martens were close to extinction, but this is clearly not the case.	Dormouse workshop Farmer/landowner Bird-piedfly.net Forestry	Increase understanding of national context and process. Peer to peer discussions from areas where pine martens exist.	Medium

	• Many questions and concerns around the issue of insufficient knowledge of costs and benefits to proceed.			
Insufficient connected, suitable quality habitat for viable population of pine marten.	• Is there enough woodland for pine martens in Devon [SW]? • Lack of connectivity to support a viable population. • Smaller area available than for other populations [Scotland, Wales]. • Concern that landscape has changed [negatively] since pine marten were last here.	Devon Mammal Group Cornwall Mammal Group Dormouse workshop Game keeping & shoot workshop. Farmer/landowner workshop	Habitat creation & restoration. Need for more information about habitat requirements.	Medium
Low genetic diversity among introduced animals	• Long-term failure of the population.	Forestry workshop	Sourcing sufficient donor animals appropriately.	Low

		Dormouse workshop		
Conflict with other conservation aims & projects	• If we are going to spend time and money on initiatives like the Curlew Project, it doesn't make sense to reintroduce pine martens at the same time nearby.	Farmer/landowner		High
Human pressure on ecosystem leading to poor outcomes for reintroduction	• Greater than in other areas [Highlands of Scotland].	Farmer/landowner workshop		Low
Project failure & reputational risk from unsolicited releases	• Would unsolicited releases 'derail' the project?	Dormouse workshop		Low
IMPACT ON OTHER WILDLIFE				
General negative impact on other wildlife [prey species]	• Impact on both common and vulnerable species. • Impact on ground nesting birds	Game keeping & shoot workshop. Bird workshop	Peer support from other areas – 'living with pine martens'.	High

	• Conflict with current practices to support wildlife. • Questions on impact of previous projects	Dormouse workshop Bat workshop Farmer/ landowner workshop Bird-piedfly.net	Dissemination of information from Welsh & Forest of Dean projects.	
Poor/degraded habitat will result in greater pressure on pine marten prey species	• Poor habitat can't support avoidance behaviour [of prey]. • Fragile ecosystems can't support another predator [& prey]. • Bats already likely to suffer because of ash dieback [habitat loss].	Bird workshop Bird- piedfly.net Farmer/ landowner workshop Bat workshop		High
Impact of pine martens on other carnivores/predators	• Unknown interaction • Concern for stoats, weasels			Low
General concern over reintroducing a predator	• Voracious apex predators and could do a lot of damage.	Farmer/landowners		High

IMPACT ON SPECIFIC WILDLIFE				
Negative impact on specific species of concern. These are scored separately due to differing levels of concern between species	Conflict with Curlew project – predation risk • Impact on ground-nesting birds, specifically … and Curlew. • Wildlife industry is more interested in reintroducing predators than reversing decline of Exmoor's birds, e.g., curlew.	Bird- piedfly.net Bird Farmer/landowner Forestry		High
	• Predation on trans-saharan migrants [birds] (e.g., Pied Flycatcher, Willow Warbler, Wood Warbler) which are under threat.	Bird - Piedfly.net Bird workshop	Can modify nest boxes to reduce predation for hole nesters in boxes. Piedfly.net have a large network to gain good sample sizes to test impact of modification on occupancy.	High concern for non box users. Stakeholders felt confident in discussed mitigation to reduce predation
	• Predation of goosanders [tree cavity nesters].	Bird - Piedfly.net		Low

	• Dormouse predation – impact on vulnerable population due to existing pressures. • Predation of hibernating dormice.	Dormouse workshop Bird workshop Shoot	Boxes identified as vulnerable element – mitigation is straight forward and advised as good practice already by PTES.	Low
	Predation of woodland bats – Barbastelles & Bechstein's, especially maternity roosts • Small event (in numbers) could have very large effect on e.g. barbastelle colony. • Barbastelles and Bechstein's – difficult to find roosts and so may only be found after the event [predation].	Bat workshop	Limited mitigation options available and felt to be effective.	High
	• Predation & disturbance of greater and lesser horseshoe bats at roost.	Bat workshop	VWT planned roost mitigation as part of the HRA (see section 5.3.1).	Medium

	• Predation of barn owls nesting in buildings and boxes. • Impact barn owl control of vole numbers.	Bird workshop Forestry	Barn Owl Trust to develop / disseminate modifications for boxes.	Low
	• Predation of harvest mice, a possibly declining population due to climate change.	Harvest mouse specialist	Need a comprehensive baseline survey in release areas.	Low
PERSECUTION				
Illegal killing or moving of problem pine martens	• Concerned some commercial shoots will kill (despite compensatory measures) any pine martens that venture onto their estate.	Birds -Piedfly.net Forestry Farmers/landowners		Medium
NEGATIVE IMPACT OF HIGH NUMBERS				
Concern over high numbers of a protected species – lack of control	• Population increasing beyond acceptable levels without control. (Often compared with badgers).-	Shoot Forestry Famer/landowner	Having a clear exit strategy with visible responsibility for executing it.	High

	e.g. 'As a result of badgers being protected, they have become very common which is a problem.' • Need to re-capture rogue animals. • Who is responsible? • Need an [lethal] exit strategy • Lack of sufficient predators			
SOCIO-ECONOMIC IMPACTS				
DISEASE				
Host and vector of diseases	• Concerned they will carry bTB & avian influenza. • Harbouring pests and diseases.	Dormouse Birds -Piedfly.net Famer/landowner Forestry	Some concerns addressed by DRA.	Medium
IMPACT ON GAME BIRDS, SHOOT MANAGMENT				
Direct predation risk to young game birds	• Who is liable for damage?	Shoot workshop	Compensation payments for losses and/or security.	High within group

	• Advised measures to protect game bird in pens are potentially costly and may be a challenge for small shoots. • Could an individual pheasant pen get wiped out? Mass killing.	Forestry workshop BASC members	Plans/advice on protecting game birds.	
Disturbance of roosting birds because of pine marten hunting activity.	• Consequences for a shoot that finds its roosting woods and/ or covers abandoned could be severe.	BASC members Shoot Forestry		High within group
IMPACT ON POULTRY				
Predation of poultry	• Concerned about risk to field mobile poultry house. • Main concern is whether smallholders with poultry have had an input into the project.	Bat workshop Famer/landowner	Information being given to poultry sector to prevent predation of their animals.	Medium
DISTURBANCE OF FORESTRY OPERATIONS (due to				

presence of protected species)				
Impact on lethal trapping for grey squirrels to protect woodland (presence of protected species vulnerable to trapping)	• Business of not controlling grey squirrels makes it difficult to support the project; otherwise, it would be ok. Has been carrying out squirrel control since 1985 and wouldn't want to be forced to stop now. • We will be unable to continue to use dead traps if pine martens are introduced and all our work will have been wasted.	Birds -Piedfly.net Shoot Forestry Famer/landowner BASC members	Development or dissemination of established guidance on integrated pest control as a sustainable approach to woodland protection. Explore potential sources of payments for squirrel control & woodland creation.	High
Impacts on woodland/ forestry management operations – tree harvesting impacted due to pine marten denning/breeding	• This can impact on business and could increase costs, affect income. • How to minimise conflicts? – for example using den boxes to encourage animals to sites not being felled that year.	Forestry BASC members	Offer or secure support and advice. Explore possibilities for it to be embedded in standard forestry management with other protected species.	Medium in group

COMMUNITY				
Farming community	• If farmers and landowners not informed and consulted, the project is bound to fail and be a huge waste of money. • Timing is important for farmers and landowners – they have lots to think about – make sure they are supported and reintroducing another protected species does not create more work and expense without support and payments. • We should be focusing on food production.	Forestry Farmer/landowner	Explore potential sources of payments.	Medium
Shooting community	• Shooting is very important in economy – really important not to alienate them. Especially small shoots. Need	Forestry Shoot Birds -Piedfly.net		High

	to find ways of engaging with them. • Shooting interests will have very different concerns to the general public – need to be heard. • Density of gamebirds around the proposed release areas, especially on Exmoor, is significantly higher than in the areas where pine marten have been released in the recent past. • Could be a threat to game bird businesses.	BASC members		

7.3 Public meetings

In addition to the purposely small, focussed workshops described above, the Two Moors Project also ran two drop-in sessions to meet with a wider sector of the local community. This was to capture the range of opinions held and inform the general public of pine marten ecology and the aspirations of the project.

This community engagement element took place close to the potential release areas within the PRRs. These open drop-in sessions will be repeated in other communities throughout the project. Two initial drop-in sessions were advertised and held in Porlock (population c.1,440, situated in the north of the Exmoor PRR) and Bovey Tracey (population c.8,000, situated in the south of the Dartmoor PRR).

The sessions included a talk about pine martens and the Two Moors Project followed by a short Q&A session. Any points made were recorded on interview forms. The remainder of the four-hour session allowed detailed interviews with individuals to record viewpoints, concerns and support. Attendees were invited to leave contact details if they wished to receive project updates and/or volunteering opportunities.

All attendees of these workshops were invited to contact the University of Exeter and participate in their Q-method survey - Perspectives of stakeholder representatives and interest groups.

The sessions were advertised through local outlets and social media, as opportunities for local people to find out more about the project. Information was available for people to read.

7.3.1 Public meeting results

A total of approximately 60 people attended the workshops with similar numbers at both. People attended during the whole four hour period, with the majority attending the talks. In addition to the points made during the Q&A session, 23 individual interviews were held (11 at Porlock and 12 at Bovey Tracey). 12 of these wished to receive project updates (Porlock:5, Bovey Tracey:7).

In addition, 4 short forms were completed by people wishing to indicate positive and high level of support for the project and leave their contact details for project updates. 4 people came forward, who were interested in volunteering for the project.

Table 7.3 summarises the responses by broad theme.

Table 7.3. A summary of responses made during the drop-in sessions either as part of the Q&A session or as individual interviews.

Viewpoint theme	Further detail: examples of viewpoints	Stakeholder category if given
A general desire to see return of a native species, particularly in the context of widespread decline of wildlife.	• Overall, think it's good. They should be here. Because of us, they aren't here anymore. • Nature is ruined and we need to make changes. • Native species and should be here. • Recover nature	General
General unspecified benefits and reintroduction support.	• Great idea, we should go ahead and do it. • Landowners in favour- expansion to sites near Witheridge • Increase biodiversity. • Part of our ecosystem • Open mind to reintroductions - benefits of predators • Fully support • Exciting to see -photograph	Exmoor Natural history Society member General
Grey squirrel control	• Predation of grey squirrels • Bringing in predators to combat grey squirrels	General
Benefits to red squirrel	• More supportive of project when it benefits red squirrels. • Red squirrels should come back.	Landowner General

Project / workshop related	• All concerns and question answered – great idea.	General- wildlife volunteer
Exit strategy/ population control	• Exit strategy- if too large numbers- [need to be] controlled. • Localised control where an issue. No problem with them as long as exit plan in place. • If the numbers get large- lethal control? • Mitigation will take too long – UK gov't [re licences to control]. • Worried after landowner permission is sought, pine martens will spread everywhere. – won't stay where released.	Ex hill farmer Landowners
Disease	• Concerned they will carry bTB • bTB transmission/carrying	Landowner
Wildlife predation	• They will eat all things. How can we manage the effect on vulnerable species? • I fear for small birds, struggling species: hedgehogs, dormice etc. • [A lot of comments around bird predation] • Why release another predator? Do we need it?	Landowner General Farmer/landowner

	• Vicious predator killing all birds. Decline of songbirds is solely down to predation. • Would they take otter kits? • If it was framed around corvids and bird recovery you would probably have more farmers on board.	
Nest boxes concerns: birds/bats	• Bird/bat box protection? What is the cost to make these pine marten proof?	Landowner
Ecological habitat, predator / prey concerns	• Concerns of welfare of pine marten. • Fewer rabbits, curlews. Need better food source. Put that back instead of predator. • Want the long-term study of predator populations and habitat in feasibility study.	General Gamekeeper
Livestock / pet predation	• Small mammal and pets [guinea pigs] protection? • Poultry protection [concern] • Need more information on how to keep guineafowl safe. • Son in France gave up keeping poultry as wiped out by pine martens. • What about people's chicken industry? Domestic and business.	Farmer/landowner Gamekeeper

Community	• Farmers need support and help from other farmers. • Got to have everybody onboard otherwise it won't work.	General
Project concerns	• Didn't believe any stakeholder engagement had occurred. • Having a meeting and drop-in session at an awkward time and badly publicised. • Felt feedback would be completely ignored. • Surveys impossible to complete outside of these [drop-ins] and for those without internet and lot of the local community. • Felt [public Uni of Exeter] survey was skewed in favour of project. • Not supportive – would prefer to see them [pine marten] get here naturally.	Landowner

7.4 Media coverage/communications

A media campaign to launch the project took place in summer 2022. This aimed to raise awareness of the project, the pine marten and raise funds. Nine pages on the Devon Wildlife Trust website are dedicated to various aspects of the project from news stories, appeals, the pine marten itself and the project. Included is a Frequently Asked Questions document developed from the initial stakeholder meetings. See https://www.devonwildlifetrust.org/two-moors-pine-marten-project-faqs

A Devon Wildlife Trust fund raising appeal from 2022, raised over £40,000.

https://www.devonwildlifetrust.org/return-pine-marten-appeal

Table 7.4. Summary of TV and Radio coverage July 2022-23

Year	Outlet	Type	Reach
2022	Sky	TV	National
2022	BBC Spotlight	TV	Regional
2022	ITV Westcountry	TV	Regional
2022	BBC Radio Devon	Radio	Local
2022	BBC Radio Somerset	Radio	Local
2022	BBC Radio 4	Radio	National
2022	BBC News 24	TV	National
June 22	The Guardian	Newspaper	National
July 22	The Telegraph	Newspaper	National
eg https://www.telegraph.co.uk/environment/2022/07/22/pine-martens-reintroduced-red-squirrels-could-return/			
July 22	Metro	Newspaper	Regional
May and June 23	Mid-Devon Advertiser	Newspaper	Regional
May 23	Okehampton Times	Newspaper	Local
June22 / July 22	Devon Live	News	Local

May 23	Somerset County Gazette	Newspaper	Local
2022 and 2023	Articles in Wild Devon	DWT publication	Local
2023	BBC Radio Somerset	Radio	Regional

7.5 Common themes from project-led engagement

Over the eight stakeholder workshops there were common themes that emerged quickly, despite the broad range of stakeholder groups present. Some of these were also present in the community drop-in sessions. These were comparable to themes found in other social feasibility studies for pine marten reintroductions and broadly reflected the findings of Bavin *et al*., (2020). Some of the feedback forms came from people either before they attended the workshop or from those who were unable to. Therefore, they may have had limited knowledge about pine marten ecology and the nature of the project.

7.5.1 Nature recovery benefits

The support for restoring nature and a native species was strong within conservation interest groups, the public and some farmers. This view was integrated within a broader desire to increase biodiversity and have better ecosystem function and was the main reason given for supporting reintroduction of pine marten. There was great interest in the project from people who held this viewpoint, and some are now volunteering for the project.

7.5.2 Impacts on extant wildlife

A less confident view displayed apprehension around potential and unknown impacts to wildlife (especially birds) of reintroducing an extirpated predator was commonly expressed by all groups. Learning from previous projects and a greater understanding of the benefits of predation within a healthy ecosystem could allay fears for some people. However, complex ecological themes are not easy to relay, so simple messaging and discussions with people who live with pine marten would allow for a more realistic dialogue around this concern. There was a desire to see habitat improvements and incentives for landowners to create and/or restore woodland habitat.

7.5.3 Risks to pine martens

Concern for the pine marten themselves having insufficient genetic diversity, habitat, prey, and being persecuted was also present. Attendees were keen to see this Feasibility Report when complete and for transparency of the process. Persecution is a major risk for reintroduction of a carnivore, especially one whose decline was primarily due to hunting and persecution. Feedback from BASC members indicated a desire for support and guidance

from the project including up to date information on released pine marten whereabouts, should releases go ahead.

7.5.4 Grey squirrel benefits

There was great interest and support for pine marten controlling grey squirrel, which was generally considered a non-native pest. This was countered with a fear that a protected species would constrain forestry operations. Some were unwilling to consider changing from lethal trapping methods and would need clear advice and guidance in this regard. Guidance available for the control of grey squirrel, such as that produced by Forest Research, consider live trapping or targeted shooting preferable to lethal trapping to avoid the killing of non-target species Controlling grey squirrels in forests (forestresearch.gov.uk). Natural predation by pine marten and goshawk could be part of an integrated pest management approach for grey squirrel control, to aid in woodland habitat restoration and combat potential negative effects grey squirrel has on other wildlife through food competition and predation.

7.5.5 Risks to poultry and gamebirds

Poultry and gamebird predation were strongly identified as areas of risk. Measures can be taken to protect poultry and game species from pine marten predation. An extensive study of pine marten diet in Scotland found that the number of pheasants *Phasianus colchicus* taken by pine martens (2.9/km^2) represented less than 1% of the birds released (Halliwell 1997). This is a small proportion in comparison to other predators, but this relates to free-flying birds. Mammalian predators can cause considerable damage if they get into a pheasant release pen and poultry houses. However, it has been shown that pens and poultry runs can be protected against pine martens and other predators with slight adjustments (for details see Living with pine martens.pdf (vwt.org.uk); https://pinemarten.ie/subject/gun-clubs/ and Balharry (1998)). Support for this in terms of advice and guidance was wanted (see above).

7.6 Reflections from the workshops

There was strong resonance with the findings of the University of Exeter Q-method study (see below); however, a broader range of general viewpoints associated with stakeholder groups were presented due to the larger number of people attending.

The broad aim of the workshops was to identify concerns present in order to inform and adapt project plans, develop mitigation plans and communication plans.

The targeting of audiences to attend specific workshops to discuss their thoughts and concerns resulted in a skew of viewpoints towards the negative, since this was how the workshops were framed for discussion. The larger groups at the public drop-in sessions and the pied flycatcher meeting contrasted, with a wider discussion of benefits and risks noted. The primary motivation for attending these was to ‘find out more about pine martens’ and

to discuss pied flycatcher monitoring and research – hence the focus was broader and drew in participants with a range of viewpoints.

Whilst many concerns were heard within the group discussions, a number of people expressed positive perspectives in separate conversations afterwards, either in person or via email. This extended to frustration with the dominance of negative viewpoints held by the group, suppressing the opportunity to discuss positive aspects.

For some of the concerns, there appeared to be common underlying themes around unwillingness to change habits/ fear of the unknown, concerns about a lack of control and issues around trust of organisations with different agendas e.g., conservation, legislation. Building trust and confidence in the project and its presence and support into the future is of paramount importance.

This process has been able to capture the key concerns of people who live in proximity to potential release areas. These are recognised concerns from previous projects and methods used previously are likely to provide effective mitigation for the Two Moors Project. Practical steps to mitigate potential impacts of pine marten can be developed and, in many cases, already exist. The ongoing process of engagement will be guided by the findings and reflections of the University of Exeter study with its intimate insight of the perspectives of the various stakeholder groups.

7.7 University of Exeter- Perceptions of Pine Marten Reintroduction in South-West England: Results of a Q-Method Stakeholder Study and Regional Public Survey

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7.3.1 Executive Summary

This summarises the methods, key findings and reflections of an independent study carried out by the University of Exeter for the Two Moors Project, and has been adapted from their independently written report. For a full account please read the report by Auster *et al*., (2023) which can be found online at http://hdl.handle.net/10871/134228

Neither the University of Exeter nor individual authors of this report are members of the Two Moors Partnership. The authors of this report were commissioned by the Two Moors Partnership to undertake two research exercises to facilitate an understanding of perceptions that exist about pine marten reintroduction in the south-west. The first of these activities was focused on developing an understanding of perspectives held by key stakeholders or groups that may have an interest if pine marten were reintroduced, for which a technique known as Q-Methodology was used (see Part 1). The second was to complete an exploratory study to capture perceptions held more broadly among residents in the south-west of England, for which an online perceptions survey was undertaken (see Part 2).

Between March and July 2023, two studies were completed in parallel. This is a summary of a factual report that presents the findings from these two studies (see accompanying report).

Part 1. Q-Method: Perspectives of stakeholder representatives and interest groups

To understand stakeholder views, a method known as Q-Methodology was used. Q seeks to identify shared perspectives that exist within a context and understand the subjectivity in depth. For this study the approach was adapted from a previous, peer-reviewed study (Bavin *et al*., 2020).

For participants, the method involves a statement sorting exercise with discussion. Following the analysis procedure, the output resembles a qualitative profile of each identified viewpoint.

The participants included representatives with backgrounds or interests in: farming; land ownership or management; wildlife or conservation; forestry; shooting or gamekeeping; professional environmentalism; and residents living within or near to a proposed release zone.

Table 7.5. Summary of Q-Method study participants.

Participant	Gender	Background / Interest Group
1	Male	Resident in proposed release region and volunteer for environmental organisation
2	Male	Farmer
3	Female	Market trader with farming background
4	Male	Long-time resident in release region
5	Female	Eco-writer and resident near proposed release region
6	Male	Landowner in release site area
7*	Male and Female	Two farmers with poultry
8	Female	Resident with wildlife interest, on committee of an environmental organisation
9	Male	Resident near proposed release region with an interest in wildlife
10	Male	Shooting sports representative
11	Female	Land manager with livestock
12	Female	Volunteer wildlife warden in region of possible release zone
13	Female	Volunteer wildlife warden in region of possible release zone
14	Male	Gamekeeper and conservationist
15*	Male and Female	Farmers and conservationists
16	Male	Independent chartered forester
17	Female	Farmer
18	Male	Farmer
19	Male	Environmental professional
20	Male	Environmental professional and public official
21	Male	Conservation and forestry professional
22	Male	Conservation professional, dedicated to species conservation and enhancement in the UK
23	Female	Conservation professional
24	Male	Environmental farm advisor
25	Male	Landowner and conservationist
26	Female	Species conservation professional
27	Male	Farmer and landowner

Three distinct perspectives were identified. Full, detailed descriptions are provided within the full report. We encourage the reader to read these in full to enable a nuanced understanding. For headlines in brief:

Perspective 1 is favourable to pine martens and perceives there to be potential benefits from reintroduction, which it supports as a point of principle. This perspective is unsure if there would be negative impacts. Participants associated with this perspective were primarily local residents (some of whom had voluntary wildlife roles), as well as an environmental farm advisor and species conservation professional.

Perspective 2 is opposed to pine marten reintroduction. There are strong concerns about the impact of predation on native wildlife, and about predation on poultry and gamebirds. There was a view that there should be more effort to support existing wildlife or habitats before introducing a species which predates. Participants associated with this perspective primarily had interests in farming, landownership, shooting and gamekeeping.

Perspective 3 is favourable to pine martens and believes there would be benefits from reintroduction which is strongly supports. However, support for reintroduction is conditional on the process through which reintroduction takes place, and on there being ecological monitoring. Participants associated with this factor were primarily professionals in forestry, the environment, or conservation.

Whilst there was a high degree of alignment between Perspectives 1 and 3, there was a high degree of divergence between those two perspectives and Perspective 2.

Part 2. Regional Residents' Survey: Public perceptions

To capture an understanding of perceptions among the wider public, an online regional public survey was undertaken. This was open for any resident across the South-West.

880 responses were received, 814 of which were from participants that identified their county of residence to be within the south-west. (Results from the south-west are prioritised in the remaining summary).

Through three multiple choice questions, participants demonstrated a familiarity with the species in question. When asked how much participants felt they knew about pine marten reintroduction in the south-west, most answered either 'I know something about it' or "I have heard something but don't know much".

Participants were asked whether they supported the reintroduction of pine marten in the south-west, to which they could answer on a five-point scale from 'very negative' to 'very positive'. A high majority in this respondent pool took a position of support.

- Groups statistically more likely to support the reintroduction included respondents aged 16-24 or 25-34, and respondents who identified their occupation to be in 'Education'.

- Respondents who identified their occupation to be in 'Farming & Agriculture' were statistically less likely to support the reintroduction.
- A higher proportion of respondents who felt able to express their opinion where it may influence decision makers indicated a position of support, compared to those who did not feel able to do so.
- Among those very supportive of reintroduction, the most frequently given reasons related to: increased biodiversity creating healthier ecosystems; control of grey squirrel populations; and pine martens being a native/indigenous species.
- Among those very opposed to reintroduction, the most frequently given reasons related to: concerns over the effect of pine martens on their prey species; a view that another protected predator will have negative effects on the existing ecosystem; and experiences of pine marten damaging property in other parts of the UK or Europe.

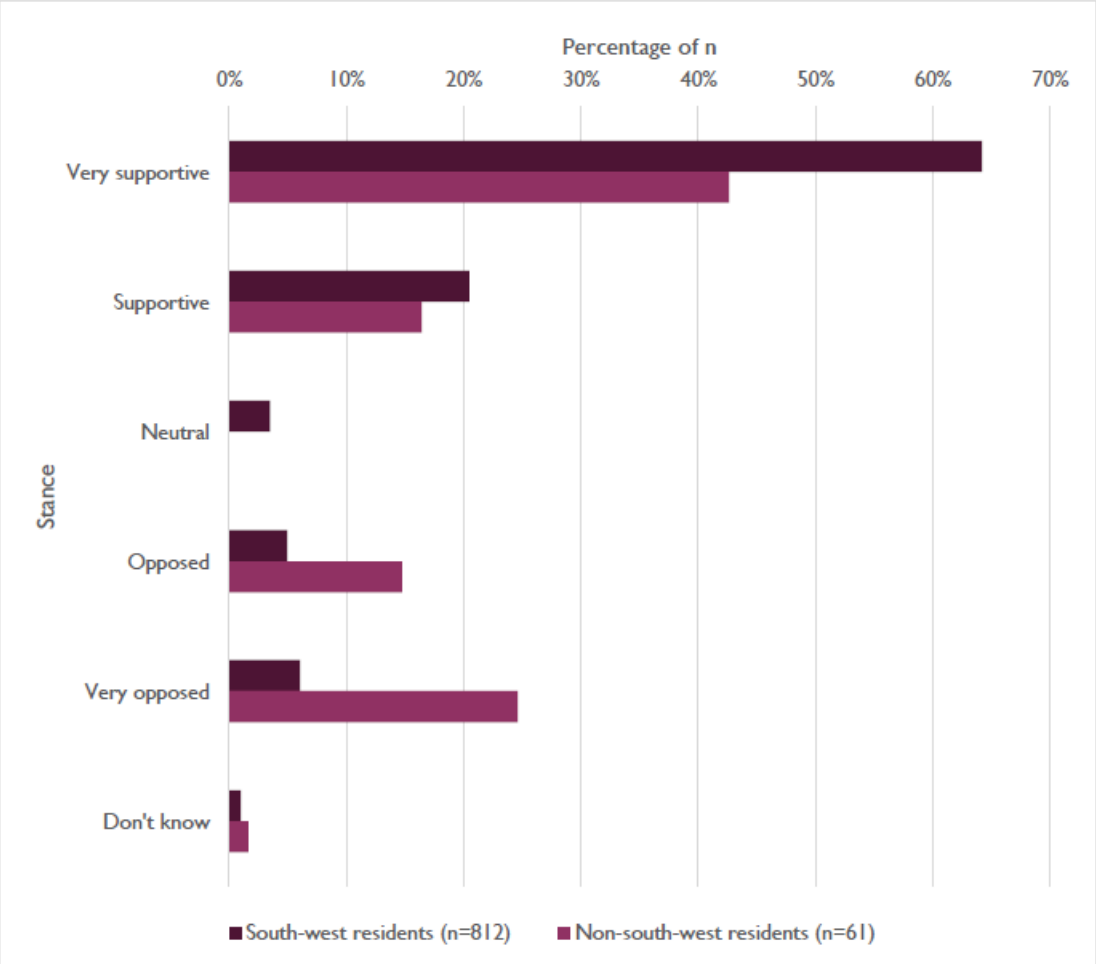

Figure 7.2. Summary of answers to Question 6: "Do you support the reintroduction of pine marten in the south west of England?"

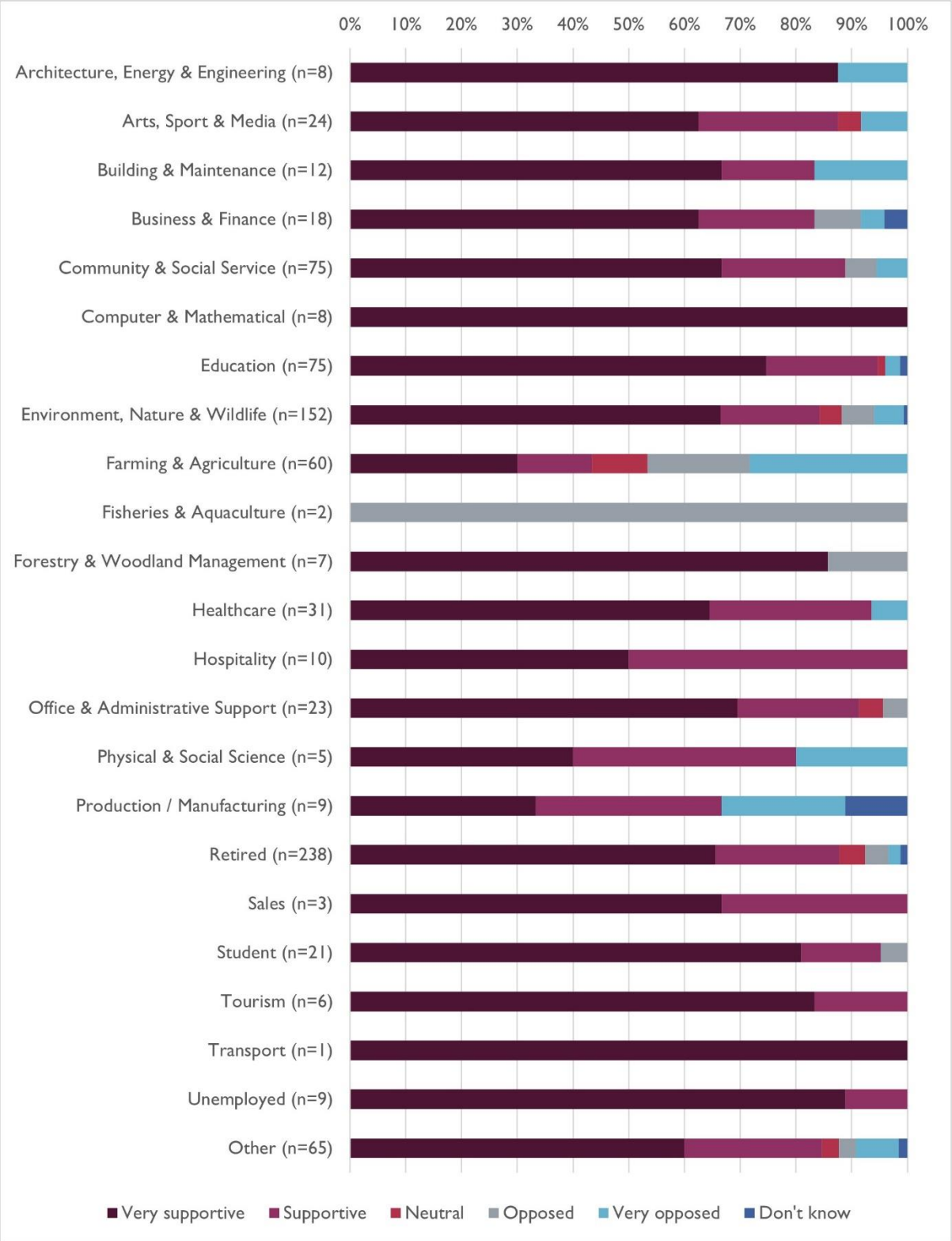

Figure 7.3. Stance on pine marten reintroduction in relation to participant occupations

Participants were asked to rank how important each of a set of conditions would be for support of any pine marten reintroduction project on a scale. Among the mean scores, that which scored as most important was monitoring the ecological impacts of the pine martens, followed by putting in place mitigation measures to manage the risks to pine martens.

Table 7.6. Levels of support for management methods in relation to participant stance on pine marten reintroduction

Management method	Position of support (n=687)	Neutral (n=28)	Position of opposition (n=89)	Don't know (n=8)
Protection of fruit crops (fencing)	36.1%	39.3%	24.7%	62.5%
Increased habitat/woodland coverage and connectivity (woodland planting)	92.6%	57.1%	25.8%	62.5%
Poultry or game bird protection (fencing)	37.7%	53.6%	64.0%	50.0%
Habitat enhancement (e.g. woodland management)	90.0%	64.3%	36.0%	75.0%
Provision of volunteer opportunities (e.g. monitoring)	78.0%	46.4%	11.2%	50.0%
Compensation for losses resulting from pine marten predation	31.7%	57.1%	74.2%	62.5%
Translocation (moving pine marten to another location)	47.5%	50.0%	41.6%	50.0%
Lethal control (or culling)	10.0%	50.0%	87.6%	37.5%
Targeted education, advice and support to enable coexistence with pine martens (e.g. for landowners)	94.2%	64.3%	34.8%	75.0%
Raising awareness and understanding of pine martens (e.g. public events)	92.7%	53.6%	23.6%	87.5%
No management will be necessary	1.9%	0.0%	0.0%	0.0%

Participants were given a list of management techniques and asked to tick which they would support.

- Most highly selected among participants who took a position of support on reintroduction was 'Targeted education, advice and support to enable coexistence with pine martens', followed by 'Raising awareness and understanding of pine martens'.
- Most highly selected among participants who took a position of opposition on reintroduction was 'Lethal control (or culling)', followed by 'Compensation for losses resulting from pine marten predation'.
- Among all groups, least highly selected was 'No management will be necessary'.

Table 7.7. Mean participant scores for importance of management conditions.

Condition	South-west residents (n=812)		Non-south-west residents (n=46)		Forest Research (Ambrose-Oji et al., 2018)	
	Rank	Mean Score	Rank	Mean Score	Rank	Mean Score
Monitoring the ecological impacts of the pine martens (i.e. monitoring impacts on the natural environment or other wildlife)	1	8.8	1	9.1	1	8.2
Mitigation measures to manage the risks to pine martens (i.e. ways to minimise harm to pine martens)	2	8.1	5	7.5	5	7.5
Continuing communication from the reintroduction project team	3	8.0	3	8.3	3	7.9
Putting in place mitigation measures to manage any ecological risks posed by pine martens (i.e. using techniques to try and prevent negative impacts)	4	8.0	2	8.6	2	8.0
The inclusion of community representatives in reintroduction management	5	7.9	8	7.0	4	7.8
Having an agreed plan to deal with problem animals	6	7.4	4	8.1	7	7.4
The establishment of stakeholder forums to input into reintroduction management	7	7.2	5	7.5	8	6.8
Having a robust exit strategy (i.e. having a plan to stop and reverse the reintroduction if required)	8	6.9	7	7.1	5	7.5

Part 3. Researcher reflections

The research team are not the decision-makers on whether or how pine marten reintroduction may proceed in the south-west, not part of the Two Moors Partnership. In this report however, four reflections are given in response to results.

Reflection 1: Perceptions and understandings of predation will be a key factor if this project proceeds. Although challenging, two-way understanding of knowledge, experience, and evidence regarding the role of predation in ecosystems may be required. Stakeholders expect ecological monitoring to be part of a project. Regular and honest dissemination of monitoring findings, as well as information about management / mitigation employed in the event of negative outcomes, is likely to be beneficial.

Reflection 2: Due to polarisation in perspectives, there is a risk of conflict. To overcome this, consideration should be given to how to facilitate a respectful dialogue with and between groups with different views, in a participatory process grounded in listening. Efforts to reach out and build relationships proactively could facilitate trust and feelings of involvement in the process. One consideration may be to form a participatory stakeholder and community partnership or Steering Group (perhaps informed by the Beaver Management Group approach).

Reflection 3: The outcomes of this project will be likely to influence future environmental initiatives in the area, whether reintroductions or otherwise. It may be more difficult to engage with parties in future if they feel they have had a negative experience, or alternatively where parties feel their views have been listened to, there may be greater willingness to engage or participate in other future endeavours.

Reflection 4: The researchers agree with Bavin *et al*., (2020) that Q-Methodology aides a better understanding of stakeholder perspectives. In future, the researchers suggest undertaking Q prior to a public survey to enable opportunity for the Q outcomes to inform the public survey's design.

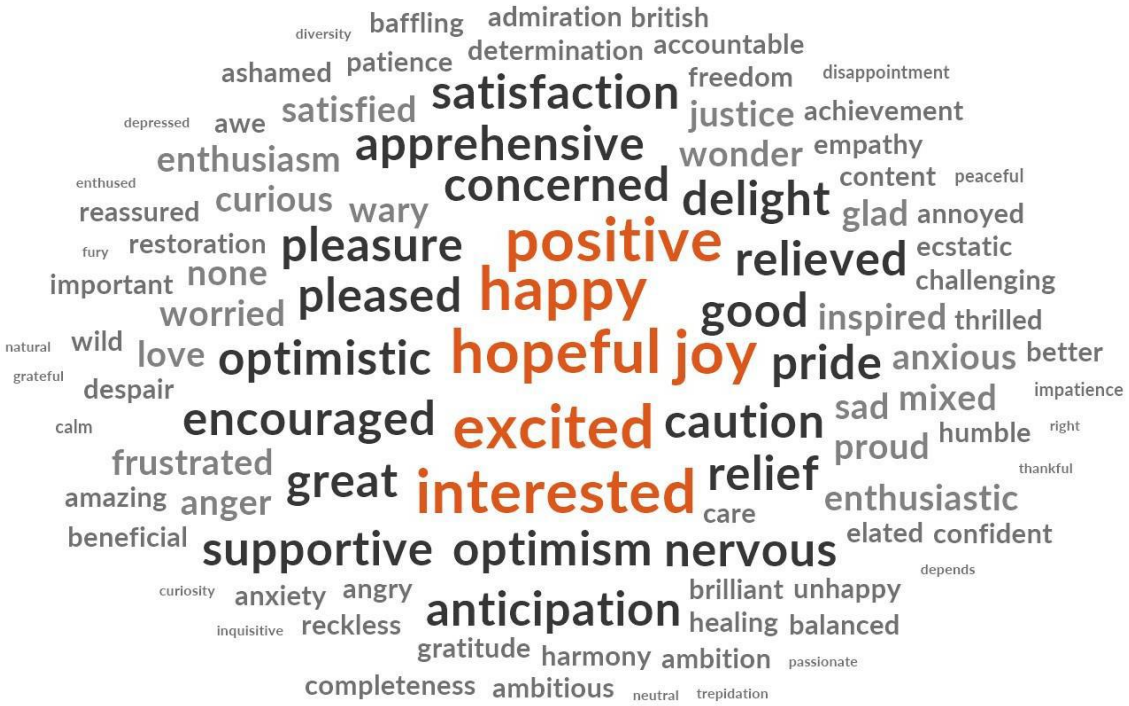

Figure 7.4. Word cloud representing the frequencies of all emotion words used when thinking about reintroductions generally (not specifically pine marten).

7.8 References

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Appendices

Devon Wildlife Trust

Appendix 1. Two Moors Pine Marten Project Risk Register

	Pre Mitigation					Post Mitigation				
CATEGORY	**RISK**	**IMPACT**	**LEVEL**			**CONTROL**	**LEVEL**			
			I	**L**	**C**		**I**	**L**	**C**	
Governance and management	Deterioration in relationships between Steering Group members	Major rift between members and/or organisations threatens effective delivery	4	2	8	Relationships bolstered through regular meetings, events and activities. High quality and timely information provided and successes celebrated collectively. Key governance document agreed and signed including Terms of Reference, MOA and Communications Plan.	2	1	**2**
	Project loses a key delivery partner	Development Phase delivery is seriously constrained	3	3	9	Relationships have been developed during initial feasibility phases - the partnership is therefore highly resilient. Regular meetings, events and activities. High quality and timely information provided.	2	1	**2**
Compliance	Serious breach of H&S resulting in investigation and/or legal action.	Project lead or partner organisations are shut down	4	2	8	DWT has a robust H&S management system. Project Steering group to regularly review all H&S risks and procedures and have an ongoing action plan to address key issues.	4	1	**4**
	Breach of legal requirements around consents, permissions and licences.	Project incurs serious reputational damage	4	2	8	Regular Steering Group meetings are held, appropriate expertise is accessed, high quality reporting is provided by DWT. Detailed applied knowledge of the legal and regulatory frameworks associated with the release. Expert advice and support given by project partners and statutory advisers.	4	1	**4**

	We fail to meet safeguarding requirements and responsibilities when working with young people or vulnerable adults.	We breach legal requirements and incur serious reputational damage.	4	2	8	DWT and partners have strong Safeguarding Policies & systems in place. Project staff have appropriate training and experience. Volunteer training reflects good practice requirements. Project community partners provide guidance and expertise and support targeted work with more vulnerable groups.	4	1	**4**
	Confidentiality agreements are breeched causing Data Protection offences to occur	Serious reputational damage - prosecution.	4	2	8	Data processing and sharing agreements in place. Confidential information kept to a minimum. Names redacted where required. Document status clearly identified.	3	1	**3**
	Project staff, volunteers or partners do not adhere to Equality, Diversity and Inclusion policies or support an inclusive culture within the project.	Failure to meet moral and ethical responsibilities and a key strategic priority of partners. We exclude audiences we wish to involve. Our reputation suffers.	3	2	6	All project plans, systems and processes are subject to accessibility and inclusion audits; appropriate training for staff, volunteers and programme leads; EDI champion appointed on the Project Steering Group to ensure it is appropriately considered; Youth champions appointed to EWG and CWG; diverse audiences and perspectives included in wider project forums and stakeholder groups	3	1	**3**
Operational	Unable to secure consultancy resource within tight development phase timelines for delivery.	Key development phase outputs delayed or undelivered.	3	2	6	Briefs scoped and preferred provider list in place by June. Tender process commence early June (with clarity that appointment subject to NLHF funding) tbc with NLHF. Mitigation plans in place to back fill work from partnership resource.	3	1	**3**

Unable to deliver development phase outputs due to tight timelines	NLHF application not deemed strong enough and elements of the project are off track	3	2	6	Core feasibility and development activity for reintroduction element has been ongoing for some time and related Development Phase activities are achievable. We have a clear plan for the engagement elements which are a key focus of Development Phase. We have a clear plan and partnership in-kind staff committed well in advance to support delivery; and additional resource funded via NLHF to support	3	1	**3**
Loss of key staff members delivering the project	Project delivery is seriously constrained for an extended period	3	2	6	Ensure a great working environment and proper support for team members. Investors in People and HR best practices adhered to. Support provided by the DWT team and partner organisations.	3	1	**3**
Delivery staff are overstretched and/or quality of delivery is compromised.	Quality of work declines. Risk to health and wellbeing. Staff absence.	3	2	6	Project is sufficiently resourced. Clear work plans in place. Investors in People and HR best practices adhered to. Support with work prioritisation. Regular appraisals and 1:1s. Mental health first aiders provide support.	2	2	**4**
Loss of stakeholder / contractor organisations in priority landscapes due to financial hardship	Key skills or financial resources lost	3	2	6	Integrated multifunctional project approach has limited reliance on single contractors or stakeholder bodies.	3	1	**3**
We fail to recruit sufficient volunteers or volunteers leave the project.	We do not have the skills and resources needed to deliver core project activity; we struggle to meet our engagement aims.	3	2	6	Multiple routes to engagement with the project through different and well defined roles and through partners and community links. Well established volunteering programmes and processes for recruitment. Sufficient resource in the project to support volunteer recruitment and support.	2	1	**2**

	Volunteers are unhappy or feel unsupported	We do not have the team culture we value; we don't hold onto volunteers; harder to reach groups are not well supported; reputation suffers.	3	2	6	Adequate staff resource to support; adhere to best volunteering practice and IiV standards; clear volunteering roles with appropriate support and supervision plans; mentors to support less confident volunteers; volunteers involved in shaping project plans through regular stakeholder forums and by assuming leadership roles within the project.	2	1	**2**
Profile and reputation	Community conflicts occur as a result of pine marten behaviour	Project reputation is damaged, detracting from positive achievements secured. Community cohesion is impacted.	2	2	4	Significant investment in engaging with communities and co-creation of a diverse range of events and activities. Social feasibility programme delivered. Detailed mitigation plan agreed and adhered to - with continuous feedback and review.	2	1	**2**
	Negative media coverage as a result of a significant incident, compliance breach or as a result of actions by associated organisations.	Project and partner reputation is damaged	3	2	6	Established comms plan and media protocols shared by all partners. Maintain close involvement in national issues and media stories, take prompt action where needed.	2	1	**2**
Income	NLHF support for the Development Phase is not secured	Project is unable to progress - or outcomes are severely constrained	4	2	8	A high quality bid is submitted which clearly demonstrates the considerable range of benefits that reintroduction will achieve - meeting all NLHF priority outcomes	5	1	**5**
	NLHF support for the Delivery Phase is not secured	Project is unable to progress - or outcomes are severely constrained	4	2	8	A high quality bid is submitted which clearly demonstrates the considerable range of benefits that reintroduction will achieve - meeting all NLHF priority outcomes	5	1	**5**

	Match funding for project not secured during the NLHF Development Phase	Impacts NLHF decision to award funding - project is unable to progress or outcomes are severely constrained	4	3	12	Funding plan in place and supported by project partners; targets are prudent; funding gap underwritten.	1	3	**4**
	Major partner withdraws financial support	Significant funding gap created	4	2	8	Clear funding and partnership agreements in place. Contingency funding opportunities identified.	2	2	**4**
External	Significant reduction in funding available for wider landscape enhancement through agri-environment programmes	Wider project outcomes are not achieved	3	2	6	Close engagement with ELMS tests and trials. Clear and effective communication of project need and outcomes. Ministerial meetings and field visits. Close liaison with farming and wildlife advisers to highlight the benefits of pine martens as a flagship species for scheme support.	3	1	3
	Government revises key legislation which lowers protection for pine martens	Pine marten populations are at risk of localised persecution	3	2	6	Key government agencies are integrated within project governance structure. High quality population status data presented to Natural England.	3	1	**3**
	Failure/difficulty in securing sufficient release sites due to lack of access, suitable habitat	Limitations on scope of release.	3	2	6	Planning to include redundancy of possible sites. Timely site assessment to allow adaptation and compensation elsewhere (Exmoor vs Dartmoor)	1	2	**2**

Failure to secure legal consents to translocate pine martens	Project would be unable to move to delivery phases until issues are resolved	4	2	8	PM reintroductions already established as acceptable so subject to local conditions and DWT strong track record and reputation following ROBT. Feasibility work has already established project area as suitable and a priority for pm reintroduction, key steps of consenting process already underway and will be completed during NLHF development phase. Maintain regular and detailed communication with statutory authorities, receiving feedback and updates to enable timely changes to project plans, and adaptation where required.	3	1	**3**
Failure to secure legal consents due to competing requirements for animals for FoD and/or Welsh project	Project (releases yr 1 or yr 2) delayed until requirments for these projects are resolved	4	2	8	Maintain regular and detailed communication with statutory authorities, receiving feedback and updates to enable timely changes to project plans, and adaptation where required.	4	1	**4**
Legal consenting process takes too long	Project misses opportunity window to access Scottish pine martens resulting in delays to delivery phase	4	2	8	Carefully planned timeline for work; consenting processes already well underway; maintain regular and detailed communication with statutory authorities, receiving feedback and updates to enable timely changes to project plans, and adaptation where required.	3	1	**3**
Outbreaks of notifiable or other diseases, such as foot and mouth disease or avian influenza	Restrictions on team movements in the project area, delivery targets are not met	4	2	8	Pine marten disease risk analysis complete and best practice adhered to. Continue to implement recommended biosecurity measures in line with Government advice.	4	1	**4**

Two Moors Pine Marten Project

Pine marten population status and impacts	High levels of pine marten mortality are recorded	Population viability is severely impacted	4	2	8	Expert advice and guidance has been secured and will be available throughout the project term. Detailed monitoring plans in place which will identify cause of mortality. Mitigation and contingency plans in place if local factors are having an unforeseen impact.	5	1	**5**
	Pine martens exert significant impact on other threatened species populations	Population status of other species declines	4	1	4	Monitoring plans in place. Mitigation plans to be fully developed in consultation with special interest groups during the Development Phase.	4	1	**4**
Community Support	Communities and volunteers don't engage as expected	Project outcomes are not secured and legacy benefits contract	4	2	8	Overwhelming demand and excitement from communities and individuals looking to learn & take action. Partner organisations including local community partnerships will promote.	4	1	**4**
	Landowners / land managers don't engage	A key audience feels alienated and doesn't contribute actively	4	2	8	DWT and partners have strong reputations and established, trusted relationships, with a substantial pool of land manager contacts.	4	1	**4**
	Citizen science participants lose interest and discontinue recording	Key evaluation data is missing. Large numbers of community members are not able to derive significant benefits from engagement	4	2	8	Training and support from specialists enables key individuals to lead & motivate groups into the future. High quality reporting and feedback celebrates volunteer support.	4	1	**4**

	Key new audiences fail to engage with or benefit from the project,	We do not meet engagement aims around reaching and involving new audiences with our work; social feasibility for reintroduction compromised	3	3	9	Excellent audience insight and learning from successful delivery models has informed engagement plans. Sufficient staff and other resource in place to deliver plans and support audiences. Work with community partners to ensure our reach is successful and our approaches respond to audience need and preference. Audience connections and insight will be deepened during the NLHF development phase via further consultation and delivery plans adapted if needed. A strong engagement evaluation framework in place and close monitoring of engagement impacts throughout the life of the project.	3	1	**3**
C19 / or other pandemic	Covid19 lockdown in project areas	Staff activity is restricted. Volunteers are unable to travel and record key data. Important engagement opportunities are constrained.	2	4	8	Robust business continuity plan and project designed with Covid 19 in mind. Covid 19 risk assessments already in place for project activities. Most citizen science activity can be completed without the need to travel a large distance. Volunteers kept engaged through regular communications and online events.	1	4	**4**
	Partnership is strained due to financial hardship	Significant funding gap and delivery targets are not met.	4	2	8	Many partners have already provided their cash contributions or have a formal agreement in place with DWT. New funders have supported the Pine Marten project. Fundraising contingency plan will be adopted in case a major partner is in financial crisis.	3	2	**6**

Volunteering events are curtailed	Number of volunteers actively engaged is lower than expected. Audience reach is constrained.	2	3	6	Project designed with Covid19 restrictions in mind. Many events and activities will be held outdoors, others can be delivered online if necessary. DWT successfully navigated the C19 crisis - lessons learnt will inform response to a new outbreak.	2	2	**4**
Landowners and other key audiences are reluctant to receive visits	Targets for landowner visits and associated benefits for treescapes not met.	4	2	8	DWT and partners have strong reputations and established, trusted relationships with a substantial pool of land manager contacts. Landowners fed back their support for the DWT approach during the pandemic lockdowns.	4	1	**4**

Appendix 2. Red and Amber List bird species recorded as confirmed, probable or possible breeding in one or more 10km squares in the Two Moors potential release region.

Information on predation was taken from the RSPB publication '*The predation of wild birds in the UK. A review of its conservation impact and management*' (Gibbons et al., 2007) and the references therein. All references are listed in the relevant section 5.6.

Species	Red or Amber List	Nest habitat type	% of British breeding distribution in Exmoor PRR	% of British breeding distribution in Dartmoor PRR	Evidence of interaction	Modern environmental differences	Levels of predation by other predators
Cirl Bunting ***Emberiza cirlus***	Red	Hedge of scrub	0	21.43%	No evidence of pine marten predation of cirl bunting could be found. Cirl bunting will breed near woodland but are not woodland dependent. Level of local spatial overlap in the Dartmoor PRR could be extensive.	Conservation status.	See section 5.2.2 for a broad review of other predators of ground-nesting birds.

Common Cuckoo ***Cuculus canorus***	Red	Parasitic	0.38%	0.38%	No evidence of pine marten predation of common cuckoo could be found. Common cuckoos are not woodland dependent. Level of local spatial overlap in the PRRs is expected to be low.	Conservation status.	See Birds introduction for a broad review of other predators of open-nesting birds.
Common Starling ***Sturnus vulgaris***	Red	Tree hole or building	0.36%	0.36%	No evidence of pine marten predation of swift could be found. Common starlings are not woodland dependent. Level of local spatial overlap in the PRRs is expected to be low.	Conservation status	Avian predators, in particular magpies, are the predominant nest predators of common starling. See Birds introduction for a broad review of other predators of cavity-nesting birds.
Common Swift ***Apus apus***	Red	Building, tree hole, nestbox	0.42%	0.42%	No evidence of pine marten predation of swift could be found. Swift are not woodland dependent. Level of	Conservation status. Swifts will use nest boxes.	Pine marten predation unlikely. See Birds introduction for a broad review of

					local spatial overlap in the PRRs is expected to be low.		other predators of cavity-nesting birds.
Dunlin Calidris alpina	Red	Ground in tussock	0	0.47%	No evidence of pine marten predation of dunlin could be found. Dunlins are not woodland dependent. Level of local spatial overlap in the PRRs is expected to be low.	Conservation status.	Main nest predators of dunlin are corvids, gulls and hedgehogs. See Birds introduction for a broad review of other predators of ground-nesting birds.
Eurasian Curlew ***Numenius arquata***	Red	Ground	0.12%	0.06%	No evidence of pine marten predation of curlew could be found. Curlews are not woodland dependent. Level of local spatial overlap in the PRRs is expected to be low.	Conservation status.	Main predators of curlew are corvids, gulls and foxes. See Birds introduction for a broad review of other predators of ground-nesting birds.
Grasshopper Warbler ***Locustella naevia***	Red	In dense vegetation	0.30%	0.42%	No evidence of pine marten predation of grasshopper warbler	Conservation status.	Main predators of grasshopper warbler are rats and weasels

					could be found. Grasshopper warblers are not woodland dependent. Level of local spatial overlap in the PRRs is expected to be low.		Pine marten predation unlikely. See Birds introduction for a broad review of other predators of ground-nesting birds.
Greenfinch ***Cardeulis chloris***	Red	Dense hedges, shrubs and trees	No data	No data	No evidence of pine marten predation of greenfinches could be found. Greenfinches will breed in woodland but are not woodland dependent. Level of local spatial overlap in the PRRs could be extensive.	Conservation status	See Birds introduction for a broad review of other predators of open-nesting birds.
Lesser Redpoll ***Acanthis cabaret***	Red	Tree nesting	0.58%	0.45%	No evidence of pine marten predation of lesser redpoll could be found. Lesser redpoll will breed in woodland. As a woodland	Conservation status.	See Birds introduction for a broad review of other predators of open-nesting birds.

					specialist, levels of overlap in the PRRs could be extensive.		
Lesser Spotted Woodpecker ***Dendrocopos minor***	Red	Tree cavity	0.54%	1.25%	No evidence of pine marten predation of lesser spotted woodpecker could be found. As a woodland specialist, levels of overlap in the PRRs is expected be extensive (**see HRA summary for review**).	Conservation status. Nest box use is minimal.	Lesser spotted woodpecker are negatively associated with grey squirrel density (Stringer et al., 2018), and also suffer predation by great spotted woodpecker. See Birds introduction for a broad review of other predators of cavity-nesting birds.
Linnet ***Linaria cannabina***	Red	Low in bush	0.37%	0.37%	No evidence of pine marten predation of linnet could be found. Linnet may breed near woodland but is not woodland dependent. Level of local spatial	Conservation status.	Avian predators, in particular magpies and carrion crow, are the predominant predators of linnet. See Birds introduction for a

					overlap in the PRRs is expected to be low.		broad review of other predators of ground-nesting birds.
Marsh Tit ***Poecile palustris***	Red	Tree hole	0.84%	0.75%	No evidence of pine marten predation of marsh tit could be found. As a woodland specialist, levels of overlap in the PRRs could be extensive.	Conservation status. Marsh tits are unlikely to use nest boxes.	Marsh tit are predominantly predated by great spotted woodpeckers. See Birds introduction for a broad review of other predators of cavity-nesting birds.
Merlin ***Falco columbarius***	Red	Ground, cliff or nest of other bird, tree nesting	0.60%	0	No evidence of pine marten predation of merlin could be found. Merlins are not woodland dependent. Level of local spatial overlap in the PRRs is expected to be low (**see HRA document for review**).	Conservation status.	Avian predators, in particular corvids, are the predominant nest predators of merlin. See Birds introduction for a broad review of other predators of open and ground-nesting birds.

Mistle Thrush *Turdus viscivorus*	Red	In major fork of old tree	0.37%	0.37%	No evidence of pine marten predation of mistle thrush could be found. Mistle thrush will nest in woodland but is not woodland dependent. Level of local spatial overlap in the PRRs could be extensive.	Conservation status.	Avian predators, in particular corvids, are the predominant nest predators of mistle thrush. See Birds introduction for a broad review of other predators of open-nesting birds.
Northern Lapwing *Vanellus vanellus*	Red	Ground	0	0.19%	No evidence of pine marten predation of lapwing could be found. Lapwings are not woodland dependent. Level of local spatial overlap in the PRRs is expected to be low.	Conservation status.	Main predators of lapwing are corvids and foxes. See Birds introduction for a broad review of other predators of ground-nesting birds.
Red-backed Shrike *Lanius collurio*	Red	Small trees or bushes	0	8.3%	No evidence of pine marten predation of red-backed shrike could be found. Red-backed shrikes will nest in and	Conservation status.	See Birds introduction for a broad review of

					near woodland. Level of local spatial overlap in the PRRs could be extensive.		other predators of open-nesting birds.
Ring Ouzel ***Turdus torquatus***	Red	Ground; in mature heather or under bracken, on rock ledges or slopes	0	0.94%	No evidence of pine marten predation of ring ouzel could be found. Ring ouzel are not woodland dependent. Level of local spatial overlap in the PRRs is expected to be low.	Conservation status.	Main predators of ring ouzel nests are raptors, mustelids and foxes. See Birds introduction for a broad review of other predators of ground-nesting birds.
Skylark ***Alauda arvensis***	Red	Ground among vegetation	0.33%	0.33%	No evidence of pine marten predation of skylark could be found. Skylarks are not woodland dependent. Level of local spatial overlap in the PRRs is expected to be low.	Conservation status.	Main predators of skylark nests are foxes, carrion crows, and adders. See Birds introduction for a broad review of other predators of ground-nesting birds.
Spotted Flycatcher ***Muscicapa striata***	Red	Tree nesting	0.41%	0.41%	No evidence of pine marten predation of	Conservation status. Will	Spotted flycatchers are negatively

					spotted flycatcher could be found. Spotted flycatcher will nest in woodlands but are not woodland dependent. Level of local spatial overlap in the PRRs could be extensive.	sometimes use nest boxes.	associated with grey squirrel density. Avian predators, primarily jays, are also key nest predators of spotted flycatcher. See Birds introduction for a broad review of other predators of open and cavity-nesting birds.
Tree Pipit ***Anthus trivialis***	Red	Ground	0.63%	0.63%	No evidence of pine marten predation of spotted flycatcher could be found. Tree pipits are not woodland dependent. Level of local spatial overlap in the PRRs is expected to be low.	Conservation status.	Tree pipit nests are commonly predated by foxes, badgers, hedgehogs, and mustelids. See Birds introduction for a broad review of other predators of ground-nesting birds.

Turtle Dove ***Streptopelia turtur***	Red	Bush or low trees	0.16%	0.64%	No evidence of pine marten predation of turtle dove could be found. Turtle doves will nest in woodlands but are not woodland dependent. Level of local spatial overlap in the PRRs could be extensive.	Conservation status.	Pine marten predation unlikely. See Birds introduction for a broad review of other predators of ground-nesting birds.
Willow Tit ***Poecile montana***	Red	Tree hole	0.18%	0.72%	No evidence of pine marten predation of willow tit could be found. As woodland specialists, levels of local spatial overlap in the PRRs is expected to be extensive.	Conservation status. Willow tits are unlikely to use nest boxes.	Willow tits are negatively associated with grey squirrel density. Avian predators, primarily jays and great spotted woodpeckers, are key nest predators of spotted flycatcher. See Birds introduction for a broad review of

							other predators of cavity-nesting birds.
Wood Warbler ***Phylloscopus sibilatrix***	Red	Ground	0.87%	0.87%	Pine marten predation of wood warbler has been observed in three studies and has been shown to be higher in areas of greater edge complexity and habitat fragmentation (Maag,et al., 2022; Maziarz *et al*., 2018). As a woodland specialist, levels of overlap in the PRRs are expected to be extensive (**see HRA report for review**).	Conservation status.	Main predators of wood warbler include jays, buzzards, sparrowhawks, pine martens, foxes and badgers. See Birds introduction for a broad review of other predators of ground-nesting birds.
Yellowhammer ***Emberiza citrinella***	Red	Ground or just above	0.41%	0.46%	Yellowhammer predation by pine martens was observed in one study in the Czech Republic, where pine marten predation	Conservation status.	Avian predators, such as carrion crows, jays and magpies, are the primary nest predators of

					accounted for 37% of 178 predation events. However, yellowhammer was one of 13 species predated in the study, so actual number of yellowhammer nests predated by pine martens are likely to be much lower (Mainwaring, 2015). Level of local spatial overlap in the PRRs is expected to be low.		yellowhammers. Other nest predators are small rodents. See Birds introduction for a broad review of other predators of ground-nesting birds.
Bullfinch ***Pyrrhula pyrrhula***	Amber	Bush or scrub	0.39%	0.39%	No evidence of pine marten predation of bullfinch could be found. Bullfinches will nest in woodlands and scrub but are not woodland dependent. Level of local spatial overlap in	Conservation status.	Main nest predators of bullfinch are jays and carrion crows. Stoats are also known to predate their nests. See Birds introduction for a broad review of

					the PRRs could be extensive.		other predators of open-nesting birds.
Common Kestrel ***Falco tinnunculus***	Amber	Tree hole, disused nest and cliff edge	0.37%	0.37%	No evidence of pine marten predation of common kestrel could be found. Common kestrels will nest in woodlands but are not woodland dependent. Level of local spatial overlap in the PRRs could be extensive.	Conservation status. Will use nest boxes.	Avian predators, in particular magpies and carrion crows, are the predominant nest predators of common kestrel. See Birds introduction for a broad review of other predators of open and cavity-nesting birds.
Common Quail ***Coturnix coturnix***	Amber	Ground, under cover	0.46%	0	No evidence of pine marten predation of common quail could be found. Common quails are not woodland dependent. Level of local spatial overlap in the PRRs is expected to be low.	Conservation status.	See Birds introduction for a broad review of other predators of open-nesting birds.

Common Redshank *Tringa totanus*	Amber	Ground	0.10%	0.10%	No evidence of pine marten predation of common redshank could be found. Common redshanks are not woodland dependent. Level of local spatial overlap in the PRRs is expected to be low.	Conservation status.	Main predators of common redshank include corvids, gulls, foxes, hedgehogs and stoats. See Birds introduction for a broad review of other predators of ground-nesting birds.
Common Redstart *Phoenicurus phoenicurus*	Amber	Tree hole or stump	0.79%	0.70%	No evidence of pine marten predation of common redshank could be found. However, as woodland specialists, extensive spatial overlap is expected in the PRRs (**see HRA report for review**).	Conservation status. Common redstart will use nest boxes.	See Birds introduction for a broad review of other predators of cavity-nesting birds.
Common Sandpiper *Actitis hypoleucos*	Amber	Ground in vegetation	0.08%	0.08%	No evidence of pine marten predation of common sandpiper could be found. Common sandpipers are	Conservation status.	See Birds introduction for a broad review of

					not woodland dependent. Level of local spatial overlap in the PRRs is expected to be low.		other predators of ground-nesting birds.
Common Whitethroat ***Sylvia communis***	Amber	Bush, scrub and hedgerows	No data	No data	No evidence of pine marten predation of common whitethroat could be found. Common whitethroats are not woodland dependent but do use scrub and hedgerows. Level of local spatial overlap in the PRRs could be extensive.	Conservation status.	See Birds introduction for a broad review of other predators of open-nesting birds.
Dartford Warbler ***Sylvia undata***	Amber	Near ground in dense vegetation	4.03%	4.70%	No evidence of pine marten predation of Dartford warbler could be found. Dartford warblers are not woodland dependent. Level of local spatial	Conservation status.	See Birds introduction for a broad review of other predators of ground-nesting birds.

					overlap in the PRRs is expected to be low.		
Dipper ***Cinclus cinclus***	Amber	Cavities in riverbank, walls or trees, or cup nest on ledge over water	0.69%	0.62%	No evidence of pine marten predation of dipper could be found. Dippers are not woodland dependent but will nest near and in woodlands. Level of local spatial overlap in the PRRs could be extensive.	Conservation status. Will use nest boxes.	A common predator of dipper is mink (ref below). See Birds introduction for a broad review of other predators of open and cavity-nesting birds.
Dunnock ***Prunella modularis***	Amber	Cup nest in bush, often near ground	0.34%	0.34%	No evidence of pine marten predation of dunnock could be found. Dunnock nest mostly in woodland and hedgerows. Level of local spatial overlap in the PRRs could be extensive.	Conservation status.	See Birds introduction for a broad review of other predators of ground-nesting birds.

European Nightjar ***Caprimulgus europaeus***	Amber	Ground near dead wood	1.23%	2.16%	No evidence of pine marten predation of nightjar could be found. Nightjars are not woodland dependent but do use clearings. Level of local spatial overlap in the PRRs could be extensive.	Conservation status.	Nightjar face predation from many predators, including carrion crows, foxes, hedgehogs, mice and badgers. See Birds introduction for a broad review of other predators of ground-nesting birds.
Meadow Pipit ***Anthus pratensis***	Amber	Ground, near vegetation	0.35%	0.35%	No evidence of pine marten predation of meadow pipit could be found. Meadow pipits are not woodland dependent. Level of local spatial overlap in the PRRs is expected to be low.	Conservation status.	Avian predators, in particular rooks, magpies and carrion crows, are the predominant nest predators of meadow pipit nests. See Birds introduction for a broad review of other predators of ground-nesting birds.

Pied Flycatcher ***Ficedula hypoleuca***	Amber	Tree hole or nestbox	1.50%	1.50%	Pied flycatcher predation was observed in multiple studies and pine martens are seen as a key predator of pied flycatchers in Europe. For example, in a long running Swedish study, pied flycatcher nest predation by pine martens ranged between 5.5% -17.5% of nests (Schölin & Källander, 2011). However, other studies where pine martens and pied flycatchers are in the same study areas found no evidence of predation (**see HRA for review**). Level of local spatial overlap in the PRRs is expected to be extensive.	Conservation status. Pied flycatchers are known to utilise nest boxes extensively in the PRRs.	Pied flycatcher's nests are commonly predated by stoats, weasels and small mammals, as well as jays and great spotted woodpecker (see HRA). See Birds introduction for a broad review of other predators of cavity-nesting birds.

Rook ***Corvus frugilegus***	Amber	Tree nesting	No data	No data	No evidence of pine marten predation of rooks could be found. Rooks are not woodland dependent but will nest in woodland edge habitat. Level of local spatial overlap in the PRRs could be extensive.	Conservation status	See Birds introduction for a broad review of other predators of open-nesting birds.
Short-eared Owl ***Asio flammeus***	Amber	Ground	0.24%	0	No evidence of pine marten predation of short-eared owl could be found. Both species do, however, compete for similar dietary niches. Short-eared owls are not woodland dependent. Level of local spatial overlap in the PRRs is expected to be low.	Conservation status.	See Birds introduction for a broad review of other predators of ground-nesting birds.

Song Thrush ***Turdus philomelos***	Amber	Trees, shrubs and hedgerows	0.34%	0.34%	Song thrush predation by pine martens was observed in two studies in the Czech Republic and Poland (Weidinger, 2009 & Jędrzejewski, 1993). The latter study showed birds accounted for 37% of biomass of pine marten prey. However, song thrush was one of 13 species predated in the study, so unlikely to be of significance at a population level impact. Level of local spatial overlap in the PRRs is expected to be low. Song thrush nest in and near woodlands. Level of local spatial overlap in the PRRs is expected to be extensive.	Conservation status.	See Birds introduction for a broad review of other predators of open-nesting birds.

Sparrowhawk ***Accipiter nisus***	Amber	Tree nesting	No data	No data	Pine martens are considered to be an important predator of sparrowhawks and will also compete with sparrowhawks for their nesting site (Sonerud 1985; Otterbeck, 2019 and refs therein). As woodland specialists, extensive spatial overlap is expected in the PRRs. While no evidence has been found of sparrowhawk within studies of pine marten dietary analyses, raptors as a group occasionally are mentioned. This suggests that sparrowhawk predation is opportunistic only. (See HRA)	Conservation status.	See Birds introduction for a broad review of other predators of open-nesting birds.

Stock Dove ***Columba oenas***	Amber	Tree cavity	0.47%	0.47%	No evidence of pine marten predation of stock dove could be found. Stock doves are not woodland dependent, but will nest in woodland edges, amongst other habitats. Level of local spatial overlap in the PRRs is expected to be low.	Conservation status.	See Birds introduction for a broad review of other predators of cavity-nesting birds.
Tawny Owl ***Strix aluco***	Amber	Tree cavity	0.41%	0.41%	Tawny owls appear in low numbers in pine marten diet in Europe (ed ref). One study in Sweden found predation of tawny owl nests effected nest site selection (Karell *et al.*, 2020). Both species also compete for similar dietary niches (Jedrzejewski, 1993). As woodland specialists,	Conservation status. Will use nest boxes.	See Birds introduction for a broad review of other predators of cavity-nesting birds.

					extensive spatial overlap is expected in the PRRs (**see HRA for review**).		
Willow Warbler ***Phylloscopus trochilus***	Amber	Ground, often in low vegetation	0.34%	0.34%	No evidence of pine marten predation of willow warbler could be found. Willow warblers' nest in woodland edges and woodland scrub. As woodland specialists, extensive spatial overlap is expected in the PRRs.	Conservation status.	See Birds introduction for a broad review of other predators of ground-nesting birds.
Woodpigeon ***Columba palumbus***	Amber	Trees, hedges and ledges	No data	No data	No evidence of pine marten predation of woodpigeon could be found. Woodpigeons nest in woodland and woodland edge, amongst other habitats. Level of local spatial overlap in the PRRs is	Conservation status.	See Birds introduction for a broad review of other predators of open-nesting birds.

					expected to be extensive.		
Wren ***Troglodytes troglodytes***	Amber	Bank, wall, bush or tree cavity	No data	No data	One study found wrens had been cached by pine martens in their den boxes in Scotland and Northern Ireland (Twining *et al*., 2018). Wrens nest in woodland and woodland edge, amongst other habitats. Level of local spatial overlap in the PRRs is expected to be extensive.	Conservation status. Will sometimes use nest boxes.	See Birds introduction for a broad review of other predators of cavity-nesting birds.